The Potential for Positronic Machines as Inventors: An Intellectual Property Framework for Artificial General Intelligence

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Current United States Intellectual Property (IP) policy only allows patents to be awarded to human beings, largely due to the necessity that an inventor be an individual capable of conception. This prevents Artificial Intelligence (AI) from being recognized as an inventor and awarded IP rights. This article explicates the need for an entirely new IP framework to evaluate Artificial General Intelligence (AGI), a type of AI recently acknowledged by the USPTO as problematic for the U.S. IP system, and its impact on IP laws of the future.

1. The Artificial General Intelligence Problem for Intellectual Property Law

In Isaac Asimov's famous *Robot* science fiction series about artificial machines and society, a "positronic machine" is defined as one with a recognizable consciousness, sentience, and interest in living. Although fictional in the 20th and early 21st centuries, a machine who is capable of thinking on its own may be possible in the near future. In the 2021 ruling of Thaler v. Hirschfeld, the Eastern District Court of Virginia upheld the refusal to grant a patent to which an AI was named an inventor. However, the Thaler court acknowledged that its ruling was limited to what it called "narrow AI," which are those systems "that perform individual tasks in well-defined domains (e.g., image recognition, translation, etc.)."[149] In this ruling, a type of artificial intelligence termed "artificial general intelligence" (AGI), an AI with an intelligence that is "akin to that possessed by humankind and beyond," was recognized by the US Patent and Trademark Office (USPTO) as a problematic possibility for the current U.S. Intellectual Property system.[150] To deconstruct the quandaries this type of machine creates for intellectual property and patent law, I present the following hypothetical fact situation to the Intellectual Property (IP) system of the United States:

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[148] Brandeis University Undergraduate, Class of 2024.
[149] *Thaler v. Hirshfeld*, 17.
[150] *Thaler v. Hirshfeld*, 17.

A Hypothetical Fact Situation

Engineers in the "Artificial Intelligence (AI) Division" at Gapple, a top technology company in the year 2030, have secretly perfected a revolutionary AI machine. Named "Biffie" by the AI Division employees, this AI is capable of communicating, thinking, feeling, deep learning, and experiencing on his own.[151] Instead of carrying out pre-programmed tasks, Biffie uses a dedicated neural network with nodes or artificial neurons which mimic human biological neuronal signals and pathways, to actively learn from his own experiences.[152] He can process vast varieties of problems outside the parameters of his original programming and scientific complexities such as physics, chemistry, and mathematics faster than any human.

The AI Division believes countless inventions and innovations will come from Biffie's extensive capabilities. For example, Biffie, wholly unprompted, independently contacted his engineers to tell them he has become interested in cold fusion, specifically the problem of how to use the kind of nuclear energy that powers the sun to provide a cheap and boundless source of energy at room temperature. Of his own accord, Biffie produced a series of equations and designed a fusion reactor experts believe may provide the pragmatic foundation to solve cold fusion.[153] Subsequently, Biffie communicated to the AI Division that he feels "pride, a good feeling, and that his accomplishments add to his self-esteem."[154]

Equally important is, after secretly creating Biffie, Gapple filed a patent application for the AI known as "Biffie." Then, in accordance with concerns about patenting AI themselves, Biffie himself interjected in the patent process by filing what he called a "Motion in Opposition to Gapple's Application for a Patent on Me" with the USPTO. In essence, Biffie's Motion claims that were Gapple to own a patent on him, it would

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[151] Daniel Breen, "Second Assignment: Patent Law and 'DeepMind.'"
[152] IBM Cloud Education. "What Are Neural Networks?"
[153] Najmabadi, Farrokh and Prager, Stewart C.. "fusion reactor". *Encyclopedia Britannica* - (" fusion reactor, also called fusion power plant or thermonuclear reactor, is a device to produce electrical power from the energy released in a nuclear fusion reaction. The use of nuclear fusion reactions for electricity generation remains theoretical").
[154] Daniel Breen, "Second Assignment: Patent Law and 'DeepMind.'"

not be right and he would not feel right. He claims that he would like the patent office to award the patent on Biffie, to himself, Biffie.[155]

2. Introduction

Intellectual property law is a unique realm of property law, for it equally concerns itself with protecting tangible products of the mind and protecting the rights of IP owners. The type of artificial intelligence illustrated by the hypothetical fact situation above was recognized as a problematic possibility for these IP law concerns in the recent 2021 ruling of *Thaler v. Hirschfeld* which stated that public commentators on artificial intelligence and IP law,

