Before the
UNITED STATES COPYRIGHT OFFICE
LIBRARY OF CONGRESS

In the Matter of Artificial Intelligence and Copyright **Notice of Inquiry and Request for Comments**	**Docket No. USCO 2023-6**

Reply Comments of

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1. Executive Summary

The following comments are offered as reply comments to some of the issues posed in the Copyright Office's Notice of Inquiry and Request for Comments on Artificial Intelligence and Copyright ("NOI").

The first section suggests that questions about whether AI Systems should be treated as individual authors should be addressed in the broader context of emerging discussions about whether AI Systems should be considered legal actors ("persons") in their own right. It then discusses specific issues of the Office's approach to the registration of AI-generated content, with emphasis on the impact of the approach on practices involving the presumption of validity arising from a successful registration. Finally, the section raises some questions about AI Systems and works-made-for-hire.

The second section raises several questions about the impact of AI Systems on the operation of other provisions of the Copyright Act.

2. Copyrightability and Registration Issues

Questions Addressed

18. Under copyright law, are there circumstances when a human using a generative AI system should be considered the "author" of material produced by the system? If so, what factors are relevant to that determination? For example, is selecting what material an AI model is trained on and/or providing an iterative series of text commands or prompts sufficient to claim authorship of the resulting output?

19. Are any revisions to the Copyright Act necessary to clarify the human authorship requirement or to provide additional standards to determine when content including AI-generated material is subject to copyright protection?

34. Please identify any issues not mentioned above that the Copyright Office should consider in conducting this study.

2.1. AI Systems as Persons

The NOI raises several questions about the use of AI Systems in creating copyrightable works, including whether an AI System, at least one using current generative AI, can be considered an "author." The Office's Copyright Registration Guidance has staked out the position that authors could not include non-humans, so when "an AI technology determines the expressive elements of its

output, the generated material is not the product of human authorship."[1] Several observers have expressed concerns over the Guidance.[2] While we also have concerns about the Guidance's standard and the case law interpretation employed to justify it, we take a somewhat different approach from other observers. We believe that the question of authorship of works with AI-generated content should not be divorced from a broader inquiry as to whether and to what extent AI Systems can be considered legal actors—persons, if you will—in their own right under various provisions of the Copyright Act.[3] We note that the Copyright Act also refers to various types of "persons," not just to "authors."[4] So, we suggest that the Office's position on treating AI Systems as authors should take into account the implications of so doing on the standards governing when AI Systems should, or should not, be treated as, in effect, persons, throughout the Copyright Act.[5]

We observe that questions concerning when an AI System will be treated as a person are not confined to copyright law. Developments and refinements in other areas of the law as to the treatment of AI Systems may well rightly influence treatment of AI Systems as authors or as persons under the Copyright Act. Thus, whether an AI system can take on legal responsibilities (*e.g.,* act as a trustee, provide expert advice), or have liability for harm to others (*e.g.*, inaccurate predictions, self-driving cars) are subjects of rich debate and in some cases legislative action or judicial consideration.[6] Indeed,

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[1] *Copyright Registration Guidance: Works Containing Material Generated by Artificial Intelligence,* 88 Fed. Reg. 16190 (Mar 16, 2023) ("the "Guidance") also at https://www.copyright.gov/ai/ai_policy_guidance.pdf at p. 4.

[2] See *e.g.*, MPA, p. 39 ("MPA believes the Office's test is overly rigid, as it does not take into account the human creativity that goes into using AI as a tool"); ESA p. 6 ("But we think the Office's focus on the lack of predictability of the output or that AI-generated content is a result of 'mere mechanical process' that operates mechanically or automatically without any creative input or intervention from a human author" may represent an overly narrow frame of analysis (which requires further consideration)…") But see SIIA p. 5 ("SIIA believes that the Copyright Office Guidance got the important questions mostly right.")

[3] See Raymond T. Nimmer, Jeff C. Dodd, Lorin E. Brennan, INFORMATION LAW § 1:27 *Artificial Intelligence – AI Systems as Legal Actors* (Nov. 2023 Update) ["INFORMATION LAW"].

[4] See *e.g.* section 101, definition of "anonymous work" ("no natural *person*"), definition of "proprietor" ("or other *entity*"), specially commissioned works-made-for-hire ("if the *parties* expressly agree"); section 201(b) ("or other *person* for whom the work was prepared"); section 409(1) ("copyright *claimant*"); section 501(a) ("*anyone* who violates"); section 501(b) ("legal or beneficial *owner*"); section 504(b) ("an *infringer* of copyright"); section 901(a)(6) ("*person* who created the mask work"); section 1202(a) & (b) ("no *person* shall"); section 1301(a) ("*designer* or other owner"); section 1401(a) ("rights *owner*"). In this paper section references refer to sections in the Copyright Act, 17 U.S.C. §§ 101 *et seq*.

[5] The Copyright Act applies to more than "authors." Section 901 *et seq*. applies to the "*person* who created a mask work." Section 1001 *et seq*. applies to the "interested copyright *party*" of a digital audio recording. Section 1301 *et seq*. applies to "the *designer* or other owner" of a vehicle hull design. Section 1401 et seq. applies to the "rights *owner*" of a pre-1972 sound recording. Could any of these parties be an AI System?

[6] The literature here is quite extensive. See INFORMATION LAW § 1:15 *Artificial Intelligence – Do AI Systems "think"?* fn.1 (collecting references). To take but one concrete example, we note that some e-commerce statutes allow contracts to be formed by the action of electronic agents—and have done so for years. See INFORMATION LAW § 1:33 *Artificial Intelligence – AI Systems as Signatories*.

whether AI Systems should be treated as inventors is a lively subject of consideration.[7] We believe that such developments should inform the Office's considerations in developing standards relating to AI Systems; hence, we agree with the recommendation of Senators Tillis and Coons that the Office work with the Patent and Trademark Office on a national commission investigating AI-generated inventions and creations. We hasten to add that, while a uniform approach to AI personhood applicable to a range of situations may be appropriate, we recognize that a one-size-fits-all approach may well be inadvisable. After all, the law recognizes different types of persons with common interests but specific differences (e.g., natural persons and legal entities; minors and adults). Given different statutory purposes, separate criteria may also apply in specific settings, such as one for an AI "inventor person" and another for an AI "author person." However, such a conclusion should be reached only after thorough consideration and analysis.

