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ARTIFICIAL VS. NATURAL: SHOULD AI SYSTEMS BE NAMED AS INVENTORS ON PATENT APPLICATIONS?

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Artificial intelligence ("AI") machines have refashioned the way humans invent over the past two decades. Several inventions by AI machines, such as neural flashlights, fractal containers, and complex lens systems, have outperformed competitors in the market, improved efficiency in the workplace, and alleviated hazards. Recently, the patentability of these inventions has created contention in the legal arena.

Patent law in the United States traces its roots to Article I, Section 8 of the Constitution, which grants Congress the power to seek to advance and promote the progress of science and useful art. Patent law grants inventors monopolies to utilize and sell their inventions for a limited period of time to incentivize innovation so that the public may benefit from new inventions and discoveries.

Unfortunately, patent law in the United States has failed to keep pace with developments in technology, specifically as it relates to inventions developed by AI machines. To the consternation of AI developers, patent law has, ironically, become a major roadblock to patent protection of AI-generated inventions. Dr. Stephen Thaler's recent dispute with the United States Patent and Trademark Office ("USPTO") illustrates the obstacles standing in the way of developers seeking to obtain patents for AI-generated inventions.

Patent law's current interpretation and application prevents inventions by AI systems from receiving patent protection. This directly frustrates the purpose of patent law, since it disincentivizes AI developers from developing creative machines and fails to

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facilitate the dissemination of AI-derived inventions to the public. Accordingly, to realize the full potential of American innovation, several aspects of patent law must evolve to permit AI-generated inventions to receive patent protections.

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I. INTRODUCTION

Artificial intelligence ("AI") systems, particularly in the last two decades, have transformed the world by revolutionizing various industries and improving quality and efficiency of goods and services.[1] For example, in 2003, John Koza capitalized on Darwin's theory of evolution to create "Darwin in the Machine."[2] His creation, dubbed the "Invention Machine," is an evolutionary programming machine which is designed from basic codes and generates innovative solutions and designs.[3] The machine's inventions are created through a process akin to natural selection.[4] Natural selection, the instrument for evolution, is the process whereby organisms pass down to subsequent generations favorable traits which increase the likelihood of survival in the organism's environment.[5] Like natural selection, Darwin in the Machine pairs systems together, and over the course of many generations, or iterations, generates codes that are best suited for an intended purpose.[6]

To the amazement of astronomers and scientists, the machine invented a complex lens system that outperformed top-of-the-line

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[1] Amanda Peterson, *How AI Has Advanced During the 21st Century and Where It's Headed*, PROSAPIEN: ENV'T, HEALTH, & SAFETY BLOG, https://www.prosapien.com/blog/how-ai-has-advanced-during-21st-century-and-where-its-headed/ [https://perma.cc/8M6Q-VKE7] (last visited Oct. 14, 2022).

[2] U.S. Patent No. 6,564,194 (filed Sept. 10, 1999) (issued May 13, 2003).

[3] *See* Jonathon Keats, *John Koza Has Built an Invention Machine*, POPULAR SCI. (Apr. 19, 2006), https://www.popsci.com/scitech/article/2006-04/john-koza-has-built-invention-machine/ [https://perma.cc/WTQ7-XC37].

[4] *Id.*

[5] *Natural Selection*, NAT'L GEOGRAPHIC, https://education.nationalgeographic.org/resource/natural-selection [https://perma.cc/C4AC-AZJU] (last visited Nov. 15, 2022).

[6] Keats, *supra* note 3.

wide-field eyepieces in telescopes and binoculars.[7] The machine synthesized the design "from scratch" for an improved wide-field eyepiece "without starting from a pre-existing good design and without pre-specifying" the number, physical layout, or parameters of the lenses.[8] After randomly generating more than 70,000 prescriptions, the machine evaluated them against the ideal specifications, including wide-field views and minimal distortion.[9] The machine combined the best prescriptions together, redistributing some characteristics and mutating others.[10] After many transformations, the machine was able to meet the ideal design specifications on the 295th generation.[11]

Another AI system took competition to an even higher level. Watson, a computer system that "generates millions of ideas out of the quintillions of possibilities, and then predicts which ones are [best], applying big data in new ways," competed in a 2011 Jeopardy! Challenge.[12] Watson defeated two former Jeopardy! winners in the challenge and, to the disappointment of its opponents, won $1 million.[13] The creativity and self-learning capabilities of Watson stem from its ability to create and evaluate hypotheses based on data input, learn from data output, and store information.[14] Three years later, in 2014, Watson's learning had advanced to the point where it was running a food truck and generating novel recipes and food combinations from various data input.[15]

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[7] John R. Koza et al., *Automated Re-Invention of Six Patented Optical Lens Systems Using Genetic Programming,* GECCO '05: PROC. 7TH ANN. CONF. ON GENETIC & EVOLUTIONARY COMPUTATION 1952 (2005).

[8] *Id.*

[9] *Id.*

[10] Keats, *supra* note 3.

[11] *Id.*

[12] Ryan Abbott, *I Think, Therefore I Invent: Creative Computers and the Future Computers and the Future of Patent Law*, 57 B.C. L. REV. 1079, 1089 (2016).

[13] *Id.*

[14] *See* Jo Best, *IBM Watson: The Inside Story of How the Jeopardy-winning Supercomputer was Born*, *and What it Wants to do Next*, TECH REPUBLIC (Sept. 9, 2013, 8:45 AM), https://www.techrepublic.com/article/ibm-watson-the-inside-story-of-how-the-jeopardy-winning-supercomputer-was-born-and-what-it-wants-to-do-next/ [https://perma.cc/78GC-DPNK].

[15] Abbott, *supra* note 1212, at 1090.

Despite these technological advancements in AI over the course of many decades, the issue of the patentability of AI inventions remains unresolved. The unanswered, operative question is whether an AI system that is the architect of its designs, that is, it "invents" things as the term is used in common parlance, should be granted inventorship. This was the point of contention between Dr. Thaler and the United States Patent and Trademark Office ("USPTO").[16] Dr. Thaler is the developer of the Device for the Autonomous Bootstrapping of Unified Science ("DABUS"), an AI system which is made up of neural networks modeled after the human brain. DABUS creates complex ideas from basic notions through a feedback system that reinforces or removes an idea to achieve a desired result.[17] Dr. Thaler sought to list DABUS as the inventor on two patent applications.[18] However, both the Eastern District of Virginia[19] and the Court of Appeals for the Federal Circuit[20] rejected the notion that non-human entities could be named inventors, as a matter of law.[21]

The current state of the law, as articulated by the District Court and the Federal Circuit Court in Dr. Thaler's case, is impractical, discouraging developers of AI systems from filing patents for AI-generated inventions. The prevailing position is that because patent law uses the terms "person," "individual," and "whoever," an inventor can only be a natural person.[22] This position, however, ignores how these terms are defined in the Dictionary Act,[23] which

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[16] *See In re* Application No. 16/524,350, 2020 Dec. Comm'r Pat. 1, https://www.uspto.gov/sites/default/files/documents/16524350_22apr2020.pdf [https://perma.cc/ZQ9A-YJ6L] [hereinafter USPTO decision].

[17] *Founder*, IMAGINATION ENGINES INC., https://imagination-engines.com/founder.html [https://perma.cc/43FN-3NU9] (last visited Sept. 28, 2022).

[18] Brief of Plaintiff-Appellant at 6, Thaler v. Vidal, 43 F.4th 1207 (Fed. Cir. 2022) (No. 2021-2347) [hereinafter Brief].

[19] Thaler v. Hirshfeld, 558 F. Supp. 3d 238, 245–47 (E.D. Va. 2021).

[20] Thaler v. Vidal, 43 F.4th 1207, 1211 (Fed. Cir. 2022).

[21] *Id.* at 1209 ("At first, it might seem that resolving this issue would involve an abstract inquiry into the nature of invention or the rights . . . of AI systems. In fact, . . . we do not need to ponder these metaphysical matters. Instead, our task begins—and ends—with consideration of the applicable definition in the relevant statute.").

[22] *See infra* notes 75–80, 84, 86, and accompanying text.

