2019

Authors and Machines

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ABSTRACT

Machines, by providing the means of mass production of works of authorship, engendered copyright law. Throughout history, the emergence of new technologies tested the concept of authorship, and courts in response endeavored to clarify copyright's foundational principles. Today, developments in computer science have created a new form of machine, the "artificially intelligent" (AI) system apparently endowed with "computational creativity." AI systems introduce challenging variations on the perennial question of what makes one an "author" in copyright law: Is the creator of a generative program automatically the author of the works her process begets, even if she cannot anticipate the contents of those works? Does the user of the program become the (or an) author of an output whose content the user has at least in part defined?

This Article frames these and similar questions that generative machines provoke as an opportunity to revisit the concept of copyright authorship in general and to illuminate its murkier corners. This Article examines several fundamental relationships (between author and amanuensis, between author and tool, and between author and co-author) as well as several authorship anomalies (including the problem of "accidental" or "indeterminate" authorship) to unearth the basic principles and latent ambiguities which have nourished debates over the meaning of the "author" in copyright. This Article presents an overarching and internally consistent model of authorship based on two basic pillars: a mental step (the conception of a work) and a physical step (the execution of a work), and defines the contours of these basic pillars to arrive at a cohesive definition of authorship.

The Article then applies the conception-and-execution theory of authorship to reach a series of conclusions about the question of machine "authorship." Even the most technologically advanced machines of our era are little more than faithful agents of the humans who design or use them. Asking whether a computer can be an author therefore is the "wrong" question; the "right" question addresses how to evaluate the authorial claims of the humans involved in either preparing or using the machines that "create." In many cases, either the upstream human being who programs and trains a machine to produce an output, or the downstream human being who requests the output, is sufficiently involved in the conception and execution of the resulting work to claim authorship. But in some instances, the contributions of the human designer and user will be too attenuated from the work's creation for either to qualify as "authors"—leaving the work "authorless."

DOI: https://doi.org/10.15779/Z38SF2MC24

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†† Columbia Law School JD Class of 2018. Many thanks to the members of the Columbia Law School faculty workshop; Ben Bogart, PhD; Madeline Rose Finkel; Rebecca Giblin and François Petitjean; Jeremy Kessler; Catherine Kessedjian; Ed Klaris; Enoch Liang and James Lee; Samuel Pitkin Niles; Javed Qadrud-Din; Blake Reese; and Jeffrey Stein.

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I. INTRODUCTION

Machines, by providing the means of mass reproduction of works of authorship, engendered copyright law.[1] Later, cameras—machines employed to create works, rather than merely to reproduce them—called into question copyright's coverage of works whose human authorship those machines purportedly usurped.[2] The digital era exacerbates the anxiety of authorship, as "artificial intelligence" supposedly supplants human artists, writers, and composers in generating visual, literary, and musical outputs indistinguishable

1. *See, e.g.*, Brad A. Greenberg, *Rethinking Technological Neutrality*, 100 MINN. L. REV. 1495, 1502 (2016) ("Modern copyright law's existence can be traced to a transcendent technology: the movable-type printing press."); Paul Edward Geller, *Copyright History and the Future: What's Culture Got To Do With It?*, 47 J. COPYRIGHT SOC'Y 209, 215–19 (2000) (tracing history of copyright law beginning with the introduction of the printing press in 15th century Europe).

2. *See infra* Section II.A (discussing the debate about copyright in photographic works); *see also* Christine Haight Farley, *The Lingering Effects of Copyright's Response to the Invention of Photography*, 65 U. PITT. L. REV. 385, 388 (2004) (noting that photography was the "first technological challenge" for copyright law).

from human-produced endeavors.[3] Other commentators have posited adapting copyright law to the challenges of machine authorship;[4] we ask the predicate questions: What is authorship in copyright law, and how do its precepts apply to machine-enabled outputs? In addressing the first question, and in keeping with the 1976 Copyright Act's general norm of technological neutrality,[5] we derive general principles of authorship from copyright cases arising in the analog world in order to apply them to emerging modes of machine-implicated creativity. Only after ascertaining whether computer-enabled outputs are works of authorship according to underlying principles of copyright law can one determine whether, for authorless outputs, copyright law provides the right regulatory regime, or whether these outputs instead require some other form, if indeed any, of intellectual property protection.

In an earlier study, addressing authorship in the analog world, one of us concluded that authorship in copyright entwines conception and execution.[6] Our analysis here further develops those two essential elements. By "conception" we mean more than envisioning the general ideas for a work; we mean elaborating a detailed creative plan for the work. Conception guides the work's "execution," the process through which the author[7] converts the plan to concrete form. This basic process—through which conception informs execution—underlies all acts of authorship.

Because U.S. copyright law requires that original works of authorship be fixed in a tangible medium of expression,[8] the author must embody her detailed ideas; conception alone (no matter how novel or imaginative) does

3. *See* Annemarie Bridy, *Coding Creativity: Copyright and the Artificially Intelligent Author*, 2012 STAN. TECH. L. REV. 5, 27 (2012) (noting that "AI authorship" may have placed the copyright system in a "digitally induced crisis").

4. *See, e.g.*, Robert C. Denicola, *Ex Machina: Copyright Protection for Computer-Generated Works*, 69 RUTGERS U. L. REV. 251, 284 (2016) (arguing that "users" should be recognized as the "authors and owners of computer-generated works" if they initiate the creation of computer-generated expression).

5. *See* N.Y. Times Co. v. Tasini, 533 U.S. 483, 502 (2001) (noting that the "transfer of a work between media does not 'alter the character' of that work for copyright purposes"); 4 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 12A.16(b) (1963) (referring to technology neutrality as a "unifying theme" of the 1976 Act) [hereinafter NIMMER ON COPYRIGHT § 12A.16(b)].

6. Jane C. Ginsburg, *The Concept of Authorship in Comparative Copyright Law*, 52 DEPAUL L. REV. 1063, 1072 (2003) ("An 'author' conceives of the work and supervises or otherwise exercises control over its execution.").

7. Or the author's agents or collaborating co-authors; *see infra* Sections II.B and II.F, respectively.

8. 17 U.S.C. § 102(a) (2018).

not suffice to create a protectable work.[9] But neither does mere execution; the amanuensis who transcribes an author's words, or the welder who follows the artist's instructions to create a monumental size rendition of the artist's model for a sculpture[10] are not "authors" of the resulting works. Where the author directs another to give concrete form to the author's conception, and the person executing the assigned task acts within the intended scope of the author's delegation of authority, then the assistant's contribution lacks the "intellectual conception[]"[11] that characterizes an original work of authorship.[12]

Where, by contrast, the assistant participates in the conceptual elaboration, she may be a co-author, or even a sole author, when the instructions offer no more than a general idea and the assistant devises her own creative plan. St. Exupéry's Little Prince commanded the downed aviator: "Draw me a sheep!"[13] The imperious little boy was not the author of the resulting image (a rather scrawny ovine). Had he instead detailed the sheep's intended appearance (for example, color, length, and curl of pelt; roundness of form; openness of eyes and mouth, etc.), he might have shared authorship with the aviator who gave visual form to the boy's words.[14] But only if the aviator had made no personal expressive choices in his rendering of the "ideas in the mind"[15] of the Little

9. *See* Cmty. for Creative Non-Violence v. Reid, 490 U.S. 730, 737 (1989) ("As a general rule, the author is the party who actually creates the work, that is, the person who translates an idea into a fixed, tangible expression entitled to copyright protection.").

10. For example, Alexander Calder has routinely relied on a metal-working shop to create his massive stabile sculptures. *See infra* notes 118–120 (discussing Calder's process of working with a team of welders).

11. *See* Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 58 (1884) ("We entertain no doubt that the Constitution is broad enough to cover an act authorizing copyright of photographs, so far as they are representatives of original intellectual conceptions of the author.").

12. *See* Andrien v. S. Ocean Cty. Chamber of Commerce, 927 F.2d 132, 135 (3d Cir. 1991) ("[W]riters are entitled to copyright protection even if they do not perform with their own hands the mechanical tasks of putting the material into the form distributed to the public."); *see also* Lindsay v. The Wrecked & Abandoned Vessel R.M.S. Titanic, No. 97 Civ. 9248 (HB), 1999 WL 816163, at *4–6 (S.D.N.Y. Oct. 13, 1999) (affirming the authorship claim of the director of a documentary film about the *R.M.S. Titanic* who had "exercised . . . a high degree of control over a film operation," and was the "driving force behind the final film product," and dismissing defendants' objection that the director "[could] not have any protectable right in the . . . footage since he did not dive to the ship and thus did not himself actually photograph the wreckage").

13. *See* ANTOINE DE ST. EXUPÉRY, THE LITTLE PRINCE 9 (1943).

14. *Cmty. for Creative Non-Violence*, 490 U.S. at 753 (indicating, but not deciding, that the commissioning party might give such detailed instructions as to become a co-author).

15. *Burrow-Giles*, 111 U.S. at 58 (noting that the scope of copyright includes "all forms of writing, printing . . . etc., by which the ideas in the mind of the author are given visible expression").

Prince (an unlikely prospect given the hand-drawn medium),[16] would the Little Prince have been a sole author.

While these copyright precepts are well-settled, challenges arise when the putative author partners with a machine or with natural forces to create a work of authorship. These paired productions require us to ask whether they are "original works of authorship" entitled to copyright protection. The burgeoning of computer-enabled works[17]—outputs of generative machines[18] designed to create works and to mimic human creativity, perhaps through the use of "artificial intelligence"[19] techniques like machine learning—offers the newest iteration of those challenges. But the questions AI raises precede the

16. Bleistein v. Donaldson Lithographing Co., 188 U.S. 239, 250 (1903) ("Personality always contains something unique. It expresses its singularity even in handwriting, and a very modest grade of art has in it something irreducible, which is one man's alone. That something he may copyright unless there is a restriction in the words of the act.").

17. This Article uses the term "computer-enabled" or "machine-enabled" and avoids the more commonly used term "computer-generated" to highlight that the machines themselves do not necessarily *generate* or *author* these works—but that instead humans produce the works with the *assistance* of sophisticated generative machines. *See infra* Section III.A (rejecting the idea of "machine authorship" and instead arguing that machines should be considered tools of their creators).

18. "Generative machine" refers to any machine, other than a mere "ordinary tool," that "contributes to or results in a completed work," either by creating a work at the push of a button ("fully-generative" machines) or by inviting the user to input instructions, which guide and inform a creative output, thereby fusing the creative contributions of the machine's designer and user ("partially-generative" machines). *See* Philip Galanter, *Thoughts on Computational Creativity*, DAGSTUHL SEMINAR PROCEEDINGS 09291 - COMPUTATIONAL CREATIVITY: AN INTERDISCIPLINARY APPROACH (2009), http://drops.dagstuhl.de/opus/volltexte/2009/2193/ [https://perma.cc/D5MQ-JCW2] (introducing the definition and theories of generative machines); *infra* Section III.B.1 (discussing "ordinary tools"); *infra* Sections III.B.2–3 (discussing and defining "fully-generative" and "partially-generative" machines).

"Generative machine" also includes "generative models." *See, e.g.*, Andrej Karpathy et al., Generative Models, OPENAI BLOG (June 16, 2016), https://blog.openai.com/generative-models/ [perma.cc/9LX9-9Q6F] ("To train a generative model we first collect a large amount of data in some domain (e.g., think millions of images, sentences, or sounds, etc.) and then train a model to generate data like it."). However, "generative machine" also includes machines and systems built for the purpose of creating "generative art." *See* Galanter, *supra* note 18 (providing a "wide" definition of the term "generative art" which refers to "any art practice where the artist cedes control to a system that . . . contributes to or results in a completed work of art").

19. The term "artificial intelligence" is an "umbrella term," comprising "many different techniques," and broadly refers to the "set of techniques aimed at approximating some aspect of human or animal cognition using machines." Ryan Calo, *Artificial Intelligence Policy: A Primer and Roadmap*, 51 U.C. DAVIS L. REV. 399, 404–05 (2017).

digital era.[20] These questions arose with the advent of photography and persist whenever a work's creator incorporates uncontrolled forces, whether faunal or meteorological, mechanical or digital, to generate the work.

Part II of this Article reviews non-digital examples to derive general principles of copyright authorship. All non-digital examples present an intervening element complicating the putative author's causal relationship to the creation of the work. Thus, in addition to mechanical and natural forces, this Article considers whether the participation of another human contributor deprives the initiator of sole or even any claim to authorship.

Part III applies those traditional principles to explore the authorship status of potential computer-enabled outputs. Properly programmed computers may increasingly encroach on human execution of a work, but their role in engendering the work's conception is far more debatable. Because computers today, and for proximate tomorrows, cannot themselves formulate creative plans or "conceptions" to inform their execution of expressive works, they lack the initiative that characterizes human authorship.[21] The computer scientist who succeeds at the task of "reduc[ing] [creativity] to logic" does not generate new "machine" creativity[22]—she instead builds a set of instructions to codify and simulate "substantive aspect[s] of human [creative] genius," and then commands a computer to faithfully follow those instructions.[23] Even the most sophisticated generative machines proceed through processes designed entirely by the humans who program them, and are therefore closer to amanuenses than to true "authors."[24] Therefore, even if the concept of

20. *See* Benjamin L.W. Sobel, *Artificial Intelligence's Fair Use Crisis*, 41 COLUM. J.L. & ARTS 45, 47 (2017) (noting that the question "Can a computer be an author?" is "not as novel as it may seem" and noting that "[o]ver a century has passed since the Supreme Court first evaluated whether the outputs of a new creative technology, capable of operating with less human oversight than its predecessors, could manifest authorship to the degree intellectual property laws required . . . [t]hat technology was photography").