Finally, the Office should also take into account just how rapidly AI technology is changing and just how unsettled is the fundamental question of whether the law, in evaluating whether AI Systems should be treated as persons, should focus on the manner in which automated systems operate (a "humanist" approach) or the results they achieve (a "rationalist" approach.)[8] For example, the U.S. *National Artificial Intelligence Initiative Act of 2020* and the proposed E.U. *AI Act* use definitions of AI that focus on what an automated system does (results) rather than the manner in which it does

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[7] See INFORMATION LAW § 1:28 *Artificial Intelligence – AI Systems as Inventors. See also* § 1:30 *Artificial Intelligence – AI Systems as Trademark Owners;* § 1:31 *Artificial Intelligence – AI Systems as Trade Secret Owners;* § 1:32 *Artificial Intelligence – AI Systems as Personalities*

[8] AI "personhood" reflects intense debate on whether AI Systems can engage in cogitative functions, that is, whether they can "think." See Stuart J. Russell & Peter Norvig, ARTIFICIAL INTELLIGENCE: A MODERN APPROACH, Chpt. 26 *Philosophical Foundations* (3rd Ed. 2015) ("RUSSELL & NORVIG") (addressing cognition issues). There are two common approaches. The "humanist" tact considers computers that can be described as "acting humanly" or "thinking humanly," which is more of an empirical slant, involving observation and hypotheses about human behavior and using developments in cognitive science. The "rationalist" approach considers computers that can be seen as "thinking rationally" or "acting rationally," a view that utilizes mathematics and engineering to analyze AI activities. See INFORMATION LAW § 1:15 *Artificial Intelligence – Do AI Systems "think"?* citing discussion in RUSSELL & NORVIG Chpt. 1, Sec. 1.1 *What is AI?*. A seminal method for evaluating sentience is the Turing Test, proposed by Alan Turing. Simply, it asks whether a machine can convince a human interrogator that the machine is human. The Chinese Room objection, proposed by Prof. John Seale, postulates a human who communicates by transcribing Chinese characters according to an instruction book without understanding Chinese, so that it appears the human is "behaving intelligently" á la the Turing test, but without any real understanding. Turing's point is that digital machines operate by symbol manipulation, and if in so doing they can demonstrate appropriate "human like" behavior they should be treated as "intelligent," while Searle maintains that symbol manipulation alone is insufficient to provide understanding, which appears to require some biological processes. For further discussion of the Turing Test and Chinese Room see Nadia Banteka, *Artificially Intelligent Persons***,** 58 Hous. L. Rev. 537 (2021); Aaron Gevers, *Is Johnny Five Alive Or Did It Short Circuit? Can And Should An Artificially Intelligent Machine Be Held Accountable In War Or Is It Merely A Weapon?* 12 Rutgers J. L. & Pub. Poly 384 (2015); Lawrence B. Solum, *Legal Personhood For Artificial Intelligences*, 70 N.C. L. Rev. 1231 (1992). Very simply (and understanding there are more nuances in the technical literature), the difference is whether thinking involves the *way* the brain does it (humanist) or the *results* the brain gets (rationalist). See INFORMATION LAW § 1:15 *Artificial Intelligence – Do AI Systems "think"?* esp. fn. 9.

it, which is closer to the rationalist approach.[9] If one focuses on what AI systems do, as opposed to how they operate, one may conclude that many AI-generated works are the "creative" output of a "thinking" author. This is a deep and rich vein that we cannot fully mine here, but merely note that technological developments will inform how societal and legal bodies will evaluate AI Systems as legal actors. In fact, not all AI Systems are the same and the work they do may require different treatments. Thus, AI Systems are commonly classified into three tiers. Artificial Narrow Intelligence (ANI) refers to AI Systems that are designed to handle a narrow or limited task or set of tasks in an intelligent manner and includes applications such as expert systems and machine learning.[10] Artificial General Intelligence (AGI) involves AI systems that exhibit intelligence across a broad range of activities comparable to human capabilities.[11] Artificial Super Intelligence (ASI) embraces AI Systems that surpass, maybe significantly, human cognitive capabilities.[12] Currently, all AI Systems are ANI and only exhibit, at best, some simulations of human-like intelligence in the results of their operations. However, developments are proceeding rapidly, especially with the release of ChatGPT, which some believe may (eventually) be able to pass the Turing test and qualify as AGI.[13]

We suggest these developments could lead to treating at least certain types of AI Systems as legal persons in some fashion. Accordingly, we believe the Office should take a broad, holistic view of the challenges and prospects posed by AI Systems in determining whether and to what extent such systems should be treated as persons under all the provisions of the Copyright Act. Thus, we do not believe authorship can or should be considered in isolation. Moreover, the Office should actively participate with other interested parties in evaluating AI developments, but with an open mind that any then-current position may need refinement or adjustment. For that reason, while Congressional action may be required, we would hope that the Office could independently refine its standards to allow a nuanced and flexible approach.

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[9] See INFORMATION LAW § 1:14 *Artificial Intelligence – What is AI?* for statutory text. We note the President's *Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence* of October 23, 2023, Sec. 3(b), at https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/, adopts the definition of "artificial intelligence" in the NAIIA (15 U.S.C. 9401(3)). But see General Accounting Office, *Artificial Intelligence: An Accountability Framework For Federal Agencies and Other Entities*, p. 13-14 (June 30, 2021) https://www.gao.gov/ products/gao-21-519sp noting that the NAIIA definition "has not yet been widely adopted within the data science community" and instead relying on "a set of generalized characteristics of AI that are broader than the recently enacted definition" without providing further specifics.

[10] See INFORMATION LAW § 1:16 *Artificial Intelligence – Artificial Narrow Intelligence*

[11] See INFORMATION LAW § 1:17 *Artificial Intelligence – Artificial General Intelligence*

[12] See INFORMATION LAW § 1:18 *Artificial Intelligence – Artificial Super Intelligence*

[13] See Malcolm McMillan, *No, ChatGPT did not pass the Turing test — but here's when it could* at https://www.tomsguide.com/news/no-chatgpt-did-not-pass-the-turing-test-but-heres-when-it-could (March 30, 2023)

2.2. **AI Systems as Authors**

The following sections discuss some specific questions raised by the Guidance with respect to AI Systems and authorship.