[23] 1 U.S.C. § 1.

provides the basis for interpreting terms not clearly defined in statutes, and instead, improperly substitutes how these terms are defined in wholly unrelated statutes. Moreover, this prevailing position on the interpretation and application of inventorship does not account for the intent of Congress and the Founders.

Though the Federal Circuit Court ruled that AI systems cannot be named as inventors on patent applications in Dr. Thaler's case, foreign courts have had compelling reasons to rule otherwise. For example, the Federal Court of Australia interpreted the term "inventor" in accordance with its grammatical use as an agent noun to include natural and non-natural persons.[24] The current interpretation of the term "inventor" adopted by the USPTO and United States courts, and the ambiguity of the judicially-imposed conception requirement, are both incongruent with the purpose of the Patent Act.[25] Accordingly, the USPTO and courts should limit the application of the conception requirement to controversies involving priority of inventorship. The USPTO and the courts should also interpret the term "inventor" to include any person or entity that invents, consistent with the purpose of patent law to incentivize and preserve inventorship. In the alternative, Congress should amend the definition of "inventor" in the Patent Act to include natural and non-natural persons, consistent with the purpose of patent law and the grammatical use of the word. In addition, Congress should relax the disclosure requirement.

This Article proceeds in five parts. Part II discusses relevant patent law concepts. Part III provides an overview of the decisions of the USPTO, the Eastern District of Virginia, and the Federal Circuit Court in Dr. Thaler's case concerning DABUS's inventions. Part IV discusses how the current interpretation and application of the law on inventorship to AI systems is impracticable and frustrates the purpose of patent law. Finally, Part V proposes redefining inventorship as it relates to AI systems, and explores the Federal Court of Australia's decision to recognize AI systems as "inventors."

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[24] *See generally* Thaler v. Commissioner of Patents [2021] FCA 879 (30 July 2021) (Austl.).

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

II. PATENT LAW CONCEPTS

The Patent and Copyright Clause of the U.S. Constitution grants Congress the power "[t]o promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."[26] Patents grant inventors exclusivity to their inventions and the right to preclude others from "making, using, importing, and selling the patented innovation for a limited period of time."[27] However, third parties are allowed to use the invention, so long as they pay royalties to the patent holder.[28] By incentivizing technological advancements and granting inventors the exclusive right to their inventions, patent law seeks to encourage creativity and innovation.[29]

A. The Patent Act

Congress enacted the Patent Act pursuant to the powers granted to it by the Constitution in the Patent and Copyright Clause. The Patent Act allows for patents to be granted to "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof."[30] The Patent Act also defines "inventor" as "the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention."[31] In order to be patentable, an invention must be useful, novel, nonobvious, and not a product of nature.[32] In addition, the specifications of the invention and the processes for developing the invention must be disclosed.[33] The specification requirement deals with disclosures needed to publicly disseminate the information:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to

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[26] *Id.*

[27] *Patent*, LEGAL INFO. INST., https://www.law.cornell.edu/wex/patent [https://perma.cc/7L8K-KANR] (last visited Oct. 15, 2022).

[28] *Id.*

[29] *See id.*

[30] 35 U.S.C. § 101.

[31] § 100.

[32] *Patent*, supra note 27.

[33] *Id.*

> which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.[34]

In many cases, the inventor and the applicant are the same person, and that person would execute an oath confirming that they are the original inventor.[35] It is possible, however, that the applicant and the inventor are two different individuals. Patent law accounts for that, recognizing that "[in] lieu of executing an oath or declaration, . . . the applicant for a patent may provide a substitute statement under the [permitted] circumstances."[36] One such permitted circumstance is "legal incapacity,"[37] which is a category that an AI system falls under, given its lack of ability to execute an oath.

Applicants are expected to name the correct inventor on patent applications, but it is possible that the wrong inventor is named, or the correct inventor is omitted. The law accounts for this possibility by allowing the applicant to amend the application and correct the named inventor:

> [w]henever through error a person is named in an issued patent as the inventor, or through error an inventor is not named in an issued patent, the Director may, on application of all the parties and assignees, with proof of the facts and such other requirements as may be imposed, issue a certificate correcting such error.[38]

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[34] 35 U.S.C. § 112(a).

[35] *See* § 115(a) ("[E]ach individual who is the inventor or a joint inventor of a claimed invention in an application for patent shall execute an oath or declaration in connection with the application.").

[36] § 115(d)(1). "A substitute statement . . . is permitted with respect to any individual who is . . . deceased; is under legal incapacity; or cannot be found or reached after diligent effort." § 115(d)(2).

[37] § 115(d)(2). *Incapacity*, LEGAL INFO. INST., https://www.law.cornell.edu/wex/incapacity [https://perma.cc/8QVT-NNBG] (last visited Oct. 28, 2022). Congress has not defined legal incapacity in the context of patent law, nor has the USPTO adopted a definition or an interpretation. *Id.* However, one common definition of the term in the legal landscape is "[the] lack of ability to understand one's actions when making a will or other legal document." *Id.*

[38] 35 U.S.C. § 256(a).

However, if the applicant knowingly falsifies facts in the application, he or she could be subject to criminal sanctions since it is illegal to make fraudulent statements to governmental agencies.[39]

B. The Leahy-Smith America Invents Act

The Leahy-Smith America Invents Act ("AIA") was passed by Congress with the goal of promoting the purpose of progressing science and useful arts, encouraging innovation, and harmonizing the American patent system with patent systems commonly used in other countries.[40] One of the underlying concerns was the economic impact of a weak patent system which fostered patent litigation.[41] Instead of capitalizing on their patents and reaping their profits, holders of weak patents were suing manufacturing companies who might incorporate the patents in their business operations.[42] In response, Congress sought to eliminate the "legal gamesmanship from the current system that rewards lawsuit abuses."[43]

In addition to improving the efficacy of the patent system, Congress sought to harmonize the American patent law with other patent systems.[44] Prior to the enactment of AIA, the American patent system awarded patents to the party that first conceived and created the invention.[45] Most of the other patent systems, however, award patents to the party that first files for the patent.[46] As a result, U.S. patent applicants who wished to file for patents in a different country encountered difficulties while "navigat[ing] through two different

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[39] 18 U.S.C. § 1001(a)(2) ("[W]hoever, in any matter within the jurisdiction of the executive . . . branch of the Government of the United States, knowingly and willfully . . . makes any materially false, fictitious, or fraudulent statement or representation shall be fined under this title, imprisoned not more than 5 years.").

[40] Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 3, 125 Stat. 284, 293 (2011).

[41] Patrick A. Doody, *Comprehensive Legislative History of the Leahy-Smith America Invents Act*, PILLSBURY L. 1, 6–7 (2012), https://www.pillsburylaw.com/images/content/4/0/v2/4067/AIA-LegislativeHistory-final.pdf [https://perma.cc/TWP4-77GY].

[42] *Id.*

[43] *Id.*

[44] *Id.* at 134.

[45] *Id.*

[46] *Id.*

patent filing systems, adding cost and uncertainty to their package of patent rights."[47] One of the AIA's intended results is altering the priority of inventorship tests by eliminating the "first to invent" analysis and replacing it with the "first inventor to file [for a patent application]" analysis.[48] In explaining what constitutes "first inventor to file," the AIA defined the term "inventor" as the "individual or . . . individuals who invented or discovered the subject matter of" the invention.[49]

C. The Judicially-Imposed Conception Requirement

The conception requirement[50] has long been used to resolve priority of inventorship between two parties filing for patents for substantially similar inventions.[51] Conception, in the context of patent law, is defined as "the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice that constitutes an available conception within the meaning of the patent laws."[52] It is worth emphasizing, however, that the conception requirement was adopted not as an additional measure of determining inventorship, but for use in circumstances where there is a dispute over the

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[47] Patrick A. Doody, *Comprehensive Legislative History of the Leahy-Smith America Invents Act*, PILLSBURY L. J. 1, 134 (2012), https://www.pillsburylaw.com/images/content/4/0/v2/4067/AIA-LegislativeHistory-final.pdf [https://perma.cc/TWP4-77GY].

[48] Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 3, 125 Stat. 284, 293 (2011) ("[C]onverting the United States patent system from 'first to invent' to a system of 'first inventor to file' will promote the progress of science and the useful arts by securing . . . to inventors the exclusive rights to their discoveries and provide inventors with greater certainty regarding the scope of protection provided by the grant of exclusive rights to their discoveries.").