21. *See infra* Section III.A.1 (discussing and rejecting the possibility of true "machine authorship").

22. SELMER BRINGSJORD & DAVID FERRUCCI, ARTIFICIAL INTELLIGENCE AND LITERARY CREATIVITY: INSIDE THE MIND OF BRUTUS, A STORYTELLING MACHINE xiii, xvi (1999) (describing the task of generating a machine capable of writing fiction as the "attempt to reduce creativity to computation").

23. *Id.* at xxii, xxiv ("As we uncover reasons for believing that human creativity is in fact beyond the reach of computation, we will be inspired to nonetheless engineer systems that dodge these reasons and *appear* to be creative.").

24. *Cf.* Jack M. Balkin, *2016 Sidley Austin Distinguished Lecture on Big Data Law and Policy: The Three Laws of Robotics in the Age of Big Data*, 78 OHIO ST. L.J. 1217, 1223–24 (2018) (describing the "homunculus fallacy," or the "way that people tend to think about robots, AI agents, and algorithms" with the "belief that there is a little person inside the program who is

"author" in the U.S. Constitution and the Copyright Act could encompass non-human actors,[25] the machines of today would not qualify as "authors." Asking whether a computer can be an author therefore is not a fruitful inquiry.

Having dismissed computer authorship as the "wrong" question, this Article focuses instead on the "right" question: how to evaluate the authorial claims of the humans involved in either preparing or using the machines that "create." Thus, in Part III, this Article ascertains whether the upstream human being who programs and trains a computer to produce an output, or the downstream human being who requests the output, is the (or an) author of the resulting production based on authorship principles. In other words, Part III probes the distinction between a "tool" (output attributable to the user) and a

making it work," and arguing that "[w]hen we criticize algorithms, we are really criticizing the programming, or the data, or their interaction. But equally important, we are also criticizing the use to which they are being put by the humans who programmed the algorithms, collected the data, or employed the algorithms and the data to perform particular tasks"); Carys Craig & Ian Kerr, *The Death of the AI Author* 25 (Osgoode Legal Studies Research Paper, 2019) ("It is important to remember . . . that[] even if a machine predicts all the right words . . . it neither knows, understands, nor appreciates the connotation of its word assemblage, let alone the meaning or value of the 'work' as a whole.").

25. Many authorities concur that "authorship" in copyright law implies human creativity. *See* Naruto v. Slater, 888 F.3d 418, 426 (9th Cir. 2018) (holding that "animals other than humans . . . lack statutory standing to sue under the Copyright Act"); *see also* Urantia Found. v. Maaherra, 114 F.3d 955, 958 (9th Cir. 1997) ("For copyright purposes, however, a work is copyrightable if copyrightability is claimed by the first *human beings* who compiled, selected, coordinated, and arranged [the work]."") (emphasis added); UNITED STATES COPYRIGHT OFFICE, COPYRIGHT OFFICE PRACTICES COMPENDIUM §§ 306, 313.2 (2017) [hereinafter COMPENDIUM] (noting that "the Office will refuse to register a claim if it determines that a human being did not create the work" and "the Office will not register works produced by a machine or mere mechanical process that operates randomly or automatically without any creative input or intervention from a human author"). *But see* Denicola, *supra* note 4, at 265–69 (raising doubt about the existence of a human-authorship requirement); Arthur R. Miller, *Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU?*, 106 HARV. L. REV. 977, 1060–65 (1993) (concluding that "[i]t is far from clear that the federal courts ultimately will conclude that our copyright law requires human authorship," and that "[t]he Constitution[] . . . does not mandate that authors be flesh and blood"). For a recent exploration of the human authorship requirement in the context of artificially-intelligent machines, see generally Craig & Kerr, *supra* note 24, at 41–42 ("[T]he outputs generated by AI—whether or not that AI passes a Turing test—are never in fact 'the same' as the human creations they seek to imitate. . . . If text is a vehicle through which our consciousness relates to another consciousness—one or any, immediate or asynchronous—then authorship presupposes something that AI does not have, and cannot produce. . . . To say authorship is human, that it is fundamentally connected with humanness . . . is to say that human communication is the very point of authorship as a social practice, indeed as a condition of life.").

truly "generative" machine (output attributable to the programmer of the machine).

Part IV shows that the answer may often be "neither," even when these authorless outputs' literary, musical, or artistic *appearance* would surely soar over the minimal threshold of creativity required of traditionally-authored works. Nonetheless their lack of an author—i.e., a creative actor who both conceives of and executes the work—would disqualify them from copyright subject matter. If divergent treatment of otherwise potentially identical human-generated and authorless machine-enabled works seems problematic, it may be appropriate to revisit some of the analog world principles whose application may render many computer-enabled outputs "authorless." Current doctrines of joint works, or distinguishing ideas from expression, furnish likely candidates for revision. The former reform would pair the downstream user with the upstream programmer(s) as co-authors. The latter would permit the designation of the downstream task-assigner as the "author," a solution the UK and other Commonwealth countries have adopted.[26] Nonetheless, the reluctance to strand computer-enabled outputs on authorless shores does not warrant relaxing the statutory and the case law criteria in either instance, notably because accommodations for the inclusion into copyright of otherwise authorless outputs are unlikely to remain cabined to that context.[27]

This Article concludes this exploration of copyright authorship with a taxonomy of outputs, from those enjoying copyright protection by virtue of their human-dominated creation to those lacking sufficient human participation to characterize the output as an "original work of authorship." As to the latter group, some may fear that a complete lack of protection for authorless outputs might discourage the development of the technologies or of the business models required to produce and commercialize these outputs. But one should not simply assume that without copyright-like protection,

26. *See, e.g.*, Copyright, Designs and Patents Act 1988, c. 48, § 178(b) (U.K.) (defining a "computer-generated" work as a work "generated by computer in circumstances such that there is no human author of the work"); *see also id.* at § 9(3) ("In the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken."); Copyright Ordinance, (1997) Cap. 528, § 11(3) (H.K.) (same); Copyright and Related Rights Act 2000 (Act No. 28/2000) § 21(f) (Ir.) (same); Copyright Act 1994, s 5, sub 2, pt a (N.Z.) (same); Copyright Act 98 of 1978 § 1 (S. Afr.) (same); *cf.* Copyright Act, 1957, No. 14, Acts of Parliament, 1957 § 2(d)(vi) (India) (" 'Author' means . . . in relation to . . . [a] work which is computer-generated, the person who causes the work to be created.").

27. *See* Kalin Hristov, *Artificial Intelligence and the Copyright Dilemma*, 57 IDEA 431, 441 (2017) ("Redefining copyright authorship to include non-human authors would undermine the current U.S. legal system, creating further uncertainty by raising more questions than answers.").

society will be deprived of these benefits. Any regime design must ascertain the kinds of incentives (if any) different sorts of authorless outputs might require. To the extent that proponents of protection can empirically demonstrate the necessity for some form of coverage, regime design must also consider how to tailor the impetus to the need.

II. BEFORE AI—CHALLENGES PRESENTED BY MECHANICAL AND NATURAL FORCES

This Part identifies conception and execution as the hallmarks of authorship and examines the emergence of their articulation in the progression of U.S. copyright cases elaborating these two terms. Section II.A discusses conception and execution in controversies involving photography—the first cases of alleged "machine authorship." If the process of authorship consists of the "conversion of . . . 'things of the mind into transferable articles of property,' "[28] this transformation implies two predicate steps: first, a creative plan, and, second, the physical generation of a tangible "work" executing that plan. The "core concept" of authorship, therefore, is "creativity in *conceiving* the work and controlling its *execution*."[29]

Section II.B then considers scenarios that validate the claims of the initiator of a work of authorship, in cases involving amanuenses—participants we cast as "agents" of the author-principal. Sections II.A and II.B together demonstrate that the law does not require that to "execute" the work, the author have by her own hand given physical form to its every element. Section II.C shifts to scenarios that challenge the initiator's authorship status, in instances involving the intervention of uncontrolled external natural or random causal forces in the execution of the work.

Section II.D assesses the extent to which those instances might require more nuance when identifying authorship along the axes of conception and controlled execution. It reexamines the "conception" requirement, concluding that the author's intellectual conception of the work need not reflect a complete or even an accurate prediction of the resulting work's contents. Copyright case law encompasses works that result from acts of unintended or accidental creativity,[30] despite the dissonance between what the author

28. ALVIN KERNAN, THE DEATH OF LITERATURE 123 (1990) (quoting Sutherland, in *Plagarism—A Symposium*, Times (London) Literary Supp., Apr. 9, 1982, at 414, col. 4).

29. Ginsburg, *supra* note 6, at 1067, 1072 ("An 'author' conceives of the work and supervises or otherwise exercises control over its execution.").

30. *See id.* at 1086 (noting that "images generated by bad eyesight, claps of thunder, and frustrated flinging of sponges" are protected by copyright); *see, e.g.*, SUSAN SONTAG, ON

expected and how the final work turned out. "Accidental authorship" in fact merely presents an evocative example of the creative process: an author may create a work without precise foresight of the work's ultimate form or contents. Acknowledging that conception may often be subsumed in contemporaneous execution, because the author's conception of the work may emerge as she creates it, does not detract from conception's cornerstone role in the process of authorship.

In effect, authorship's "conception" element merely requires the author to devise a *creative plan* for the work. Accordingly, an author who is entirely responsible for formulating the work's creative plan and executing that plan is presumptively the author of the resulting work. In most cases, there is no need to extricate these elements from the creative bundle. Scholars generally do not endeavor to ascertain whether the putative author in fact envisioned or how she brought forth the work. But we do call authorship into question if the circumstances of a work's creation cast doubt on the attribution of authorship. As Section II.C discusses, natural or mechanical forces, if unmastered by a human being, may usurp the dominant role in a work's execution, thus calling on courts to ascertain the actor to whom (or to which) to attribute the work's creation.

Section II.E further discusses how the relationship among multiple (or competing) contributors to a work furnishes another basis for querying the creative process. When we inquire whether an amanuensis—an agent—has faithfully carried out her subordinate task (in which case she is not an author), or has instead struck out on her own creative path, we are asking whether she has wholly or partly superseded the principal's authorship by furnishing her own "creative plan," or by completing the insufficient creative plan supplied by the putative author.[31] Similarly, when co-authorship aspirants claim to share authorship status, this Section investigates the extent of their alleged collaboration with the putative author, and the nature of the contributions they bring to the work.[32]

PHOTOGRAPHY 117 (1977) ("[M]ost photographers have always had—with good reason—an almost superstitious confidence in the lucky accident."); *see also* Time Inc. v. Bernard Geis Assocs., 293 F. Supp. 130, 131 (S.D.N.Y. 1968) (Abraham Zapruder intended to film the presidential motorcade; he captured the JFK assassination "by sheer happenstance"); *infra* Section II.D.2.

31. The principal-agent dynamic offers another reason for declining to characterize computers as "authors": agents violate the relationship by exceeding the scope of their delegated authority; a computer cannot (at least not now) go off on a "frolic of its own." *See infra* Section III.A (discussing machines as "agents").

32. *See infra* Sections II.E and II.F.

Accordingly, we consider the application of authorship's essential elements to the problem of works that inseparably merge the inputs of their various contributors. Section II.E provides a taxonomy of different relationships in situations involving multiple contributors to a single work and provides a framework to determine the allocation of sole authorship between "upstream" and "downstream" contributors.

Section II.F addresses the statutory criteria for joint works and co-authorship, and distinguishes works comprised of interdependent contributions from those whose components are inseparable. Part II concludes by demonstrating that if multiple creators contribute to the creation of a work but do not meet the statutory requirements of inseparable joint works, the resulting work may be "authorless."

A. THE CONJOINED COMPONENTS OF AUTHORSHIP: DETAILED CONCEPTION + CONTROLLED EXECUTION

The advent of photography confronted judges with a novel task: to determine whether a human could claim authorship of a machine-generated image.[33] Prior mechanical adjuncts, from engraving through lithography, served as modes of reproduction of a pre-existing hand-drawn image. By contrast, without the camera's intervention, there would be no image. And while the photographer's manipulation of the camera or the subject might emulate the aesthetics of works directly formed by an artist's hand,[34] the camera substituted for the artist's hand in the initial fixation of the subject. This particularity in the means of creation sparked debate over the attribution of the output of the mechanical process. On the one hand, if the output owes its origin to a machine, then it lacks a human author, and by that token, cannot be the object of copyright. On the other hand, if the machine provides a means of expressing the photographer's vision of the image, and the author controls that means, then the machine has not displaced the author.