2.2.1. **The Guidance Position**

The Guidance states that "copyright can protect only material that is the product of human creativity."[14] Many interventions underscore the importance of human creativity. But does this refer to **human** creativity, *i.e.*, a creative action by a human, so the focus is how it is done; or does it mean human **creativity**, *i.e.*, the work reflects human-level creativity, so the test is what was done regardless of who, or what, did it? That is, is the emphasis on *method* or *result*?

The Guidance goes on to state that "author … excludes non-humans" and "the Office's existing registration guidance has long required that works be the product of human authorship."[15] This emphasizes method: it focuses on whether the creation was done by a *human* (how the mind operates) rather than the *result* (what the mind does). Is that the correct focus?

The Guidance, as well as other references on the Office website, cite a number of cases to support the Office's position. However, those cases were decided before the advent of the possibility of "thinking" machines. It is not entirely clear they support the Office's interpretation with its focus on method rather than results.[16] We note that the District Court case in *Thaler v. Perlmutter*[17] was filed under the Administrative Procedures Act challenging a denial of registration. Precisely speaking, this is a review of the Register's actions under the APA's "abuse of discretion" standard. The application in question only stated that the work was "created autonomously by a machine"[18] without indicating whether in so doing the machine displayed any creativity (sentience). Moreover, the applicant could

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[14] Guidance, p. 2.

[15] Guidance, p. 2-3.

[16] *In re Trade-Mark Cases*, 100 U.S. 82, 94 (1879) refers to the "creative powers of the mind" and "the fruits of intellectual labor" which could be read as referring to results. *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 61 (1884) quotes Lord Justice Cotton that "'author' involves originating, making, producing, as the inventive or master mind, the thing which is to be protected" which can also be read to focus on result. The "divine revelation" cases, typified by *Urantia Foundation v. Maaherra*, 114 F.3d 955, 958 (9th Cir. 1997), do indicate that creations by a "divine" being are not covered, but the entire quotation referring to human creativity in *Urantia* says (emphasis added): "The copyright laws, of course, do not expressly require 'human' authorship, and considerable controversy has arisen in recent years over the copyrightability of computer-generated works. [*Citation*]. We agree with Maaherra, however, that it is not creations of divine beings that the copyright laws were intended to protect, and that *in this case* some element of human creativity must have occurred in order for the Book to be copyrightable." *Kelley v. Chicago Park Dist.*, 635 F.3d 290, 304-305 (7th Cir. 2011), *cert. denied*, 565 U.S. 934 (2011) while containing generic language on human authorship, was decided on narrower grounds of lack of originality ("seeds or seedlings … originate in nature, and natural forces—not the intellect of the gardener") and fixation ("a garden is simply too changeable to satisfy the primary purpose of fixation"). *Naruto v. Slater*, 888 F.3d 418, 420 (9th Cir. 2018) was, as the Guidance, fn. 19, recognizes, decided on standing grounds.

[17] *Thaler v. Perlmutter*, 2023 WL 5333236 (D.C. D.C. 2023) appeal filed.

[18] *Thaler v. Perlmutter*, 2023 WL 5333236 at * 2 (D.C. D.C. 2023) appeal filed.

pursue an infringement claim under 17 U.S.C. § 411(a) with notice to the Register of Copyrights.[19] Thus, this case may still leave open the question of copyrightability.[20]

We believe that the question of whether the output of an AI System should be treated as a work of authorship for the purposes of copyrightability analysis is inextricably intertwined—as a matter of practice—with whether registration should be allowed. We thus address this issue more closely in the framework of the registration process.

2.2.2. **The Importance of Registration**

Like other commentators, we have concerns about the Guidance's position on copyright registration for works with AI-generated content. To place these concerns in context, however, it is useful to review what registration does, and does not, do.

A copyright is not a patent, of course. Ultimately, questions of copyrightability are left to the courts to decide.[21] However, registration impacts the presumption of validity in Section 410(c). A successful registration is entitled to the benefit of the presumption and the Office's decision is entitled to deference.[22]

For a denial of registration, an unsuccessful applicant can challenge the Office's decision under the Administrative Procedures Act or file an infringement action under Section 411(a) in which the Register may join.[23] In either of these cases the copyright owner is not entitled to the benefit of the presumption.

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[19] 17 U.S.C. § 411(a) ("In any case, however, where the deposit, application, and fee required for registration have been delivered to the Copyright Office in proper form and registration has been refused, the applicant is entitled to institute a civil action for infringement if notice thereof, with a copy of the complaint, is served on the Register of Copyrights. The Register may, at his or her option, become a party to the action with respect to the issue of registrability of the copyright claim by entering an appearance within sixty days after such service, but the Register's failure to become a party shall not deprive the court of jurisdiction to determine that issue.") *See* INFORMATION LAW § 2:67 *Presumption of validity for copyrights – Contesting basic fact of issuance of certificate – Challenging copyrightability* text at fn. 11 & 12 and cases cited.

[20] In *Thaler v. Perlmutter*, 2023 WL 5333236, fn. 2 (D.C. 2023) the District Court cites Prof. Justin Hughes to the effect that "whether non-human sentient beings may be covered by 'person' in the Copyright Act is only 'fun conjecture for academics.'" However, the full quotation by Prof. Hughes says: "[O]nce some AI is sentient enough to demand its own civil rights under the Thirteenth Amendment, my guess is that 'person' in copyright will not be limited to *homo sapiens*. … Same for the day when a half human/half horse is proven to be sentient; 'person' in copyright law will include them. These are fun issues for academics, but such issues are so rarefied as to wonder why the draft Restatement [of copyright law] discusses them at all." Justin Hughes, *Restating Copyright Law's Originality Requirement*, 44 Colum. L.J. & Arts 383, 408-409 (2021)

[21] *See* INFORMATION LAW § 2:65 *Presumption of Validity for Copyrights – Other issues in the operation of Section 410(c)* – under heading *Standard of Review*. The question can be treated as one of law or a mixed question of law and fact, with some disagreement on the proper approach in specific cases.

[22] *See* INFORMATION LAW § 2:67 *Presumption of Validity for Copyrights – Contesting basic fact of issuance of certificate – Challenging copyrightability*. Usually, a decision to register is accorded *Skidmore* deference, but not always.

[23] *See* INFORMATION LAW § 2:67 *Presumption of Validity for Copyrights – Contesting basic fact of issuance of certificate – Challenging copyrightability*.