[49] *Id.* at 285.

[50] *See* Mergenthaler v. Scudder, 11 App. D.C. 264, 276 (D.C. Cir. 1897). In 1897, the Court of Appeals of the District of Columbia established the conception test to resolve priority of inventorship between two parties filing for patents, thereby setting precedent that the court follows today. *Id.*

[51] *See e.g.,* Dawson v. Dawson, 710 F.3d 1347 (Fed. Cir. 2013) (resolving priority of inventorship for a method of treating eye infections); Sanofi-Aventis v. Pfizer Inc., 733 F.3d 1364 (Fed. Cir. 2013) (resolving priority of inventorship for DNA segment used in therapeutics).

[52] Townsend v. Smith, 36 F.2d 292, 295 (C.C.P.A. 1929); *Dawson*, 710 F.3d at 1352.

entitlement to inventorship.[53] The misconstruction of these laws is the main reason AI-generated inventions are not protected.

III. DABUS'S INVENTIONS AND DR. THALER'S ATTEMPT TO SECURE PATENT PROTECTIONS

Inventions involving AI have surged in the past two decades.[54] In fact, from 2002 to 2018, AI patent applications more than doubled from 30,000 to 60,000.[55] Advances in AI technology have allowed AI machines to independently carry out tasks that would normally require human intelligence, such as writing newspaper articles, creating software, designing paintings, and even generating other AI systems.[56] DABUS is an illustration of how far AI technology has progressed.

A. DABUS and its (Un)Patentable Inventions

"[W]hat fires together, wires together."[57] This axiom is used to describe the process by which neurons acquire knowledge, the same mechanism used by DABUS.[58] The machine is made up of neural networks and each network consists of layers of connection points.[59] These nodes transmit information and feedback from the bottom layer, which is provided with the basic training data, to the top

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[53] *Townsend*, 36 F.2d at 294–95 ("The sole question at issue in this case is the question of priority as between the appellant and appellee . . . . A complete conception as defined in an issue of priority of invention . . . .").

[54] *See* 5 USPTO, *Inventing AI—Tracing the Diffusion of Artificial Intelligence with U.S. Patents* 2 (2020), https://www.uspto.gov/sites/default/files/documents/OCE-DH-AI.pdf [https://perma.cc/6W27-KMJF].

[55] *Id.*

[56] Shlomit Yanisky Ravid & Xiaoqiong (Jackie) Liu, *When Artificial Intelligence Systems Produce Inventions: An Alternative Model for Patent Law at the 3A Era*, 39 CARDOZO L. REV. 2215, 2219 (2017).

[57] Christian Keysers & Valeria Gazzola, *Hebbian Learning and Predictive Mirror Neurons for Actions, Sensations and Emotions,* 369 PHIL. TRANSACTIONS ROYAL SOC'Y 1, 2 (2014) (discussing how psychologist Donald Hebbs, who coined this axiom, was interested in the functioning of brain cells).

[58] *Frequently Asked Questions*, ARTIFICIAL INVENTOR PROJECT, https://artificialinventor.com/frequently-asked-questions/ [https://perma.cc/Q7US-G7JN] (last visited Nov. 1, 2022).

[59] *Id.*

layers, through intermediary layers where the evaluation occurs.[60] If the connection exceeds the threshold value, the node will send the data to all the other nodes in the intermediary layers.[61] The connections that are transformed in the intermediary layers eventually reach the output layer, leading to the formation of a new idea or concept.[62]

Another way to understand this process is to envision a big circle that engulfs the semantic space of the machine. Within this circle are tiny circles representing foundational ideas.[63] As the machine crosses over two tiny circles, a potential new concept is born and that process is repeated over and over again.[64] Then, the concepts are crossed over until the machine exhausts all the possible permutations.[65] However, not all potential ideas make it out of the big circle, only the ones that exceed the threshold.[66]

Dr. Thaler developed DABUS to "simulate[] human brainstorming and create[] new inventions."[67] DABUS invented two designs, the neural flame and the fractal container,[68] whose patentability gave rise to the issue of whether a non-human entity could be listed as an inventor on a patent application. The neural flame is a flashing light "that emits light with a [] pulse frequency based on specific rhythm at which the brain's stream of consciousness occurs," which is more effective at attracting an

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[60] Larry Hardesty, *Explained: Neural Networks,* MASS. INST. TECH. NEWS (Apr. 14, 2017), https://news.mit.edu/2017/explained-neural-networks-deep-learning-0414 [https://perma.cc/RU4A-TVL4].

[61] *See id.* ("If the number exceeds the threshold value, the node 'fires,' which in today's neural nets generally means sending the number—the sum of the weighted inputs—along all its outgoing connections.").

[62] *See id.*

[63] Strange Loop Conference, *"Creative Machines" by Joseph Wilk (2013)*, YOUTUBE (Feb. 26, 2021), https://www.youtube.com/watch?v=92s_loXgaCM [https://perma.cc/6HK6-ZEEG].

[64] *Id.*

[65] *Id.*

[66] *Id.*

[67] Meshandren Naidoo, *In a World First, South Africa Grants a Patent to an Artificial Intelligence System*, QUARTZ (Aug. 9, 2021), https://qz.com/africa/2044477/south-africa-grants-patent-to-an-ai-system-known-as-dabus [https://perma.cc/2QX2-2AAB].

[68] Brief, *supra* note 1818, at *2.

individual's attention than other flashing lights.[69] This light source is very helpful as an emergency alarm in an environment containing flickering lights, which might otherwise interfere with the typical flashing emergency light.

The fractal container has an intricately detailed structure "design[ed] with pits and bulges that enables multiple containers to be coupled together."[70] The container's interlocking structure is practical, saving up space needed to store the containers and making it possible for robots to pick up the containers and stack them.[71] This structure is useful because it makes it possible to allocate the human workforce to more sophisticated tasks. This structure is also mechanically useful as it preserves the temperature of the container at a steadier rate than that of a typical container.[72]

B. DABUS's Inventorship Case Before the USPTO and Federal Courts

In July 2019, Dr. Thaler applied for patents with the USPTO for DABUS's two inventions, listing himself as the applicant and DABUS as the inventor.[73] He also provided a substitute statement as DABUS's legal representative in lieu of DABUS executing the inventor's oath.[74] Furthermore, he filed a statement of inventorship explaining how and why the inventions were completely conceived by DABUS.[75] In this statement, he plainly stated that "DABUS was not . . . trained on any special data relevant to the instant invention[s]" and "identified the novelty and salience of the instant invention."[76]

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[69] Stanley M. Gibson & Jessica P. G. Newman, *What Happens When Artificial Intelligence Invents: Is the Invention Patentable?,* 41 AI MAG. 96, 97 (2020).

[70] *Id.*

[71] *See* Naidoo, *supra* note 67.

[72] *See Patents and Applications*, ARTIFICIAL INVENTOR PROJECT, https://artificialinventor.com/patent-applications/ [https://perma.cc/7PUJ-AGD2] (last visited Oct. 29, 2022).

[73] Brief, *supra* note 1818, at *2.

[74] *Id.* at *6.

[75] *Id.* at *6–*7.

[76] *Id.* at *7.

Dr. Thaler did not list himself as the inventor of the neural flame or fractal container, since doing so would subject him to criminal sanctions for making a false statement to the USPTO because he did not "contribute[] to the conception of the instant invention[s]."[77] The USPTO was unpersuaded, and denied DABUS's patent application for both inventions, determining that the patent statute does not include a broad interpretation of the term inventor and therefore, DABUS could not be an "inventor" for the purposes of the patent.[78]

The USPTO considered four factors in determining that DABUS could not be listed as an "inventor" on the patent.[79] First, it considered the dictionary definition of the term "whoever," which it concluded extends to natural persons only.[80] Second, it considered the use of "pronouns specific to natural persons" in the statute.[81] It argued that the statute does not use pronouns that refer to *all* things but is limited to pronouns normally associated with *living* things.[82] Third, it applied its analysis from an earlier decision ruling that a non-natural person, like a state, cannot be an inventor.[83] Fourth, it considered the applicability of the conception requirement and its use of the terms "mental" and "mind" which "indicate[] that conception must be performed by a natural person."[84]

Dissatisfied with the USPTO's decision, Dr. Thaler exercised his right to seek judicial review.[85] Dr. Thaler incorporated the statements he made to the USPTO in the initial patent application in his argument before the Eastern District of Virginia.[86] Moreover, he made policy arguments stating that "the Court should seek to give effect to Congress's intent 'to create a system that would encourage

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[77] *Id.* at *7.

