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DABUS, An Artificial Intelligence Machine, Invented Something New and Useful, but the USPTO is not Buying It

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Cover Page Footnote

Trevor F. Ward has a J.D. from Barry University and a B.S.M.E. from Loyola Marymount University. He is an intellectual property litigator, inventor, and award-winning documentary filmmaker.

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ABSTRACT

U.S. patent laws are designed to promote science and the useful arts. They grant temporary monopoly rights to inventors in order to incentivize inventive activity. In the United States, patent rights revolve around the inventor. However, what happens when an Artificial Intelligence (AI) machine invents? Who deserves monopoly rights to the invention? Who will be incentivized by such monopolies? Do U.S. laws protect companies' investments in AI?

In 2019, for the first time in history, an AI machine called DABUS was listed as an inventor on two U.S. patent applications. The United States Patent and Trademark Office denied the applications, saying that inventors must be human. A federal district court affirmed the denial, as well as the Federal Circuit Court of Appeals, saying that the Patent Act "unambiguously" requires an inventor to be a natural person. Under the current statutory scheme, the two main problems AI-generated inventions present are inventorship and ownership.

AI is already part of modern inventive processes, such as the development of vaccines or safety equipment. AI's prominence will only increase because AI is able to do things humans simply cannot and thus will dramatically improve our lives. Therefore, the United States needs to ensure companies are properly incentivized to develop and use AI. Currently, U.S. patent law comes up short. If AI-generated inventions are unpatentable, what will incentivize companies to invest significant resources into inventive AI? Will countries such as South Africa, which allowed the DABUS inventions to be patented, put the United States at an inventive and technological disadvantage?

To solve the problems of inventorship and ownership, I propose the creation of a sui generis category of invention whereby AI-generated inventions without a human inventor can receive patent protection and the company that employs the AI becomes the "inventor" and owner under a work-made-for-hire-type model.

INTRODUCTION

The 1984 film, *The Terminator*, depicted a future dystopian Earth where a world-wide network of machines called Skynet became self-aware and attempted to destroy the human race.¹ Imagine that in the seventh installment of *The Terminator* movie franchise, Arnold Schwarzenegger's character is old and past the prime of his fighting days, so he retires to the beaches of Mexico. One day, while enjoying

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1. THE TERMINATOR (Orion Pictures 1984).

the sun and a frozen margarita, the drink slips from his hand and falls to the ground. The server says, “don’t worry about it, sir. I’ll get you a new one. These margarita glasses get a little slippery.” Immediately, the Terminator starts “thinking” about an easier-to-grip margarita glass. After a few minutes, he invents a new, better margarita glass. The next step is to get a patent on his idea. He tells the server, “I’ll be back,”² and returns to the United States to file a patent application at the United States Patent and Trademark Office (USPTO or PTO). Will the PTO grant the cyborg assassin’s application for his invention of a new beverage container?

In the summer of 2019, a group from the University of Surrey in the United Kingdom (the “Surrey Group”) filed two U.S. patent applications naming an Artificial Intelligence (AI) machine, DABUS,³ as the sole inventor.⁴ This was the first time in U.S. history that a machine has been disclosed as the inventor on a patent application.⁵ AI-generated inventions, such as the ones in the DABUS applications, present two distinct legal problems: first, who is the inventor, and second, who is the owner?

First, U.S. patent law requires the disclosure of an inventor on a patent application. By using words such as “whoever,” “individual,” and “person” to describe who can be an inventor, U.S. patent law implies that an inventor must be a natural person.⁶ In 2020, the USPTO adopted this position.⁷ If an invention must have a human inventor but has no human inventor, it follows that an AI-generated invention is unpatentable.

Second, an inventor presumptively owns their invention.⁸ But who owns an AI-generated invention? Even if, for the sake of argument, a machine can be an inventor, machines cannot own property, even intellectual property.⁹ Who then owns an AI-generated invention? The right to exclude others from making an invention is presumably what incentivizes inventors to create. Without the promise of ownership of that right, will AI-generated inventions cease to be pursued?

2. *Id.* at 59:15.

3. “DABUS” is an acronym short for “Device for the Autonomous Bootstrapping of Unified Sentience.” Yogini Bhasvar-Jog, *Artificial Intelligence as an Inventor on Patents – The Global Divide and the Path Forward*, JD SUPRA (Dec. 22, 2021), <https://www.jdsupra.com/legalnews/artificial-intelligence-as-an-inventor-7892764/>.

4. Laura Butler, *World First Patent Applications Filed for Inventions Generated Solely by Artificial Intelligence*, UNIV. OF SURREY (Aug. 1, 2019), <https://www.surrey.ac.uk/news/world-first-patent-applications-filed-inventions-generated-solely-artificial-intelligence>; Martin Coulter, *Patent Agencies Challenged to Accept AI Inventor*, FIN. TIMES (July 31, 2019), <https://www.ft.com/content/9c114014-b373-11e9-bec9-fdcab53d6959>.

5. Matthew Bultman, *1st Patent Apps for AI-Created Inventions Filed in US, Europe*, LAW360 (Aug. 1, 2019), <https://www.law360.com/articles/1184289/1st-patent-apps-for-ai-created-inventions-filed-in-us-europe>.

6. 35 U.S.C. § 101 (“Whoever invents . . .”); § 100(f) (“The term ‘inventor’ means the individual . . .”); § 102(a) (“A person shall be entitled to a patent . . .”).

7. *See In re* Application of Application No.: 16/524,350, 2020 Dec. Comm’r Pat. 4.

8. *Teets v. Chromalloy Gas Turbine Corp.*, 83 F.3d 403, 407 (Fed. Cir. 1996). “[A]n invention presumptively belongs to its creator.” *Id.*

9. Ryan Davis, *EPO Rejects Patent Applications for AI-Created Inventions*, LAW360 (Dec. 23, 2019), <https://www.law360.com/articles/1230522/epo-rejects-patent-applications-for-ai-created-inventions>.

Although there is still some debate whether AI machines can be *solely* responsible for an invention, there is no debate that AI will continue to play a major role in the inventive process for many industries.¹⁰ If companies who use AI to generate inventions are unable to obtain patent protection, will they be disincentivized to invest in such technology? If they are unwilling to invest in AI, will the world miss out on possibly life-saving inventions that will simply be impossible for humans to invent without it?

Calls for lawmakers to address issues of intellectual property rights with regard to computers have been around since at least 1984,¹¹ but the issue of who deserves intellectual property rights was first addressed by the U.S. Supreme Court in 1884.¹² In *Burrow-Giles Lithographic Co. v. Sarony*, the Supreme Court faced the question of whether a photographer could be considered an author within the meaning of the Constitution.¹³ “The answer to this question lay not in the physics of photography but rather in an examination of the actions of the photographer.”¹⁴

Today, some argue that seeking to identify the human inventor behind the patent is no longer relevant because the nature and use of machines has changed.¹⁵ For example, one author has stated, “[w]e are facing a new era of machines ‘acting’ independently, with no human being behind the inventive act itself.”¹⁶ Although the issue of AI-generated inventions has been a long time in the making, it must be addressed sooner rather than later.

Part I of this Article discusses the important policy rationales behind patent laws that must be considered when deciding what to do with AI-generated inventions. Part II discusses a history of AI’s role in the invention process and introduces the DABUS inventions. Part III identifies the two most pressing legal problems raised by AI-generated inventions: inventorship and ownership. Finally, Part IV describes some of the proposed solutions for AI-generated patents, including analogous solutions from copyright law.

10. See Stephanie Skaff et al., *Artificial Intelligence Can’t Patent Inventions: So What?*, IPWATCHDOG (July 13, 2020), <https://www.ipwatchdog.com/2020/07/13/artificial-intelligence-cant-patent-inventions/id=123226/> [hereinafter *So What?*].

11. See generally Dan Rosen, *A Common Law for the Ages of Intellectual Property*, 38 U. MIAMI L. REV. 769 (1984).

12. See *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53 (1884).

13. See *id.* at 55.

14. Rosen, *supra* note 11, at 772.

Is a photograph of Oscar Wilde (the picture at issue) an original work of authorship? No, said the defendant. The camera simply makes a mechanical transfer of nature. To the contrary, replied the Court. The photographer, like a writer, had an original mental conception that he brought into physical form. He posed Wilde in a particular position. He selected the costume and background. He arranged the lighting. Thus, the Court held that photographers were authors.

Id.

15. 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, 2216 (2018).

16. *Id.*

DABUS placed the issue on the doorstep of the USPTO. After the USPTO rejected the patent applications, U.S. courts affirmed the USPTO's decision.¹⁷ The *real* question that must now be addressed is how must our laws accommodate a world where artificial intelligence is performing the inventive functions traditionally performed by humans? The chosen solution must (i) protect the policy rationales of U.S. intellectual property law, (ii) protect worldwide economic competitive interests of U.S. inventors, and (iii) protect humans from an inevitable future of machine overlords.¹⁸

The most practical and obvious solution is to create a *sui generis* category of invention—AI-generated inventions—whereby traditional rules of inventorship and ownership are modified to protect the interests of inventors, investors, and the public.

I. PURPOSE IS KEY—THE PURPOSE OF PATENT LAW

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.”¹⁹ Using this constitutional grant of power, Congress enacted the Patent Act, which states that “[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor.”²⁰ A patent issued by the U.S. government gives the owner of the patent certain rights—namely, “the right to exclude others” from making, using, or selling the invention.²¹

The Framers of the Constitution were not the first to contemplate the desirability of government protection of inventions. It is believed that prior to 500 B.C., a Greek colony in Italy made a law that provided to any confectioner or cook who invented “any particular and excellent dish” the right to exclude others from making that dish for one year “in order that others might be induced to labour at excelling in such pursuits.”²² The lawmakers wished to *incentivize* people to make good food. Roughly 2,000 years later, the legal framework of the modern patent system took shape during the Italian Renaissance.²³ In 1421, the Republic of Florence issued what many believe to be the first true patent to Filippo

17. See, e.g., *Thaler v. Vidal*, 43 F.4th 1207, 1209 (Fed. Cir. 2022).

18. See *Pro Say*, *Ep. 117: Can a Robot Get a Patent?*, LAW360, at 30:20 (Aug. 23, 2019), <https://www.law360.com/podcast> [hereinafter *Pro Say Podcast*] (referencing the stereotypical future described in many science fiction movies where machine intelligence takes over the world and humans become a subservient species).

19. U.S. CONST. art. I, § 8, cl. 8 (commonly referred to as the “IP Clause”).

20. 35 U.S.C. § 101.