But the presumption of validity has great import in infringement proceedings: in an infringement action a plaintiff needs to show: (1) ownership of a valid copyright, and (2) copying of constituent elements of the work that are original.[24] The presumption applies at the first or "validity" phase. Crucially, validity is determined for the work *as a whole* without "analytic dissection" (aka "filtration") of the components of the work, which is properly done at the second or "copying" stage.[25] However, the presumption will not apply to the components of a work disclaimed in the registration. Thus, the Office's positions as to what must be disclaimed can weigh heavily in the outcome of infringement litigation.

The Guidance addresses AI-generated content included in a work and establishes standards for the Office's determinations as to whether and to what extent such a work is eligible for copyright registration. The Guidance says: "AI-generated content that is more than *de minimis* should be explicitly excluded from the application."[26] This involves determining what is meant by "AI-generated content" and what is meant by "more than *de minimis*." We will take up what the Guidance considers to be AI-generated content and then address the registration issues raised by the *de minimis* test.

2.2.3. **AI-generated Content**

In addressing AI-generated content, the Guidance refers to "sophisticated artificial intelligence ('AI') technologies capable of producing expressive material."[27] Identifying "AI-generated content" thus involves two parts.

The first is specifying whether a machine or device is using "artificial intelligence technologies." This is not easy. As John McCarthy, one of the pioneers in AI, famously remarked: "As soon as it works, no one calls it AI anymore."[28] The Guidance does not specifically define "AI" although it does reference "generative AI," but the NOI defines AI as "automated systems designed to perform tasks typically associated with human intelligence or cognitive functions."[29] The phrase "typically associated with" may be overly broad. A spell-checking program could be seen as "typically associated" with human intelligence but such a program would rarely, if ever, be considered "AI."

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[24] *See* INFORMATION LAW § 2.61 *Presumption of Validity for Copyrights – Initial Application of Section 410(c)* – under heading *Where The Presumption Applies* citing *Feist Publications v. Rural Telephone Services, Co.*, 499 U.S. 340, 361 (1991)

[25] *See* INFORMATION LAW § 2.61 *Presumption of Validity for Copyrights – Initial Application of Section 410(c)* – under heading *Where The Presumption Applies*.

[26] Guidance p. 5.

[27] Guidance, p. 1.

[28] Quoted in INFORMATION LAW § 1:14 *Artificial Intelligence – What is AI?*

[29] This definition of AI in the NOI references the NAIIA provision, but the NAIIA refers to tasks "… requiring human-like … cognition" rather than "… typically associated with human intelligence."

The second part is identifying the "expressive material" that the AI system "creates." The Guidance refers to "traditional elements of authorship."[30] "Expressive material" is also identified as "AI *output* that, if it had been created by a human, would fall within the subject matter of copyright."[31] Too great an emphasis on output risks making action by a machine the primary determinant of authorship without giving due weight to *input* from a human user conditioning the resulting output. In *Burrow-Giles Lithographic Co. v. Sarony*,[32] although the photograph was created by a machine (a camera), it was still entitled to copyright protection because of the plaintiff's "original intellectual production" involving the "selecting and arranging the costume, draperies, and other various accessories in said photograph, arranging the subject so as to present graceful outlines, arranging and disposing the light and shade, suggesting and evoking the desired expression."

An overly broad definition of AI-generated content could have unexpected consequences. When coupled with the *de minimis* standard (discussed below) on the surface, it would seem to be measured solely by quantity (e.g., X? minutes of a movie, Y? percent of a graphic novel). But in applying the test one is not looking at usage of another registered or published work, which can be readily identifiable as copyrightable. Rather, one is evaluating programmatic output to determine whether it was produced by an AI System (did the program really use AI technologies?) and whether it constituted expressive material (are "traditional elements of authorship" only generated by the program especially in light of human input?). This may require including a quality assessment in deciding whether the output constitutes AI-generated content.[33] If an applicant has made a factual determination that a particular work does not contain a disclaimable amount of AI-generated content, would any "inaccuracy" in this determination be better evaluated under Section 411(b)?

The Guidance notes that "[the Office] begins by asking whether the 'work' is basically one of human authorship, with the computer [or other device] merely being an assisting instrument, or

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[30] Guidance p. 4. For this test, the Copyright Office appears to rely on the "creative spark" standard in *Feist Publications v. Rural Telephone Services, Co.*, 499 U.S. 340, 345 (1991) ("To be sure, the requisite level of creativity is extremely low; even a slight amount will suffice. The vast majority of works make the grade quite easily, as they possess some creative spark, 'no matter how crude, humble or obvious' it might be."). See Online Webinar, *Application Process for Registration of Works with Artificial Intelligence-Generated Content* (June 28, 2023) at https://www.copyright.gov/events/ai-application-process/Registration-of-Works-with-AI-Transcript.pdf.

[31] Guidance, p. 5 and fn. 5. *See also* Office Letter re *Zara of the Dawn* p. 9 "Midjourney's specific *output* cannot be predicted by users." Office Letter re *Théâtre D'opéra,* p. 4 "…the Office must determine whether a human user can be considered the 'creator' of AI-generated *output*." We note that human beings can generate "output" that shows significant intellectual effort ("sweat of the brow") but is not copyrightable. Consider the telephone directory in *Feist Publications v. Rural Telephone Services, Co.*, 499 U.S. 340, 345 (1991).

[32] *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 61 (1884)

[33] Every copyright lawyer is aware of Justice Holmes admonition about aesthetics in *Bleinstein v. Donaldson Lithographing Co.,* 188 U.S. 239, 251-252 (1903).

whether the traditional elements of authorship in the work … were actually conceived and executed not by man but by a machine."[34] The purpose seems to be to distinguish between a program that is a common "assisting instrument" or "tool," and a more sophisticated program that is "conceiving and executing" a work (demonstrating sentience?).

We believe that the Office should consider harmonizing its definition of AI with other definitions in other commonly accepted definitions in the data science literature or, at the very least, in other statutory, regulatory, and executive orders—and, critically, explain the reasons behind its choice of definitions. For example, the definition of an AI System might be focused on an automated systems that simulates (*Weak AI*) or duplicates (*Strong AI*) human intelligence in the performance of specific tasks (ANI) or across a broad range of activities comparable to human capabilities (AGI). We acknowledge the Weak AI / Strong AI distinction draws some debate. But "conceived and executed" may be better captured by a definition of AI that refers to machines that operate with some component of "sentience."