[78] USPTO decision, *supra* note 16, at 6, 84.

[79] *See infra* notes 77–81.

[80] USPTO decision, *supra* note 16, at 6, 84.

[81] *Id.* at 4.

[82] *See id.*

[83] *Id.* at 4–5 (citing Univ. of Utah v. Max-Planck-Gesellschaft Zur Forderung Der Wissenschaften E.V., 734 F.3d 1315, 1323 (Fed. Cir. 2013)).

[84] *Id.* at 4–6.

[85] Brief, *supra* note 18, at *12; 5 U.S.C. § 702 ("A person suffering legal wrong because of agency action, or adversely affected or aggrieved by agency action within the meaning of a relevant statute, is entitled to judicial review thereof.").

[86] Thaler v. Hirshfeld, 558 F. Supp. 3d 238, 245 (E.D. Va. 2021).

innovation, as well as to promote disclosure of information and commercialization of new technologies.'"[87]

Unfortunately for Dr. Thaler and DABUS, the district court granted the USPTO's motion for summary judgment, reasoning that (1) Congress used only the word individual to define the term inventor; (2) the United States Supreme Court concluded that the term individual as used in another statute refers to a natural person; (3) the Federal Circuit Court had previously ruled that "inventors must be natural persons;" and (4) there is no support for the argument that "policy considerations should override the plain meaning of" the statutory term "inventor."[88]

Dr. Thaler appealed the district court's decision to the Federal Circuit Court.[89] The Federal Circuit Court affirmed the district court's ruling and further reasoned that if Congress had intended inventorship to extend to non-humans, it would have used terms like "itself" instead of "himself" or "herself."[90] Not only is this analysis incongruent with the proper application of the law, but it also does not serve the purpose of patent law.

IV. HOW THE CURRENT INTERPRETATION OF THE LAW ON INVENTORSHIP AND ITS APPLICATION TO AI SYSTEMS IS IMPRACTICAL AND FRUSTRATES THE PURPOSE OF PATENT LAW

It is quite arduous for the legal system to keep up with technological advancements, especially since the law "is at least five years behind technology."[91] Dr. Thaler's experience with the USPTO is illustrative of how the current state of the law prevents AI developers from seeking protections for inventions created by their AI systems. The common denominator between AI systems,

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[87] *Id.* at 247–48.

[88] *Id.* at 244–49; Beech Aircraft Corp. v. EDO Corp., 990 F.2d 1237, 1248 (Fed. Cir. 1993) (stating that corporations cannot be named inventors because only natural persons can be inventors).

[89] *See* Thaler v. Vidal, 43 F.4th 1207, 1210 (Fed. Cir. 2022).

[90] *Id.* at 1211.

[91] Manav Tanneeru, *Can the Law Keep Up with Technology?*, CNN (Nov. 17, 2009, 10:08 AM), http://www.cnn.com/2009/TECH/11/17/law.technology/index.html#:~:text=%22Generally%2C%20it%20is%20at%20least,catch-up%2C%20experts%20said [https://perma.cc/8NA8-3NZ4].

like DABUS and Watson, is that their inventions could only be eligible for a patent if a human were named as the inventor under the current interpretation and application of the law. Such inventions, like many other AI-generated inventions, are innovative, helpful, novel innovations and, therefore, fit the criteria for patentability.[92]

Since listing an entity that does not contribute to the creation of the invention fails to satisfy patent law's requirement of listing the correct inventor, a patent would not be issued.[93] AI developers are left to wonder whether an AI system's inventions can be protected. This ambiguity would ultimately result in a choice between two unsatisfactory options: file for patent protection by listing a natural person as the inventor and face the repercussions of having the protection invalidated, or avoid filing for patent protection and suffer potential exploitation of the invention.

Imagine, for example, that an AI system with self-learning capabilities invents a new method to detect and isolate viral particles.[94] Because the tech company who created the AI would likely want to protect the AI's invention, it lists the AI's developers as the inventors in conformity with the current requirement of a "natural person" for inventorship.[95] Then, a pharmaceutical company that wishes to use this patented method discovers that the intricacy with which this method was conceived could not have been solely invented by the developers. The pharmaceutical company could call into question the validity of the patent, and the tech company would not be able to prove that the listed inventors conceived this invention. Although patent law allows the applicant to correct the named inventor,[96] the tech company, under the current

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[92] *See* 35 U.S.C. §§ 102–03.

[93] *See* § 101.

[94] For background on this type of technology, *see* Nanyang Tech. Univ., *Scientists Create Device that Uses 'Light Tweezers' to Trap and Move Viruses,* SCIENCEDAILY (Oct. 27, 2021), https://www.sciencedaily.com/releases/2021/10/211027122115.htm [https://perma.cc/7LQE-69ZZ] (describing an invention that "uses 'light tweezers' to trap and move viruses," which could aid in vaccine research and development).

[95] Thaler v. Vidal, 43 F.4th 1207, 1208 (Fed. Cir. 2022).

[96] 35 U.S.C. § 256 ("Whenever through error a person is named in an issued patent as the inventor, or through error an inventor is not named in an issued

law, would be unable to list the AI system as the inventor. Instead, under the current law, the USPTO could invalidate the patent for failure to name the correct inventor,[97] and the pharmaceutical company would be free to use this method, leaving no legal recourse to the tech company overseeing the AI system that created it. The tech company not only lost its investment in the AI system, but is now hesitant to pursue other AI-created inventions because it cannot guarantee those inventions will be protected. This uncertainty is exactly what patent law should serve to prevent. Ambiguities in key aspects of patent law, in addition to flawed and inconsistent interpretations of terms within the Patent Act, have resulted in a legal regime wherein AI systems cannot be listed as inventors. This system leaves an entire class of inventions devoid of patent protection, directly impinging on the intent and purpose of patent law.

A. The Ambiguity and Limitations of the Conception Requirement

Steve Jobs and his first ever patent, titled "Personal Computer," provides a useful illustration of the ambiguity and limitations of the conception requirement.[98] While there is no doubt that Jobs is the creator of the personal computer, he did not magically appear on this earth.[99] It would seem unreasonable for his parents to claim that they were the inventors of the personal computer simply because they created him.[100] Although it is clear that his parents helped contribute to his success, Jobs put in the time, energy, creativity, and effort to create the invention.[101]

This is where the idea of conception comes in. Conception, in the context of patent law, refers to "the formation in the mind of the

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patent, the Director may . . . issue a certificate correcting such error . . . . The error of omitting inventors or naming persons who are not inventors shall not invalidate the patent in which such error occurred if it can be corrected as provided in this section.").

[97] USPTO, MPEP § 2104 (9th ed. rev. 10, Oct. 2019) [hereinafter MPEP].

[98] Antonio Regalado, *Steve Jobs Lives on at the Patent Office*, MIT TECH. REV. (Nov. 27, 2014), https://www.technologyreview.com/2014/11/27/170289/steve-jobs-lives-on-at-the-patent-office/ [https://perma.cc/JET3-K3M9].

[99] *Id.*

[100] *Id.*

[101] *Id.*

inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice."[102] However, when the focus shifts from the "who" and the "what" to the "how," the lines become blurry. This is not to say that envisioning an end product is not valuable for creating inventions, but that it is difficult to prove purely subjective processes that are formed in the mind. In Steve Jobs's example, it would be difficult to prove that he began the development process with a clear mental picture of the full and complete personal computer, which he reduced to practice.

Oddly enough, while the conception requirement is in place to protect inventorship, it requires that, in addition to forming a mental picture of the final product, "[t]here must be a contemporaneous recognition and appreciation of the invention for there to be conception."[103] Apart from the ambiguity of the "formation in the mind" element, if person A invents a water-resistant car paint, that person would be the inventor regardless of whether anyone else recognized and appreciated the invention. If an AI machine, developed by person A, invents a water-resistant car paint—and if one of A's employees, who helped A with developing the AI system, notices and appreciates the invention before A does—it is very possible that the employee would satisfy the so-called conception requirement. This approach is questionable in cases in which the natural person has not contributed to the invention.