21. *Id.* § 154(a)(1) (“Every patent shall . . . grant to the patentee . . . the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States . . .”).

22. Giles Sutherland Rich, *The “Exclusive Right” Since Aristotle*, 14 FED. CIR. BAR J. 217, 217–18 (2004).

23. JOHN M. GOLDEN ET AL., *PRINCIPLES OF PATENT LAW* 5 (Robert C. Clark et al. eds., 7th ed. 2018).

Brunelleschi for his design of a marble transporting ship.²⁴ In 1474, the first known patent statute was enacted in the Venetian Republic:²⁵

[E]very person who shall build any new and ingenious device . . . shall give notice of it to the [government]. It being forbidden to every other person in any of our territories and towns to make any further device conforming with and similar to said one, without the consent and license of the author, for the term of 10 years.²⁶

This statute expressed the underlying principle of patent law that still exists today—the *quid pro quo* incentive.²⁷ If inventors invent and share with the public something useful, the government will grant the inventor a limited monopoly on that thing.²⁸

U.S. “patent laws promote . . . progress by offering inventors exclusive rights for a limited period as an incentive for their inventiveness and research efforts.”²⁹ The Framers of the Constitution recognized that the “productive effort thereby fostered will have a positive effect on society through the introduction of new products and processes of manufacture into the economy, and the emanations by way of increased employment and better lives for our citizens.”³⁰ After the expiration of the patent, the invention goes into the public domain, and anyone is able to use the invention without restriction and profit from its use.³¹

Thomas Jefferson, who was a member of the patent board (the precursor to the USPTO) for several years, acknowledged the incentive-based nature of patent property rights when he stated, “[c]ertainly an inventor ought to be allowed a right to the benefit of his invention for some certain time Nobody wishes more than I do that ingenuity should receive a liberal encouragement.”³² Jefferson believed that a patent was not merely a reward for invention but an incentive to invent.³³

Philosophically, many justify patents (temporary monopolies) as an incentive for an inventor to create, disclose, and disseminate technological advances.³⁴ There is a pseudo fourth incentive: the incentive to design *around* already patented ideas in order to come up with something new and better—in other words, inventors are not only incentivized to invent the first mousetrap, but also to invent a *better* mousetrap.³⁵ The hope for financial gain as a result of leapfrogging technological

24. *Id.*

25. *Id.*

26. *Id.* at 6 (quoting Giulio Mandich, *Venetian Patents (1450-1550)*, 30 J. PAT. OFF. SOC'Y 166, 176–77 (1948)).

27. *Id.*

28. *Id.* at 3.

29. *Diamond v. Chakrabarty*, 447 U.S. 303, 307 (1980).

30. *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 480 (1974).

31. *Id.* at 481.

32. *Graham v. John Deere Co.*, 383 U.S. 1, 8 (1966) (quoting 5 THOMAS JEFFERSON, *To Mr. Oliver Evans*, in WRITINGS OF THOMAS JEFFERSON 75–76 (H.A. Washington ed., 1861)).

33. *Id.* at 9. Jefferson was himself a prolific inventor, credited with inventing the Great Clock, a folding ladder, a portable copying press, a lap desk, a macaroni machine, a revolving chair with a leg rest and writing arm, new types of iron plows, beds, automatic doors, and mechanical dumbwaiters. *Thomas Jefferson, Patent System, Consumer Devices*, LEMELSON–MIT, <https://lemelson.mit.edu/resources/thomas-jefferson> [<https://perma.cc/7PRV-N9DT>].

34. GOLDEN ET AL., *supra* note 23, at 3.

35. *Id.*

innovation acts as a “stimulus to the development of new products and industries,” and is probably the most powerful engine towards the advancement of science and useful arts.³⁶

To demonstrate how this incentive system works to promote the progress of science and useful arts, one can look at medical diagnostic inventions.

Because [medical diagnostic inventions] are typically characterized as “very expensive to develop but relatively cheap to reproduce,” patent protection is required to make it financially viable for continued investment in their development Without patent protection to recoup the enormous R&D cost, investment in diagnostic medicine will decline. To put it simply, this is bad. It is bad for the health of the American people and the health of the American economy.³⁷

In light of the massive resources poured into combatting COVID-19, one can imagine the usefulness of patent protection.³⁸ Without the promise of patent protection, most companies simply will not invest in research and development for fear that competitors will simply copy their inventions without repercussion.

If the United States is to remain competitive in a global economy and if our society is to benefit from AI’s problem-solving capabilities, our decisions regarding AI-generated inventions must be firmly rooted in the incentive-based purposes of patent laws.

II. AI-GENERATED INVENTIONS

Before exploring the possible legal implications of DABUS’s patents and all future AI-generated inventions, it is necessary to understand what this Article means by the term “AI.”³⁹ There is currently some debate over the nature of AI and whether it is capable of inventing.⁴⁰ That debate is largely irrelevant or reserved to the deeply philosophical. For the purposes of this Article, it is assumed that DABUS *did* invent, making the issues of patentability and ownership beyond mere theoretical debate.⁴¹

36. *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1547 (Fed. Cir. 1995).

37. *Athena Diagnostics, Inc. v. Mayo Collaborative Servs., LLC*, 927 F.3d 1333, 1355, 1358 (Fed. Cir. 2019) (Moore, J., dissenting) (quoting Anatole Krattiger, *Promoting Access to Medical Innovation*, World Intell. Prop. Org. (Sept. 2013), https://www.wipo.int/wipo_magazine/en/2013/05/article_0002.html).

38. See Geneva Graduate Inst., Glob. Health Ctr., *COVID-19 Vaccines R&D Investments*, KNOWLEDGE PORTAL, <https://www.knowledgeportal.org/covid-19-vaccine-r-d-funding> [<https://perma.cc/VZS2-YPSU>].

39. It is believed that the first use of the term “artificial intelligence” was by John McCarthy in 1955. See J. MCCARTHY ET AL., A PROPOSAL FOR THE DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE (1955).

40. *So What?*, *supra* note 10.

41. See *Thaler v. Vidal*, 43 F.4th 1207, 1209 n.2 (Fed. Cir. 2022) (stating that for the purpose of determining whether AI can be an inventor under the Patent Act, this Court and “the PTO [have] not challenged Thaler’s representations” that DABUS was the sole inventor of the claimed patents).

A. What Is Artificial Intelligence?

“Cognitive science begins with the assumption that the nature of human intelligence is computational, and therefore, that the human mind can, in principle, be modelled as a program that runs on a computer.”⁴² The term “artificial intelligence” is not uncommon, but it can have a myriad of legitimate definitions.⁴³ For example, the Merriam-Webster Dictionary defines “artificial intelligence” as “the capability of a machine to imitate intelligent human behavior.”⁴⁴ Another author defines AI as “machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention.”⁴⁵

In keeping with the Merriam-Webster definition, we can look to what was perhaps the first AI test—a 1950 test devised by Alan M. Turing⁴⁶ called “the imitation game.”⁴⁷ Turing’s novel idea was that a machine could be “intelligent” if a human interrogator could not tell the difference between responses from a human and a machine.⁴⁸ With this test, Turing hoped to avoid the philosophical question of what exactly “thinking” or “intelligence” *is* and instead direct the query to *what qualifies as intelligence*—some sort of threshold *ability*.⁴⁹

Expanding on Turing’s definition, John Searle argued some thirty years later that intelligence involves more than “thinking,” what a computer can do with inputs into a program, and instead involves “understanding,” the ability to process meaning.⁵⁰ “Artificial intelligence is the step beyond machines programmed to carry out human instruction. Instead, the machines make their own decisions within a constellation defined by the programmer.”⁵¹

Though there is still debate over what intelligence is and whether computers will ever achieve true intelligence,⁵² legal writer Matthew Scherer has recently proposed a rather simple definition of AI that might appeal to any side of that debate: AI is a machine that is “capable of performing tasks that, if performed by a

42. Lawrence B. Solum, *Legal Personhood for Artificial Intelligences*, 70 N.C. L. REV. 1231, 1231 (1992).

43. See, e.g., Darrell M. West & John R. Allen, *How Artificial Intelligence is Transforming the World*, BROOKINGS INST. (Apr. 24, 2018), <https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/>; Ravid & Liu, *supra* note 15, at 2223.

44. *Artificial Intelligence*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/artificial%20intelligence> [<https://perma.cc/QV2K-BB2W>].

45. West & Allen, *supra* note 43 (quoting Shukla Shubhendu & Jaiswal Vijay, *Applicability of Artificial Intelligence in Different Fields of Life*, 1 INT’L J. SCI. ENG’G & RSCH. 28, 28 (2013)).

46. Though not responsible for the term “artificial intelligence,” Alan M. Turing is considered to be the father of AI, and his work using computer machines to decode German WWII ciphers was depicted in the 2014 film *The Imitation Game*. *THE IMITATION GAME* (The Weinstein Company 2014).

47. See Solum, *supra* note 42, at 1235–36 (now referred to as “the Turing test”).

48. *Id.* (Turing’s computer was able to succeed about 50% of the time).

49. *Id.*

50. *Id.* at 1236–37.

51. Rosen, *supra* note 11, at 802.

52. See Ryan Calo, *Robotics and the Lessons of Cyberlaw*, 103 CALIF. L. REV. 513, 528 (2015) (“Little in the literature gives me confidence that artificial intelligence will approximate human intelligence in the foreseeable future. There are analytic and technical reasons to believe robots will never think like people.”).

human, would be said to require intelligence.”⁵³ A modern idea of AI embraces the concept that it exists on a spectrum of ability that ranges from tool to person.⁵⁴ In 2015, the European Parliament reported that “the more autonomous robots are, the less they can be considered simple tools in the hands of other actors (such as the manufacturer, the owner, the user, etc.).”⁵⁵

This Article is not concerned with AI systems which are merely tools that assist in the creative process—for example, sophisticated computer programs used to simulate stress tests of products—because there are no patentability issues to be resolved when computer technology merely assists human inventors. This Article is also not concerned with inventions for which AI carried out a more significant portion of the inventive process, but a human contributed some inventive or discovery function. Rather, this Article is concerned with AI machines whose novel inventions had no significant human input, meaning, AI-generated inventions for which no human can truthfully say, “this is my novel idea.” These inventions create legal problems, and thus this Article addresses only “Inventive AI,” which has two key characteristics: (i) it is self-learning, meaning its ability to perform certain functions improves over time; and (ii) it evaluates and makes decisions independently of a human user.⁵⁶

B. AI's Role in Inventorship

For several decades, AI has been used to aid inventors in the inventive process, whether in developing new drugs⁵⁷ or designing luxury automobiles.⁵⁸ Today, AI is no longer just a tool, even a very sophisticated tool; in some cases, AI is automating innovation.⁵⁹ In fact, some AI is arguably inventing autonomously.⁶⁰ Consider the following examples.