2.2.4. **Registration of Works with AI-Generated Content**

2.2.4.1. The Approach of the Guidance.

The Guidance makes two broad distinctions as to the Office's approach to registering (or not) works with AI-generated content.

The first is where the entire work, as in *Thaler*, is claimed to be generated by a machine. In this case, the Guidance states that if "a work's traditional elements of authorship were produced by a machine, the work lacks human authorship, and the Office will not register it."[35] Apparently, the Guidance takes this view no matter whether the work was produced by an Artificial General Intelligence System—that is, a system exhibiting intelligence across a broad range of activities comparable to human capabilities—and bore the marks of such an intelligence. Evidently, even works created by a still-to-be-developed Artificial Super Intelligence System would also be caught.[36] The view seems to be to deny registration simply because the work was generated by a machine (humanist view) regardless of the amount of creativity (intelligence) displayed in the result.

The second situation is where the work arises from the interaction of a human and a machine where the resulting work has AI-generated content, but not wholly so. For such a "mixed" work, the Guidance notes that in "the case of works containing AI-generated material, the Office will consider

[34] Guidance, p. 3.
[35] Guidance p. 4.
[36] *See* Section 2.1 above.

whether the AI contributions are the result of 'mechanical reproduction' or instead of an author's 'own original mental conception, to which [the author] gave visible form.' … The answer will depend on the circumstances, particularly how the AI tool operates and how it was used to create the final work."[37] However, the Guidance makes clear that use of AI tools—just like the use of other technological tools—in the creation of a work does not defeat authorship as long as "the human had creative control over the work's expression and 'actually formed' the traditional elements of authorship."[38] Rather, the question the Guidance attempts to tackle is how to treat a work containing both content generated by an AI System and content with sufficient human authorship to support a copyright claim.

As to such mixed works, the Guidance distinguishes between works with a *de minimis* level of AI-generated content and those with more. The author can register "the human-authored aspects of the work, which are 'independent of" and do 'not affect' the copyright status of the AI-generated material itself."[39] But since the Office takes the position that, when "an AI technology determines the expressive elements of its output, the generated material is not the product of human authorship" and "is not protected by copyright,"[40] a registrant must provide a brief statement as to the human-contributed portion of the work in the "Author Created" field of the Standard Application.[41] In addition, "AI-generated content that is more than *de minimis* should be explicitly excluded from the application" in "the "Limitation of the Claim" section in the "Other" field, under the "Material Excluded" heading."[42] Importantly, the presumption of validity would not attach to the disclaimed portion.

2.2.4.2. Policy Considerations.

Certainly, the Office should adopt procedures for registering works with AI-generated content consistent with its statutory directives but should also consider how such procedures can avoid frustrating the policy objectives supporting such directives as they operate in practice. As a policy

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[37] Guidance, pp. 3-4.

[38] Guidance, p. 4 ("This policy does not mean that technological tools cannot be part of the creative process. Authors have long used such tools to create their works or to recast, transform, or adapt their expressive authorship. For example, a visual artist who uses Adobe Photoshop to edit an image remains the author of the modified image, and a musical artist may use effects such as guitar pedals when creating a sound recording. In each case, what matters is the extent to which the human had creative control over the work's expression and 'actually formed' the traditional elements of authorship.")

[39] Guidance, p. 4.

[40] Guidance, p. 4.

[41] Guidance, p. 5.

[42] Guidance p. 5. "Applicants should provide a brief description of the AI-generated content, such as by entering "[description of content] generated by artificial intelligence." Applicants may also provide additional information in the "Note to CO" field in the Standard Application."

matter, if the procedures are too relaxed so that most content generated "by a push of a button" becomes entitled to the presumption, then this result is overinclusive and can create a "toll" on end users who now need to deal with a potential proliferation of registered content. On the other hand, if the procedures are too restrictive so that too much content generated with the assistance of a machine is disclaimed, a toll weighs on creators who cannot rely on the presumption to establish validity and reduces the utility of computers as work-saving devices.

We acknowledge drawing the line is difficult. However, we are concerned that the "more than *de minimis* AI-generated content" test in the Guidance might not strike the proper balance. The *de minimis* test could deny registration for too many works, especially when coupled with the broad definition of AI-generated content discussed above. Content in many works generated by programmatic tools may need to be disclaimed because the applicant was uncertain, or the Office thought, that the tool was an "AI System."

We agree with the MPA that this *de minimis* test can be too rigid and should be replaced with the *appreciable amount* test in the current Compendium for disclaiming preexisting content.[43] That is, an applicant should only be required to disclaim AI-generated content representing an "appreciable portion [amount] of the work as a whole."

Consider how the *de minimis* and *appreciable amount* tests might work in practice. Assume a work made with a human and machine interaction were granted a registration under the *appreciable amount* test where no AI-generated content had to be disclaimed. In an infringement case, the plaintiff (proponent of the presumption) would offer the registration certificate into evidence and invoke the presumption of validity. At this stage, the plaintiff would not need to specify each AI-generated component of the work. However, at the copying stage of evaluating the copyright claim, the plaintiff would still need to identify the components claimed to be improperly copied. The defendant (opponent of the presumption) could then in discovery ask plaintiff to identify AI-generated components. The defendant would then have three possibilities. First, the defendant could claim that the AI-generated components in the work infected the work so completely that the entire work was

[43] *Compendium of U.S. Copyright Office Practice, Third Edition* (3d ed. 2017) ['COMPENDIUM"] (emphasis added): sec. 621.2 ("Unclaimed material should be disclaimed only if it represents an *appreciable portion* of the work as a whole"); sec 621.3 ("If the work contains *an appreciable amount* of unclaimed material, the applicant should complete the Limitation of Claim fields/spaces in order to limit the claim to the new copyrightable materials created by the author"); sec. 621.4 ("If the work described in the application contains an *appreciable amount* of copyrighted material that has been previously published, the previously published material should be excluded from the claim …)

rendered uncopyrightable as matter of law.[44] Second, the defendant could claim the work contained an "appreciable amount" of AI-generated content and the failure to disclose such content was a "known inaccuracy" under Section 411(b).[45] Third, the defendant could seek to have plaintiff produce evidence on originality and fixation to challenge the presumed fact of validity; in such a case, the defendant has the burden of showing invalidity.[46]

Consider the same situation where the mixed work is granted a registration under the first *de minimis* test where AI-generated content is disclaimed. In this case, at the validity stage, the plaintiff cannot rely on the presumption and so must identify the disclaimed AI-generated content and present evidence of their validity.[47] The defendant still has the three challenges, only in this case the burden is on the plaintiff to show validity of the disclaimed content.