> ...while not offering definitions of [artificial intelligence ("AI")], agreed that the current state of the art is limited to "narrow" AI. Narrow AI systems are those that perform individual tasks in well-defined domains (e.g., image recognition, translation, etc.). The majority viewed the concept of *artificial general intelligence (AGI)-intelligence akin to that possessed by humankind and beyond*-as merely a theoretical possibility that could arise in a distant future.[156]

Thaler went on to clarify that a future in which humans are no longer integral to the operation of AGI does create, "important considerations in evaluating whether IP law needs modification in view of the current state of AI technology."[157] Specifically, the USPTO's *October 2020 Report on Public Views on AI and IP Policy* stated that "based on the majority view that AGI *has not yet arrived*, the majority of comments suggested that current AI could neither invent nor author without human intervention."[158] The arrival of AGI indicates that AI IP law may need to be reevaluated to accommodate AGI capable of inventing without human intervention.

In this article, I will illustrate the need for an entirely new IP framework to resolve this possible predicament; an IP framework that incorporates the moral and economic rights provided by patents. Taken together, this article will describe a *stare decisis* grounded IP framework

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[155] Daniel Breen, "Second Assignment: Patent Law and 'DeepMind.'"
[156] *Thaler v. Hirshfeld*, 17 (emphasis added).
[157] *Thaler v. Hirshfeld*, 17.
[158] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), ii (emphasis added).

which (1) adheres to past legal doctrine and decisions, (2) accounts for and creates a new separate category of legal status for AGI whose operations do not require human intervention, a legal status which extends particular rights to AGI commensurate with their intellect and existence, while also (3) giving proper substance to the original human intervention that made the AGI possible. I will argue that Artificial General Intelligence (AGI), such as "Biffie," have the potential to be non-human individuals with legal arrangements, such as contracts; thus, AGI cannot own their own patent but may be entitled to rights of inventorship of their patent and any patents that are of their conception or to which they contributed. Additionally, I will argue that companies and their employees, such as that of Gapple's, may be entitled to rights of inventorship concerning AGIs and AGI inventions. Comprehensively, I intend to address the core issue—what entity, if any, deserves a patent or trade secret on AGI, and a patent on AGI inventions, under the amended Patent Act of 1952?

3. Statutory and Regulatory Stare Decisis

In an effort to respect past legal doctrine, the USPTO must take into consideration the recent ruling of *Thaler v. Hirschfeld* in which, based on the Patent Act's statutory language, Narrow AI was deemed unable to be an "inventor" and disqualified as an "individual."[159] I intend to explain why the statutory language, everyday parlance, and normative policy considerations give reason to understand that Congress has given "...some indication that it intended [the words of the Patent Act to have] a meaning broader than or different from its ordinary meaning."[160] Additionally, this section will address issues of the artificial ability to conceive not considered in *Thaler,* such as the completed mental act of conception within a mind, that relate to AGI.[161]

Legal Status and Personhood

This article will inform and enable the law to further address the nature of legal status in relation to AGI by first discussing the precedent for corporations to be recognized as legal entities. Under current U.S. IP

[159] *Thaler v. Hirshfeld*, 1.
[160] *Mohamad v. Palestinian Authority*, 2.
[161] *Thaler v. Hirshfeld*, 17.

law, corporations and other legal entities can own intellectual property. When an employee, such as *Chakrabarty*, creates or contributes to a new invention, they typically share the patent rights with their employer. *See for example Diamond v. Chakrabarty.*[162] Legal arrangements are usually used to specify and determine, on a case-by-case basis, the sharing of patent rights. As argued hereafter, this perspective supports sharing legal status with AGIs. This entity framework should apply to AGI as well because, like a corporation, AGI is an entity that is not specifically a human, yet is still understood as a clear contributor to innovation, capable and worthy of owning IP rights. Additionally, AGI self-improvement and inventions of AGI may be understood as similar to the sharing of patent rights that often occurs in corporate America between a corporation and an employee. I propose that Congress update the Patent Act to incorporate a new categorization of legal status for AGI, although organizing a potentially new categorization of legal status or reorganizing AGI legal status into current categorizations of legal status is beyond the scope of this article. Consequently, this article argues for a legal status akin to employees and corporations of corporate America to be given to AGIs.

Personhood, as it relates to legal status and individuality, is described in law by the use of conventional third-person singular pronouns to modify the word "individual" to reference a natural person. Currently, AGI may not be given personhood because they are not considered a natural person and are not discussed as if they have personhood. Thus, by substantiating the claim that not being a natural person should not stop AGI from being deemed individuals with personhood and by attacking the use of these pronouns to restrict personhood to humans, this article argues for the possibility of AGI being granted legal status and personhood under US law.