The conception requirement was created to protect patent ownership for the entity that first invented a product.[104] To determine the priority of invention, the Board of Patent Appeals and Interferences[105] conducts interference proceedings,[106] during which "evidence may be presented of conception, reduction to practice, and diligence, as appropriate to the positions of the parties."[107] Lack

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[102] Mergenthaler v. Scudder, 11 App. D.C. 264, 276 (D.C. Cir. 1897).

[103] MPEP, *supra* note 97, § 2138.05.

[104] Hyatt v. Boone, 146 F.3d 1350, 1351 (Fed. Cir. 1998); 35 U.S.C. § 102(g).

[105] The Board of Patent Appeals and Interferences was replaced with "Patent Trial and Appeal Board." Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 3, 125 Stat. 284, 290 (2011) (codified as amended at 35 U.S.C. § 146).

[106] "Interference proceeding" was replaced with a "derivation proceeding." *Id.*

[107] *Hyatt,* 146 F.3d at 1351.

of evidence of conception (the formation in the mind of the inventor) should not be used to deny inventorship, but merely to determine priority of invention if two parties simultaneously conceived of a substantially similar invention.[108] Even then, however, with the modernization of patent law and the transition to the "first to invent" system,[109] the conception requirement seems pointless because the determination rests solely on which party files for a patent application first.

As it is applied by the USPTO and interpreted by courts, the conception requirement runs counter to congressional intent. A similar judicially-imposed requirement for patents, the "flash of creative genius" doctrine,[110] which required the inventor to conceive of his or her invention as a result of a sudden, intelligent idea, was rejected by Congress in 1952.[111] Congress eliminated the flash of genius requirement and incorporated language in the Patent Act prohibiting patents from being denied based on how an invention was made, stating that "[p]atentability shall not be negated by the manner in which the invention was made."[112] This language insinuates that the creativity of the invention should be the subject of inquiry and that the use of thought processes to determine eligibility for inventorship should be very limited in scope[113]

As applied to inventions by AI systems, the conception requirement works as a complete bar to obtaining a patent. Not only does the conception requirement conflict with the transition to the "first to invent" system,[114] but it deters individuals who are otherwise

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[108] *Id.*

[109] Leahy-Smith America Invents Act § 3.

[110] Cuno Eng'g Corp. v. Automatic Devices Corp., 314 U.S. 84, 91 (1941) (requiring that the invention "must reveal the flash of creative genius, not merely the skill of the calling").

[111] Act of July 19, 1952, ch. 950, 66 Stat. 792 (1952) (revising and codifying laws relating to patents).

[112] 35 U.S.C. § 103.

[113] Graham v. John Deere Co. of Kan. City, 383 U.S. 1, 17 n.8 (1966) ("[I]t is immaterial whether [the invention] resulted from long toil and experimentation or from a flash of genius.").

[114] Leahy-Smith America Invents Act § 3.

able to obtain patents from filing applications due to their inability to recall the exact process by which they conceived their inventions.

B. The Inconsistent and Erroneous Interpretation of the Term "Whoever" in Patent Law

In DABUS and Dr. Thaler's case, both the USPTO and the federal courts took the position that the term "inventor" is understood to mean a natural person.[115] Part of the USPTO's analysis was centered on the use of the term "whoever" in the section addressing patent infringement, which reads that "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter . . . may obtain a patent therefor, subject to the conditions and requirements of this title."[116] The USPTO argues that because a dictionary definition of the term "whoever" is "whatever person: no matter who,"[117] the term "'whoever' as it is used in patent law suggests a natural person."[118] The Federal Circuit Court did not think the term "whoever" was controlling in its analysis of what qualifies as an inventor, arguing that using the term "whoever" to include "non-humans" in the context of patent infringement does not indicate that "non-humans" can also invent.[119] However, the problem with the discrepancy in the interpretation of the plain language of the statute remains unresolved.

The term "whoever" as it is used in the section of the Patent Act addressing patent infringement[120] includes corporations and

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[115] *See supra* notes 78–83, 87, 89, and accompanying text.

[116] 35 U.S.C. § 101.

[117] *Whoever*, MERRIAM-WEBSTER DICTIONARY, https://www.merriam-webster.com/dictionary/whoever [https://perma.cc/8XGE-Z5VQ] (last visited Sept. 29, 2022).

[118] USPTO decision, *supra* note 16, at 4.

[119] Thaler v. Vidal, 43 F.4th 1207, 1212 (Fed. Cir. 2022) ("Section 271 . . . uses 'whoever' to include corporations and other non-human entities. That non-humans may infringe patents does not tell us anything about whether non-humans may also be inventors of patents. The question before us inevitably leads back to the Patent Act's definition of 'inventor,' which uses the word 'individual'—and does not use 'whoever.'").

[120] 35 U.S.C. § 271(a) ("Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention,

non-human entities,[121] yet the USPTO determined that "whoever," in the context of the section addressing patentable inventions[122] does not include non-natural persons.[123] While the Federal Circuit Court is correct in arguing that infringement is not indicative of invention,[124] the issue here is the inconsistency in the use of the term "whoever" that is interpreted differently within the same statute.

Ironically, the USPTO relied on a dictionary definition that uses the terms "person" and "who." The Dictionary Act, enacted in 1871, is (or should be) the courts' first resort when interpreting common words like "person," "whoever," "writing," and "officer," among many other terms.[125] The terms "person" and "whoever," which are central to this discussion, "include corporations, companies, associations, firms, partnerships, societies, and joint stock companies, as well as individuals."[126] It does not follow, therefore, that the term "whoever" is used to refer only to natural persons when there is indication to the contrary.

Moreover, it is unprecedented for an agency to adopt an interpretation based on secondary sources—such as a dictionary—when Congress has clearly defined the term.[127] Not only was the USPTO's interpretation of the language in the section concerning patentable inventions erroneous, but it was also in violation of principles of statutory construction.

The inconsistent and erroneous interpretation of the term "whoever" in patent law precludes AI-generated inventions from receiving the protections and benefits of patents, thereby impeding innovation.

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within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.").

[121] *Vidal*, 43 F.4th at 1212.

[122] 35 U.S.C. § 101.

[123] USPTO decision, *supra* note 16, at 4–6.

[124] *Vidal*, 43 F.4th at 1212 ("That non-humans may infringe patents does not tell us anything about whether non-humans may also be inventors of patents.").

[125] 1 U.S.C. § 1. This, however, does not preclude Congress from passing new legislation that clarifies the meaning of less common words, such as inventor.

[126] *Id.*

[127] Hughes Aircraft Co. v. Jacobson, 525 U.S. 432 (1999) ("Where the language [of a statute] provides a clear [definition], [the inquiry] should end[] there . . . .").

C. The Erroneous Interpretation of "Individual" in Patent Law

When deciding DABUS and Dr. Thaler's case, both the USPTO and the federal courts asserted that, because the section dealing with the inventor's oath uses the term "individual," an inventor could only be a natural person.[128] In assessing the term "individual," the federal courts adopted the reasoning of the United States Supreme Court in *Mohamad v. Palestinian Authority*.[129] In *Mohamad*, the inquiry was limited to whether a corporation could be considered an individual under the Torture Victim Protection Act ("TVPA"). TVPA mandates that "[a]n individual who, under actual or apparent authority or color of law . . . subjects an individual to torture shall, in a civil action, be liable for damages to that individual."[130] In the context of the TVPA, the Court ruled that "only a natural person is an 'individual' who can be held liable."[131]

There are two issues with courts relying on this ruling when assessing the meaning of "individual" in the Patent Act. In their assessments of the term "individual," the courts did not distinguish natural persons from AI systems. The *Mohamad* Court also noted that "Congress plainly evinced its intent in the TVPA not to subject organizations to liability."[132]

In *Mohamad,* the Court determined that, for the purposes of liability under TVPA and in accordance with congressional intent, liability is limited to natural persons. But still, that interpretation only applies in suits arising under TVPA.[133] Evidently, the interpretation of "individual" in *Mohamad* does not extend to the term "individual" as it is used in the Patent Act.