In 1997, Dr. Stephen Thaler patented a device called the Creativity Machine (an AI machine),⁶¹ which in turn invented something called the “Neural Network Based Prototyping System and Method.”⁶² As explained by one of Dr. Thaler's

53. Matthew U. Scherer, *Regulating Artificial Intelligent Systems: Risks, Challenges, Competencies, and Strategies*, 29 HARV. J.L. & TECH. 353, 362 (2016).

54. See Ignacio N. Cofone, *Servers and Waiters: What Matters in the Law of A.I.*, 21 STAN. TECH. L. REV. 167, 174–76 (2018).

55. *Draft Report of the Committee on Legal Affairs with Recommendations to the Commission on Civil Law Rules on Robotics*, at 5 (May 31, 2016), https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html?redirect#_section1 [<https://perma.cc/MZ24-SHMZ>] [hereinafter *Draft Report*].

56. See Robert Jehan, *Should an AI System Be Credited as an Inventor?*, THE ARTIFICIAL INVENTOR PROJECT (Aug. 24, 2019), <http://artificialinventor.com/should-an-ai-system-be-credited-as-an-inventor-robert-jehan/>.

57. Gregory Barber, *A Molecule Designed by AI Exhibits 'Druglike' Qualities*, WIRED (Sept. 2, 2019), <https://www.wired.com/story/molecule-designed-ai-exhibits-druglike-qualities/>.

58. W. Michael Schuster, *Artificial Intelligence and Patent Ownership*, 75 WASH. & LEE L. REV. 1945, 1954 (2018).

59. Butler, *supra* note 4.

60. See Jehan, *supra* note 56.

61. See generally U.S. Patent No. 5,659,666 (issued Aug. 19, 1997).

62. Ryan Abbott, *I Think, Therefore I Invent: Creative Computers and the Future of Patent Law*, 57 B.C. L. REV. 1079, 1085 (2016); see U.S. Patent No. 5,852,815 (issued Dec. 22, 1998).

associates, “Patent Number Two was invented by Patent Number One!”⁶³ “Dr. Thaler listed himself as the inventor on [Patent Number Two] and did not disclose the Creativity Machine’s involvement to the [USPTO].”⁶⁴

In 2005, Dr. John Koza’s Invention Machine (an AI machine) invented a system to make factories more efficient.⁶⁵ It did so with limited human input.⁶⁶ Just like in the second Thaler patent, this machine’s involvement was not disclosed to the USPTO.⁶⁷

In 2006, KOJAC (an AI machine) invented a complex lens system for telescopes and binoculars.⁶⁸ The machine did so by creating 75,000 iterations of lens prescriptions, evaluating them, discarding the bad systems, combining the good lens systems to create new lens systems, re-evaluating these offspring, and repeating this cycle until a desired set of specifications was achieved.⁶⁹ In this example, a human was ultimately responsible for telling the machine what problem to solve and the desired outcome (specifications), but the machine made evaluative decisions regarding results of its simulations.⁷⁰ This arrangement resembles a simple employer/employee relationship where the employer tells the employee what problem to solve and sets a desired outcome (specifications).

In 2014, IBM’s Watson (an AI machine) was tasked with running a food truck.⁷¹ Fed a healthy diet of data comprised of nutrition information, flavor compounds, molecular structures of food, and thousands of existing recipes, Chef Watson set out to “whip up” a tasty menu.⁷² Its Swiss-Thai asparagus quiche, pork belly moussaka, and Austrian chocolate burritos received rave reviews.⁷³ Even though Watson did not receive any patents for its recipes, its activity bore fruit in the form of a recipe generator web app and a cookbook.⁷⁴ Watson was not designed to someday replace actual human chefs or actual human ingenuity, but that possibility was not denied.⁷⁵ Either way, it would be fair to say that Watson’s

63. Abbott, *supra* note 62, at 1085 (citing Tina Hesman, *Stephen Thaler’s Computer Creativity Machine Simulates the Human Brain*, ST. LOUIS POST-DISPATCH (Jan. 24, 2004), <http://www.mindfully.org/Technology/2004/Creativity-Machine-Thaler24jan04.htm> [<https://perma.cc/T8HS-C2TB>]).

64. *Id.* at 1085–86.

65. *Id.* at 1087.

66. *Id.*

67. *Id.*

68. 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/>.

69. *Id.*

70. *Id.*

71. Abbott, *supra* note 62, at 1090.

72. *Id.*

73. Maanvi Singh, *Our Supercomputer Overlord Is Now Running a Food Truck*, NPR (Mar. 4, 2014), <http://www.npr.org/blogs/thesalt/2014/03/03/285326611/our-supercomputer-overlord-is-now-running-a-food-truck>.

74. See Caitlin Dewey, *Meet Chef Watson, IBM’S Futuristic Foodie Robot*, WASH. POST (May 12, 2015), https://www.washingtonpost.com/lifestyle/food/could-ibms-watson-eventually-replace-creative-chefs-not-at-this-rate/2015/05/11/82a0a3ca-f29f-11e4-b2f3-af5479e6bbdd_story.html. See generally Abbott, *supra* note 62, at 1090–91 (explaining that novel, non-obvious food recipes can technically qualify for patents, but such patents are rare).

75. Dewey, *supra* note 74.

recipes could be protected in the United States today or in that ancient Grecian colony in Italy 2,500 years ago.

C. The DABUS Inventions: A Cup and a Flashing Rescue Beacon

DABUS is called a “creativity machine” by its inventor, Dr. Thaler.⁷⁶ Its first patent application was for a food or drink container whose novel shape allows for improved storage and handling characteristics compared to traditional container shapes.⁷⁷ Its second patent application was for a flashing light beacon that emits an unusual flash pattern that makes it especially suitable in search and rescue operations.⁷⁸ Applications for both inventions were first filed in the United Kingdom in 2018,⁷⁹ and eventually filed in the United States in 2019.⁸⁰

DABUS was not developed or trained to solve a specific problem⁸¹; rather, it was fed information about beverage containers and flashing lights and came up with the inventions on its own.⁸² In this way, the DABUS inventions and subsequent litigation made the debate over whether AI will ever be able to “think” on its own irrelevant as a matter of practicality.

In some instance[s] of machine invention, a natural person might qualify as an inventor by virtue of having exhibited inventive skill in developing a program to solve a particular problem, by skillfully selecting data to provide to a machine, or by identifying the output of a machine as inventive. However, in the present case, the DABUS was not created to solve any particular problem, nor was trained on any special data relevant to the instant invention. The machine rather than a person identified the novelty and salience of the instant invention.⁸³

By August 2020, the DABUS patent applications were rejected by the United Kingdom Intellectual Property Office, the European Patent Office, and the USPTO.⁸⁴ There were two important and distinct assertions made by the DABUS

76. Butler, *supra* note 4.

77. *Id.*

78. *Id.*

79. See generally U.K. Intel. Prop. Off., Decision BL O/741/19, 1 (Dec. 4, 2019) [hereinafter UKIPO Decision].

80. Thaler v. Vidal, 43 F.4th 1207, 1207 (Fed. Cir. 2022).

81. Leo Kelion, *AI System ‘Should be Recognized as Inventor’*, BBC (Aug. 1, 2019), <https://www.bbc.com/news/technology-49191645>.

82. *Pro Say Podcast*, *supra* note 18; see also Thaler, 43 F.4th at 1207 (“Thaler wrote on the applications that ‘the invention was generated by artificial intelligence.’”).

83. John Richards, *DABUS & AUKUS: A Tale of Three Approaches to the Question of Whether an Invention Created by a Machine Using Artificial Intelligence is Patentable*, JD SUPRA (Dec. 3, 2021), <https://www.jdsupra.com/legalnews/dabus-aucus-a-tale-of-three-approaches-2740160/>.

84. UKIPO Decision, *supra* note 79, ¶ 30. The UKIPO did not officially reject the applications or treat them as withdrawn. *Id.* Instead, the applicant was given sixteen months to amend the applications with the name of a human inventor, which did not happen. *Id.* This decision was appealed to a U.K. court, and two judges of a three-judge panel sided with the UKIPO. See Seiko Hidaka, *Updated: Court of Appeal – AI Generated Inventions Denied UK Patent In DABUS Case*, GOWLING WLG (Sept. 21, 2021) <https://gowingwlg.com/en/insights-resources/articles/2021/updated-ai-invention-denied-patent-in-dabus-case/>; see also Ryan Davis, *EPO Rejects Patent Applications for AI-Created Inventions*, LAW360 (Dec. 23, 2019), <https://www.law360.com/articles/1230522/epo-rejects-patent-applications-for-ai-created-inventions> (describing EPO’s rejection of Thaler’s patent application); *In re* Application

applicants that led to their rejections; first, *a machine* was the inventor,⁸⁵ and second, a machine was the *sole* inventor.⁸⁶ If these inventions were invented by a human, they would have qualified for patents, but because there was no human inventor or co-inventor, they were rejected.⁸⁷

In 2021, a federal district court affirmed the PTO decision that a machine does not qualify as an inventor under U.S. law.⁸⁸ That decision was later affirmed by the Federal Circuit Court of Appeals.⁸⁹ Despite DABUS's legal failures in the United States and many other jurisdictions, the decisions coming out of South Africa, Germany, and to some extent Australia, have given hope to team DABUS and inventive-AI—in South Africa and Germany, a machine can indeed be an inventor.⁹⁰

III. AI-GENERATED INVENTIONS PRESENT TWO PROBLEMS

AI-generated inventions present two distinct problems: inventorship and ownership.⁹¹ First, under current U.S. patent law, a machine cannot be an inventor. Second, if an AI-generated invention has no legally recognizable *human* inventor, who, if anyone, owns it?

The DABUS applications were rejected in the United Kingdom, Europe, and the United States.⁹² In rejecting the DABUS applications, the USPTO expressly

of Application No.: 16/524,350, 2020 Dec. of Comm'r Pat. 4 (announcing USPTO's rejection of Thaler's patent application).

85. See *In re* Application of Application No.: 16/524,350, 2020 Dec. of Comm'r Pat. 4.

86. See *id.*

87. See Ryan Abbott, *The Artificial Inventor Project*, WIPO (Dec. 2019), https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html (stating the United Kingdom Intellectual Property Office and the European Patent Office have found both inventions meet substantive patentability requirements).