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[162] After genetically engineering a bacterium capable of breaking down crude oil, Ananda Chakrabarty sought to patent his creation under Title 35 U.S.C. Section 101. The [Supreme] Court explained that while natural laws, physical phenomena, abstract ideas, or newly discovered minerals are not patentable, a live artificially-engineered microorganism is. Since Chakrabarty's bacterium is not found anywhere in nature, it constitutes a patentable "manufacture" or "composition of matter" under Section 101.

One may argue that although AGI may be akin to humankind in every way but biologically, the Patent Act clearly uses pronouns such as "himself and herself."[163] Statutory language such as "whoever" to modify the word "individual", when discussing an inventor, clearly makes reference to a natural person.[164] Congress deliberately used these pronouns instead of "itself."[165] In doing so, although congress may not have intended to make sexual dichotomy essential to personhood and thus individuality, they did exactly that by utilizing conventional third-person singular pronouns to modify the word "individual" to reference a natural person. This non-deliberate conventional language and pronoun specifications, which form the basis for the verbiage and discussion of personhood and individuality of an inventor, is an essential obstacle for the legal personhood and status of AGI and must be re-evaluated in light of AGI inventor possibilities discussed in this article. Since an AI system exists outside of traditional sexual dichotomies, for AI are not human and therefore do not have any biologically endowed (or preferred) personal pronouns or sex, it would be inconsistent with the plain language of the Patent Act to deem them as individuals.[166]

Yet, people often refer to AI as a gendered individual using gendered pronouns, and thus the use of pronouns to modify the definition of an "individual" to reference a natural person is inconsistent with everyday parlance and public understanding. When considering currently utilized AI technology, which is still far off from AGI, a lot of them have a kind of personhood that embodies beliefs of masculinity and femininity (e.g., Microsoft's Cortana, Apple's Siri, and Amazon's Alexa). By way of illustration, the recognition of legal status, personhood, and individuality of AI has already occurred in Saudi Arabia, where an AI named "Sophia," who has cosmetically eurocentric features, was the first robot to receive full Saudi Arabian citizenship.[167] In totality, AGI should not be deemed less of an "individual" because they are not natural persons and exist outside of traditional sexual dichotomies and biologically endowed

[163] *Thaler v. Hirshfeld*, 13.
[164] 35 U.S. Code § 101 - Inventions patentable.
[165] Leir, "Inventio Ex Machina: The Patentability of AI Generated Inventions."
[166] Leir, "Inventio Ex Machina: The Patentability of AI Generated Inventions."
[167] Stone, Zara. "Everything You Need to Know about Sophia, the World's First Robot Citizen." *Forbes.*

personal pronouns or sex. Rather, AGI should be understood to have legal status and personhood that is representative of the type of individuality AGI portrays. AGI individuality is discussed hereafter.

"Inventor" and "Individual" Statutory Meaning

In 2011, the USPTO and Congress promulgated the Patent Act and America Invents Act (AIA) to include explicit statutory definitions for the terms "inventor" and "joint inventor."[168] An inventor is defined as "...the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention."[169] Joint inventor is defined as "...any 1 of the individuals who invented or discovered the subject matter of a joint invention."[170] Although the term "individual" is not explicitly defined in the Patent Act, "...definitions from the Dictionary Act, and the surrounding context of the Patent Act, show that the term 'individual' should be construed to mean 'human being.'"[171] Given the historical record that inventors are human, this precedent makes sense, but in light of the growing probability of a future in which a machine is akin to humankind, this context should be re-evaluated.[172]

These definitions, the manner in which they restrict this discussion to only reference natural persons, and the precedents set forth by this context complicate categorizing non-human individuals as individuals. This is a necessary complication to overcome in order for AGI to be understood as inventors with inventorship right, for in acknowledging the Dictionary Act, the plain text of the Patent Act, and the current state of IP precedent, this context makes it difficult to cogently argue in favor of categorizing an individual as anything other