However, the reasoning in *Mohamad* could be indicative of how the Court would rule if it had to analyze the term "individual" as it relates to AI systems in the patent law context. Justice Sotomayor, who delivered the opinion of the Court, cautioned that "[t]his is not

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[128] USPTO decision, *supra* note 16, at 4–6; *Vidal*, 43 F.4th at 1213; Thaler v. Hirshfeld, 558 F. Supp. 3d 238, 245–47 (E.D. Va. 2021).

[129] *See* Mohamad v. Palestinian Auth., 566 U.S. 449, 454-61 (2012).

[130] Torture Victim Protection Act of 1991, Pub. L. No. 102-256, 106 Stat. 73.

[131] *Mohamad*, 566 U.S. at 459.

[132] *Id.* at 449.

[133] *Id.* at 461 ("The text of the TVPA convinces us that Congress did not extend liability to organizations, sovereign or not.").

to say that the word 'individual' invariably means 'natural person' when used in a statute,"[134] emphasizing that congressional intent is the controlling factor. In his concurrence, retired Justice Breyer echoed this sentiment, stating that "linguistically speaking," the term "individual" could be interpreted in different ways and could mean "natural persons, corporations, [or] other entities."[135]

The erroneous interpretation of the term "individual" ignores the intent of Congress in patent law and excludes AI-generated inventions from receiving patents, thereby undermining the progress of technology.

D. The Futile Reliance on Pronouns

Reflexive pronouns, like "himself" and "herself,"[136] according to the USPTO and the Federal Circuit Court, are indicative of congressional intent to limit inventorship to natural persons.[137] Further inquiry into the legislative history of the Patent Act suggests that up until 2011, the Patent Act only used the pronoun "himself." Prior to amending the section dealing with the inventor's oath, "himself" was used as a catchall term to refer to the entity performing the oath.[138] In 2011, Congress amended the law to include female pronouns.[139] It would be unreasonable, however, to think that before it amended the law in 2011, Congress intended only for males to be inventors. Similarly, it would be improper to conclude that the inclusion of female pronouns amounts to an intent of limiting inventorship to natural persons.

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[134] *Id.* at 455.

[135] *Id.* at 462 (Breyer, J., concurring).

[136] 35 U.S.C. § 115(b)(2) ("[S]uch individual believes himself or herself to be the original inventor.").

[137] Thaler v. Vidal, 43 F.4th 1207, 1211 (Fed. Cir. 2022).

[138] 35 U.S.C. § 115 (2006) ("The applicant shall make oath that he believes himself to be the original and first inventor of the process, machine . . . .") (amended 2011).

[139] Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 4, 125 Stat. 284, 294 (codified as amended at 35 U.S.C. § 115(b)(2)).

E. The Frustration of the Intent of Congress and the Founders

The Eastern District Court of Virginia misread the Supreme Court's analysis of congressional intent in *Mohamad*. The Court highlighted that Congress has the discretion to afford a broader or different meaning to a term and that such assumption by a court is only warranted if there is "some indication [that] Congress intended such a result."[140] To clarify what could "perhaps" qualify as an indication of congressional intent to broaden the meaning, the Court cited a statute that defined the term "individual" to include corporations, which it acknowledged to be a "rare" occurrence.[141] The district court then deduced that "there must be 'some indication' that Congress intended a particular provision to be one of the 'rare statute[s]' that contains a different meaning for the term 'individual.'"[142] This is not the case, however.

The use of broad terms like "individual" and "person" can provide some indication that Congress intended to include many entities and not just natural persons. In different sections of patent law, Congress used the terms "individual" and "person" to refer to the inventor.[143] Absent in these sections (and in all other sections of patent law) are the terms "natural person" or "human." If Congress had intended to afford such a specific meaning to the term inventor, it would have used more narrow language or adopted a different meaning for the terms "individual" and "person" to reflect that they do not extend to non-natural entities.

In the alternative, even if Congress had not conceived of technological advances such as AI-generated inventions—thereby precluding any congressional intent to apply the term "inventor" broadly—patents should still be granted for inventions designed by AI systems. "A categorical rule denying patent protection for 'inventions in areas not contemplated by Congress . . . would frustrate the purposes of . . . patent law.'"[144]

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[140] *Mohamad*, 566 U.S. at 455.

[141] *Id.*

[142] Thaler v. Hirshfeld, 558 F. Supp. 3d 238, 247 (E.D. Va. 2021).

[143] 35 U.S.C. §§ 115–16.

[144] Bilski v. Kappos, 561 U.S. 593, 605 (2010) (quoting Diamond v. Chakrabarty, 447 U.S. 303, 315 (1980)).

In *Diamond v. Chakrabarty,* the court reasoned that protecting unanticipated inventions, such as microorganisms created through genetic engineering, is in accordance with patent law.[145] Absent congressional intent to exclude particular inventions or inventors from patents, courts should interpret the language, to the extent allowed, in an inclusive way.[146] That same reasoning could be extended to unanticipated inventors who create innovative designs. There is nothing in the language of patent law that carves out an exception for non-natural inventors.

The Patent Clause serves as a check on congressional activities, ensuring that the laws that Congress passes do not obstruct or impede the "progress of science and useful arts."[147] This principle is reflected in the constitutional-doubt canon, which requires federal courts to interpret a statute that is susceptible to more than one interpretation in conformity with the Constitution.[148] The ambiguous reading of "inventorship" based on conflicting interpretations of the terms "whoever" and "individual" raises constitutional issues and invokes the constitutional doubt canon. To the degree inventorship qualifications are unclear, courts should adopt the interpretation that is in conformity with the Constitution and promotes scientific and technological development.[149]

The rationale behind patents is to encourage individuals to create new and utilitarian developments by allowing them to reap the

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[145] 447 U.S. 303, 318 (1980) ("A rule that unanticipated inventions are without protection would conflict with the core concept of the patent law that anticipation undermines patentability." (citing Graham v. John Deere Co*.,* 383 U.S. 1, 7–10 (1966))).

[146] *Id.* at 318 ("Congress is free to amend § 101 so as to exclude from patent protection organisms produced by genetic engineering . . . [o]r it may choose to craft a statute specifically designed for such living things. But, until Congress takes such action, this Court must construe the language of § 101 as it is.").

[147] *Id.* at 307 (citing U.S. CONST. art. I, § 8, cl. 8).

[148] Crowell v. Benson, 285 U.S. 22, 62 (1932) ("[W]hen the validity of an act of the Congress is drawn in question, and even if a serious doubt of constitutionality is raised, it is a cardinal principle that [the] Court will first ascertain whether a construction of the statute is fairly possible by which the question may be avoided." (citing Panama R. Co. v. Johnson, 264 U.S. 375, 389–90 (1924))).

[149] U.S. CONST. art. I, § 8, cl. 8.

benefits of their work, and receive recognition and royalties via government-granted monopolies. The USPTO's decision to deny the patents frustrates the purpose of the Patent Clause, by carving out a class of inventors that are, nonetheless, shaping the landscape of the modern world, and excluding their inventions from patent protection. Although the prospects of a patent or its financial incentives would not motivate an AI system, it would encourage AI developers to design creative machines like DABUS.

V. RECOMMENDATIONS

The current framework for patent law does not completely serve the interests of the public it is presumed to protect. By excluding the creations of AI systems from patent eligibility, the current interpretation and application of patent law contravenes policy goals and has a chilling effect on what could be scientific innovation. Accordingly, it is imperative that the laws surrounding inventorship are changed to account for advances in AI technologies and other potential technological advancements to serve the purpose of encouraging innovative discoveries. This can be achieved in multiple ways.

A. Courts Should Eliminate the Conception Requirement

The conception requirement as applied by courts today determines inventorship based on subjective mental processes that are difficult to ascertain. The risk that accompanies the conception requirement is in its application. In the case of the fractal container and neural flame created by DABUS, any individual that can form a definite idea of a design and appreciate it could be named as an inventor by virtue of conception.