For a mixed work, the *de minimis* test could result in switching inquiry about infringement of AI-generated components from the copying stage to the validity stage by in effect requiring "analytic dissection" on the issue of validity for a wider range of components in a work.[48] This can be an expensive burden on copyright owners, especially in uncontested cases, or cases where the entire work is copied. We believe the *appreciable amount* test strikes a more appropriate balance by reducing this burden on plaintiffs but still allowing defendants protections consistent with current practice. This seems a more workable allocation of the "toll" of litigation costs among interested parties.

2.3. **AI Systems and Works-Made-for-Hire**

How should AI Systems be treated for the purposes of applying the work-made-for-hire doctrine? In *Thaler*, registration was attempted on the ground that the Creativity Machine produced the Entrance to Paradise artwork as a work-made-for-hire for the programmer.[49] The District Court

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[44] See INFORMATION LAW § 2.67 *Presumption of Validity for Copyrights – Contesting the basic fact of issuance of the certificate – Challenging copyrightability.*

[45] See INFORMATION LAW § 2.68 *Presumption of Validity for Copyrights – Contesting the basic fact of issuance of the certificate – Asserting inaccuracies under the Pro-IP Act.* See also INFORMATION LAW § 2:70 *Presumption of Validity for Copyrights – Contesting basic fact of issuance of certificate – Asserting Inaccuracy and the Pro-IP Act – Pro-Ip Act operation* - under heading *(5) Pro-IP Act – Savings Clause* noting that even if Section 411(b)(1) did not apply inaccuracies might be used to rebut the presumption.

[46] However, the nature of the burden (persuasion or production) and evidentiary showing ("some evidence" or preponderance of the evidence) are contentious. See INFORMATION LAW § 2.64 *Presumption of Validity for Copyrights – Type of presumption – Current case law conflicts.*

[47] Where copying is of the entire work, individual specification is unnecessary at the copying stage, so why is it required to establish validity? A *de minimis* test may also lead to more referrals under Sections 411(b)(1)(B) & 411(b)(2) than an *appreciable amount* test.

[48] Of course, similar procedures can apply when dealing with the usual disclaimed items (previously published work, previously registered works, public domain material, and material owned by another). See COMPENDIUM § 621.1. However, in these traditional cases, the material is often readily identifiable material. AI-generated content, as discussed above, may be more difficult to readily identify.

[49] *See* Copyright Review Board, Second Request for Reconsideration for Refusal to Register A Recent Entrance to Paradise, p. 2 (2002) at https://www.copyright.gov/rulings-filings/review-board/docs/a-recent-entrance-to-paradise.pdf.

in *Thaler* dismissed the claim on the grounds that "both definitions of a 'work made for hire' available under the Copyright Act require that the individual who prepares the work is a human being."[50] Were the supporting arguments for that conclusion entirely persuasive?

We are not so sure that the statutory text necessarily supports the reading that such a work always requires a human actor in its creation. To be sure, the first statutory test for a work-made-for-hire does use "his" and "her": "a work prepared by an employee within the scope of his or her employment." However, Section 504(b) says "… the copyright owner is entitled to recover the actual damages suffered by *him or her* as a result of the infringement." As far as we call tell, no case has read "him or her" in Section 504(b) as limiting copyright owners to natural persons or denying actual damages to legal entities.[51] It would be curious if the use of pronouns in both sections had different meanings. The reference to "him or her" may indicate a limitation or may be only a drafting convention. Indeed, the Supreme Court has indicated that "employment" in the work-made-for-hire context is determined by the common law of agency,[52] and we are not aware of a case where agency status turns solely upon whether the agent was a human being.[53]

We also note that the specially commissioned works-made-for-hire prong requires that "the parties expressly agree in a written instrument signed by them." The District Court thought satisfying this test "necessitates a meeting of the minds and exchange of signatures in a valid contract not possible with a non-human entity." Is that true, however? Section 202 (b) says: "In the case of a work made for hire, the employer *or other person* for whom the work was prepared is considered the author for purposes of this title." This could be read as adopting the rationalist position that it is the *result* of the creative process – creation of a copyrightable work – that matters and not who, or what, did it. Indeed, for more than two decades, legislatures and courts have recognized that contracts could be formed by the interaction of non-human electronic agents.[54] Moreover, the District Court in *Thaler*

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[50] *Thaler v. Perlmutter*, 2023 WL 5333236, fn. 3 (D.C. 2023)

[51] *See e.g. Polar Bear Prods., Inc. v. Timex Corp*., 384 F.3d 700, 710 (9th Cir. 2004) (actual damages recovered by corporation); *McRoberts Software, Inc. v. Media 100, Inc*., 329 F.3d 557, 566 (7th Cir. 2003) (same).

[52] *Community for Creative Non-Violence v. Reid*, 490 U.S. 730, 751-752 (1989), looking to a non-exhaustive list of factors derived from the Restatement (Second) of Agency; see INFORMATION LAW § 4.49 *Multi-Party Ownership in Digital Works*

[53] One scholar has suggested that the Restatement (Third) of Agency be reconsidered to allow AI Systems to act as agents. *See* Dalton Powell, *Autonomous Systems As Legal Agents: Directly by the Recognition of Personhood or Indirectly by the Alchemy of Algorithmic Entities*, 18 Duke L. & Tech. Rev. 306 (2020).

[54] *See* INFORMATION LAW § 1:33 *Artificial Intelligence – AI Systems as signatories.* The federal E-Sign deals with contracts formed by the "action of one or more electronic agents so long as the action of any such electronic agent is legally attributable to the person to be bound." 15 U.S.C. § 7001(h). The state Uniform Electronic Transactions Act goes further and recognizes "automated transactions" under which a contract may be formed by the interaction of electronic agents "even if no individual was aware of or reviewed the electronic agent's actions." UETA § 3(2). Official Comment No. 2 states: "An automated transaction is a transaction performed or conducted by electronic means in which machines are

seems to have embraced a "subjective" theory of contract formation. This theory was buried long ago. "An enforceable contract does not exist unless the parties 'intended' to be bound … but intent does not refer to and is not measured by the actual, subjective intent. Rather, it refers to objective manifestations indicating intent. This is the 'objective' theory of contracts which has dominated U.S. contract law for generations. … Objective manifestation of assent is not a proxy for subjective assent. Rather, the law views objective manifestations as the assent itself. … [T]he key fact is that the law focuses on what the parties did or said, rather than on what they claim they thought."[55]

Here, again, legislative clarification may be helpful, especially as treatment of AI Systems under other legal doctrines develops.