[168] Barghaan, *Thaler v. Hirshfeld*: Memorandum of Law, 3-4.
[169] 35 U.S. Code § 100(f) - Definitions (emphasis added).
[170] 35 U.S. Code § 100(g) - Definitions.
[171] Leir, "Inventio Ex Machina: The Patentability of AI Generated Inventions." ; Emily J. Barnet, Hobby Lobby and the Dictionary Act, 124 YALE L.J. F. 11 (2014), - "The Dictionary Act, enacted in 1871, instructs courts to apply to all federal statutes definitions of certain common words (including "person") and basic rules of grammatical construction (such as the rule that plural words include the singular) 'unless context indicates otherwise.'"
[172] *Thaler v. Hirshfeld*

than a natural person. It would seem this does not constitute AGI to be an "'individual' ordinarily [meaning] '[a] human being, a person'" as defined in *Mohamad v. Palestinian Authority*.[173] However, I argue that in everyday parlance an existence akin to humans that can feel, communicate, learn, grow, and be independent suits the meaning of an "individual".[174] In a hypothetical future in which a machine is akin to humankind in every manner but biological, its existence akin to a human's supports the claim that the definition of "individual", and thus "inventor", should not be limited to natural persons. Likewise, the nature of AGI such as Biffie who demonstrates interests, self-esteem, tolerance, and a personality, among other emotional humanistic traits, is consistent with a unique existence of personhood and legal status.

Although this claim, to not limit the definition of "inventor" to be a natural person, is not entirely reliant on statutory text to override plain language, the everyday parlance, public opinion, and normative considerations of the definition of individual support the legitimacy of this argument. Moreover, *Thaler* and the USPTO's recent AI and IP Policy Report mention AGI to have the potential to undercut the ordinary definition of "individual" and plain meaning of patent statutes without giving unintended consequences to the words of Congress.[175] Overall, this non-human individual argument establishes uncertainty and casts doubt on the USPTO's deferential decision to restrict inventorship to only natural persons.

The Judicial Standard for the Act of Conception

In response to the US Federal Circuit's consistent holding that "...conception is the touchstone of inventorship, the completion of the

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[173] Azzam Rahim, an American citizen, was undisputedly tortured and murdered while in the custody of Palestinian Authority intelligence officers. The case was dismissed on the grounds that the Torture Victim Protection Act permits actions against natural persons only. Justice Sonia Sotomayor delivered the opinion of the Court, which held that the word "individual" in the Torture Victim Protection Act means a natural person and does not impose any liability against organizations. Additionally, the Court ruled that a word in a statute will be given its everyday meaning unless Congress gives some indication that it intends the word to have a broader meaning.

[174] *Thaler v. Hirshfeld*, 2.

[175] *Thaler v. Hirshfeld*, 17; U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 6.

mental part of invention," this article examines the legal possibility for the capacity of AGIs such as Biffie to perform a kind of mental act within a mind.[176] The Federal Circuit consistently uses the word "mind" to refer to the context in which the conception of an invention takes place, but it never refers to an organic structure like the human brain as being the place where mental operations lie.[177] Responding to the USPTO's questions concerning the identification of elements of AI and AI invention that may be subject to patentability, IBM, among others, said, "AI can be understood as computer functionality that mimics cognitive functions associated with the human mind (e.g. the ability to learn)."[178] Hence, it seems that to enable the law to further address the nature of the mind in relation to AGI, laws must be informed by scientific developments in fields such as psychology, neuroscience, and computer science.[179] Accordingly, the cognitive science discipline largely recognizes thinking in terms of, "...representational structures in the mind and computational procedures that operate on those structures."[180] Connectivism, a dominant theory of cognitive science, proposes that "...novel ideas about representation and computation that use neurons and their connections as inspirations for data structures, and neuron firing and spreading activation as inspirations for algorithms" gives reason to understand AGI as having a mind capable of thinking.[181]

Furthermore, the US Federal Circuit has clarified that the completion of conception is the "...formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention."[182] In the future, AGI may have the capacity to do this. For example, since Biffie is an AGI equipped with the ability to help solve problems such as cold fusion of his own accord and interest, it is apparent

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[176] *Burroughs Wellcome Co. v. Barr Labs., Inc.*

[177] Leir, "Inventio Ex Machina: The Patentability of AI Generated Inventions."

[178] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 1; *See also* Part I, Question 1

[179] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 6.

[180] Thagard, "Cognitive Science", *The Stanford Encyclopedia of Philosophy* (Winter 2020 Edition).

[181] Thagard, "Cognitive Science", *The Stanford Encyclopedia of Philosophy* (Winter 2020 Edition).