It is very ironic that the application of the conception requirement is creating the very dangers that patent law seeks to protect inventors from. Congress realized the risk of determining inventorship based on subjective mental processes and transformed patent law from a "first to invent" system to a "first to file" system, conforming with many other patent systems around the world.[150] It

[150] Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 3, 125 Stat. 284, 293.

is not in accordance with the law to apply the conception requirement in controversies involving priority of inventorship,[151] let alone in cases where there is only one inventor, and the innovation of the product is not contested. In light of this, the conception analysis should be eliminated in conformity with the AIA and the purposes of patent law.

This would ensure that AI-derived inventions and all other inventions are patentable, regardless of the subjective mental processes that led to the formation of the invention in the mind of the inventor.

B. The Term "Inventor" Should be Reevaluated

Another way to resolve the issue of AI systems' inability to acquire patent protection would be to redefine the term "inventor" as it relates to patent law. This could be achieved in three ways: (1) the USPTO could adopt an interpretation of the term inventor that would include non-natural persons; (2) Congress could amend the AIA to clearly define the term inventor as any person, natural or non-natural, that invents; or (3) Congress could amend the AIA to define the term inventor as an agent noun.

1. The USPTO Could Adopt an Interpretation of "Inventor" that Includes Non-Natural Persons

Courts should seek "to give effect to the intent of Congress."[152] The intent of Congress was to create a system that would encourage innovation, as well as to promote disclosure of information and commercialization of new technologies.[153]

In the Patent Act, Congress defined inventor as an "individual" or "individuals who invented or discovered the subject matter of the invention."[154] "Individual" is not defined in the Dictionary Act or within the context of inventorship in patent law. However, relying on an interpretation of the term in a specific, unrelated context, such as who is an individual under the TVPA for the purposes of liability,

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[151] *Id.*
[152] United States v. Am. Trucking Ass'ns, Inc., 310 U.S. 534, 542 (1940).
[153] S. REP. NO. 111-18, at 1 (2009).
[154] 35 U.S.C. § 100(f).

like the courts did in DABUS and Dr. Thaler's case,[155] substitutes and completely ignores the intent of Congress in enacting the Patent Act.

While the ruling from *Mohamad* should not be applicable in DABUS's case, the underlying analysis is informative. The Court determined that non-natural persons cannot be considered individuals under the TVPA, because "Congress plainly evinced its intent in the TVPA not to subject organizations to liability."[156] Considering that the term "individual" does not have a clear definition in patent law, other terms demonstrate congressional intent. The use of the terms "whoever" and "person" in various sections of patent law,[157] which could be used to refer to non-natural persons like companies and organizations,[158] is indicative of congressional intent to extend inventorship to non-human entities.

If Congress had intended to limit inventorship to humans, it would have used more restrictive language like "natural persons." For example, in Title 22 of the U.S. Code, which deals with foreign relations, Congress evinced its intent to make a distinction between natural persons and non-natural persons.[159] Under this title, U.S. nationals could settle claims with certain foreign governments, such as Vietnam and Czechoslovakia, and recoup damages for any harm suffered as a result of the wrongdoing of that government.[160] In defining U.S. nationals for the purpose of international claims settlement, Congress created two distinct categories: "[a] natural person who is a citizen of the United States" and "a corporation or a legal entity which is organized under the laws of the United States."[161] Clearly, this is some indication that Congress intended to distinguish and treat differently nationals that are natural persons and nationals that are non-natural. The lack of distinction between

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[155] Mohamad v. Palestinian Auth., 566 U.S. 447, 455 (2012).

[156] *Id.* at 449.

[157] 35 U.S.C. §§ 101–02, 115–16.

[158] 1 U.S.C. § 1 ("[T]he words 'person' and 'whoever' include corporations, companies, associations, firms, partnerships, societies, and joint stock companies, as well as individuals.").

[159] 22 U.S.C. § 1645a(1).

[160] §§ 1642(1), 1643a(1), 1644a(1), 1645a(1).

[161] §§ 1643–45.

natural and non-natural persons in patent law indicates that each should be treated the same.

Absent a clear definition of a term, the USPTO should take into consideration the congressional intent to promote innovation and include different entities and adopt an interpretation of "inventor" that includes non-human entities. Not only should the interpretation give effect to congressional intent, but it should also conform to the Constitution. The rise in AI-generated inventions in the past two decades, such as the complex lens system and the neural flame, warrants a reevaluation of the current approach to determining inventorship.[162] In accordance with the intent of the Founders and in order to ensure the continued improvement and progress of technology, both natural and non-natural persons should be considered inventors in the context of patent law.[163]

2. Congress Can Amend the AIA to Include a More Comprehensive Definition of the Term "Inventor"

Currently, the AIA defines inventor as the "individual . . . or the individuals collectively who invented or discovered the subject matter of the invention."[164] Congress should amend the AIA by replacing the term "individual," which is not defined in the Dictionary Act, with "person," which is defined in the Act and includes non-natural persons.[165] For example, under the foreign relations statute discussed above, Congress established that settlement awards for claims against Bulgaria, Hungary, Rumania, Italy, and the Soviet Union should not be paid "to or for the benefit of any person who . . . collaborated with or in any manner served any government hostile to the United States during World War II."[166] To ensure that the prohibition applies to natural and non-natural persons, Congress made the proper word choice and opted for the more inclusive term, "person," instead of the more restrictive term "individual." In addition to replacing "individual" with "person,"

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[162] Ravid & Liu, *supra* note 56, at 2218–20.

[163] U.S. CONST. art. I, § 8, cl. 8.

[164] Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 3, 125 Stat. 284, 285 (2011).

[165] 1 U.S.C. § 1.

[166] 22 U.S.C. § 1641k.

Congress should explain that "person" includes both "natural and non-natural persons," to emphasize that inventorship extends to humans and non-humans alike.

Even then, the definition is still not adequate to resolve the issues concerning the patentability of AI-derived inventions. Any person can recognize the essence of an invention, but that does not and should not make them an inventor for purposes of a patent. To that end, Congress should eliminate "or discovered the subject matter of the invention" from the definition of the term "inventor." In essence, an "inventor" would be recognized as a person (natural or non-natural) that creates a novel product.

3. Congress Can Adopt a Definition for "Inventor" Based on its Common Usage

The AIA was not only intended to "promote the progress of science and useful arts,"[167] but it also sought to "harmoniz[e] the United States patent system with the patent systems commonly used in nearly all other countries throughout the world with whom the United States conducts trade," promoting "greater international uniformity and certainty in the procedures used for securing the exclusive rights of inventors to their discoveries."[168] Australia is one of the largest trading partners of the United States.[169] The United States-Australia Free Trade Agreement promotes innovation in both countries "by enshrining strong protections for intellectual property and cross-border investments, securing ongoing access to each other's services markets[,] and guaranteeing open trade settings that facilitate cross-border supply chains."[170] Because Australia is advanced in medical technologies and has a regulatory framework that protects intellectual property, the United States often relies on Australia for innovative health technology.[171] It follows, then, that

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[167] Leahy-Smith America Invents Act § 3(o).

[168] *Id.*

[169] *Australia*, U.S. TRADE REPRESENTATIVE, https://ustr.gov/countries-regions/southeast-asia-pacific/australia [https://perma.cc/3B5X-67V7] (last visited Nov. 16, 2022).

[170] *Innovation*, AUSTRALIA IN THE USA, https://usa.embassy.gov.au/trade-investment/innovation [https://perma.cc/EZT2-6GV9] (last visited Sept. 26, 2022).

[171] *See id.*

the United States should harmonize its patent system with Australia's.