In 1879, Eugène Pouillet's *Traité pratique de la propriété littéraire et artistique* stated the cases for and against recognizing photographs as works of

33. *See* Farley, *supra* note 2, at 387–88 (describing the "invention of photography" as a "critical episode in the development of the authorship doctrine," and noting that the law "finds authorship in photographs" and "does not credit the technology as playing a role in the authorship").

34. *Id.* at 390 (noting ways "in which a photographer can manipulate the image" produced by a camera, and noting that "[t]hese activities . . . [have] definite analogies in the world of artistic production").

authorship.[35] Both sides shared the essential terms of the debate: does the output reflect the author's mental labor in the execution of the image? Articulating the case against authorship of a photograph, Pouillet distinguished "the labor of thought previous to execution" from "the mental labor in the material output."[36] Under this view, the law "does not protect the thought without the execution. . . . All of the intellectual and artistic work of the photographer is anterior to the material execution, his mind or his genius have nothing to do with this execution."[37] Painting and engraving are different, this side of the debate urges, because the law intervenes at the moment of materialization of the artist's conception, when he puts brush to canvas; the law does not afford protection to the artist's imagination before it assumes material form. By contrast, "the photographer erects his apparatus, he thenceforth remains a complete stranger to what is taking place; light does its work: a splendid but independent agent has accomplished all."[38]

Shifting to the case in favor of copyright in photographs (a conclusion he endorsed), Pouillet disputed the disappearance of the author from the process of materializing his conception:

> [I]t is always the thought of the artist which directs the instrument,—which guides and inspires the material means. Thought retains its supreme role. In photography, the apparatus takes the place, though not entirely, of hand labor,—the material part of the labor,—but it leaves to the artist, to its fullest extent, the labor of the mind. . . . The photographer conceives his work, he arranges the accessories and play of light, he arranges the distance of his instrument according as he wants, in the reproduction, either distinctness or size; thus, also, he obtains this or that effect of perspective.[39]

Thus, from the outset, the analysis focused on the role of the human author not only in imagining what the work would look like, but in controlling the process of its materialization. Early photography cases in England and the United States tested both elements of the equation. In *Nottage v. Jackson*,[40] the dispute focused not on whether a photograph was a work of authorship, but

35. Sarony v. Burrow-Giles Lithographic Co., 17 F. 591, 597–601 (1883) (quoting EUGÈNE POUILLET, *Property in Photographs*, *in* TRAITÉ PRATIQUE DE LA PROPRIÉTÉ LITTÉRAIRE ET ARTISTIQUE (William Alexandre Heydecker trans.) [hereinafter Pouillet on Photography]).

36. *Id.*

37. *Id.*

38. *Id.* at 597–98.

39. *Id.* at 599–601.

40. Nottage v. Jackson [1883] 11 QBD 627.

on who its author was. The claimants' employee had instructed a hired photographer to take the picture of an Australian cricketer.[41] The Court of Queen's Bench upheld the challenge to the claimants' authorship: their role entailed neither a specific conception of the work nor any involvement in its execution. Lord Justice Cotton opined:

> It is not the person who suggests the idea, but the person who makes the painting or drawing, who is the author. . . . [H]e must be the originator in the making of the painting or drawing. . . . The mere preparing the materials, or preparing and supplying of the instruments . . . cannot, in my opinion, make a man the author . . . . In my opinion, "author" involves originating, making, producing, as the inventive or master mind, the thing which is to be protected, whether it be a drawing, or a painting, or a photograph.[42]

Lord Justice Bowen agreed:

> I think it is evidently not the man who pays—not the man who contributes the machinery—*not the man who does nothing except form the idea—not the man who does nothing toward embodying the idea*—not the man who finances the expedition or who sends it out—none of those persons, in the ordinary sense of the term, can be considered the artist.[43]

Thus, supplying the material or financial means to create a work does not make one its author. A work's "originator" does more than order its creation: she must both form and embody her concept for the work.[44]

The U.S. Supreme Court applied the *Nottage* framework in a case decided the next year, but this time challenging whether a photograph, given the role of a machine in its creation, could be the "writing" of an "author." In *Burrow-Giles*,[45] the defendant had made lithographic copies of one of celebrity photographer Napoleon Sarony's portraits of Oscar Wilde. Construing those terms in the Constitutional copyright clause, the Supreme Court declared:

> An author . . . is "he to whom anything owes its origin; originator; maker; one who completes a work of science or literature." . . . By writings in that clause is meant the literary productions of those authors, and Congress very properly has declared these to include all

41. *Id.* at 630.
42. *Id.* at 634–35.
43. *Id.* at 636 (emphasis added).
44. *See* Ginsburg, *supra* note 6.
45. Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53 (1884).

> forms of writing, printing, engraving, etching, etc., by which the ideas in the mind of the author are given visible expression.[46]

The "writing" thus embodies the "author's" conception of the work, but the Court's description indicates that authorship requires more than a disembodied idea of the work. If the "author" is the "maker" or "one who completes a work of science or literature,"[47] then authorship conjoins conception and execution. The defendant nonetheless urged that the mechanical and chemical operations of the photographic process, designed to produce the most accurate representation of "some existing object," precluded any "intellectual conception" on Sarony's part.[48] Whether or not such lack of creativity might "be true in regard to the ordinary production of a photograph,"[49] the Court abstained from generalizing, approvingly citing the lower court's finding that Sarony made his photograph

> entirely from his own original mental conception, to which he gave visible form by posing the [subject] in front of the camera, 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, and from such disposition, arrangement, or representation, made entirely by plaintiff, he produced the picture in suit.[50]

Although Oscar Wilde did not "owe[] [his] origin" to Napoleon Sarony, the photographer created the *mise en scène* depicting Wilde.[51] Sarony did not, it appears, in fact press the camera's shutter nor choose the precise moment to fix the image.[52] Nonetheless, Sarony's selection and arrangement of the component visual elements "gave visible form" to his "own original mental conception."[53] The Supreme Court's decision thus points to two precepts. First, a machine does not usurp authorship when it fixes a carefully composed

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46. *Id.* at 57–58.

47. *Id.*; *see also* Cmty. for Creative Non-Violence v. Reid, 490 U.S. 730, 737 (1989) ("As a general rule, the author is the party who actually creates the work, that is, the person who translates an idea into a *fixed, tangible expression* entitled to copyright protection.") (emphasis added); Sands & McDougall Proprietary Ltd. v. Robinson [1917] HCA 14; (1917) 23 CLR 55 (Isaacs, J.) (Austl.) ("[I]n copyright law the two expressions 'author' and 'original work' have always been correlative; the one connotes the other.").

48. *Burrow-Giles*, 111 U.S. at 59.

49. *Id.*

50. *Id.* at 60.

51. *See id.* at 58.

52. *See* Farley, *supra* note 2, at 434–35 (noting the role of Sarony's cameraman).

53. *Burrow-Giles*, 111 U.S. at 60.

image. The mechanical and chemical processes may capture reality, but the author has constructed the arrangement of the "existing object[s]" and their lighting to express her intellectual conception of the image.[54] Second, the author may delegate the physical embodiment of her conception, that is, the execution of the work, to an assistant, yet still retain authorship, at least where the execution hews closely to the author's conception. The Supreme Court cited the Justices of the Queen's Bench in *Nottage v. Jackson* at length, including Lord Justice Cotton's evocation of the author as the "master mind" of the photographic image, and the Master of the Rolls' statement that the author is "the person who has superintended the arrangement, who has actually formed the picture by putting the persons in position, and arranging the place where the people are to be."[55] Sarony "actually formed the picture," even though his assistant fixed the formation in the photographic plate.[56] The assistant was effectively an amanuensis whose creative contributions, if any, neither the Supreme Court nor the court below even considered.

B. AUTHORS AND AMANUENSES: THE PRINCIPAL-AGENT RELATIONSHIP

Copyright law indeed distinguishes authors from amanuenses: as the late Justice Laddie of the High Court of England and Wales colorfully put it: "In my view, to have regard merely to who pushed the pen is too narrow a view of authorship. . . . It is wrong to think that only the person who carries out the mechanical act of fixation is an author."[57] Rather, the law attributes authorship to the "mastermind," whose detailed conception so controls its subsequent execution that the individuals carrying out the embodiment exercise no creative autonomy.[58] Attribution of authorship effectively follows general rules of agency: "the physical acts of the agent are attributed wholly to the author" under whose control and direction the amanuensis acts.[59]

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54. *Id.* at 59.

55. *Id.* at 61.

56. *Id.*

57. Cala Homes v. Alfred McAlpine Homes [1995] EWHC 7 (Ch).

58. *Burrow-Giles*, 111 U.S. at 61 (noting that the "author" is the "inventive or master mind" behind the work).

59. *See* RESTATEMENT (THIRD) OF AGENCY § 2.02(1) (AM. LAW INST. 2006) ("An agent has actual authority to take action designated or implied in the principal's manifestations to the agent and acts necessary or incidental to achieving the principal's objectives."). The specific rules of agency law do not supply an exact parallel to author-amanuensis doctrine, but instead provide a structural parallel through which copyright law might deal with and rationalize the (often silent) role of the amanuensis. *See, e.g.*, Elizabeth Adeney, *Authorship and Fixation in Copyright Law: A Comparative Comment*, 35 MELB. U. L. REV. 677 (2011) (noting that "when

The principal author "controls" the amanuensis when the principal author influences not only *what* the amanuensis does, but *how* she accomplishes her task. For example, in *Andrien v. South Ocean County Chamber of Commerce*,[60] the Third Circuit upheld the claimant's sole authorship of a seaside community map whose contents he had extensively described to the defendant printer, even though the plaintiff did not in fact draw the map's contours.[61] The plaintiff did, however, closely supervise the printer's execution of his instructions. The Third Circuit held that Andrien was the author of the work because Andrien had "directed the copy's preparation in specific detail," and because "[h]is compilation needed only simple transcription to achieve final tangible form," the printer "acted as his amanuensis just as does a stenographer in typing material dictated by another person."[62] Like a faithful agent, the printer carried out its tasks as instructed, injecting no alterations of its own. And Andrien, as the principal author, utilized his control to influence and supervise the work's execution: he dictated *how* the printer should make the work.

Similarly, in *Lindsay v. The Wrecked and Abandoned Vessel R.M.S. Titanic*,[63] the court attributed authorship to the film director who had extensively planned and controlled each shot, rather than to the underwater camera operators who actually filmed the sunken vessel:

> All else being equal, where a plaintiff alleges that he exercised such a high degree of control over a film operation—including the type and amount of lighting used, the specific camera angles to be employed, and other detail-intensive artistic elements of a film—such that the final product duplicates his conceptions and visions of what the film should look like, the plaintiff may be said to be an 'author' within the meaning of the Copyright Act.[64]

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another person acts as an amanuensis to the author, the author will achieve copyright protection for the words recorded," and that "[t]he physical acts of the agent or scribe are attributed wholly to the author who has supplied the words to be recorded").

60. Andrien v. S. Ocean Cty. Chamber of Commerce, 927 F.2d 132 (3d Cir. 1991).

61. *Id.* at 133.

62. *Id.* at 135; *see also* WALTER ARTHUR COPINGER, THE LAW OF COPYRIGHT 109–10 (Stevens & Haynes, eds. 1915) (describing the case of Stannard v. Harrison, 1871 W.R. 811 (Eng.), in which the court held that the plaintiff who "cannot draw himself" and had thus employed another man to "make a [map] for him" was the author because he "invent[ed] the subject of the design beyond all question").

63. Lindsay v. Wrecked and Abandoned Vessel R.M.S. Titanic, No. 97 Civ. 9248 (HB), 1999 WL 816163 (S.D.N.Y. Oct. 13, 1999).

64. *Id.* at *5 (noting further that "[t]he fact that Lindsay did not literally perform the filming," and had not "[dove] to the wreck and operat[ed] the cameras, will not defeat his

Where, by contrast, the putative author's conception of the work does not fully constrain another's execution, or where the putative author exercises too little influence over *how* the other creator creates the work, the latter will be an author in her own right, because she will have exercised creative autonomy in her embodiment of the former's ideas. In giving concrete form to the work, she will have implemented her own ideas about the intended result. Indeed, the less formed the initial ideas and the less influence the putative principal author exercises over the process of execution, the less likely will sole, or even any, authorship be attributed to the person claiming to have conceived the work.[65]

For example, in *Geshwind v. Garrick*,[66] the plaintiff Geshwind, a producer of computer graphics animation, worked with Leich, a third party's employee animator, to create a fifteen-second animated sequence simulating a flight over Japan. Geshwind supplied a topographical map and other information, but the animator, "acting entirely without Geshwind,"[67] created the sequence. Geshwind retained the right of approval, reviewed the sequence, and made suggestions that the animator did not always adopt. Although Geshwind asserted that he "gave Leich minute instructions in every aspect of [the work], to such an extent that it was his sole creation," the court credited the animator's account.[68] While Geshwind may have attempted to influence Leich's execution of the work,[69] his inability to influence Leich meant that he could not

claims of having 'authored' the . . . footage" because of the plaintiff's significant involvement in the film's pre- and post-production efforts).