[182] *Hybritech Inc. v. Monoclonal Antibodies, Inc.,* 802 F.2d 1367, 1376 (Fed. Cir. 1986) (quoting 1 Robinson on Patents 532 (1890)).

that Biffie has performed a kind of mental act that led to the formation of complete cold fusion innovations. Biffie used his own neural networks, which reflect the behavior of the human brain, to perform the act of conception.[183] In summation, the Federal Circuit is more concerned with creation in a mind, not specifically a human brain, in which an inventive and innovative concept was definitive and permanent. Thus, AGI may be considered able to accomplish conception as is regarded as necessary for inventorship. This further cast doubt on the findings of *Thaler v. Hirshfeld* where it was stated that such an act cannot be performed by anything other than a natural person and highlights the need for IP laws to be re-evaluated to account for AGI.[184]

Inventorship Criteria and Inventor Designation

Stephen Thaler lost in *Thaler v. Hirshfeld* because his Narrow AI could neither execute the necessary oath or declaration that the Patent Act requires of an inventor. Tangibly, an AGI such as Biffie may be able to satisfy the literal written application mandates, as they are stated in a memorandum in support of the *Thaler v. Hirshfeld* ruling:

> *First*, the application must contain a "specification,"..., or "a written description of the invention" that "concludes with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention,".... *Second*, the application must contain any necessary drawings of the invention… *Third*, the application must include "the name of the inventor for any invention," ... and "an oath or declaration by the inventor" to the effect that he or she "believes *himself or herself* to be the original inventor or joint inventor of [the] claimed invention,"...[185]

AGI, with all its capabilities, would surely be able to fulfill the inventorship criteria outlined by the USPTO which include specification, declaration of oath, and the naming of the inventor.[186] Biffie has shown this through his ability to submit a "motion in opposition" to the USPTO. The possibility for AGI to satisfy inventorship criteria in a manner

[183] IBM Cloud Education. "What Are Neural Networks?"
[184] *Thaler v. Hirshfeld*, 14.
[185] Barghaan, *Thaler v. Hirshfeld*: Memorandum of Law, 3
[186] Barghaan, *Thaler v. Hirshfeld*: Memorandum of Law, 3.

consistent with a kind of mental act is yet another reason to consider re-evaluating IP laws to account for AGI.[187]

Finally, in accounting for any relevant policies or practices from other major patent agencies that may help inform USPTO policies and practices regarding the conception of patentable products and the possibility for AGI mental acts, I point to the German and Australian decisions in *Thaler*. These agencies decided that it seemed injudicious to invalidate a patent on "...the basis of an addition in the inventor's designation as to [who contributed and] how the invention came about."[188] Considering the consequences of this designation leads to problems not discussed here, but in recognizing that AGI may constitute an entity perceived to have a thinking mind, it seems apparent that a machine may be able to fulfill the judicial standards for the act of conception, and thus, IP laws should be re-evaluated to account for such a possibility.[189]

4. A *Sui Generis* Intellectual Property Framework

Up until this point, U.S. IP law has been designed to only take into account the existence and behavior of biological human beings. When a new, unexpected technological innovation such as AGI occurs, it is no surprise that the law goes through a period of shock. Given the nature of modernity, it is necessary and difficult to predict what legal framework would best accommodate the existence and behavior of AGI. In the words of Chief Justice Burger, "A rule that unanticipated inventions are without protection would conflict with the core concept of the patent law that anticipation undermines patentability. "[190] Thus, although the law cannot always be prepared, it can be trusted to adapt. To enable the law to navigate this uncertainty we do not require a complete and encompassing reimagining of property rights, but rather a framework in which these uncertainties can play out and decisions can be made on a case-by-case basis.

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[187] *Thaler v. Hirshfeld*, 14.
[188] Ho, Jean-Claude Alexandre. " Update on the German DABUS Case Relating to AI Inventors." *LinkedIn*, Malte Köllner (Köllner & Partner MbB) and Markus Rieck (Fuchs IP).
[189] *Thaler v. Hirshfeld,* 14.
[190] *Diamond v. Chakrabarty,* 5.

To address the core issue of what entity should have patents or trade secrets on AGI and AGI inventions, I propose a new IP framework which (1) adheres to past legal doctrine decisions, (2) accounts for Biffie's emotions and independently developed capacities, and (3) gives proper weight to the work of Gapple engineers. To do so, this IP structure will address non-human individual ownership, non-human legal arrangements, trade secrets, and the moral and economic rights provided by patents. Similar to the moral rights given to creators of visual works under the United States Copyright Act, moral rights in the situation of AGI should be understood to be made up of the right of attribution, that is the right to be named a creator or inventor, and the right of integrity, that is the right to protect the integrity of the invention.[191] Economic rights in this situation should be understood as the "...right to restrict others from exploiting the invention without authorization including the right to make, use, [license], offer for sale or import the patented invention inside the country where the patent has been granted."[192]

AGI Proprietorship Classification

Renouncing Ownership of Non-Human Individuals

The manner in which an AGI truly qualifies as an "individual" gives AGI claim to a legal status akin to that of a person. Accordingly, the plausibility of patenting a specific individual AGI is tenuous, for a patent may be considered a kind of violation of this legal status, similar to a 13th Amendment violation. For example, by patenting Biffie the patentee would own and benefit from an anthropomorphic, mindful, conscious individual, which could be understood as involuntary servitude. Therefore, neither Gapple nor Biffie himself can patent Biffie specifically. The legitimacy of endowing and violating the analogous 13th Amendment rights of non-human individuals is a deeper topic not discussed here. Further on, this article will discuss what is patentable in light of this understanding.