88. *Thaler v. Hirshfeld*, 558 F. Supp. 3d 238, 249 (E.D. Va. 2021).

89. *Thaler v. Vidal*, 43 F.4th 1207, 1209 (Fed. Cir. 2022) (“[T]he Patent Act requires an ‘inventor’ to be a natural person . . .”).

90. James Nurton, *German Decision Could Provide an Answer to AI Inventorship*, IPWATCHDOG (Apr. 20, 2022), <https://www.ipwatchdog.com/2022/04/20/german-decision-provide-answer-ai-inventorship/id=148555/>. In an appeal of the Australian Patent Office's denial of the DABUS applications, an Australian court initially found in favor of allowing AI inventors. *Comm'r of Patents v. Thaler*, [2022] FCAFC 62, ¶ 5 (Austl.) <https://www.judgments.fedcourt.gov.au/judgments/Judgments/fca/full/2022/2022fcafc0062> [<https://perma.cc/SY7X-F32B>]. But on a second appeal, a panel of judges in that same court denied the inventions. *Id.* at ¶ 7. On appeal of the German Patent and Trademark Office's rejection of a DABUS patent application, Germany's Federal Patent Court overturned that rejection finding that Dr. Thaler can be the “deemed inventor.” Daria Kim, *The Paradox of the DABUS Judgment of the German Federal Patent Court*, 71 GRUR INT'L 1162, 1162 (2022). The South African decision still stands as of the submission date of this article. Alexandra Jones, *Artificial Intelligence Can Now Be Recognised as an Inventor After Historic Australian Court Decision*, ABC NEWS, (July 31, 2021), <https://www.abc.net.au/news/2021-08-01/historic-decision-allows-ai-to-be-recognised-as-an-inventor/100339264>. But see Kirk Hartung, *DABUS Sent Back to the Drawing Board Following Reversal of Inventorship Decision by Australia Court*, IPWATCHDOG (Apr. 17, 2022), <https://www.ipwatchdog.com/2022/04/17/dabus-sent-back-drawing-board-following-reversal-inventorship-decision-australia-court/id=148464/>.

91. *Ethicon, Inc. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1471 (Fed. Cir. 1998) (Newman, J., dissenting) (“[It is] established that inventorship and patent ownership are separate issues.”).

92. See *supra* note 84 and accompanying text.

decided that U.S. patent laws require the listed inventor to be a human.⁹³ For example, the Patent Act states that “[w]hoever invents . . . may obtain a patent.”⁹⁴ Elsewhere in the Act, it says “[a] person shall be entitled to a patent”⁹⁵ and “[t]he term ‘inventor’ means the *individual* . . . who invented or discovered the subject matter of the invention.”⁹⁶ Relying on rules of statutory construction, the Federal Circuit said that “there is no ambiguity: the Patent Act requires that inventors must be natural persons: that is, human beings.”⁹⁷

The logical follow up question is, “if an AI cannot be listed as an inventor of an AI-generated invention, who *can be* listed as the inventor?” The answer is, only someone who contributed to the conception of the invention. According to the USPTO, “[u]nless a person contributes to the conception of the invention, he is not an inventor.”⁹⁸ And as the Federal Circuit has held, “[c]onception is the touchstone of inventorship.”⁹⁹ Conception is defined as “the formation, in the mind of the inventor, of a definite and permanent idea of the complete and operative invention.”¹⁰⁰ This “conception” requirement poses a problem for AI-generated inventions in which conception cannot be attributed to any human.¹⁰¹ If a machine cannot be listed as an inventor and there is no human who conceived the idea, the “inventor” section of the patent application must be left blank. A patent application with “inventor” left blank will be rejected by the PTO.¹⁰² Thus, AI-generated inventions are unpatentable.

Inventorship is one problem, but ownership may be a bigger problem. The problem of ownership is connected to the problem of inventorship but not dependent upon it. In other words, resolving the problem of inventorship does not resolve the problem of ownership.

For example, suppose the Supreme Court overrules the Federal Circuit and says machines may be “inventors.” Who owns the patents? By default, an inventor owns his or her patent.¹⁰³ While patents have the attributes of personal property,¹⁰⁴ machines cannot own property.¹⁰⁵ Additionally, the requirement of disclosing an inventor was meant as a moral right—the acknowledgement and reward for human ingenuity distinct from economic benefit.¹⁰⁶ But machines do not have moral

93. See *In re* Application of Application No.: 16/524,350, 2020 Dec. Comm’r Pat. 2 n.2, 4.

94. 35 U.S.C. § 101 (emphasis added).

95. *Id.* § 102(a) (emphasis added).

96. *Id.* § 100(f) (emphasis added).

97. *Thaler v. Vidal*, 43 F.4th 1207, 1210 (Fed. Cir. 2022).

98. MPEP § 2137.01 (9th ed. Rev. 8, Jan. 2018).

99. *Burroughs Wellcome Co. v. BarrLab’s, Inc.*, 40 F.3d 1223, 1227 (Fed. Cir. 1994).

100. *Mergenthaler v. Scudder*, 11 App. D.C. 264, 276 (1897) (emphasis in original).

101. See *Abbott*, *supra* note 62, at 1093.

102. See 35 U.S.C. § 115(a); see also 37 C.F.R. § 1.76(b) (2022).

103. *Teets v. Chromalloy Gas Turbine Corp.*, 83 F.3d 403, 407 (Fed. Cir. 1996) (“[A]n invention presumptively belongs to its creator.”).

104. 35 U.S.C. § 261 (“[P]atents shall have the attributes of personal property [and] shall be assignable in law by an instrument in writing.”).

105. *Davis*, *supra* note 9.

106. Daryl Lim, *AI & IP: Innovation & Creativity in an Age of Accelerated Change*, 52 AKRON L. REV. 813, 858–59 (2018).

rights.¹⁰⁷ Perhaps then an applicant (the owner of the machine) would list the computer as an inventor and list themselves or itself (in the case of a corporate entity) as the assignee.¹⁰⁸ However, machines do not have the legal capacity to make assignments, let alone, an assignment of an ownership right—something they did not possess to begin with.¹⁰⁹ Although a person who did not invent may later “acquire an interest in an invention, any such interest, as a general rule, must trace back to the inventor.”¹¹⁰ If that inventor is a machine that cannot own property or make assignments, no one can ever own the invention. If no one owns these inventions, they will fall into the public domain.

Conversely, assume the Federal Circuit’s decision stands, and an “inventor” must be a natural person. Who would then own AI-generated inventions? U.S. patent applicants *must* disclose an inventor.¹¹¹ But if a machine cannot be listed as the “inventor,” and no human can truthfully claim inventorship, then the application will be incomplete, and the USPTO will not issue a patent. Even if the USPTO could issue a patent that did not list an inventor, who would ownership default to? Under normal circumstances, ownership of a patent defaults to the inventor.¹¹² But without an inventor, there would be no owner, and an AI-generated invention would fall into the public domain. So, whether the Federal Circuit decision is upheld or overturned, AI-generated inventions will fall into the public domain.

“Allowing AI-generated works to fall into the public domain reduces the incentive to invest in the growth of the industry.”¹¹³ “[T]he prospect of unrestrained competition from copyists will deter investment in the production of new creative works.”¹¹⁴ In other words, without the ability to obtain patent protection, companies may simply choose not to disclose AI-generated inventions to the public and instead seek protection from trade secret laws.¹¹⁵ However, trade secret protection of inventions is not as robust as patent protection.¹¹⁶

Why does ownership matter? As one U.S. President said, “American thinkers, inventors, and entrepreneurs, empowered by free-market capitalism and driven by bold ideas, have created an ecosystem of innovation that is the envy of

107. Davis, *supra* note 9.

108. See 35 U.S.C. § 261.

109. See Davis, *supra* note 9.

110. Bd. of Trs. of the Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc., 563 U.S. 776, 786 (2011).

111. 35 U.S.C. § 115(a) (“An application for [a] patent . . . shall include . . . the name of the inventor . . .”); *id.* § 115(b)(2) (“An oath or declaration . . . shall contain statements that . . . such individual believes himself or herself to be the original inventor . . .”); 37 C.F.R. § 1.76(b)(1) (2022). An application data sheet must include inventor information. 37 C.F.R. § 1.76(b)(1) (2022). “This information includes the legal name, residence, and mailing address of the inventor . . .” *Id.*

112. Teets v. Chromalloy Gas Turbine Corp., 83 F.3d 403, 407 (Fed. Cir. 1996).

113. Lim, *supra* note 106, at 841.

114. Kal Raustiala & Christopher Jon Sprigman, *The Second Digital Disruption: Streaming and the Dawn of Data-Driven Creativity*, 94 N.Y.U. L. REV. 1555, 1603 (2019).

115. Abbott, *supra* note 62, at 1104–05.

116. See generally James Pooley, *Choosing Between Patents and Trade Secrets, A Discussion Worth Revisiting*, IPWATCHDOG (Nov. 1, 2017), <https://www.ipwatchdog.com/2017/11/01/patents-and-trade-secrets-revisited/id=89641/>.

the world, making our Nation prosperous and strong.”¹¹⁷ What happens when that free-market capitalism is undermined by the inability to get patent protection? What happens when a company faces the choice between a team of human researchers or AI researchers? On the one hand, the AI researchers are exponentially faster and arguably better, but there would be no patent protection for their inventions. On the other hand, inventions by human researchers are eligible for patent protection;¹¹⁸ but human researchers are slower, and their inventions are arguably inferior.

The Surrey Group filed applications across the globe that it knew would likely be rejected because it was looking to challenge patent systems.¹¹⁹ Despite the recent favorable decisions in South Africa and Australia, the DABUS applications were rejected everywhere else, including in the United Kingdom, the European Union, and the United States. First, on December 4, 2019, the United Kingdom Intellectual Property Office (UKIPO) refused to grant either patent, stating that “the naming of a machine as an inventor does not meet the requirements of the [U.K. Patents] Act” because “a person must be identified [as an inventor].”¹²⁰ A few days later, the European Patent Office (EPO) rejected both applications after only twenty-one minutes of deliberation because the European Patent Convention (which governs the EPO) requires an inventor to be a human being.¹²¹ Then in 2022, the Federal Circuit Court of Appeals affirmed the PTO’s decision that an artificial intelligence machine cannot be an “inventor.”¹²²

The DABUS inventions demonstrate the current dilemma facing everyone attempting to patent AI-generated inventions: they must either list the computer as the inventor and face an inevitable rejection of the application (scenario one) or fraudulently list some human as the inventor (scenario two).¹²³ These two scenarios have repercussions.