65. *See* Sheldon v. Metrokane, [2004] 135 FCR 34, ¶ 85 (Austl.) (concluding that the respondent's agent, who had to a "limited extent" supervised the production and design of a corkscrew by a factory in China, was not the sole author of the resulting design "because of the input of unidentified persons . . . involved in the manufacturing and associated activities of the factory," and further noting that "the notion of authorship . . . is not satisfied merely by the giving of instructions to a manufacturer"). For a discussion of co-authorship, see *infra* Section II.F.

66. Geshwind v. Garrick, 734 F. Supp. 644 (S.D.N.Y. 1990).

67. *Id.* at 649.

68. *Id.* at 650.

69. *Id.* (noting that Geshwind may have "wanted changes in details and aspects of the [work] and even made suggestions"); *see also* F. Jay Dougherty, *Not A Spike Lee Joint? Issues in the Authorship of Motion Pictures Under U.S. Copyright Law*, 49 UCLA L. REV. 225, 244–45 (2001) (discussing the Geshwind case and noting that "[s]imply having the right to accept or reject expression originated by another, although a relevant factor in determining economic authorship, does not otherwise constitute authorship").

successfully claim that Leich was his creative agent; thus Leich's actions were those of an independent and sole author.[70]

The amanuensis doctrine and the photography cases share a bottom line: the author (acting as principal) can outsource acts of execution to agents (machines or human helpers); as long as those agents act within the scope of the author's intended delegation of authority, and as long as the principal constrains how the agent carries out her task, the principal remains the author.

C. WHEN RANDOM FORCES, FAUNAL OR METEOROLOGICAL, INTERVENE IN THE CREATIVE PROCESS

The authorities in Sections II.A and II.B instruct that copyright law will attribute authorship to creators who outsource the execution of their conception of the work to compliant human beings or to machines whose processes the creators control. But that discussion leaves open the question of how to analyze the results when creators allow their control over the work's execution to dissipate. For example, what of creators who intentionally incorporate random forces into the process of executing the work?[71] These creators strain the boundaries of both elements of authorship: they challenge us to spurn line-drawing between authors who maintain control over outside forces and those who cede "too much" control to natural or other unmastered causes. They also push us to recognize that the "conception" prong does not require that the author have formed an exact pre-fixation conception of what the work will look like.[72] For example, Jackson Pollock could not have anticipated the precise trajectory and landing points of the paints, even though his splatter painting process was, despite appearances, highly controlled;[73] yet copyright law would not doubt his authorship of his occasionally aleatory

70. *Geshwind*, 734 F. Supp. at 650–51 (noting that Geshwind's failed attempts to control Leich's creative process "[did] not make him the creator" and that "[t]he artist, Leich, is the creator").

71. *See* Alan R. Durham, *The Random Muse: Authorship and Indeterminacy*, 44 WM. & MARY L. REV. 569, 596–607 (2002) (discussing the use of randomness and chance in the art of Jean Arp, Marcel Duchamp, Jackson Pollock, Max Ernst, and John Cage).

72. *See infra* Section II.D (discussing imprecise or incomplete "conceptions" of a work).

73. Interview by William Wright with Jackson Pollock, in The Springs, Long Island, NY (1950), *reprinted in* JACKSON POLLOCK: INTERVIEWS, ARTICLES, AND REVIEWS 20–23 (Pepe Karmel ed., 1999). The painter Max Ernst employed an even more random process: he "[swung] a paint can with a pin-hole in it at the end of a string" to create the "elliptical linear patterns" in his work *Young Man Intrigued by the Flight of a Non-Euclidean Fly*. William Rubin, *Jackson Pollock and the Modern Tradition*, *in* JACKSON POLLOCK: INTERVIEWS, ARTICLES, AND REVIEW 167–68 (Pepe Karmel ed., 1999).

output.[74] But if copyright theory tolerates some degree of randomness in a work's execution, is there a point at which the putative author has surrendered so much control over the execution that the independence of the work's embodiment calls into question whether her initial conception of the work was anything more than a general idea?

Consider two versions of the "Monkey Selfie" controversy. Version One, widely reported on the Internet,[75] recounts that nature photographer David Slater was photographing macaques in a wildlife reserve in Indonesia, when "Naruto," a particularly curious monkey, snatched Slater's camera away, and began snapping pictures, including the remarkably accomplished self-portrait that quickly garnered viral celebrity. Version Two, as told by Slater,[76] counters that Slater had been studying the macaques in the reserve; realizing that the monkeys had been observing his activities, but would not cooperate in a portrait-sitting, Slater positioned the camera to frame the shot, including setting lighting and perspective, and waited for a curious monkey to come along, stare at the camera, and push the button, which Naruto obligingly did. The consequences of Version One for copyright are clear: merely supplying the camera does not make one an author.[77] Because Naruto not only pushed

74. *See* Morgan M. Stoddard, *Mother Nature as Muse: Copyright Protection for Works of Art and Photographs Inspired By, Based On, Or Depicting Nature*, 86 N.C. L. REV. 572, 578 (2008) (assuming that Jackson Pollock's famous Autumn Rhythm is a protectable work).

75. Sarah Jeong, *The Monkey Selfie Lawsuit Lives*, VERGE (Apr. 13, 2018), https://www.theverge.com/2018/4/13/17235486/monkey-selfie-lawsuit-ninth-circuit-motion-to-dismiss-denied [perma.cc/EY6C-67SK] ("Back in 2011, nature photographer David Slater left some camera equipment out in the Indonesian rainforest. By Slater's account, an enterprising Sulawesi crested macaque . . . picked up a camera and took a selfie."); *see also* Plaintiff Naruto's Combined Opposition to Defendants' Motions to Dismiss at 3, Naruto v. Slater, No. 15-CV-04324-WHO, 2016 WL 362231 (N.D. Cal. Jan. 28, 2016) ("In or around 2011, Naruto found an unattended camera brought into Naruto's habitat by [David] Slater. Using that camera, Naruto took a series of photographs of himself . . . through a series of purposeful and voluntary actions that were entirely unaided by Slater.").

76. Julia Carrie Wong, *Monkey Selfie Photographer Says He's Broke: 'I'm Thinking Of Dog Walking'*, GUARDIAN, July 12, 2017, https://www.theguardian.com/environment/2017/jul/12/monkey-selfie-macaque-copyright-court-david-slater [perma.cc/P863-KAZZ] (noting that Slater "has long maintained that the selfies were the result of his ingenuity in coaxing the monkeys into pressing the shutter while looking into the lens, after he struggled to get them to keep their eyes open for a wide-angle close-up"); *id.* (quoting David Slater) (" 'It wasn't serendipitous monkey behavior . . . . It required a lot of knowledge on my behalf, a lot of perseverance, sweat and anguish, and all that stuff.' ").

77. *See* Nottage v. Jackson [1883] 11 QBD 627, 636 (Eng.) (Bowen L.J.) ("I think it is evidently not . . . the man who contributes the machinery . . . [who] can be considered the artist."); *see also* Naruto v. Slater, No. 15-CV-04324-WHO, 2016 WL 362231 (N.D. Cal. Jan. 28, 2016).

the button, but also selected the subject (himself), positioned himself and the camera, and framed the image, only he originated the conception (to the extent he had one) and the execution of the image. But copyright's human authorship precept precludes assigning authorship to proximate primates or other species of creators.[78]

As for Version Two, Slater's role perhaps resembles Sarony's. Recall that Sarony neither pushed the shutter nor selected the precise moment to seize the image. But he did designate the photograph's subject, pose him, arrange other accoutrements and light, and frame the image. While Slater knew neither which of the monkeys he had been observing would wander over to the camera, nor how the monkey would pose before pushing the button, his initial setup of the equipment and partial definition of the resulting image constituted the formulation of a creative plan for the photographs' creation.[79] When Naruto pushed the button on the camera, the curious macaque perfected Slater's creative plan and "executed" the work on behalf of Slater, just like Sarony's camera operator.[80] In other words, although he left some elements to chance, many specifics of the grand design and most of its implementation remained Slater's.

Naruto Version Two nudges an intuitive borderline between copyrightable reining in of randomness and unprotected surrender of control. The Seventh Circuit, in its much-debated *Kelley v. Chicago Park District* decision,[81] confronted that line in a controversy involving "Wildflower Works," a work whose creator, Chapman Kelley, described as "natural canvases of Kelley-designed color patterns"[82] formed by wildflowers sprouting in oval-shaped flower beds. The court characterized the work as "a living garden" and ruled it "lacks the

78. *See* sources cited *supra* note 26 (discussing the human authorship requirement).

79. *See infra* Section II.D (discussing the conception requirement and its definition as a "creative plan" for the work's creation).

80. *See supra* Section II.A (discussing *Burrow-Giles* and noting the role of Sarony's camera operator).

81. Kelley v. Chicago Park District, 635 F.3d 290 (7th Cir. 2011). For commentary, see, e.g., Jani McCutcheon, *Shape Shifters: Searching for the Copyright Work in Kinetic Living Art*, 64 J. COPYRIGHT SOC'Y U.S.A. 309 (2017) [hereinafter McCutcheon, *Shape Shifters*]; Jani McCutcheon, *Natural Causes: When Author Meets Nature in Copyright Law and Art. Some Observations Inspired by Kelley v. Chicago Park District*, 86 U. CINN. L. REV. 707 (2018) [hereinafter McCutcheon, *Natural Causes*]; Joseph P. Liu, *What Belongs in Copyright*, 39 COLUM. J.L. & ARTS 325, 329–32 (2016) (discussing *Kelley*, 635 F.3d 290).

82. *Kelley*, 635 F.3d at 293.

kind of authorship and stable fixation normally required to support copyright."[83]

> [W]orks owing their form to the forces of nature cannot be copyrighted. . . . Most of what we see and experience in a garden—the colors, shapes, textures, and scents of the plants—originates in nature, not in the mind of the gardener. At any given moment in time, a garden owes most of its form and appearance to natural forces, though the gardener who plants and tends it obviously assists. All this is true of Wildflower Works, even though it was designed and planted by an artist.[84]

The court distinguished Jeff Koons' "Puppy," a topiary composed of individually-selected flowers planted in meshwork to fill out the canine form. "Puppy" may be a sculpture; Wildflower Works "is quintessentially a garden."[85] Many have criticized the court's perception that natural forces dictated the appearance of Wildflower Works; they contend that the court failed to appreciate Kelley's intervention in studying seed and wind patterns and preparing the soil to accommodate seasonal seed arrivals that would produce particular color patterns.[86] The court and its critics do not in fact differ on the terms of debate: how much control did Kelley exercise over the creative process?[87] For the court, the garden was "conceptual art," i.e., a mere idea (flowers forming color patterns), whose actualization did not owe its origin to Kelley, but rather to Mother Nature. For its critics, Kelley had thought through the particular color patterns that the seasonal wildflowers would embody (detailed conception), and he sufficiently—if not minutely down to the last flower like Koons—controlled the patterns' execution by anticipating and to some extent manipulating natural forces. Were actual control irrelevant, as some advocates of conceptual art might urge,[88] the Seventh Circuit's critics

83. *Id.* at 303–04 ("[T]he law must have some limits; not all conceptual art may be copyrighted. In the ordinary copyright case, authorship and fixation are not contested . . . [b]ut this is not an ordinary case. A living garden like Wildflower Works is neither 'authored' nor 'fixed' in the senses required for copyright.").

84. *Id.* at 304 (citations omitted).

85. *Id.* at 304–06.

86. *See, e.g.*, McCutcheon, *Natural Causes*, *supra* note 81, at 709 (noting that the Seventh Circuit "failed to give sufficient weight to [Chapman Kelley's] selection and arrangement, . . . wrongly allocating to nature the primary responsibility for the material form of the work").

87. *See* Shyamkrishna Balganesh, *Causing Copyright*, 117 COLUM. L. REV. 1, 31 (2017) (characterizing the flaw in Kelley's claim as a failure of "control over the creative process").

88. *See* Durham, *supra* note 71, at 597–98 (noting how Jean Arp "tipped [the] balance between accident and deliberation more than usual in the direction of accident" and sought to

would not be seeking to construct the facts to enhance Kelley's determinative role in the formation of the color patterns; it would suffice that he conceived the garden's grand design, of which the delegation of its execution to natural forces may have been an essential component.

Finally, an example of "conceptual art" that most likely joins Naruto Version One on the authorless side of the line, rather than straddling it, as did *Kelley* or Naruto Version Two. The artist Agnieszka Kurant produces brightly colored sculptures by feeding primary-colored crystals to termites, who then build mounds in the colors of the crystals they ingest and then excrete.[89] Apart from providing the colors, Kurant exercises no control over the vaguely phallic forms the termites construct. Thus, Kurant formulates a creative plan whose execution she leaves almost entirely to faunal forces. At the front end, conception, her study of termite activity might enable her to anticipate unspecified overall shapes; at the back end, execution, she contributed solely the color component of the building materials (akin to supplying the film for the photographer's camera). Her role implicates scarcely more input than the Little Prince's command to "Draw me a sheep!" But, from a copyright law perspective, where the aviator could claim the mantle of authorship, the termites' output yields an authorless production. Kelley's garden and Kurant's termite mounds serve as reminders that the copyright law's notions of authorship may at times diverge from the art world's.

abandon "conscious volition" in his art as an "exercise in self negation") (citing Jane Hancock, *Arp's Chance Collages*, *in* DADA/DIMENSIONS 47 (Stephen C. Foster ed., 1985)).