In September 2019, while DABUS's patent applications were pending before the USPTO, Dr. Thaler filed a patent application for DABUS's two inventions with IP Australia, the Australian agency which administers intellectual property rights.[172] IP Australia denied the patents and Dr. Thaler sought judicial review from the Federal Court of Australia, the Australian court with trial jurisdiction.[173] The court ruled that DABUS could be named as an inventor because an "inventor" is an agent noun which refers to "a person or thing," providing a viable framework for granting inventorship to AI systems.[174] The court went on to state:

> [A]s the word "inventor" is not defined in the Act or the Regulations, it has its ordinary meaning. In this respect then, the word "inventor" is an agent noun. In agent nouns, the suffix "or" or "er" indicates that the noun describes the agent that does the act referred to by the verb to which the suffix is attached. "Computer," "controller," "regulator," "distributor," "collector," "lawnmower[,]" and "dishwasher" are all agent nouns. As each example demonstrates, the agent can be a person or a thing. Accordingly, if an artificial intelligence system is the agent which invents, it can be described as an "inventor."[175]

While the Full Court, the Australian court with appellate jurisdiction, reversed the lower court's decision and concluded that non-humans could not be inventors, the Full Court did not preclude any further consideration of the interaction between AI and patents, indicating that such issues could be addressed by legislation.[176] Thaler filed a special leave application to the Australian High Court, which is expected to resolve the difference in opinion.[177] Still,

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[172] *See Food Container and Devices and Methods for Attracting Enhanced Attention*, AUSPAT, http://pericles.ipaustralia.gov.au/ols/auspat/applicationDetails.do?applicationNo=2019363177 [https://perma.cc/D56V-LR6Z] (last visited Oct. 30, 2022).

[173] *See Thaler v. Commissioner of Patents* [2021] FCA 879 (30 July 2021) (Austl.).

[174] *Id.* ¶ 10.

[175] *Id.* ¶ 120.

[176] *See Commissioner of Patents v. Thaler* [2022] FCAFC 62 (13 Apr. 2022) (Austl.).

[177] *See* Peter Divitcos et al., *Dr Thaler Seeks Special Leave to Appeal to the High Court from the Full Federal Court of Australia*, DENTONS (May 18, 2022),

however, the lower court's analysis is helpful for lawmaking purposes. In anticipation of potential change to patent law in Australia, Congress should consider redefining "inventor" in accordance with its common usage.[178] The word "inventor" is an agent noun or "a noun denoting the performer of an action."[179] An inventor, in this case, would be defined as someone or something that invents.

This interpretation would resolve the issue regarding the patentability of AI-derived inventions by eliminating the ambiguity of the term that is subject to different interpretations, and establishing a clear and predictable definition of inventorship.

C. The Standard for the Specification Requirement Should be Amended

In keeping with the purpose of patent law and the intent of the Founders, innovation would be useless if the public did not benefit from it. Yet, it would be viewed as a burden if the inventor had to disclose the most intricate details of their invention. The specification requirement should be applied in a manner that serves the interests of the public and the inventor on an equal footing, balancing the public's interest in the disclosure of the relevant processes of the invention and the inventor's interest in protecting their invention.[180]

Currently, as required by patent law, a specification should include a written statement of the "invention, and of the manner and process of making and using it, in such full, clear, concise, and exact

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https://www.dentons.com/en/insights/articles/2022/may/17/full-federal-court-of-australia-holds-that-an-artificial-intelligence [https://perma.cc/XAV4-UUFX].

[178] *See* Robert C. Farrell, *Why Grammar Matters: Conjugating Verbs in Modern Legal Opinions*, 40 LOY. U. CHI. L. J. 1, 2 n.10 (2008).

[179] *Agent Noun*, MERRIAM-WEBSTER DICTIONARY, https://www.merriam-webster.com/dictionary/agent%20noun [https://perma.cc/55YJ-ND5P] (last visited Sept. 30, 2022).

[180] Sean B. Seymore, *Symposium: The Disclosure Function of the Patent System*, 69 VAND. L. REV. 1455 (2016) ("A lax disclosure requirement compromises the quid pro quo, meaning that the public might get shortchanged in the so-called patent bargain. But a stringent disclosure requirement might push some inventors toward trade secrecy (i.e., no disclosure)—the antithesis of the patent system.").

terms as to enable any person skilled in the art to which it pertains . . . to make and use the same."[181] Consider, however, the ramifications of revealing the "full, clear, concise, and exact terms" of the process and manner of an invention.[182] While the public dissemination of information is, to a certain degree, inherent to the purpose of promoting the progress of science, the inventor also faces the risk of having competitors imitate his or her invention, especially in circumstances where the full and exact process is revealed to the public.[183] The core presumption of patents is that inventors would be incentivized to create and innovate, and gain the full recognition and title to their invention, by excluding others from making and using their invention.[184]

AI-generated inventions add another layer of difficulty to the application of the specification requirement. Some AI systems, like DABUS, conceive of their own inventions, and while the structural process for the inventive act is well-known to the developer of the AI system, the full and exact details of the process for a particular invention is not discernible to the developer of the AI system. As far as technology goes, an AI system has yet to disclose the exact process with which it created a particular invention. A less stringent requirement that might not provide skilled persons with sufficient information to enable them to make the exact same product, but provides some insight into the making of the invention, would guarantee an better overall outcome. Consider this perspective:

> [S]imply because a patent specification fails to convey sufficient information does not mean that the invention itself will not be disclosed to the public. One must distinguish the nature of the underlying invention from the patent document itself. . . . [B]ecause patented inventions are typically self-revealing, their vulnerability to reverse engineering

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[181] 35 U.S.C. § 112(a).

[182] *Id.*

[183] Alan Devlin, *The Misunderstood Function of Disclosure in Patent Law*, 23 HARV. J. L. & TECH. 401, 419–20 (2010) ("Consider an inventor who is on the fence about choosing trade secret or patent protection . . . [T]he disclosure conditions of patentability may induce her to forego the otherwise favorable route of patent protection. Were patenting her discovery without meeting the requirements of § 112 possible, she would do so. This is the 'disincentive to disclose' in action.").

[184] *Patent*, *supra* note 27.

> ensures that society will reap the benefit of their creation. The patent document's failure to disclose the invention on a more immediate basis may be imperfect, but this failure does not thereby eviscerate the patent's raison d'être [or the ultimate purpose of the patent].[185]

Because the public interest in disclosure should be weighed against the inventor's incentive to disclose, Congress should consider an alternative to the "full, clear, concise, and exact terms"[186] requirement for revealing the inventive process, and set a more plausible standard that considers the interests and reservations of the inventor. Inventors should describe the process of the invention to the extent feasible, or to the degree in which their interests are protected and the skilled persons are able to understand the invention.

The current interpretation of inventorship under patent law excludes inventions created by AI systems, which contravenes the goals of patent law. This problem can be remedied in multiple ways. First, courts should eliminate the conception requirement. Second, the USPTO and Congress should reevaluate the term "inventor." The USPTO could adopt an interpretation that includes non-natural persons. In the alternative, Congress could (1) amend the AIA to clearly define the term inventor as any person, natural or non-natural, that invents, or (2) define the term inventor as an agent noun.

VI. CONCLUSION

AI technology has advanced tremendously over the past twenty years.[187] Today, AI systems are capable of creating inventions without the input of humans.[188] One such example is DABUS, an AI system modeled after the human brain, which invented the neural flame and the fractal container.[189] The patentability of these inventions has been the center of controversy. Dr. Thaler, the developer of DABUS, claimed that DABUS should be listed as the inventor, since it independently and autonomously created the

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[185] Devlin, *supra* note 183, at 411.
[186] 35 U.S.C. § 112(a).
[187] Peterson, *supra* note 1.
[188] *Id.*
[189] *Founder*, *supra* note 17.

inventions.[190] The USPTO, the District Court for the Eastern District of Virginia, and the Federal Circuit Court disagreed, holding that inventorship is limited to natural persons. Should those decisions be the last word on the issue of inventorship, the patentability of many inventions generated by AI systems will remain uncertain, undermining the purpose of patent law.

The dispute sheds light on the shortcomings of inconsistent interpretation and application of the terms that make up patent law. Ambiguous definitions of the term "individual," inconsistent application of the term "whoever," and the misplaced focus on the use of pronouns influenced the USPTO and courts' decisions. Such analysis does not comport with the Constitution and undermines the purpose of patent law, which is to "promote the progress of science and useful arts."[191]

Courts should eliminate the conception requirement, and adopt an interpretation of the term "inventor," in conformance with the congressional intent underlying the AIA. In the alternative, Congress should amend the AIA and redefine "inventor" to include non-natural persons that invent, or adopt a definition based on the word's common usage. Lawmakers might also adopt a less stringent standard for the specification requirement. Addressing the shortcomings of patent law and granting inventorship to AI systems will help promote the progress of science and technology.

[190] Brief, *supra* note 18, at 6–7.
[191] U.S. CONST. art. I, § 8, cl. 8.