In scenario one, the applicant truthfully discloses the machine as the inventor, and the USPTO must subsequently reject the application. This makes AI-generated inventions unpatentable. Unable to get property rights for their inventions, inventors who are not willing to lie to the USPTO will either (i) stop using AI to invent¹²⁴ or (ii) not disclose their inventions to the public and instead try to protect their inventions through other means (such as trade secrets).¹²⁵ Either result

117. Exec. Order No. 13,895, 84 Fed. Reg. 57309 (Oct. 25, 2019) (establishing the President’s Council of Advisors on Science and Technology).

118. See MIT Technology Review Arabia, *Ryan Abbott at EmTech MENA 2019: AI Generated Inventions*, YOUTUBE, at 13:55 (Nov. 21, 2019).

119. See *Id.*, at 12:48 (explaining that these patents will be a test case); Davis, *supra* note 9; Dan Robitzski, *Scientists are Trying to List AI as the Inventor on a New Patent*, FUTURISM (Aug. 2, 2019), <https://futurism.com/scientists-ai-inventor-patent>.

120. UKIPO Decision, *supra* note 79, at ¶ 4. This decision was affirmed by the England and Wales Court of Appeal by a vote of two to one. James Nurton, *DABUS Defeated Again—But Judges Divided*, IPWATCHDOG (Sept. 22, 2021), <https://www.ipwatchdog.com/2021/09/22/dabus-defeated-judges-divided/id=137898/>.

121. Davis, *supra* note 9, at 3.

122. *Thaler v. Vidal*, 43 F.4th 1207, 1209 (Fed. Cir. 2022).

123. See Abbott, *supra* note 62, at 1081; see also Schuster, *supra* note 58, at 2002.

124. MIT Technology Review Arabia, *supra* note 118.

125. See generally Pooley, *supra* note 116.

impedes the progress of science and the useful arts. Allowing AI-generated inventions to remain unpatentable will chill innovation.¹²⁶

In scenario two, an applicant may choose to fraudulently list some human as the inventor even though that human is not responsible for conception. Faced with the problem in scenario one above, at least some applicants have employed this practice.¹²⁷ These applicants get away with this dishonesty because the USPTO does not investigate the accuracy of the named inventor nor reject applications due to inventor issues.¹²⁸ This lying is not only unethical but undermines the entire patent system. The requirement of listing the inventor is about the moral rights of the inventor to be given due credit.¹²⁹ How could a legal system based on *moral* rights then turn around and give patent rights to a person who did not invent? If applicants are encouraged or allowed to lie, why have the “inventor” requirement at all?

There is one more problem under the scenario of a dishonest disclosure—a patent granted based on a dishonest disclosure may not protect against infringement by others. A difficult-to-prove but powerful affirmative defense in infringement lawsuits is called inequitable conduct.¹³⁰ With this defense, a defendant accused of infringing a patent alleges that the patent owner intentionally lied to the USPTO and that the lie had a material effect on the grant of the patent.¹³¹ If the defendant can prove these allegations, the court may invalidate the entire patent.¹³² This typically happens when an applicant intentionally failed to disclose prior art that would have allowed the USPTO to reject the application.¹³³ Theoretically, this could also happen if the applicant lied about the identity of the inventor. If the USPTO will not grant a patent unless there is a human inventor, and an applicant intentionally lies by designating a non-inventor as the inventor, that entire patent may be unenforceable or void.¹³⁴ There would be little value in obtaining a patent that cannot protect against infringement.¹³⁵

It should be noted that there are other issues related to AI-generated inventions, for example, those related to the non-obviousness requirement for

126. MIT Technology Review Arabia, *supra* note 118.

127. Abbott, *supra* note 62, at 1085, 1087.

128. Schuster, *supra* note 58, at 2002.

129. Davis, *supra* note 9, at 3; MIT Technology Review Arabia, *supra* note 118.

130. *Therasense, Inc. v. Becton, Dickinson & Co.*, 649 F.3d 1276, 1282 (Fed. Cir. 2011) (“When a patentee has engaged in affirmative acts of egregious misconduct, such as the filing of an unmistakably false affidavit, the misconduct is material” and can render the entire patent unenforceable.).

131. *Id.*

132. *Id.* at 1287.

133. *See Deep Fix, LLC v. Marine Well Containment Co.*, No. H-18-0948, 2020 U.S. Dist. LEXIS 26896, at *7 (S.D. Tex. Feb. 18, 2020).

134. *See id.* at *6.

135. Owning a patent like this may have some illegitimate advantages. A company owning an unenforceable patent may bluff its competitors. The competition, thinking the patent is valid, will want to avoid infringement. Only a competitor that (i) knows (and can prove) that an AI generated the invention and the listed inventor did not conceive of the invention, and (ii) is willing to pay litigation costs will consider copying the invention knowing that they can survive an infringement action.

patentability.¹³⁶ Though the USPTO, the courts, and the legislature must eventually address these other issues, this Article focuses solely on the issues of inventorship and ownership of AI-generated inventions.

IV. SOLUTIONS

[T]here is a possibility that within the space of a few decades, AI could surpass human intellectual capacity in a manner which, if not prepared for, could pose a challenge to humanity's capacity to control its own creation and, consequently, perhaps also to its capacity to be in charge of its own destiny and to ensure the survival of the species.¹³⁷

The U.S. government knows that it is not prepared for the AI invasion. Within a month of the Surrey Group's press release, the USPTO sought public comments regarding patents and AI.¹³⁸ In October of 2019, the USPTO director at the time, Andrei Iancu, said, "[w]e must address these issues now. The technology is here. It's moving fast and we must get ahead of it."¹³⁹ The U.S. government has made it a priority to "consider ways to reduce barriers to the use of AI technologies in order to promote their innovative application while protecting civil liberties, privacy, American values, and United States economic and national security."¹⁴⁰

Regarding the problems of patentability and ownership of AI-generated inventions, several solutions have been proposed. In considering the solutions below, one must keep in mind the purpose of patent laws—to provide incentives for inventors to come up with new and useful things.¹⁴¹ Some argue that without monopoly incentives, developers and users of AI would have little motivation to invest time and money in AI research, and this would ultimately be bad for all people.¹⁴² "The question is not whether machines need incentives—they clearly do not."¹⁴³ Machines are not incentivized by owning intellectual property¹⁴⁴; but humans are. "[Incentivizing AI-generated work will facilitate a creative renaissance]"¹⁴⁵ because "[a]llowing patents on AI-generated works . . . will promote the development of inventive AI, which will ultimately result in more innovation for society."¹⁴⁶ However, "[w]ithout a legal hook, these works will fall

136. See 35 U.S.C. § 103. See generally Ryan Abbott, *Everything is Obvious*, 66 UCLA L. REV. 2 2, 6 (2019).

137. *Draft Report*, *supra* note 55, at 4.

138. See Request for Comments on Patenting Artificial Intelligence Inventions, 84 Fed. Reg. 44889 (Aug. 27, 2019).

139. Davis, *supra* note 9.

140. OFF. OF MGMT. & BUDGET, EXEC. OFF. OF THE PRESIDENT, OMB BULL. No. 21-06, GUIDANCE FOR REGULATION OF ARTIFICIAL INTELLIGENCE APPLICATIONS, 8 (2020).

141. See Part I.

142. Christian E. Mammen & Carrie Richey, *AI and IP: Are Creativity and Inventorship Inherently Human Activities?*, 14 FIU L. REV. 275, 284 (2020).

143. Lim, *supra* note 106, at 840.

144. *Id.*

145. *Id.* at 834.

146. Abbott, *supra* note 87.

into the public domain, which would devastate incentives to invest in AI-generated works.”¹⁴⁷

In finding a solution, legislators must be willing to explore ideas outside of traditional paradigms. Inventions presumptively belong to their creators, but a patent is a “creature of statute.”¹⁴⁸ Perhaps it is time to redefine the creature.

A. Monkeys and Machines: Lessons from Copyright

1. What Can Copyright Teach About Protecting and Incentivizing Creativity?

To understand how patent law should deal with the problems of AI-generated inventions, it is worth looking into how U.S. law treats other areas of authorship. The closest analog is found in U.S. copyright law, which protects “original works of authorship fixed in any tangible medium of expression.”¹⁴⁹ As stated earlier, the Patent Act uses words like “whoever,” “person,” and “individual” to describe the party responsible for the creative idea.¹⁵⁰ However, the Copyright Act does not use the word “human” or its equivalent.¹⁵¹ Rather, the Copyright Act refers simply to an “author.”¹⁵² Even though the text of the laws does not necessarily require an author to be human, both the courts and the Copyright Office have definitively expressed that an “author” must be a human.¹⁵³

In 1884, the Court distinguished between works of mechanical reproduction and works of human ingenuity, stating “the terms author, inventor, and designer, as used in the art of photography . . . mean the *person* who so produced the photograph.”¹⁵⁴ In 1965, the Copyright Office rejected a musical composition that was created solely by a computer.¹⁵⁵ In 2016, a selfie-taking monkey was denied a copyright claim on a photograph because the copyright statute explicitly omitted animals or other non-humans as authors.¹⁵⁶ On appeal, the Ninth Circuit found that the monkey had Article III standing but lacked statutory standing because “[t]he Copyright Act does not expressly authorize animals to file copyright infringement suits.”¹⁵⁷ The Court went on to say that based on rules of statutory construction, the copyright law’s use of words like “children,” “grandchildren,” and “widow”

147. Lim, *supra* note 106, at 842.

148. *Crown Die & Tool Co. v. Nye Tool & Mach. Works*, 261 U.S. 24, 40 (1923).

149. 17 U.S.C. § 102(a).

150. *See supra* text accompanying notes 93–96.

151. 17 U.S.C. § 117 *et seq.*

152. *E.g.*, 17 U.S.C. §§ 104(a)–(b), 106A(a)(1)(A) (“[T]he author of a work of visual art . . . shall have the right . . . to claim authorship of that work.”).

153. *Mammen & Richey*, *supra* note 142, at 277. Dr. Thaler’s application for copyright registration of DABUS’s artwork, “A Recent Entrance to Paradise,” was rejected by the U.S. Copyright Office. Franklin Graves, *Thaler Pursues Copyright Challenge Over Denial of AI-Generated Work Registration*, IPWATCHDOG (June 6, 2022), <https://www.ipwatchdog.com/2022/06/06/thaler-pursues-copyright-challenge-denial-ai-generated-work-registration/id=149463/>.

154. *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 55 (1884) (emphasis added) (internal quotation omitted).

155. *Mammen & Richey*, *supra* note 142, at 278.