89. Agnieszka Kurant, *Phantom Capital, Hybrid Authorship, and Collective Intelligence*, 39 COLUM. J.L. & ARTS 371, 371 (2016) (describing the artist's piece entitled "*A.A.I.*, which stands for Artificial Artificial Intelligence," whose creation the artist "outsourced to another species—to the colonies of living termites" and noting that "there [was] no way of telling in advance what the final shape [would be]" because the mounds' structure "emerg[es] through millions of micro-contributions by [the] insects").

Figure 1: Agnieszka Kurant's "A.A.I" or "Artificial Artificial Intelligence"[90]

D. THE LIMITS OF THE AUTHOR'S "CONCEPTION"

One might imagine that an author's "conception"—her *mental* work, as distinguished from her execution or *physical* work[91]—consists of the pre-execution formulation of an overall perception of the finished product. This notion of conception reflects the traditional mode of authorship: the novelist or artist who first envisions a work and then employs her skill to transfer it from the mind's eye to the canvas or the page. We have shown that the principles underlying copyright's execution requirement accommodate modes of authorship outside this model: the author who removes herself from the physical process of creation, relying on mechanical tools, amanuenses, or natural forces, does not necessarily forego authorship status.[92] In this Section, we argue that copyright's conception requirement also accommodates modes of creation outside the traditional model, and propose a definition of the conception requirement that fits all analog authorship contexts.

1. Curing Deficiencies in Conception: The "Adoption" Theory of Authorship

Section II.C suggests that an "author" need not maintain absolute control over the execution of her work and may instead rely on external forces, like randomness and nature, to complete her work, so long as she bends those forces to her will. By the same token, those processes may develop the work in ways that the author did not conceive in detail before their intervention. If

90. Nicole Walsh, *Meet the Woman Making Art with Termites; Polish artist Agnieszka Kurant outsources her labor to an unsuspecting insect army*, VICE (Aug. 7, 2015), https://creators.vice.com/en_us/article/8qvmwz/meet-the-woman-making-art-with-termites [perma.cc/L647-LHXK].

91. *See supra* Sections II.A–C.

92. *See id.*

copyright law nonetheless accepts the creator's authorship, it follows that copyright's "conception" requirement does not oblige the author to formulate a complete and accurate mental image of the work *before* she applies her hand (or directs another's hand) to executing it.

Judge Jerome Frank in *Alfred Bell & Co. v. Catalda Fine Arts*[93] offered a proposition that expands on this basic principle. The case concerned originality in mezzotint engravings of old master paintings. The defendant had claimed that the prints, as copies of public domain works, could not enjoy copyright protection for lack of originality. The court rejoined that the differences the engravers introduced in transforming the oil paint originals into printed renditions yielded sufficient "distinguishable variations" to support a copyright. The court then speculated:

> A copyist's bad eyesight or defective musculature, or a shock caused by a clap of thunder, may yield sufficiently distinguishable variations. Having hit upon such a variation unintentionally, the "author" may adopt it as his and copyright it.
>
> Plutarch tells this story: A painter, enraged because he could not depict the foam that filled a horse's mouth from champing at the bit, threw a sponge at his painting; the sponge splashed against the wall and achieved the desired result.[94]

If copyright extends only to works deliberately conceived and purposefully executed, then the creator's after-the-fact recognition of the value in his "mistake" supplies the missing element required to vest the outcome with the stamp of authorship.[95] This authorship-by-adoption approach acknowledges that the author may deliberately revise her initial conception or creative plan to include her slip of the pen.[96] Adoption theory recognizes that authorial acts need not occur in a particular order: first with a detailed conception, and then with the conferral of concrete form on the conception. Rather, by "discovering" the aesthetic value of an expressive element that the author has unintentionally brought into being, and deciding to "adopt" it as her own expressive creation, an author is contemporaneously revising her conception of the work. To return to Judge Frank's examples, the changes wrought by the

93. Alfred Bell & Co. v. Catalda Fine Arts, 191 F.2d 99, 105 (2d Cir. 1951).

94. *Id.* at 105 n.23.

95. *Id.*

96. *Id.* Incorporating an accidental element—the product of happenstance, luck, or pure chance—into one's creative plan is no more offensive to the principle of conception than an artist's purposeful deployment of randomness. *See supra* Section II.C (discussing the use of randomness in art).

clap of thunder may yield an image the author had not expected to draw; their adoption modifies her conception of the work. In the Plutarch anecdote, the painter imagined foam at the mouth of the horse, but could not envision it with sufficient precision to render it physically. The flung sponge enabled the artist to see (as well as unintentionally to execute) what he had sought.[97]

Ultimately, authorship-by-adoption is an instance of a broader proposition: "conception" in copyright law does not mean that the work must, Athena-like, spring fully-formed from the head of the author. The author remains an author even if, during her execution of a work, she deviates from her initial expectations, whether to accommodate an unforeseen and unintentional development, or simply because her ideas have evolved in the course of creating the work.[98] An author might find that her characters have run away with the story, compelling different plot developments;[99] she might fling a sponge at her canvas in frustration and prefer the resulting splatter to anything she could have achieved with the brush; or she might accidentally knock over a paint can, spilling paint on her pointillist depiction of a seaside landscape, only to discover in Abstract Expressionism her true calling. In effect, the author's execution *perfects* her mental conception.

Authorship-by-adoption, however, makes sense only if the "adopter" also performed or directed the work's execution. If authorship-by-adoption is the post-fixation revision of an author's "conception" to include an accidental variation, then the theory does not help the creator who cannot claim authorship due to her lack of execution. Consider Naruto Version One.[100] If the monkey grabs the camera and takes the selfies, the photographs result from a supervening cause.[101] If Slater decides that one of the primate-generated

97. Judge Frank's examples also illustrate adoption of changes occurring when the author lost some control over her execution of the work. In these examples, the author in fact carried out the acts of execution, but the acts were not contemporaneously willed. By adopting the results, however, the author makes the supervening cause her own, thus overcoming her loss of control at the time of execution.

98. *See* Nathan Israeli, *Creative Processes in Painting*, 67 J. GEN. PSYCHOL. 251, 251–56 (1962) (detailing a "self-observation study of oil painting" during which the author painted "without previous planning or preparation, and without any sketch, design or imagery," describing how the author "checked" his painting "operations" as he "pause[d] to look at the painting from close at hand or from a distance" during the process of creation, and that this constant "[c]heck and evaluation of the operations and outcomes [were] followed quite often by plans, suggestions, and decisions which control the subsequent operations on the painting").

99. *Cf.* LUIGI PIRANDELLO, SIX CHARACTERS IN SEARCH OF AN AUTHOR (1921) (absurdist play in which the characters' search for the play's author drives the play's plot).

100. *See supra* notes 75–77 and accompanying text (describing Naruto Version One).

101. Balganesh, *supra* note 87, at 3–4 (discussing the Naruto case and arguing that "Slater's failure to press the shutter button himself . . . broke[] his causal connection to the work").

images corresponds to the photograph he had hoped to take, and therefore adopts it as his own, does that suffice to make him the author? Instinctively, we are likely to resist that conclusion. There is a salient difference between Slater (in this version) and Plutarch's painter: the painter did not intend or expect to achieve his desired pictorial result by flinging the sponge, but he both intended to and did throw the sponge against the wall. Slater did not himself take the picture, nor did he intend to delegate the picture-taking to the monkey.

Applying adoption theory to post-fixation selection among outputs the putative author did not herself directly or indirectly bring forth leads to implausible outcomes. Suppose the person who supplies and sets up a camera and instructs it to take pictures at predetermined intervals is not the same person as the person who selects which of the outputs to claim. For example, a security camera indiscriminately and continuously captures all that comes within the camera's sights; a third party selects an image from the thousands the camera fixed. If security camera images so lack originality as to fit the *Sarony* court's evocation of the "ordinary production of a photograph,"[102] they might not qualify as "writings" of "authors." Post-execution selection in this scenario would then supply the only authorial act. But without participation in the creation (initial conception and fixation) of the image, merely choosing a previously fixed image should not suffice to confer authorship status on the person making the selection. Otherwise, for example, a police officer who

102. Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 55–59 (1884). Courts have not yet addressed whether security camera images fit within the category of "ordinary production[s] of a photograph." The issue came up in a case which did not reach a final decision on the merits. *See* Defendant's Motion for Summary Judgment at 4–6, Southwest Casino & Hotel Corp. v. Flyingman, No. CIV-07-0949 (W.D. Okla. Aug. 28, 2008) (arguing that the plaintiff's video, taken from plaintiff's surveillance camera footage, lacked sufficient creativity for copyright). Courts and commentators have expressed some doubt regarding the continued significance of the Burrow-Giles "ordinary production" language. *See* Mannion v. Coors Brewing Co., 377 F. Supp. 2d 444, 450 (S.D.N.Y. 2005) (noting that "[a]lmost any photograph 'may claim the necessary originality to support a copyright' "). The U.S. Copyright Office's most recent compendium does not address the issue of what constitutes the "ordinary production of a photograph." *See* COMPENDIUM, *supra* note 25, at § 909.1 ("The creativity in a photograph may include the photographer's artistic choices in creating the image, such as the selection of the subject matter, the lighting, any positioning of subjects, the selection of camera lens, the placement of the camera, the angle of the image, and the timing of the image."). Assuming that security camera footage displays at least some of the characteristics listed in the compendium as elements of creativity in photography, it may well be registrable.

combs through the security camera's images searching for a good likeness of a suspect, would, on finding such an image, become its author.[103]

Were post-execution adoption to substitute for any authorial participation, even indirect or inadvertent, in giving physical form to a work, then, in addition to designating the "wrong" author, copyright law would effectively vest adopters with rights in ideas. Ponder "Fountain," Marcel Duchamp's 1917 pedestal-mounted urinal. Duchamp did not create a replica of a urinal; he adopted an actual plumbing fixture, and "gave it a new context" by setting it in a gallery.[104] Duchamp may have created the context, that is, he may have come up with a provocative and art history-altering idea, but he did not create the readymade urinal.[105]

2. Conception via Process

But what if an author creates something unexpected and is not present to "adopt" the unplanned variation? If the adoption theory contemplates an author deliberately altering her conception or "creative plan" in order to subsume an unplanned variation, then an author who never sees the unplanned

103. If the officer selected several photos from the full output, the selection might make her the author of a compilation of the photos, but copyright in the compilation does not extend to the underlying elements. *See* 17 U.S.C. § 103(b) (2018).

104. An unsigned editorial in the second issue of *The Blind Man*, published on May 17, 1917, explains in support of *Fountain*: "He took an ordinary article of life, placed it so that its useful significance disappeared under the new title and point of view—created a new thought for that object." Louise Norton, *The Richard Mutt Case*, BLIND MAN, May 1917, at 5, http://sdrc.lib.uiowa.edu/dada/blindman/2/05.htm [perma.cc/6RD4-BRFS].

105. *But see* Laura A. Heymann, *A Tale of (At Least) Two Authors: Focusing Copyright Law on Process Over Product*, 34 J. CORP. L. 1009, 1015 (2009) ("Marcel Duchamp is the 'author' of *Fountain* (1917), a 'readymade' sculpture consisting of a urinal, because he has declared his effort to be art."). Also consider the hypothetical presented by Alan R. Durham in *The Random Muse: Authorship and Indeterminacy*: an artist discovers a pattern on the "floor of a hardware store, where generations of customers had dripped paint . . . purchase[s] that section of the floor," and "[hangs] it in her gallery." Durham, *supra* note 71, at 624–25. Professor Durham notes that this case "resembles that [of the artist in Bell v. Catalda, 191 F.2d 99], with the difference that [Durham's hypothetical artist] had no physical role in the creation of the work she 'adopted.' " *Id.* The artist's selection nonetheless "reflects her tastes and proclaims her individual vision." *Id.* Durham concludes that the artist "might advance a claim [of copyright]" based on having "improved the commons" by "singling out this section of floor as one with expressive potential," and that "awarding [the artist] exclusive rights would promote the progress of the arts." *Id.* But extending copyright to an output because protection will achieve some of the copyright system's goals puts the cart before the horse: first we must ascertain whether the object at issue is a work of authorship, i.e., whether its putative author actually executed it. The object does not become a work of authorship merely because vesting its claimant with exclusive rights leads to results consonant with at least some theories of copyright law.

variation cannot utilize the theory retroactively to reconceptualize the work. Suppose Naruto Version Three: Slater positions his camera in the jungle with all the chosen settings, pushes a button that releases the shutter at timed intervals, leaves the scene, but never returns. Later, a competing photographer discovers Slater's abandoned camera and the images captured in its memory, and selects one to publish in National Geographic. The competing photographer has no greater claim to authorship of the selected photograph than does the police officer who selects among images captured by a security camera, posited earlier. Neither the rival photographer nor the police officer in any way participated in the execution of the photos.

But what about Slater's claim to authorship? Suppose that in Version Three Slater's camera captured some other denizen of the wildlife preserve unexpectedly attacking and eating Naruto. The resulting image would be very different from the image Slater thought he would capture. Can Slater claim authorship over the photograph even though he did not, at the time of execution, know precisely what image he would end up producing? If he leaves the scene (and his camera), never to return, Slater has no subsequent opportunity to bolster his claim to authorship by "adopting" the final image; does it follow that his failure to ratify the actual result deprives him of authorship over the image?