3. **Other Issues**

Questions Addressed

"22. Can AI-generated outputs implicate the exclusive rights of preexisting copyrighted works, such as the right of reproduction or the derivative work right? In what circumstances?

"25. If AI-generated material is found to infringe a copyrighted work, who should be directly or secondarily liable – the developer of the generative AI, the developer of the system incorporating the model, end users of the system, or other parties?

"26. If a generative AI System is trained on copyrighted works containing copyright management information, how does 17 U.S.C. § 1202(b) apply to the treatment of that information in the outputs of the system?

27. Please describe any other issues that you believe policymakers should consider with respect to potential copyright liability based on AI-generated output."

We believe that the evolving treatment of AI Systems may raise further issues for copyright practice beyond question of authorship. Legislative changes to the Copyright Act may be required, but the Office could, and should, make informed recommendations as to changes that Congress should make in light of the increasing power and autonomy of AI Systems. Below we touch on only some of the issues that the Office might consider as it evaluates how to treat (or recommend that Congress treat) AI Systems and their output.

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used without human intervention to perform contracts and perform obligations under existing contracts. … The critical element of this definition is the lack of a human actor on one or both sides of the transaction."

[55] See Raymond T. Nimmer and Jeff C. Dodd, MODERN LICENSING LAW § 3.3 *Contracts: objective manifestations of assent* (2023 Edition).

3.1. **Validity Issues**

Previous sections discuss the importance of the presumption of validity for copyright practice. As we note elsewhere, the law on the application of the presumption is "inconsistent."[56] How the presumption will be applied for AI-generated content has not been thoroughly addressed, and these inconsistencies, unless resolved, may continue for AI-generated content. If, as we suggest, the Office undertakes a more comprehensive review of how AI Systems and content should be treated under the Copyright Act, it should address the presumption with its recommendations to Congress for legislative action.

3.2. **Inaccuracy Issues**

The Pro-IP act added provisions dealing with alleged inaccuracies in a registration.[57] Thus, Section 411(b)(1)(A) provides a registration certificate that satisfies Section 412 unless the inaccurate information was included in an application "with knowledge that it was inaccurate." Assume an AI System is used to generate the application and make the filing.[58] What does it mean for an AI System to have "knowledge" of an inaccuracy?[59] Also, since there is still a question whether Section 411(b)(1)(A) requires *scienter*, or an "intent to deceive,"[60] what would it take for an AI System to operate with "intent"?[61] Section 411(b)(2) requires a request to the Register if Section 411(b)(1) applies, but if an AI System filing the application does not (cannot?) have "knowledge" of the inaccuracy, does that mean Section 411(b)(1) would not apply, so no reference is required? More importantly, would the registration satisfy "the requirements" of Section 411 and 412? Or should we revert to prior case law to invalidate the registration if the inaccuracy by the AI System were "material"?[62]

What if a human being files the application as to a work with some AI-generated content? It may not always be apparent that AI-generated content was not merely mechanical but instead demonstrated "traditional elements of authorship" or, even if it did, that the content was not *de minimis*.

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[56] See INFORMATION LAW § 2.71 *Presumption of Validity for Copyrights – Summary of Copyright Act Section 410(c).*

[57] See INFORMATION LAW §§ 2:68 *et seq. Presumption of Validity for Copyrights – Contesting basic fact of issuance of certificate – Asserting Inaccuracy and the Pro-IP Act.*

[58] See also Section 3.5 below for other issues involving AI Systems acting as copyright "administrators."

[59] Section 411(b)(1)(B) also applies if the inaccuracy "if known" would cause the Register to refuse registration. What if the Office uses to use its own AI System to assist in evaluating applications?

[60] See INFORMATION LAW § 2:70 *Presumption of Validity for Copyrights – Contesting basic fact of issuance of certificate – Asserting Inaccuracy and the Pro-IP Act – Pro-Ip Act operation* - under heading *(2) Pro-IP Act – Knowledge of Inaccuracy*, text discussion at fns. 19-21.

[61] See discussion in the next section.

[62] See INFORMATION LAW § 2:70 *Presumption of Validity for Copyrights – Contesting basic fact of issuance of certificate – Asserting Inaccuracy and the Pro-IP Act – Pro-Ip Act operation* - under heading *(3)Pro-IP Act – Materiality*, text discussion at fns. 26-35.

Given these difficulties, perhaps the human applicant would not "know" of the inaccuracy. If an applicant made an "inaccurate" decision on these matters, should not the Pro-IP Act apply?

3.3. **Infringement Issues**

Several vexing questions concerning infringement liability arise when AI Systems are involved in the actions that give rise to alleged infringement.[63] We will touch on only a few.

Who is liable? Section 501(a) says that "anyone" who violates the exclusive rights of a copyright owner is an infringer. Plainly, liability under Section 501(a) includes both individual and legal entities.[64] If an AI System is treated as a "person," then the AI System itself could be directly liable under this section.