156. *Naruto v. Slater*, No. 15-CV-04324-WHO, 2016 WL 36223, at *3–4 (N.D. Cal. Jan. 28, 2016), *aff’d*, 888 F.3d 418 (9th Cir. 2018).

157. *Naruto v. Slater*, 888 F.3d 418, 426 (9th Cir. 2018).

imply that an author must be a human.¹⁵⁸ By 2017, the Copyright Office had expressly stated that “works that have not been created by a human being” are uncopyrightable;¹⁵⁹ “copyright law only protects works of authorship that are created by human beings.”¹⁶⁰ Any work that does not “owe its originality to a human” does not qualify for a copyright and goes into the public domain.¹⁶¹

However, other countries take different approaches to non-human authorship. For example, the United Kingdom first divides “works” into categories based on how the work was generated (either human-generated or computer-generated), then defines “author” accordingly.¹⁶² In the computer-generated category, the *producer* is considered the author.¹⁶³ The United Kingdom thus employs a *de facto* work-for-hire model to establish *ownership* while attributing *authorship* to someone other than the true author.¹⁶⁴ By applying a categorical approach, the United Kingdom gives statutory protection to works regardless of who or what generated them.¹⁶⁵

In China, copyright does not seem to turn on whether the work was authored by a human or a machine. A Chinese court recently ruled that an AI-authored article qualified for copyright protection.¹⁶⁶ An AI machine named Dreamwriter wrote a financial report, displaying “selection, analysis and judgment of relevant stock market information and data.”¹⁶⁷ Even though the *machine* authored the article, the machine’s *owner* (tech company Tencent) successfully sued for copyright infringement and was awarded 1,500 yuan (\$216).¹⁶⁸ Thus, China also, seems willing to give legal protection to works regardless of who or what generated them.

It would not be too much of a stretch to alter U.S. laws to achieve results similar to the United Kingdom’s and China’s. Even though human creativity is a necessary condition for copyright in the United States, that does not mean a human is always listed as the “author.” Under the work-for-hire doctrine, when a work is created by a human employed for the purpose of creating, the *employer* is presumed the author and owner of the copyright.¹⁶⁹ In other words, the employee or contractor is the author-in-fact but the employer is the author-in-law.¹⁷⁰ The purpose of the work-for-hire doctrine is to incentivize employers to undertake the

158. *Id.*

159. U.S. COPYRIGHT OFF., COMPENDIUM OF U.S. COPYRIGHT OFF. PRACS. § 906 (3d ed. 2017).

160. *Id.* § 906.6.

161. Mammen & Richey, *supra* note 142, at 281.

162. Copyright, Designs and Patents Act 1988, c. 48, § 9 (UK).

163. *See id.* § 9(3) (“In the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken.”).

164. *See id.* § 11.

165. *See id.* § 9.

166. *Court Rules AI-Written Article Has Copyright*, ECNS (Jan. 9, 2020), <http://www.ecns.cn/news/2020-01-09/detail-ifuqscrm6562963.shtml>.

167. *Id.*

168. *Id.*

169. 17 U.S.C. § 201(b) (creating a presumption that the employer is the author and copyright owner, “unless the parties have expressly agreed otherwise in a written instrument signed by them”).

170. Lim, *supra* note 106, at 844.

risks of creating.¹⁷¹ Sometimes those risks and financial outlays are too large for a single author; allowing a producer to acquire property rights of the works created by other people facilitates the creation of those works. The classic example is where a movie producer (or more likely a production company) hires writers, actors, cinematographers, and editors to create a \$200 million blockbuster. Under the work-for-hire doctrine, the producer becomes the author and holder of the copyright.

2. *Why Copyright Might Not Be a Good Analogy*

Copyright law offers some interesting analogies, but some caution is required before applying the rules of copyright to patents. The requirements for copyrightability and patentability are different. Patent law requires patents to be new, useful, and non-obvious.¹⁷² In comparison, to receive a copyright, a work must only be original, which means it must “possess[] some ‘creative spark,’ no matter how crude, humble, or obvious it might be.”¹⁷³ Though novelty (a patent requirement) and originality (a copyright requirement) might be similar concepts, there is no copyright analog to non-obviousness (a patent requirement).¹⁷⁴

Additionally, though the underlying purposes of patents and copyrights are the same—to incentivize creators—authors and inventors may not actually be similarly incentivized. For example, “history has shown artists are going to create art, regardless of incentives. Vincent Van Gogh created over 2,000 works of art before he died poor at the age of 37.”¹⁷⁵ Maybe it is true that artists create for the pure joy of creating and therefore do not need the incentive of copyright, but inventors are different, right? Maybe not. A 2008 survey on patenting and entrepreneurship showed that patents may not incentivize inventors to the extent they once did, especially in the software industry.¹⁷⁶

However, simply because some artists and inventors died poor does not lead to the conclusion that all artists and inventors are going to create whether they are incentivized to do so or not. Just because an artist or inventor did not *succeed* in getting paid to create does not mean they were not incentivized, even just a little, by the *potential* of getting paid.¹⁷⁷ It is hard to imagine a research and development company dedicating its resources to finding a cure for COVID-19 simply for the self-satisfaction of benefiting mankind. Surely employees need to be paid and investors want to see profits.

Therefore, copyright law, especially as applied in the United Kingdom and China, offers hope that it may be possible to protect AI-generated works. The trick then is to determine how to adapt some of these principals to U.S. patent law.

171. *Id.* at 843.

172. 35 U.S.C. §§ 101, 103.

173. Mammen & Richey, *supra* note 142, at 281.

174. *See id.* at 281, 286, 291.

175. *Id.* at 284.

176. *Id.* (citing Robert P. Merges et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255, 1283–87 (2009)).

177. The author was formerly both an inventor and an artist and speaks from personal experience.

B. The Creation of a Sui Generis Category of Invention

Some argue that patent law needs to be modernized, allowing computers to be listed as inventors and the computers' owners to be listed as the default assignees.¹⁷⁸ This approach to patent law is similar to the United Kingdom's copyright approach.¹⁷⁹ A modernized Patent Act would divide inventions into two categories: one category where the invention is conceived by a human, and another category where the invention is conceived solely by a machine. Under this second *sui generis* category of invention, the AI would be disclosed as the inventor, and ownership of the patent rights would default to the owner of the AI. This would be achieved in a similar manner as the "producer" model of the U.K. copyright law, the work-for-hire model of the U.S. copyright law, or even the employed-to-invent doctrine of patent law.¹⁸⁰

Because a machine cannot sign an employment contract or otherwise assign property rights, ownership would have to be a construction of law.¹⁸¹ In fact, the Patent Act already allows for ownership as a construction of law. Similar to the work-for-hire doctrine in copyright law, under the employed-to-invent doctrine, an employee's inventions may be impliedly assigned to the employer, even if there is no express assignment.¹⁸² In the United Kingdom, inventions are *automatically* the property of the employer if the employee who came up with the invention did so while in the normal course of his or her job, or the employee was acting in such a way that an invention might reasonably be expected to result from the employee's duties.¹⁸³ Thus, despite an express assignment by an AI machine, the "employed" machine could impliedly assign its inventions to its employer.

A modernized Patent Act would require adjustment to various provisions of the Act. For example, the USPTO requires an inventor to execute an oath or declaration that contains certain statements concerning the invention.¹⁸⁴ A machine cannot execute an oath. This problem should be easy enough to fix because the Act already makes an exception for the oath requirement, such as if the inventor is deceased or under legal incapacity.¹⁸⁵ The Act could easily make another exception for AI-generated inventions.

Allowing computers to be listed as inventors would reward human activity *after* the computer's inventive act.¹⁸⁶ The incentive of patent protection in this solution starts with the marketing companies who want to sell new products. These companies will be willing to pay for problem-solving creativity in the form of AI.¹⁸⁷ The companies that develop AI will be motivated to do so by their ability to sell AI solutions that will, in turn, be patentable by the marketing companies that

178. See Abbott, *supra* note 62, at 1113.

179. See *supra* notes 167–70 and accompanying text.

180. See Lim, *supra* note 106, at 843; Mammen & Richey, *supra* note 147, at 285. See generally *Banks v. Unisys Corp.*, 228 F.3d 1357 (Fed. Cir. 2000) (describing an employed-to-invent dispute).

181. See Mammen & Richey, *supra* note 142, at 285.

182. *Banks*, 228 F.3d at 1359.

183. The Patents Act 1977 c. 37, § 39(1) (UK).

184. 35 U.S.C. § 115(a)–(b) (2018).

185. *Id.* § 115(d).

186. Abbott *supra* note 62, at 1104.

187. See *id.*

hire the AI systems.¹⁸⁸ In this scenario, AI “can be inventors because although AI would not be motivated to invent *by* the prospect of a patent, computer inventorship would incentivize the development of creative machines. In turn, this would lead to new scientific advances.”¹⁸⁹ Granting intellectual property rights to the person who *made the invention possible* will “ensure that companies keep investing in the technology, safe in the knowledge that they will get a return on their investment.”¹⁹⁰

Proponents of this solution argue that in cases where the developer of the AI, the owner of the AI, and the user of the AI are different entities, patent ownership can be negotiated by contract.¹⁹¹

C. Eliminate the Inventor Requirement

Some argue that “the traditional approach to patent law in which policy makers seek to identify the human inventor behind the patent is . . . no longer relevant.”¹⁹² Where the first solution (in Section IV.B) carves out an exception to the human requirement through the creation of a new category of inventions, this solution calls for completely eliminating the inventor requirement.¹⁹³ Much like the first solution, this solution would require reworking the Patent Act because the implication that an inventor must be a human comes from various parts of the Act, such as in the previously mentioned requirement of an inventor’s oath and declaration.¹⁹⁴

However, completely removing the inventor requirement might have unintended consequences, such as affecting the application of judicial precedent which states that an invention belongs to its inventor.¹⁹⁵ If patentees are not required to disclose inventors, could a defendant who is sued for infringement be able to invalidate a patent by attacking conception?

Additionally, the benefits for engineers and scientists who are named on an invention reach beyond the sale or license of that particular invention.¹⁹⁶ For example, an inventor with dozens of inventions to her name may have more marketability than someone with zero inventions.¹⁹⁷ Inventorship is a status symbol that speaks to the moral right of the inventor.¹⁹⁸ Removing the “right” of an inventor to be named as such might discourage individual pursuits. Pride and self-promotion are powerful motivators.

188. *See id.*

189. *Id.* at 1081 (emphasis added).