We intuitively sense that Slater (like all photographers) is the author of the images he executes, even if his anticipation of what he might capture is vague or proves inaccurate. Case law and professional practice[106] have confirmed our intuition:[107] many photographers and cinematographers capture events which they did not anticipate, and courts seem content to recognize them as authors despite the disjunction between expectations and outcomes. When Abraham

106. This version of the Naruto hypothetical mirrors the process many nature photographers and documentarians use to produce their works. *See, e.g.*, *Filming the 'Impossible': Sets, Filming Burrows, and Tanks*, BBC EARTH (Apr. 29, 2016), http://www.bbc.com/earth/story/20160310-filming-the-impossible-sets-filming-burrows-and-tanks [perma.cc/KSS8-B5ZW] (noting the use of remote cameras to produce the footage for BBC's Frozen Planet nature documentary).

107. For example, the U.S. Copyright Office notes that the "author and initial copyright owner of a photograph is generally the person who 'shoots' or 'takes' the photo" and that the copyright in a photograph "protects the photographer's artistic choices, such as . . . the selection of camera lens, the placement of the camera, the angle of the image." UNITED STATES COPYRIGHT OFFICE, COPYRIGHT REGISTRATION OF PHOTOGRAPHS, CIRCULAR 42 (2018), https://www.copyright.gov/circs/circ42.pdf [perma.cc/647K-8ST3]. The Copyright Office thus does not inquire whether the putative author of a photograph possessed a sufficiently accurate pre-execution conception of what the photograph might contain, or whether the author sufficiently "adopted" the unintended elements post-execution.

Zapruder, "by sheer happenstance" captured a film of President Kennedy's assassination in 1963 which later became the subject of litigation in the Southern District of New York, the court did not question Zapruder's claim of authorship over the footage, even though Zapruder's intention was to "tak[e] home movies" of the presidential motorcade, not to create a "historic document" depicting Kennedy's death.[108]

If we accept that Slater (Naruto Version Three) is the author of his photographs, but we also posit that all authors must "conceive" of their works, then Slater's "conception" of his work must consist of something other than precise anticipation of the contents of his photographs. Unlike Sarony,[109] Slater and other nature photographers "conceive" of their works not by composing the photograph to reflect a fully developed view of the resulting work, but by formulating a set of deliberate executional steps (setting up a particular type of camera in a particular location, at a particular time, with a particular type of lens, etc.), which will lead to the generation of a work, the precise composition and contents of which they cannot foresee. Like many contemporary artists, the nature photographer's "conception" consists entirely of her definition of her *creative process*.[110]

Like the archetypal author, nature photographers and other process-based authors generate a conception that guides their execution of the work. But

108. Time Inc. v. Bernard Geis Assocs., 293 F. Supp. 130, 131 (S.D.N.Y. 1968).

109. By "posing the said Oscar Wilde in front of the camera, 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, [and] suggesting and evoking the desired expression," Sarony composed his work to match his mental image of the photograph he sought to create. Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 60 (1884).

110. *See, e.g.*, KIM GRANT, ALL ABOUT PROCESS: THE THEORY AND DISCOURSE OF MODERN ARTISTIC LABOR (2017) (quoting Chuck Close) ("I really did believe that process would set you free. . . . A signature style is about how it happened, not what is made. I think of myself as an orchestrator of experience."); *id.* (noting the "elevation of artistic process over product," that "many artists consider themselves to be primarily engaged with process," and that "[a]ccompanying the recent prominence of artistic process is a corresponding decline of the artist's product as an object of independent aesthetic interest"). Steve Reich, a minimalist composer, provided an apt example of process-based art in his piece *Pendulum Music*. Reich hung "some microphones from the ceiling on very long cords and put them over loud speakers and set them in motion swinging as pendulums." Robert W. Clarida, *Copyrightability of Conceptual Art: An Idea Whose Time Hasn't Come*, 39 COLUM. J.L. & ARTS 365, 369 (2016). As the "pendulums" "cross the loud speakers they make a sound," and as several pendulums move "at once," going "in and out of phase with each other," they collectively produce the musical work. *Id.* Reich described his piece as an example of "music as a gradual process." *See* Steve Reich, *Music as a Gradual Process and Pendulum Music*, *in* MUSIC OF THE AVANT-GARDE 1966–1973 317 (Larry Austin, Douglas Kahn & Nilendra Gurusinghe, eds., 2011).

unlike the traditional author, these authors' conceptions do not involve a pre-existing "vision[] of what the [work] should look [or sound] like."[111] Their pre-fixation conceptions instead concern what the work *could* become and *how* it will come into physical being. The elements in the resulting work flow directly[112] from the choices the author makes when developing her creative plan.[113] Once the photographer completes that creative plan by generating a photograph, her execution of the work perfects her "conception" and vests her with authorship, even if she does not ratify the result. When those photographers are "astonish[ed]" by the unanticipated contents of the resulting footage (which might reveal patterns of faunal behavior previously unknown to the authors or the scientific community as a whole),[114] the dissonance between the images the photographers may have envisioned before execution and the final images does not disqualify them from claiming authorship because their authorship already vested at the moment the photograph's execution occurred. Accordingly, an author who devises such a creative plan and subsequently executes it is presumptively the author of the final work. If a putative author's sole execution of a work is uncontested, and if there is no reason to believe that anyone other than the putative author

111. Lindsay v. The Wrecked and Abandoned Vessel R.M.S. Titanic, No. 97 Civ. 9248 (HB), 1999 WL 816163, at *5 (S.D.N.Y. Oct. 13, 1999).

112. One might object that the nature photographer's actions and "creative plan" does not *entirely* determine the expressive content of the resulting images because forces of nature, operating in front of the camera's lens, are the origin of the resulting image's content. But the influence of an external force like nature or randomness does not destroy a creator's right to claim authorship. *See supra* Section II.C. Even though the contents of the nature photographer's image might depend on which animals happen to wander into her camera's viewfinder, the photographer's creative plan—to capture an image of the goings-on in front of her camera, on a particular type of film and according to a particular set of camera parameters—is complete no matter the ultimate contents of the image. Unlike Chapman Kelley or Agnieszka Kurant, the nature photographer is solely responsible for the execution of her work and has not ceded control over that physical process to nature. Only if an unforeseen event supersedes the photographer's execution, for example, if a third party were to press the shutter before the auto-timed setting, would we call into question the photographer's authorship claim.

113. *See* Durham, *supra* note 71, at 637 (noting that authorship requires a "minimal exercise of 'creative control' " which Durham defines as "choices made by the author that are reflected in the form of the work," choices which "might be made before the fact, as when John Cage established the rules of one of his indeterminate systems, based on star atlases or the *I Ching*, only to let chance take over in determining the ultimate form of the composition").

114. Emma Bryce, *Behind the Scenes of BBC America's Planet Earth II*, AUDUBON (Feb. 17, 2017), https://www.audubon.org/news/behind-scenes-bbc-americas-planet-earth-ii [perma.cc/2EQ8-F6RQ] (describing how the team of cinematographers behind BBC America's recent nature documentary worked "hand in hand with biologists" for "months" in order to capture "footage of undiscovered interactions between wildlife," including "astonishing" footage of a Bird-of-Paradise in a rarely seen mating dance).

generated the creative plan that guided that execution, then there is no need to investigate whether she adequately "conceived of" the work.

Situations of contested authorship arise when there is some reason to doubt whether the person claiming authorship both developed the creative plan behind the work, and executed (or controlled the execution of) that plan. As discussed in Section II.C, if an artist fully develops a creative plan or conception for a work (as Chapman Kelley surely did for Wildflower Works), but does not control the execution of that plan (instead delegating the execution to a force beyond the author's control), the artist may not be an "author" in the copyright law sense. In addition, when multiple putative authors contribute to a work's execution, copyright law must provide a mechanism for determining who among the claimants is responsible for generating the creative plan behind the work, and for controlling the execution of that plan. To that scenario we now turn.

E. ALLOCATING AUTHORSHIP BETWEEN UPSTREAM AND DOWNSTREAM AUTHORS

To this point, we have addressed scenarios featuring only one human author. These have presented binary outcomes: sufficiently detailed conception and controlled execution, or not. We now analyze situations in which different humans contribute to the work's execution, where both have a colorable claim to have generated the work's conception. We posit four scenarios:

(i) The upstream creator[115] remains the sole author because she has controlled the downstream contributor's process of execution and reduced the latter either to a "mere amanuensis," or to selecting among outcomes the upstream contributor has anticipated and built into the work.

(ii) The downstream creator is the sole author of the resulting work because the upstream creator has provided only an unprotectable idea, which the downstream creator has elaborated into a detailed conception which she has embodied in physical form (e.g., "draw me a sheep").

115. By "upstream creator" we mean a participant in the process who contributes to the work's creation, but does not cause the final manifestation of the work. For example, Sarony set the scene and posed Oscar Wilde, but he did not operate the camera. *See Burrow-Giles*, 191 F.2d at 105. By "downstream creator" we mean the person responsible for the last steps required to create the work. Sarony's cameraman filled that role by choosing when to press the shutter to fix the image.

(iii) The upstream and downstream creators have collaborated with the intent to merge their individual contributions (conception and execution) into a unitary whole, and are thus co-authors of a joint work.[116]

(iv) The upstream and downstream authors both contribute to the creation of the work, but they fail to qualify as co-authors.[117] Whether either or both would individually be authors of their contributions depends on whether either or both contributions would independently qualify as an original work of authorship.

Mere amanuenses supply the clearest example in the first category; the principal author has outsourced the execution of her fully-formulated conception, leaving little room for the executor to impose her own conception on the work upon its execution. For example, Alexander Calder did not personally weld his monumental stabiles; metal workers at Segre Iron Works performed the task.[118] Calder would supply "sketches of his stabiles — abstract constructions evocative of movement,"[119] leaving it to the welders to "figure [] out" how to execute the work in iron. Nonetheless, the artistic vision remained Calder's alone: "If he says it isn't right, we do it over and over again until he's pleased with it."[120]

But in other instances, the upstream contributor may not be standing over the shoulder of the downstream actor. Leaving the scene, she may present him with a range of possibilities, to choose among the branches of a decision tree. Thus, even though the upstream actor does not conclusively determine the form of the resulting work, by defining its key expressive elements, she remains the "mastermind" of the work, and effectively executes it by constraining the options through which the downstream actor will bring the final form of the work into being. In other words, while the downstream actor executes the work, he does not contribute to the work's conception—the upstream actor is solely responsible for the creative plan behind the work. The fewer the options, the less likely any attribution of authorship of the output to the downstream actor. But, by the same token, the more choices allowed the downstream actor, the greater his claim to be an author of the output. This Section considers a range of examples to test whether the upstream actor has sufficiently bounded the downstream actor's choices to retain the crown of sole authorship.

116. *See infra* Section II.F for a discussion of the rules of co-authorship and whether the upstream and downstream contributors can claim to have together created a "joint work."

117. *Id.*

118. *See* Michael Knight, *Constructing a Calder Is a Labor of Love*, N.Y. TIMES, Feb. 9, 1974, https://www.nytimes.com/1974/02/09/archives/constructing-a-calder-is-a-labor-of-love.html [perma.cc/D47Y-P45X].

119. *Id.*

120. *Id.* (quoting Frank Pisani, the foreman at Segre Iron Works).

Suppose that an author produces a "choose your own adventure" ebook. Every few pages, the author instructs the reader to choose between several options which lead the reader to different resulting storylines (e.g., "To take the blue pill, click here; to take the red pill, click here," etc.). When the reader has made the last of multiple choices, the ebook device preserves a full copy of the storyline reflecting the user's choices, thus fixing the reader-generated sequence in a tangible medium. We might conclude that the reader is not the author of the sequence because he has contributed nothing that the initial author has not foreseen; the author has preset the content of each option, and the combinations of options, though numerous, remain a very finite universe.

Now consider a kaleidoscope. The kaleidoscope's designer selects the colors and shapes of the shards of glass or paper that, when the viewer turns the outer cylinder, will form patterns, multiplied by the reflecting panels in the inner cylinder. Suppose also that the designer attaches the kaleidoscope to a camera, which fixes an image of the kaleidoscope's output every time the user turns the cylinder. The number of possible patterns will depend on the amount and shapes of the materials inside the cylinder, but sooner or later, patterns will reappear. Even if the kaleidoscope's designer did not anticipate every potential image output, the possible combinations remain finite. Moreover, by choosing the color scheme and the shapes of the components, as well as the size of the fractal patterns, the designer has selected the key aesthetic effects of the kaleidoscope. Finally, although the user turns the outer cylinder, thus causing the patterns to appear, the user will have made no intellectual contribution to the output. Here we can attribute sole authorship of the fixed images of the various patterns to the designer, not only because the user's contribution bears no stamp of authorship, but because there is no combination of pattern-producing elements that was not inherent in their initial selection and mode of presentation. In other words, while the designer of the kaleidoscope may not have anticipated each potential output, the designer formulated a *complete* creative plan which would result in a fully-formed work (or many fully-formed works, with each turn of the tube).