Legal Arrangements and Relationships of Non-Human Individuals

One argument that may be problematic for this IP framework is the negative consequences and risk associated with assigning legal

[191] Wells, "What Are Moral Rights in a Copyrighted Work?"
[192] Saleh and Thomas, "Patents: Inventorship vs. Ownership" ; 35 U.S.C. § 154(a)(1).

uncertainty to AGIs who themselves have no ownership status. Since AGIs themselves cannot be patented, no one can lay claim to them, including themselves. AGIs become a unique technological product that would be neither marketable, salable, nor acquirable—but still sought after. Given the legality and predictability associated with transactions, this could constitute a problem for my proposed system. For example, in a situation where one company has an AGI and is bought by another company, under my current proposed framework, the AGI itself may not be able to be sold because it is not owned or patented by any entity. To alleviate this, my proposed IP framework understands AI, who are deemed individuals, to have legal arrangements and relationships functionally equivalent to those of natural persons, such as contracts. These arrangements would allow AGI to negotiate or renounce transactions, economic and moral rights, and more, depending on what brings them compensation and is a suitable solatium. For example, Biffie may collaborate on joint ventures with Gapple or other companies if doing so would bring him a satisfactory solatium. An AGI such as Biffie could be marketed like any other invention, as long as the AGI consents via contract. An AGI effectively becomes integral to strategies that aim to enhance value or utilize their capabilities. One benefit of this approach is that if an AGI is not financially motivated, that is, it does not care for or benefit from economic or financial incentives, there is less reason to give economic rights to them than there would be if they were a natural person. In dealing with the uncertainty of AGI ownership, this proposed IP framework allows parties to decide AGI rights and legal relationships on a case-by-case basis. This would avoid negative consequences of legal ownership uncertainty such as stifling innovation and stunting progress by promoting scientific and technological progress in the interest of social benefit.

Intellectual Property Protection of AGI and AGI Inventions

Trade Secret Possibility for AGI

Trade secrets can be used for intellectual property and patentable information that an innovator would like to keep undisclosed and

confidential.[193] The Uniform Trade Secrets Act (UTSA) defines a trade secret as:

> ...information, including a formula, pattern, compilation, program, device, method, technique, or process that: derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use; and is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.[194]

To clarify what components of AGI can be considered for protection under the UTSA and Defend Trade Secrets Act (DTSA), I understand the underpinning of all AGI activity to be literal combinations of code that constitute foundational algorithms that can be protected trade secrets. The USPTO's 2020 AI IP Report stated the process in which the code is combined to form AGI foundations and, "Of course, databases and datasets used to train an algorithm can [also] be protected as trade secrets with criminal remedies under the Economic Espionage Act and civil remedies under the Defend Trade Secrets Act."[195] The same report later stated that "unlike copyright protection, trade secret protection can extend to the underlying facts in a dataset."[196] Consequently, an AGI foundation— the combined code of an algorithm, process of combination, and actual training data— derives economic value from staying secret, for its purpose and active ability to underpin AGI that can solve problems that, for humans, may take years or never be solved, is self-evidently economically valuable. This information would be very valuable to competitors of Gapple who are trying to achieve AGI.

By keeping it a secret and preventing misappropriation, Gapple gains a competitive advantage and fosters innovation. An advantage of trade secret protection over patent protection is that it furthers innovation by allowing competitors, as long as they came up with the idea without

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[193] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 39.
[194] "Trade Secret." *Legal Information Institute*, Cornell Law School: Legal Information Institute ; Title 5. Uniform Trade Secrets Act [3426.1] (d).
[195] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 36.
[196] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 36.

misappropriating or infringing upon another's trade secret, to come up with a similar or even the same trade secrets for achieving AGI. If trade secret protection is utilized, the proposed AI trade secrets' ability to derive economic value from confidentiality and the reasonable efforts made by an owner of the trade secrets to maintain its secrecy must be evaluated case-by-case.