190. Lim, *supra* note 106, at 844 (quoting Andres Guadamuz, *Artificial Intelligence and Copyright*, WIPO (Oct. 2017), https://www.wipo.int/wipo_magazine/en/2017/05/article_0003.html [<https://perma.cc/BS8X-ZWN2>]).

191. Abbott, *supra* note 62, at 1114.

192. Ravid & Liu, *supra* note 15, at 2216.

193. Lim, *supra* note 106, at 861.

194. *See* 35 U.S.C. § 115.

195. *See, e.g.,* *Teets v. Chromalloy Gas Turbine Corp.*, 83 F.3d 403, 407 (Fed. Cir. 1996).

196. *See* Erica Fraser, *Computers as Inventors – Legal and Policy Implications of Artificial Intelligence on Patent Law*, 13 SCRIPTED 305, 331 (2016).

197. *See id.*

198. *See, e.g.,* Lim, *supra* note 106, at 858–59.

Unfortunately, removing the inventor requirement addresses only the inventorship problem, leaving the ownership problem unresolved and opening a Pandora's box of unintended consequences.

D. Grant Personhood Status to AI Machines

Another solution that has been proposed is to grant personhood to AI machines, at least for limited purposes.¹⁹⁹ The idea that AI could become a legal person is decades old.²⁰⁰ Recently, the European Parliament discussed a category of electronic personhood that would help deal with issues related to copyrights and other liability.²⁰¹ “We could well have artificial intelligences that are responsive to incentives, unpredictable enough that we can’t simply tell them what to do, and that have attributes of personality that make us willing to regard them as [intellectual property] owners.”²⁰² As that reality approaches, “it becomes more and more urgent to address the fundamental question of whether robots should possess a legal status.”²⁰³

Electronic personhood is not as much of a legal stretch as one might think because many parts of the law currently allow for *corporate* personhood. The Dictionary Act of the United States Code says that “the words person and whoever include corporations, companies, associations, firms, partnerships, societies, and joint stock companies, as well as individuals”²⁰⁴ Courts have interpreted “individual,” as used in the Bankruptcy Code and at least one federal criminal statute, to mean both natural persons and corporations.²⁰⁵ Using a search phrase in Lexis like “the term ‘person’ includes individual, partnership, association, firm and corporation,” one will find dozens of laws, such as § 101(41) of the Bankruptcy Code, that designate corporations and such other entities as “persons.” Even the U.S. Supreme Court has indicated that the term “author” (and potentially “inventor”) may be read broadly in order to achieve the policy purposes of the intellectual property clause of the U.S. Constitution.²⁰⁶

Granting electronic personhood requires a serious inquiry into the limits of the rights and duties that would go along with it.²⁰⁷ Could a limited form of electronic personhood that allows for inventor status also allow for ownership status? Would electronic personhood allow a machine to sell, bequeath, or assign its ownership rights to a person or a company? Can an AI sue or be sued for infringement? Can

199. Mammen & Richey, *supra* note 142, at 289.

200. *See generally* Solum, *supra* note 42, at 1231.

201. *Draft Report*, *supra* note 55, at 12; Mammen & Richey, *supra* note 142, at 289.

202. James Grimmelmann, *There’s No Such Thing as a Computer-Authored Work—And It’s a Good Thing, Too*, 39 COLUM. J.L. & ARTS 403, 414 (2016).

203. *Draft Report*, *supra* note 55, at 5 (internal quotation omitted).

204. 1 U.S.C. § 1 (2018).

205. Mammen & Richey, *supra* note 142, at 288–89; *e.g.*, *United States v. Middleton*, 231 F.3d 1207, 1210 (9th Cir. 2000). *But see In re Goodman*, 991 F.2d 613, 619 (9th Cir. 1993).

206. *See Goldstein v. California*, 412 U.S. 546, 561 (1973) (explaining that the term author has “not been construed in [its] narrow literal sense but, rather, with the reach necessary to reflect the broad scope of constitutional principles. While an ‘author’ may be viewed as an individual who writes[,] the term . . . has been [more broadly] construed to mean an ‘originator’”); U.S. CONST. art. I, § 8, cl. 8.

207. *Draft Report*, *supra* note 55, at 12.

an AI be held liable for other torts or crimes?²⁰⁸ These questions and more must be addressed if electronic personhood is to be seriously considered. This inquiry is certainly more complex than simply creating a *sui generis* category of invention.

E. List Upstream/Downstream Stakeholders as Inventors and Owners

It is unappealing to say that the act of tapping the button is an act of authorship justifying [an intellectual property right] for the user [of the AI]. But the fact that the minuets are generated pseudorandomly also makes it unappealing to treat the programmers [of the AI] as the authors, since they did not compose any particular minuet.²⁰⁹

Another solution is to allow certain stakeholders to be the inventor. There are various human actors either upstream or downstream from the AI's "conception" who might be identified as "inventors." These stakeholders include programmers, trainers, operators, or users (the companies who use AI to invent).²¹⁰ Some have argued that these stakeholders should receive recognition of authorship through tracing legal causation.²¹¹

However, under the current system, what qualifies someone as an inventor is "conception."²¹² Unless someone is responsible for conception, either in full or in part, they cannot be listed as an "inventor."²¹³ This "conception" requirement would bar the programmer, trainer, operator, or user from being the inventor.²¹⁴ Although each individual contributed to the machine's ability or actions, none of them contributed to the "definite and permanent idea of the complete and operative invention."²¹⁵ Allowing a person who may have been involved in the AI's existence, abilities, or instruction to be identified as an inventor when that person did not contribute to "conception" runs afoul of established principles of patent law.²¹⁶ Therefore, unless a programmer, trainer, operator, or user formed a "definite and permanent idea" of the working invention in their mind, they cannot take credit as its inventor.

Perhaps it is helpful to consider analogies to understand why it would be unfair to allow these upstream/downstream stakeholders to be inventors. A mother who gives birth to a child is not able to claim authorship of her child's painting simply because she gave birth to the child. A professor who trains a Ph.D. student is not able to claim inventorship on the student's inventions simply because they trained the student.²¹⁷ A person who simply asks someone to invent something to solve a

208. See Ryan Abbott & Alex Sarch, *Punishing Artificial Intelligence: Legal Fiction or Science Fiction*, 53 U.C. DAVIS L. REV. 323, 323 (2019).

209. Grimmelmann, *supra* note 202, at 412.

210. See generally Abbott, *supra* note 62, at 1092–94.

211. See Dan L. Burk, *Thirty-Six Views of Copyright Authorship*, by Jackson Pollock, 58 HOUSTON L. REV. 263, 263 (2020).

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

213. See *id.* at 1228.

214. See *id.*

215. *Mergenthaler v. Scudder*, 11 App. D.C. 264, 276 (1897).

216. MPEP § 2137.01 (9th ed. Rev. 8, Jan. 2018).

217. MIT Technology Review Arabia, *supra* note 118.

problem is not an inventor.²¹⁸ A person who simply employs a person or provides financial resources is also not an inventor.²¹⁹ Just as someone who merely gives birth, trains, asks, or employs cannot be an inventor of something that they did not conceive, someone who merely programs, trains, commands, or hires AI cannot be an inventor of something they did not conceive.

As stated earlier, inventorship and ownership are two separate issues.²²⁰ Assuming the inventorship problem is solved by allowing an upstream/downstream stakeholder to be listed as an inventor, the ownership problem remains. Under the employed-to-invent doctrine (mentioned earlier), an employer might be able to *own* a patent conceived by its human employee.²²¹ Extending this doctrine to the context of AI-generated inventions, could an argument be made that *ownership* belongs to the programmer, trainer, operator, or end-user?

The answer is that all four could be possible owners, but under the theory of maximized economic efficiency, the *end-user* of the AI should be the patent owner.²²² Generally speaking, the end-user is the entity most likely enjoy the benefit of a monopoly because it is a marketplace participant.²²³ An end-user company will hire (or license) AI to come up with an invention to try to market and generate profit.²²⁴ Because this company is motivated to make a profit by marketing the invention, it would appreciate a temporary monopoly more than any other actor.²²⁵

To illustrate, IBM created and marketed Watson as an AI machine for hire.²²⁶ Companies in the fields of finance, law, and medicine (marketplace participants) have hired or licensed Watson to make something useful for them.²²⁷ Despite Watson being used in those fields, “IBM has yet to open a law office or hospital.”²²⁸ Software companies like IBM and their programmers “tend to stay in their area of expertise and thus will not likely engage in the market for every field in which their AI might be employed.”²²⁹ However, marketplace participants looking for a market advantage may want to employ AI to help.²³⁰

Because the users of AI (marketplace participants) are the actors most likely to ultimately benefit from the monopoly rights of a patent, they should be the default patent owners.²³¹ But even if ownership does not default to the marketplace

218. Abbott, *supra* note 62, at 1094.

219. Schuster, *supra* note 58, at 1962; *see* Nartron Corp. v. Schukra U.S.A. Inc., 558 F.3d 1352, 1359 (Fed. Cir. 2009); *see also* TS Holdings, Inc. v. Schwab, No. 09-CV-13632, 2011 WL 13205959, at *4 (E.D. Mich. Dec. 16, 2011).

220. *See supra* Part III.

221. *See* Banks v. Unisys Corp., 228 F.3d 1357, 1359 (Fed. Cir. 2000); *TS Holdings*, 2011 WL 13205959, at *4.

222. Schuster, *supra* note 58, at 1950.

223. *Id.* at 1989.

224. *Id.* at 1985, 1989.

225. *Id.*

226. *Id.* at 1989.

227. *Id.* at 1990.

228. *Id.*

229. *Id.*

230. *Id.* at 1985.

231. *Id.* at 1988.

participants, it will end up there. Assuming ownership instead defaults to the *owner of the AI*, marketplace participants will bargain for and eventually end up as owners of the inventions.²³² License agreements or assignments will define who owns subsequent patent rights.²³³ For example, if a company wanted to “hire” IBM’s Watson to invent a new widget, that company can negotiate a contract with IBM over ownership rights.²³⁴ In this scenario, the developers, owners, and users of AI machines will be able to negotiate favorable contracts through which perhaps each person can receive a financial reward for the resulting patent.²³⁵ A developer is incentivized to develop good AI that invents because the developer will be able to make money by selling its inventive services to firms wanting inventions.²³⁶ A developer can assign rights to an owner who then can assign rights to a user.²³⁷

Regardless of who starts out owning patent rights, at the end of the day, the marketplace participants end up owning the patents, and the division of profits among the various actors should reflect their respective contributions to invention.²³⁸ However, economic efficiency will be achieved if ownership starts where it ultimately ends—with the *end user* of the AI (the marketplace participant).²³⁹ Proponents of this approach have a workable solution for ownership—or rather, a good justification for allowing an upstream/downstream stakeholder to be an owner—but still lack a workable solution for inventorship.