The kaleidoscope scenario resembles the facts of a series of cases from the 1980s concerning early videogames.[121] The defendants copied the games' audiovisual output and claimed the works were not sufficiently fixed to qualify for copyright because the exact sequence of moving images depended on how users played the game. Thus, the defendants argued, the user shaped the

121. *See* Stern Elecs. Inc. v. Kaufman, 669 F.2d 852, 855 (2d Cir. 1982); Williams Elecs., Inc. v. Artic Int'l., Inc., 685 F.2d 870, 874 (3d Cir. 1982).

output[122] of the work, and the upstream game programmer could not predict the precise form and sequence of the user-manipulated audiovisual experience. Courts rejected this contention, holding that each possible gameplay sequence was incipient in the game's design. For example, in *Midway Manufacturing Co. v. Artic International, Inc.*,[123] the Seventh Circuit upheld the copyrightability of the audiovisual elements in classic videogames like Galaxian and Pac-Man:

> Playing a video game is more like changing channels on a television than it is like writing a novel or painting a picture. The player . . . does not have control over the sequence of images that appears on the video game screen. He cannot create any sequence he wants out of the images stored on the game's circuit boards. The most he can do is choose one of the limited number of sequences the game allows him to choose. He is unlike a writer or a painter because the video game in effect writes the sentences and paints the painting for him; he merely chooses one of the sentences stored in its memory, one of the paintings stored in its collection.[124]

In other words, the player could not cause the game to display any sequence that was not already built into the program, no more than the choose-your-own-adventure reader could pursue an adventure outside the built-in options, or the kaleidoscope user could generate a pattern different from the patterns the designer's selection of components and reflectors enabled.[125] In each of

122. *Cf.* Jani McCutcheon, *The Vanishing Author in Computer-Generated Works: A Critical Analysis of Recent Australian Case Law*, 36 MELB. U. L. REV. 915, 938 (2013) (noting that "an author can rely on another person or machine to supply the fixation effort, provided the author's mind directs and shapes the output") (citing Donoghue v. Allied Newspapers Ltd., [1938] 1 Ch 106, 109 (Farwell, J.)).

123. Midway Mfg. Co. v. Artic Int'l, Inc., 704 F.2d 1009 (7th Cir. 1983).

124. *Id.* at 1012.

125. The "finite universe" or "inherent in the program" analyses may ultimately founder as the universe of combinations expands. Courts continue to rely on *Williams Electronics* and progeny to sustain the sole authorship of the designer of the computer game. *See Stern*, 669 F.2d at 856 (concerning a coin-operated videogame named "Scramble," and concluding that the "player's participation does not withdraw the audiovisual work from copyright eligibility"); *Midway*, 704 F.2d at 1010–11 (7th Cir. 1983) (upholding copyright in the audiovisual elements in classic videogames like Galaxian and Pac-Man). However, the force of precedent may be compensating for the thinning pertinence of those decisions' premises. *See, e.g.*, Kyle Coogan, *Let's Play: A Walkthrough of Quarter-Century-Old Copyright Precedent as Applied to Modern Video Games*, 28 FORDHAM INT. PROP. MEDIA & ENT. L. J. 381, 401–02 (2018) (noting the videogame case precedent from the 1980s and arguing that "[i]f courts were to revisit [those cases] today, it seems possible that real-time gameplay would fall short of being a protectable audiovisual work" because some games "such as sandbox games or MMORPGs" "are much more like painting a portrait than they are like 'changing channels on a television' " because they "allow a vast array of possibilities for user interaction" and because it is "nearly impossible

these examples, the "upstream" contributor (who designs the videogame, the choose-your-own-adventure novel, and the kaleidoscope) has bound the "downstream" contributor to fulfilling a limited role within the "upstream" contributor's completed creative plan.[126]

By contrast, suppose that an author writes the beginning of a short story, which she posts on a website, inviting any and all participants to compose endings for the tale. In due course, many writers respond; the initiating author selects one of the offered endings. Who is/are the author(s) of the combined story?[127] The story's initial plot and character development will necessarily dictate some aspects of the story's further development and conclusion, but, unlike the previous examples, they do not foreordain all possible outcomes. The second contributor's relative creative freedom entitles her to authorship status in her contribution. In other words, while the first writer has influenced the form and structure of the second contributor's composition, the first writer did not fully formulate a creative plan for the completed work. The completion of the story required the second contributor's additional creativity. But if the initiating author is not the author of the story's ending, neither is the second contributor the author of the story's beginning. To ascertain whether they are co-authors of the combination,[128] Section II.F turns to the question of joint works.

F. SHARING AUTHORSHIP: JOINT WORKS

1. Categories of Joint Works and Modes of Co-Authorship

The Copyright Act defines a joint work as "a work prepared by two or more authors with the intention that their contributions be merged into inseparable or interdependent parts of a unitary whole."[129] The disjunctive language implies that the terms "inseparable" and "interdependent" describe distinct types of joint works.[130] All multiple-authored works are in some way

to produce an entirely similar sequence of audiovisuals from game-to-game") (quoting *Midway*, 704 F.2d at 1012).

126. If the downstream contributor instead eschews the upstream contributor's set parameters—for example, by disassembling the kaleidoscope or including new colors in order to change the appearance of the resulting patterns—the downstream contributor has interrupted and displaced the upstream contributor's creative plan and, accordingly, her ability to claim authorship over the altered resulting images.

127. Hypothetical based on Jane C. Ginsburg, *Putting Cars on the "Information Superhighway": Authors, Exploiters, and Copyright in Cyberspace*, 95 COLUM. L. REV. 1466, 1469–70 (1995).

128. As opposed to sole authors of their individual contributions.

129. 17 U.S.C. § 101 (2018).

130. The disjunctive language used in the legislative history describing the clause also supports this conclusion. *See* S. REP. NO. 94-473, at 103–04 (1975); *see also* H.R. REP. NO. 94-

"interdependent"—even a work created through close collaboration (e.g., Marx & Engels) requires the "interdependent" contributions of each participant. To give separate meaning[131] to the words "interdependent" and "inseparable" we must confine the meaning of "interdependent" to joint works comprised of multiple distinct and independently copyrightable works.[132] An "inseparable" joint work is therefore a work that is not capable of disaggregation into independently copyrightable parts attributable to each co-author.[133]

The legislative history references two distinct modes of co-authorship: (i) co-authors might "collaborate[] with each other,"[134] and (ii) each author might produce her contribution independently "with the knowledge and intention

1476, at 120 (1976) (noting that "the parts [of a joint work] themselves may be either 'inseparable' (as the case of a novel or painting) or 'interdependent' (as in the case of a motion picture, opera, or the words and music of a song)").

131. *See* Colautti v. Franklin, 439 U.S. 379, 392 (1979) (noting that it is an "elementary canon of construction that a statute should be interpreted so as not to render one part inoperative"); United States v. Menasche, 348 U.S. 528, 538–39 (1955) (citations omitted) ("It is our duty 'to give effect, if possible, to every clause and word of a statute.' ").

132. *See* Mapp v. UMG Recordings, Inc., 208 F. Supp. 3d 776, 786 (M.D. La. 2016) (noting that "parts of a unitary whole" are "interdependent" when they can have some meaning standing alone, but "achieve their primary significance because of their combined effect, as in the case of the words and music of a song") (citing Childress v. Taylor, 945 F.2d 500, 507 (2d Cir. 1991)); *see also* 2 PATRY ON COPYRIGHT § 5:6 ("Classic examples of interdependent joint authorship include the collaborative musical works of Gilbert and Sullivan, the Gershwin brothers, Rodgers and Hammerstein, and Siegel and Shuster. These works are the result of the interdependent contributions of the collaborators, i.e., one person wrote the lyrics and the other wrote the music, *either of which could on its own as* [sic] *an independent work*, but which, when combined, form a single 'interdependent' joint work.") (emphasis added). This understanding of the term "interdependent" seems to parallel the pre-1976 term "composite work," which, as contradistinguished from the term "joint work," was a work consisting of "matter drawn from various sources or contributed by different authors," or made up of "parts which are "clearly discrete and readily capable of being used or are 'intended to be used separately and whose only unity is that they are bound together.' " *See* Alfred H. Wasserstrom, *Copyrighting of Contributions to Composite Works: Some Attendant Problems*, 31 NOTRE DAME L. REV. 381, 391–92 n.57 (1956) (quoting ARTHUR WEIL, AMERICAN COPYRIGHT LAW 116 (1917)).

133. *See* 2 PATRY ON COPYRIGHT § 5:6 ("By contrast, examples of an inseparable joint work include two or more individuals collaboratively writing a screenplay, or a work of visual art. In these cases, the collaborators' contributions are woven into a whole, and *the individual contributions cannot be separated into different works*.") (emphasis added).

134. *See, e.g.*, Gaiman v. McFarlane, 360 F.3d 644, 659 (7th Cir. 2004) ("One professor has brilliant ideas but can't write; another is an excellent writer, but his ideas are commonplace. So they collaborate on an academic article, one contributing the ideas, which are not copyrightable, and the other the prose envelope, and . . . they sign as coauthors. Their intent to be the joint owners of the copyright in the article would be plain, and that should be enough to constitute them joint authors within the meaning of 17 U.S.C. § 201(a).") (citing 1 NIMMER ON COPYRIGHT § 6.07).

that [her contribution] would be merged with the contributions of other authors."[135] Congress may have enunciated the latter category to accommodate co-authors who do not actively collaborate but who nonetheless merge "interdependent," effectively free-standing works into a "unitary whole," such as the screenplay and sound track of a motion picture or the music and lyrics that make up a song[136] (though real life examples in fact suggest close collaboration between composers and lyricists).[137]

The "interdependent" variety of joint works may arise either from collaboration between co-authors,[138] or if "each of the authors prepared his or her contribution with the knowledge and intention that it would be merged with the contributions of other authors."[139] The "inseparable" variety of joint works, however, implies collaboration. It is difficult to imagine how the contributions could be indistinguishable (and thus constitute "inseparable" parts of a "unitary whole") without the contributors working together in active collaboration. Co-authors need not work together physically,[140] but in order to render the contributions "inseparable" it would seem that co-authors must, at the time of each individual's creation, be aware of each other's specific

135. "Under the definition of section 101, a work is 'joint' if the authors collaborated with each other, or if each of the authors prepared his or her contribution with the knowledge and intention that it would be merged with the contributions of other authors as 'inseparable or interdependent parts of a unitary whole.' " *See* S. REP. NO. 94-473, *supra* note 130, at 103–04; H.R. REP. NO. 94-1476, *supra* note 130, at 120.

136. The legislative history lists songs, operas, and motion pictures as examples of interdependent joint works. *See* H.R. REP. NO. 94-1476, *supra* note 130, at 120; S. REP. NO. 94-473, *supra* note 130, at 103.

137. *See* Stephen Holden, *Composer And Librettist: The New Chemistry*, N.Y. TIMES, July 27, 1986, https://www.nytimes.com/1986/07/27/theater/composer-and-librettist-the-new-chemistry.html [perma.cc/SC3B-FFMB] (describing several famous songwriting duos and their methods of collaboration, and noting that the "age-old question, 'Which comes first, words or music?' has three answers . . . either one can come first, or else the songs are pieced together more or less simultaneously").

138. *Id.* (noting that when Leonard Bernstein and Stephen Sondheim collaborated, "Lenny would develop core motifs[,] . . . and [he and Sondheim] . . . would discuss them and argue the meaning and in that way [they] would grow the songs together").

139. *Id.* (noting that when Richard Rodgers and Lorenz Hart worked together, "Rodgers would usually play a completed melody," the two would then "agree[] on a general theme," and Hart would then "write the words").

140. *See* Baker v. Robert I. Lappin Charitable Found., 415 F. Supp. 2d 473, 488 (S.D.N.Y. 2006) ("[T]he law does not require that joint authors work together or in the same place or contribute to every aspect of a project."); 1 NIMMER ON COPYRIGHT § 6.03 (noting that "joint authorship" does not require "that the several authors must . . . work in physical propinquity, or in concert, nor that the respective contributions made by each joint author must be equal either in quantity or quality"); Holden, *supra* note 137 (noting that Gilbert and Sullivan, "the most renowned of collaborators," "communicated by mail").

contributions and work together to "[weave them] into a whole."[141] As Judge Learned Hand indicated, there is no evidence of a "joint design" to create a joint work if the later-added material occasioned no reworking of the underlying text.[142] Co-authors who collaborate reciprocally influence each other's contributions.

Figure 2: Types of Joint Works and Modes of Co-Authorship

	"if the authors collaborated with each other"	"if each of the authors prepared his or her contribution with the knowledge and intention that it would be merged with the contributions of other authors"
"**Inseparable**" parts of a unitary whole	**e.g. Collaboration between author A (provides the detailed plot) + author B (provides the prose envelope)** (see, e.g., Gaiman v. McFarlane, 360 F.3d 644, 659 (7th Cir. 2004))	?
"**Interdependent**" parts of a unitary whole	**e.g. Collaboration between composer and lyricist who "piece[] together their contributions simultaneously"** (see, e.g., Leonard Bernheim and Stephen Sondheim)	**e.g. Composer writes the melody and arrangement, sends to her lyricist-partner, who then writes the libretto** (see, e.g., Richard Rodgers and Lorenz Hart)

2. Contemporaneous "Intent to Merge" and Unacquainted Co-Authors

The legislative history also posits intent to merge as a criterion for both interdependent parts and inseparable parts of the work as a whole,[143]

141. 2 PATRY ON COPYRIGHT § 5:6 (noting that in "inseparable" joint works, "the collaborators' contributions are woven into a whole, and the individual contributions cannot be separated into different works").