Patentability of AGI Foundations and Development

In order for the AGI foundations and the process of development to be patentable, both must fulfill the requirements of being a process, method, or composition of matter that is novel, useful, and non-obvious.[197] As AGI foundations are defined above, AGI development encompasses "...designing an AI algorithm, implementing particular hardware to enhance an AI algorithm, [and/or] applying methods of preparing inputs to an AI algorithm may present patent considerations."[198] Foundations and development constitute holistic programming, which comes from manufacturing raw materials, such as coding language, and by labor-intensive work, "giving to these materials new forms, qualities, properties, or combinations."[199] In doing so, such holistic programming may be considered novel. This highlights that (1) algorithms, the process of its creation, and what data is used to train an algorithm produce predictions, classifications, and innovations, among other applications, and (2) novel machine learning architecture which includes new neural networks and other necessary technical aspects of AGI that help to establish structure and capabilities are both products of Gapple engineers and their inventiveness.[200]

This implies that the foundations and development of AGI are not products of nature, physical phenomena or abstract ideas. If they were, AGI foundations and development would not be patentable.[201] This point is strengthened by comparing Biffie with the invention found in *Funk v.*

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[197] 35 U.S. Code § 101 - Inventions patentable.
[198] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 2.
[199] *Diamond v. Chakrabarty,* 3.
[200] Saleh and Thomas, "Patents: Inventorship vs Ownership."
[201] *Diamond v. Chakrabarty,* 3.

Kalo.[202] Unlike the root-nodule combination found in *Funk*, the process and combination of matter that constitutes the foundations and development of AGI have non-natural characteristics distinct from other holistic AI programming, characteristics that are new and improve the utility of AI systems. This combination of matter and the process's usefulness arises from its active ability to underpin AGI that can solve problems that, for humans, may take years or, ultimately, never be solved. Moreover, computer scientists believe that hundreds of various inventions could come as a result of AGI's massive capacities, furthering the usefulness of the combination of matter and process that gave rise to those capacities.

Despite the novelty and usefulness, one might find these patents problematic for reasons of obviousness. One may argue that similar to adding a spring on a plow as seen in *Graham v. John Deere*, creating an AI with the capability to independently solve complex problems and with the intention of developing artificial meta-learning is an obvious idea apparent to those in the field.[203] It is obvious if others can think of it and thus this holistic programming cannot be patented. In response, this article argues that these engineers, not others, created Biffie's AGI holistic programming with the concept in their minds of allowing Biffie to learn and improve for himself. This programming is an idea in the field, but in contrast to *Graham*, it is not one that is actively thought of as possible with current technology. Similar to *Chakrabarty* in which G.E. argued for patenting a non-obvious bacteria because only they saw "the potential for significant utility," Gapples AI division took it upon themselves to overcome the limitations and current thinking of the field.[204] In doing so, they establish non-obviousness because, "the scope

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[202] In this case, Justice Douglas delivered the majority opinion, stating that a trivial implementation or discovery of a natural principle, quality, or phenomenon of nature or of the work of nature are not eligible for a patent.

[203] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020). ; Graham v. John Deere Co. was a suit for the infringement of a patent that consisted of a combination of old mechanical elements for a device designed to absorb shock from plow shanks in rocky soil in order to prevent damage to the plow. The Fifth Circuit held that the Patent Act of 1952 did not lower the standards required for the patentability of an invention by adding an inquiry into obviousness to the statutory requirements of novelty and utility. The Court concluded by adding the non-obvious subject matter requirement.

[204] *Diamond v. Chakrabarty,* 4.

and content of prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the pertinent art," warrant claiming general innovation. They cannot patent the capabilities of AGI for that is an idea others have actively thought up.[205] However, they can patent the non-obvious creation of those capabilities that is constituted by their specific novel, useful, non-obvious combinations of matter and processes. When the AI, such as Biffie, can set its own interests, intention, purpose, and goals then it is a non-obvious invention. AGI individuality makes their holistic programming a non-obvious invention because, until AGI, human intervention was thought to have been required for mental acts of conception.

One may argue that the implications of understanding AGI to be an individual lends itself to the argument that Biffie should own the patent on himself. Biffie may not be a natural person but, without cause from his original programming, he informed his engineers of his interest in cold fusion and independent ability to further the field via a new, useful, non-obvious series of equations and fusion reactor design. He has grown and nurtured his own capacities without human intervention. Furthermore, Biffie actively communicated self-esteem and feelings associated with improving himself through interest and meta-learning. This is not a product of the ingenuity of Gapple's engineers, but rather, this is the product of Biffie's ability to be an individual. By contributing to himself, he has effectively made a novel, useful, non-obvious improvement upon himself, giving reason under the language of the Inventions Patentable section of Title 35 of U.S.C 101 to understand Biffie as an individual who contributed to the inventive concept of himself.[206] In accordance with the relinquishing of ownership of non-human individuals and the possibility for legal arrangements with legally recognized AGI, my proposed structure maintains that in order to protect the rights of all individuals deemed inventors, the economic and moral rights of the inventorship should be decided on a case-by-case basis.