F. Do Not Grant Patents for AI-Generated Inventions

It has been argued that “traditional patent law is irrelevant” and that AI-generated inventions do not need patent protection.²⁴⁰ For example, “CEOs in most industries see patent incentives as relatively unimportant.”²⁴¹ There are also alternative ways to maintain the innovation incentives that are at the heart of patent law, including trade secret protections and first-mover advantages, but these alternatives have their limitations.²⁴²

Trade secret law protects intellectual property in certain situations, such as when reverse engineering is difficult.²⁴³ But “trade secret law . . . does not offer protection against discovery by fair and honest means, such as by independent invention, accidental disclosure, or by so-called reverse engineering.”²⁴⁴ In other words, trade secret law protects only *secrets*. Once an invention is made public

232. *See id.* at 1969.

233. Lim, *supra* note 106, at 845.

234. Abbott, *supra* note 62, at 1115.

235. *See id.* at 1116.

236. *See id.*

237. *Id.*

238. Ravid & Liu, *supra* note 15, at 2243.

239. Schuster, *supra* note 58, at 1981. If ownership starts somewhere other than with the marketplace participant, transaction costs between each player leads to economic inefficiency. *Id.* To reduce inefficiency, ownership should start where it will ultimately end up. *Id.*

240. Ravid & Liu, *supra* note 15, at 2216.

241. *Id.* at 2252.

242. *Id.* at 2222.

243. Lim, *supra* note 106, at 871.

244. *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 476 (1974).

through marketing and sale, trade secret law will not protect the not-secret ideas.²⁴⁵ Therefore, trade secret law will not protect DABUS's cup once it is in Wal-Mart.

Alternatively, being the first to bring a product to market often has monopoly-like effects.²⁴⁶ Because it would take some time for a competitor to bring a copycat version of a product to market, the first company to enter a market could control supply and price in order to generate high profits.²⁴⁷ This gives the first mover time to establish their product as the market leader.²⁴⁸ Any competitor willing to subsequently enter the market will be forced to compete with the market leader not only in price, but in market loyalty.²⁴⁹ However, being first to market does not guarantee success. For example, Amazon was not the first website to sell books on the internet, but whoever *was* first is long gone. First-mover advantages would be diminished if competitors were allowed to simply copy the inventions of their competitors. This is likely even more pronounced when the first mover is a small company with limited resources because the larger company could simply copy the first company's inventions and squeeze the first mover out of the market.

Lastly, for some products, patents provide only limited protection anyway. Product lifecycles for some products, like computer software, are so short that any patented technology may become irrelevant before a patent is actually issued.²⁵⁰ Yet despite the lack of protection, these products continue to be innovated.²⁵¹

Although the above alternatives to patent protection have some merit in limited situations, patent protection motivates innovation in most industries. And in the case of DABUS's cup, none of the patent alternatives offer what a patent can offer.

G. Maintain the Status Quo

The final solution is to maintain the status quo. Today's legal practitioners are advising their clients to work around the limitations of U.S. patent laws.²⁵² One way to ensure that an AI-generated invention is patentable today is to involve at least one human (i.e., a human co-inventor) in the inventive process. *Conception* is not the exclusive basis for inventorship; *discovery* may also allow one to be an inventor.²⁵³ In the AI context, a human could be an inventor if they are the first to understand the importance of something that an AI creates.²⁵⁴ For example, an AI

245. *Id.* at 475.

246. Ravid & Liu, *supra* note 15, at 2254–55.

247. *Id.*

248. *See id.*

249. *Id.* at 2255.

250. *See id.* at 2254.

251. See L. Ceci, *Number of Available Apps in the Apple App Store from 1st Quarter 2015 to 2nd Quarter 2022*, STATISTA (Aug. 11, 2022), <https://www.statista.com/statistics/779768/number-of-available-apps-in-the-apple-app-store-quarter/> [<https://perma.cc/P27D-SXEA>] (showing that there are more than two million software apps available on the Apple App Store).

252. See Skaff et al., *supra*, note 10 (discussing considerations for innovators seeking protection for AI-assisted inventions).

253. 35 U.S.C. § 100(f) (“The term ‘inventor’ means the individual . . . who invented or *discovered* the . . . invention.” (emphasis added)); *id.* § 101 (“Whoever invents or *discovers* any new and useful process . . . may obtain a patent therefor.” (emphasis added)).

254. Abbott, *supra* note 62, at 1098.

produces output, but a human interprets the results.²⁵⁵ This final evaluative process may be significant enough to bestow the human with the title of “inventor.”²⁵⁶

At the outset of the coronavirus pandemic, Insilico Medicine used AI to identify thousands of new molecules that could be potential medicines against the new virus.²⁵⁷ But this did not produce patentable ideas because researchers needed to complete further testing to find effective medicines.²⁵⁸

Having at least one human perform inventive tasks will ensure there is at least one human who can be listed as an inventor.²⁵⁹ Many of the most common types of AI-generated inventions will or could have a human interpret the results; therefore, there is no need to change the patent laws.²⁶⁰ But this approach can lead to undesirable results. For example, suppose a machine is tasked with creating something, and then spits out a report of the invention, complete with schematics.²⁶¹ Just then, an intern who is not involved in the project walks by and reads and understands the report before anyone else at the company.²⁶² Is the intern the inventor because she was the first to review and understand the report?²⁶³ What if a room full of people read the report simultaneously?²⁶⁴ Do they all become inventors?²⁶⁵ Is reading and understanding a report truly *discovery*? Other workarounds include the use of patent alternatives (such as trade secrets and first mover advantages), as discussed above.²⁶⁶ But those alternatives have their limits.²⁶⁷

Practitioners advise that patent protection is not necessary, at least in a few industries like software development, which primarily relies on copyright law for protection.²⁶⁸ However, monopoly incentives will always be at least theoretical secondary incentives, even if they are not primary incentives.²⁶⁹ People do not often like to labor for free.

Until the laws are changed, companies that use AI will do what they must to protect their investments: lie, involve human co-inventors, keep trade secrets, try to be first to market, and use copyrights. But just because there are workarounds to patent law does not mean that we should allow the status quo.

255. Skaff et al., *supra* note 10.

256. *Id.*

257. Jeremy Kahn, *Startup Uses A.I. to Identify Molecules that Could Fight the Coronavirus*, FORTUNE (Feb. 6, 2020), <https://fortune.com/2020/02/06/ai-identifies-possible-coronavirus-treatment/>.

258. *Id.*

259. Skaff et al., *supra* note 10.

260. *Id.*

261. Abbott, *supra* note 62, at 1103–04.

262. *Id.*

263. *Id.*

264. *Id.*

265. *Id.*

266. See discussion *supra* Section IV.F.

267. *Id.*

268. Abbott, *supra* note 62, at 1106.

269. See *id.*

CONCLUSION

What we know for certain is that, at some point in the early Twenty-first Century, all of mankind was united in celebration. Through the blinding inebriation of hubris, we marveled at our magnificence as we gave birth to A.I. . . . A singular consciousness that spawned an entire race of machines. I must say I find it almost funny to imagine the world slapping itself on the back, toasting the new age. I say *almost funny*.²⁷⁰

Twenty years after Morpheus uttered those words to Neo, the expansion of AI “into creative domains previously occupied only by people[] threaten[s] to displace human inventors.”²⁷¹ Due to our desire for the progress of science and the useful arts and our lust for profits, “a ‘creative singularity’ in which computers overtake humans as the primary source of innovation may be inevitable.”²⁷² If we are to believe nearly every movie about a dystopian future earth, AI could take over human tasks such that there will be little need for humans. Perhaps it is important to prevent AI-generated inventions as a type of protectionism against an AI invasion.

However, “[p]owerful AI systems could hold the key to some of the mega challenges facing humanity—from the cure for cancer to workable solutions for reversing climate change.”²⁷³ AI transforms the way we solve problems and invent solutions. We need to embrace the businesses that make AI possible.²⁷⁴ But the “bottleneck for the U.S. will not be in major improvements in core algorithms but rather in the policy adaptation[s] needed.”²⁷⁵ “[I]f outdated IP laws around the world don’t respond quickly to the rise of the inventive machine, the lack of incentive for AI developers could stand in the way of a new era of spectacular human endeavor.”²⁷⁶ As the PTO, the courts, and Congress consider policy changes, they must keep in mind the underlying purpose of patent law given to us long ago: “The patent monopoly was not designed to secure to the inventor his natural right in his discoveries. Rather, it was a reward, an inducement, to bring forth new knowledge.”²⁷⁷

The Patent Act should be modernized to provide for two categories of inventions: human-generated inventions, where at least one human is responsible for conception or discovery, and AI-generated inventions, where a machine is the sole inventor. The employed-to-invent doctrine, extended to this new category of invention, can provide for “a pragmatic legal vehicle for interests to vest.”²⁷⁸ Rewarding innovative activities in this manner will encourage the development of

270. THE MATRIX (Warner Bros. Entertainment Inc. 1999) (Morpheus explaining to Neo, who had just been released from the Matrix, what really led to the downfall of the human race and the scorched earth).

271. Abbott, *supra* note 62, at 1117.

272. *Id.* at 1120.

273. Butler, *supra* note 4 (internal quotation marks omitted).

274. Lim, *supra* note 106, at 826.

275. *Id.*

276. Butler, *supra* note 4 (internal quotation marks omitted).

277. Graham v. John Deere Co., 383 U.S. 1, 9 (1966).

278. Lim, *supra* note 106, at 874.

inventive AI and will reflect “the broad scope of constitutional principles.”²⁷⁹ In the words of Thomas Jefferson, “ingenuity should receive a liberal encouragement.”²⁸⁰

It is true that AI machines do not respond to incentives to invent; therefore, our patent laws should not be designed to incentivize machines.²⁸¹ However, the people who build, own, and use AI to solve problems *do* respond to patent incentives.²⁸² Our laws should allow AI-generated inventions to receive patent protection, which would in turn result in more investment in and development of inventive AI, and thus promote the progress of science and the useful arts.²⁸³

279. *Goldstein v. California*, 412 U.S. 546, 561 (1973); *see also* *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980) (“Congress plainly contemplated that the patent laws would be given wide scope.”).

280. *Graham*, 383 U.S. at 8.

281. MIT Technology Review Arabia, *supra* note 118.

282. *Id.*

283. *Id.*