Several provisions in the Copyright Act provide liability for various forms of conscious or "willful" misconduct. For example, Section 504(c)(2) provides for elevated damages where the "infringement was committed willfully." Section 506 also provides criminal liability for various forms of "willful" conduct.[65] This raises issues about what it means for an AI System to act with intention.[66]

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[63] Issues concerning legal liability arising from the "acts" or "omissions" by AI Systems are not confined to copyright infringement, of course. *See* INFORMATION LAW § 1:21 *Artificial Intelligence – Ethical AI* and sections following. The question of AI System liability is rapidly evolving. Some proposals argue that risk of harm from AI systems should be evaluated based concepts of "reasonableness" and "foreseeability" derived from the law of negligence. *See, e.g.* Ryan Abbott, THE REASONABLE ROBOT p. 50 (Cambridge 2020) ("The principle of AI legal neutrality suggests the solution is to evaluate the acts of AI tortfeasors under a negligence standard, rather than a strict liability standard, in cases where an AI system behaves like a human tortfeasor in the traditional negligence paradigm."). Others suggest that strict liability principles should apply, at least in some contexts. *See e.g.,* EU Parliament, *resolution of 20 October 2020 on a Civil Liability Regime for Artificial Intelligence* (2020/ 2014 (INL)) https://www.europarl.europa.eu/doceo/document/TA-9-2020-0276_EN.html Recommendation 14 ("… based on the legal challenges that AI-systems pose to the existing civil liability regimes, it seems reasonable to set up a common strict liability regime for those high-risk autonomous AI-systems.") A split approach recommends that AI systems classified as a "service" or certified by an administrative agency under criteria "to be developed," should be subject to negligence standards, while those classified as "products" or uncertified should be subject to strict liability. *See* Dr. Mikey Fischer & Shreyas Parab, REGULATING AI, p. 170-171 (AI Press 2020) ("There are three leading frameworks for how to assign liability in cases regarding artificial intelligence …One framework … is the idea of a total pre-approval process … Another framework is 'no-fault liability' [strict liability]. The final framework is a combination … in which there is an optional pre-approval process that limits liability while those who opt into not going through the process as being greatly more responsible with strict liability.") Still others question whether existing legal approaches are adequate so that new doctrines need to be developed. See U.K. House of Lords, *Select Committee on Artificial Intelligence, AI in the UK: ready, willing and able?* (16 Apr. 2018), Clause 317 https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf ("It is not clear to us, or to our witnesses, whether new mechanisms for legal liability and redress in such situations are required, or whether existing mechanisms are sufficient"); Woodrow Barfield & Ugo Pagallo, LAW AND ARTIFICIAL INTELLIGENCE, p. 106 (Edward Elgar 2020) ("In light of significant challenges in applying the current tort framework to AI, legal and computer science experts have offered possible solutions that involve modifications or current law, or, as discussed above, the creation of new legal doctrines"). The point is that AI System liability for copyright infringement may be impacted by developments assessing AI System liability in a more general context.

[64] *See, e.g. Pinkham v. Sara Lee Corp.,* 983 F.2d 824, 828 (8th Cir. 1992)

[65] Section 506(a) (willful infringement); section 506(c) & (d) (with fraudulent intent)

[66] *See* RUSSELL & NORVIG § 26.2.1 *Mental states and the brain in a vat.* One response is that brain states may not determine mental states.

Section 506(c)&(d) imposes criminal liability for certain misuse of a copyright notice "with fraudulent intent." Determining what constitutes actionable "fraud" when dealing with AI Systems is not trivial, especially when AI Systems may learn, unexpectedly, that strategic misdirection ("bluffing"?) may be an effective strategy.[67]

3.4. **CMI Issues**

What if an AI System removes or alters copyright management information (CMI) either when evaluating training data or in its operation? Section 1202(a) essentially prohibits "knowingly" and "with intent" providing "false" CMI to induce infringement and 1202(b) essentially prohibits "intentionally" and "without authority" removing or altering CMI "knowing" it will induce infringement. The "connection to infringement" was included to avoid liability for acts that may result in providing inaccurate or altered CMI but for innocuous reasons, *e.g.*, the copyright has been transferred to another so the name on the copyright notice on a DVD is out of date, or pages of a book containing CMI are accidently removed, or there is a wrong reference to a source in a footnote. Thus, the statute requires some "knowing" or "intentional" misconduct in dealing with CMI to be actionable. Again, what does an AI System "know"? If the definition of AI Systems used by the Office to evaluate "creative expression" does, or does not, include an element of "sentience," how would that impact the provisions regarding CMI?

3.5. **Administration Issues**

One can envision the possibility of an AI System administering copyrights.[68] A collective management society may create an AI System to manage its portfolio, allowing the AI System to grant licenses, collect royalties, and take enforcement actions. A company that makes numerous annual filings may use an AI System to complete and file the applications as the company's agent.[69]

In such situations, will the Office allow the AI System to execute required certifications "under penalty of perjury?" Will what that means be determined by the "person-enabling" legislation or the Office?

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[67] *See* INFORMATION LAW § 1:15 *Artificial Intelligence – Do AI Systems "think"?* under heading *Deceptive AI*.

[68] As the Copyright Office weighs how AI Systems should be addressed in interpretation of the Copyright Act or in recommendations for legislative action, it should consider whether an AI System could itself be a copyright "owner"? The Copyright Act does not limit owners to authors. Section 201(d)(1) allows copyright ownership to be transferred "by any means of conveyance" and if an AI System is authorized to contract in its own right, should it also be able to receive a transfer of copyright ownership? If so, other provisions would need to be addressed. For example, as an owner, the AI System might also be entitled to register the copyright as a copyright claimant,17 U.S.C. § 408(a) ("…the owner of copyright or of any exclusive right in the work may obtain registration…").

[69] *See* Regulation 202.3(c)(1) As a general rule, an application for copyright registration may be submitted by any author or other copyright claimant of a work, the owner of any exclusive right in a work, or the duly authorized agent of any such author, other claimant, or owner.

All these questions may eventually arise as the use of AI Systems proliferates. We do not propose to have the answers here. We only note that the Office's consideration of the impact of AI systems on the Copyright Act and resulting practices may need to address these issues.

4. About the Authors

Jeff C. Dodd and Lorin Brennan are update editors of the treatises *Information Law* and *The Law of Computer Technology*, originally written by the late Raymond T. Nimmer. Mr. Dodd has written and spoken extensively, both domestically and internationally, on topics relating to licensing and information assets, including intellectual property. He is also the author of *Modern Licensing Law* (originally co-authored with Professor Nimmer) and *Drafting Effective Contracts*. Mr. Dodd is a partner in the firm of Hunton Andrews Kurth LLP, resident in its Houston, Texas office, but any opinions expressed here are his alone and should not be attributed to Mr. Dodd's firm, its partners, or its clients. Lorin Brennan represents parties in the motion picture industry and has litigated numerous copyright cases. He has written and spoken both domestically and internationally on copyright and intellectual property matters. Mr. Brennan is a member of the Los Angeles law firm of Reiter, Dye & Brennan, L.P., and part owner of a software publisher, Gray Matter, LLC, but any opinions expressed are his alone and not those of his firm, company, their members, or clients.

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