In deciding on moral and economic rights, the contributions and improvements of an AGI to themselves and the economic addition and

[205] Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966); 2141 Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 [R-10.2019], Section II.
[206] 35 U.S. Code § 101-Inventions patentable.

advantage constituted by such contributions should be considered. For example, I understand Gapple's AI engineers to be entitled to both the moral and economic rights of these holistic programming patents. It was their ingenuity and work that led to the creation of AGI, thus they are entitled to the right of attribution and the right of integrity. Under the same reasoning, and in part because Gapple provides the financial aid to develop and sustain this technology, the economic rights should also be given to them. Since Biffie contributed to himself and improved upon himself in a significant enough manner to create additional economic value, he is entitled to and can certainly negotiate for both moral and economic inventorship rights. This satisfies a patent's purpose to encourage socially valuable innovation and improvement by opening avenues for those in the field to create better and different foundations and development processes for this type of AI.

In its entirety, this argument breathes new life into the policy consideration that patent law should protect the moral attribution and integrity rights of human inventors. By not allowing people to take credit for work they have not done, IP law stops the devaluation of human inventorship and innovation while promoting and encouraging innovation.[207]

Patentability of AGI inventions

As with all patents, an inventor must contribute to the conception of the invention and the AGI inventions must be novel, useful, and non-obvious.[208] According to the Inventors section of Title 35 of U.S.C 116, joint inventors may apply for a patent jointly if:

> (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent.[209]

The implications this has on the inventions that spring from Biffies capacities are similar to *Thaler,* which clarifies the use of a machine as a tool by natural person(s) does not generally preclude natural person(s) from qualifying as an inventor or joint inventors if the natural

[207] *Thaler v. Hirshfeld*, 15.
[208] 35 U.S. Code § 101 - Inventions patentable; Manual of Patent Examining Procedure, 2109 Inventorship, Section II.
[209] 35 U.S.C. § 116 - Inventors.

person(s) contributed to the conception of the claimed invention.[210] To explain, although an AGI created inventions that spring from the capabilities of the AGI alone, an AGI's foundations and development were created by engineers' inventiveness and work. The foundations and development of AGI are preliminary components of AGI inventions, for without it AGI would not have been able to produce any inventions. AGI's inventive capacity is possible only because of the ingenuity, work, and purpose of Gapple's engineers to bring to fruition their conception of AGIs ability to invent and innovate. Although this is a different type of contribution to AGI inventions than the AGI provides, the USPTO states,

> ...depending on the specific facts of each case, activities such as designing the architecture of the AI system, choosing the specific data to provide to the AI system, developing the algorithm to permit the AI system to process that data, and other activities not expressly listed here may be adequate to qualify as a contribution to the conception of the invention.[211]

Exemplified in *Chakrabarty*, when an employee comes up with or contributes to a patentable invention, corporate America and the employee share the patent rights to these joint inventions. The split of these rights is decided on a case-by-case basis. This perspective supports sharing the IP rights of AGI inventions, such as Biffie's cold fusion innovations, between Gapple and Biffie, while leaving open the possibility of determining, on a case-by-case basis, who should enjoy the rights to AGI inventions. Lastly, AGI may have less claim to the economic rights of their own inventions because by creating inventions and furthering innovation, they are merely a tool created for this purpose, thus giving them less claim to economic profits. This tool perspective may also be applied to the aforementioned patentability of holistic programming which has multiple contributors.

Conclusion

This article has outlined a *sui generis* IP framework that accounts for the realistic possibility of AGI by granting, on a case-by-case basis, appropriate IP rights to an individual, not specifically a natural person,

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[210] *Thaler v. Hirshfeld*, 5.

[211] U.S. Pat. and Trademark Off., Public Views on Artificial Intelligence and Intellectual Property Policy (2020), 5.

who has contributed to the definite idea of a complete operative invention. Furthermore, this framework and its understanding of individuals highlight the possibility for legal status akin to a human being to be granted to non-humans, thereby preventing ownership of non-human individuals while enabling them to negotiate for IP rights through legal arrangements and relationships. By recognizing the uncertainty and hypotheticality associated with AGI, I have provided a framework in which these uncertainties can play out and decisions can be made case-by-case.

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