142. *See* Edward B. Marks Music Corp. v. Jerry Vogel Music Co., 140 F.2d 266, 267–68 (2d Cir. 1944) (referring to Harris v. Coca-Cola Co., 73 F.2d 370 (5th Cir. 1934)) (rejecting joint works characterization of asynchronous contribution of illustrations to a literary text because the addition of the illustrations brought about "no change in the text").

143. *See* Erickson v. Trinity Theatre, Inc., 13 F.3d 1061, 1068–69 (7th Cir. 1994) (noting that while the legislative history may "appear[] to state two alternative criteria—one focusing on the act of collaboration and the other on the parties' intent," "the statutory language clearly requires that each author intend that their respective contributions be merged into a unitary whole," that "[f]ocusing solely upon the fact of contemporaneous input by several parties does not satisfy the statutory requirement that the parties intend to merge their contributions into

emphasizing that "[t]he touchstone here is intention, at the time the writing is done, that the parts be absorbed or combined into an integrated unit."[144] The House and Senate Reports appear to envision simultaneous intent to merge contributions, and by implication some interaction among putative co-authors.[145] After all, how else could the contributors have the "knowledge" that their parts would be merged?

However, some commentators contend that "intent to merge" requires neither actual collaboration nor even knowledge of one's putative co-author.[146] In support of this view, one might argue that the statute requires only contemporaneous intent to merge inseparable contributions, so that, in our short-story hypothetical,[147] the initiating author might create her portion with the intention that later-comers whom she will never meet will merge their contributions. The serial contributors, albeit not necessarily working with each other, are working with each participant's contributions. Arguably, the initiating author's ignorance of who would write the chosen ending, or of how the ending would unfold, need not exclude the initiator from sharing co-authorship status with all the other contributors.

But this scenario seems to collapse the distinction between joint works and derivative works, a distinction the legislative history seeks to maintain.[148]

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a unified work," and that collaboration alone, absent mutual intent to merge contributions, is insufficient to form a joint work).

144. H.R. REP. NO. 94-1476, at 120 (1976); S. REP. NO. 94-473, at 103 (1975).

145. *See* Ginsburg, *supra* note 127, at 1471 ("[T]he legislative history suggests that, while the co-authors need not actually meet and work together, they must not only intend, but must also be *aware of each other's contributions*. For there to be not only an 'intention [] at the time the writing is done' to combine the parts, but also the knowledge (or at least the reasonable expectation) that the contributions will be merged, it would seem that each contributor's intent must be fairly contemporaneous.") (emphasis added); 2 PATRY ON COPYRIGHT § 5:20 (citing, *inter alia*, *Marks*, 140 F.2d 266) (noting that the "emphasis on intent at the time of creation is attributable to Congress's desire to depart" from pre-1976 case law holding that "where complementary efforts were performed at different times by authors unacquainted with one another, their product was a joint work . . . ").

146. *See* 1 NIMMER ON COPYRIGHT § 6.03 (2017) ("[J]oint authorship occurs even though the joint authors do not work together in their common design, do not make their respective contributions during the same period, and indeed even if they are complete strangers to each other."); *see also* Shyamkrishna Balganesh, *Unplanned Coauthorship*, 100 VA. L. REV. 1683, 1687–88 (2014) (noting the "extensive variation" in courts' analysis of the term "intention" in the 17 U.S.C. § 101 definition of "joint work," and that some courts require only "intent to create a joint work").

147. *See supra* note 127 and accompanying text (describing the short-story hypothetical).

148. H.R. REP. NO. 94-1476, *supra* note 144, at 120; S. REP. NO. 94-473, *supra* note 144, at 104 ("[A]lthough a novelist, playwright, or songwriter may write a work with the hope or expectation that it will be used in a motion picture, this is clearly a case of separate or

Rather than characterizing the evolving story[149] as a "unitary whole," it may be more accurate to view it as an underlying work (the initiator's contribution) and a series of derivative works that "recast, transform[] or adapt[]"[150] the beginning by supplying endings. Moreover, this scenario stretches the temporal limitation we perceive in the House Report. Indeed, under this view, the statutory standard could even encompass unacquainted sequential contributors, for each intends, "at the time the writing [of each individual contribution] is done," to merge their parts into an integrated unit, even without any specific knowledge of the other contribution with which her work will be merged.[151]

The capaciousness of "joint works" thus depends on whether the statute in fact allows for something less than active collaboration, among contributors who are strangers to each other, and who are separated in time. To understand why the 1976 Act intended contemporaneous participation, the next subsection reviews the case law under the prior Copyright Act, to which the 1976 Act responded.

3. Why Congress Required Contemporaneous Intent to Merge Contributions

Judicially elaborated co-authorship doctrine under the 1909 Act allowed co-authorship status to extend to participants who neither actively collaborated nor were even aware of each other.[152] This approach departed from the English common law norm articulated in *Levy v. Rutley*,[153] which established that "co-authorship required a predetermined intent to create one integral work on the part of two or more *acquainted* persons working at

independent authorship . . . . In this case, the motion picture is a derivative work . . . and section 103 makes plain that copyright in a derivative work is independent of, and does not enlarge the scope of rights in, any pre-existing material incorporated in it.").

149. *See supra* note 127 and accompanying text (describing the short-story hypothetical).

150. *See* 17 U.S.C. § 101 (2018) (definition of a derivative work).

151. *See supra* note 145.

152. *See, e.g.*, Shapiro, Bernstein & Co. v. Jerry Vogel Music Co., 221 F.2d 569 (2d Cir. 1955) (holding that the song lyrics written by the appellant were part of a "joint" work rather than a "composite" one); Edward B. Marks Music Corp. v. Jerry Vogel Music Co., 140 F.2d 266 (2d Cir. 1944) (holding that the lyrics written by the defendant and the music written by the plaintiff combined to create a joint work, consequently preserving the constructive trust between the two).

153. Levy v. Rutley, (1871) LR 6 C.P. 523 (Eng.).

approximately the same time."[154] In *Edward B. Marks v. Jerry Vogel Music Co.*,[155] Marks "composed the words for a song . . . which he took to a publisher . . . who bought it."[156] The publisher then "engaged one Loraine [a composer] to compose music for the words."[157] The lyricist and the composer "never met until years later, and had not therefore worked in conjunction, except that Marks intended the words to be set to music which someone else should compose" and that Loraine (the composer) "understood that he was composing music for those particular words."[158] The first-in-time lyricist then "applied for a renewal of the copyright upon the song as a 'musical composition' " (a category which includes music with accompanying lyrics).[159] "[I]f the song was the joint work of Marks and Loraine, when Marks took out the renewed copyright, it was valid, but he held it upon a constructive trust for Loraine."[160] Judge Learned Hand held that the work was a "joint work" because both the composer and the lyricist created their components "in furtherance of a common design."[161] He noted that "it makes no difference whether the authors work in concert, or even whether they know each other; it is enough that they mean their contributions to be complementary in the sense that they are to be embodied in a single work to be performed as such."[162]

154. *See* Note, *Accountability Among Co-owners of Statutory Copyright*, 72 HARV. L. REV. 1550, 1551 (1959) (emphasis added) (observing that "American decisions have substantially modified this intent requirement"). In the case, Levy was the proprietor of a theatre, who had employed a dramatist (Wilks) to write a play. *See* Elena Cooper, *Joint Authorship In Comparative Perspective: Levy v. Rutley And Divergence Between The UK and USA*, 62 J. COPYRIGHT SOC'Y U.S.A. 245, 255 (2015). After Wilks presented the finished play to Levy, Levy made changes to the dialogue and wrote a new scene without Wilks's participation. *See id.* at 255–56. After Wilks died, Levy sued a rival theatre which had mounted the play, claiming that he was Wilks' coauthor. *See id.* at 256.

155. *See Marks*, 140 F.2d 266.

156. *Id.* at 266.

157. *Id.*

158. *Id.*

159. *Id.* at 267.

160. *Id.*

161. *Id.* ("It is true that each knew that his part could be used separately; the words, as a 'lyric'; the melody, as music. But that was not their purpose; the words and the music were to be enjoyed and performed together; unlike the parts of a 'composite work,' each of which is intended to be used separately, and whose only unity is that they are bound together. . . . [But] when both plan an undivided whole . . . their separate interests will be as inextricably involved, as are the threads out of which they have woven the seamless fabric of the work.").

162. *Id.*; *see Accountability Among Co-owners*, *supra* note 154, at 1551 (noting that Marks established that "not only is an intent at the time of creation to combine with a *particular* person unnecessary to enable that person to be the co-author of the product of a subsequent combination, but even the specific intent at that time to combine with someone else does not prevent it") (emphasis added).

The Second Circuit further expanded this capacious concept of co-authorship in *Bernstein v. Jerry Vogel Music Co.* (*12th Street Rag* case),[163] holding the contested musical composition a joint work even when the first author never intended for his work to be merged with the contribution of a follow-on author. In that case, a composer wrote "an instrumental piano solo" and then "by assignment transferred all his rights in the piece" to a publisher, who then employed a lyricist to supply lyrics. The publisher registered a copyright in the completed song.[164] Even though the first author created a stand-alone wordless musical composition, the court found the requisite collaborative intent in the publisher, who had succeeded to the composer's copyright interest. Because the publisher "consent[ed] . . . at the time of the collaboration, to the collaboration by the second author," the work was joint.[165]

The 1976 Act rejected this case law and substituted a requirement of contemporaneous collaboration or intent to merge contributions. While the legislative history emphasized that "[t]he touchstone here is the intention, *at the time the writing is done*, that the parts be absorbed or combined into an integrated unit,"[166] some argue that a requirement of contemporaneous intent does not necessarily imply a full return to the *Levy v. Rutley* rule that the contributors must be acquainted.[167] In other words, if Congress clearly repudiated the *12th Street Rag* case, it may nonetheless have left room to argue for the survival of *Edward B. Marks Music Corp. v. Jerry Vogel Music Co.*[168]

163. Shapiro, Bernstein & Co. v. Jerry Vogel Music Co., 221 F.2d 569, 569–70 (2d Cir. 1955).

164. *Id.* at 570.

165. *Id.* ("Since [the assignee's] intent was to merge the two contributions into a single work to be performed as a unit . . . we should consider the result 'joint' rather than 'composite.' ").

166. H.R. REP. NO. 94-1476, at 120 (1976); S. REP. NO. 94-473, at 103 (1975) (emphasis added); *see also* 2 PATRY ON COPYRIGHT § 5:20 ("Th[e] emphasis on intent at the time of creation is attributable to Congress's desire to depart markedly from opinions of the Second Circuit [including the *Marks* and *12th Street Rag* cases] [which] held that where complementary efforts were performed at different times by authors unacquainted with one another, their product was a joint work because they had a common design.").

167. *See* 1 NIMMER ON COPYRIGHT § 6.03 (2017).

168. The legislative history may be in tension with this speculation. The House Report states that to "write a work with the hope or expectation" that it will be incorporated into a motion picture does not make a subsequently incorporated work one of joint authorship with the motion picture. H.R. REP. NO. 94-1476, *supra* note 166, at 120. On the other hand, if "the basic intention behind the writing of the work was for motion picture use," perhaps a joint work would result. S. REP. NO. 94-473, *supra* note 166, at 104.

Whether courts should entertain that argument turns on the policies one can infer from Congress' discrediting of the Second Circuit's pre-1976 case law. The *Marks* and *12th Street Rag* scenarios both involved the assertion of copyright by the successors in title to the author of a preexisting work (in *Marks*, the poem, in *12th Street Rag*, the musical composition) over a work that combined those works with newly-created, purpose-built complements (in *Marks*, the music, in *12th Street Rag*, the lyrics). In both cases, the combined components formed "interdependent" units. While the facts of each case may have made a finding of joint authorship appear the most equitable outcome,[169] the holdings unmoored from their facts risk producing problematic results. Within the context of "interdependent" joint works, finding co-authorship without acquaintance or contemporaneous intent would effectively allow a later author to bootstrap another's work,[170] and thus to exercise non-exclusive rights in the combined work or in its components, including a component the second author did not create.[171] By the same token, because all co-authors must agree to grant exclusive rights,[172] the later author could prevent the first author from transferring exclusive rights in the whole or any of its parts, including the part for which she initially was the sole author. By contrast, recognizing the components as independent works would not have deprived either creator of copyright; the separate works would instead be treated as an original work and a derivative work,[173] or as two separate copyrightable works joined together as

169. Without a finding of joint authorship, the component works might otherwise have fallen into the public domain for incomplete renewal. *See* Edward B. Marks Music Corp. v. Jerry Vogel Music Co., 42 F. Supp. 859, 867–68 (S.D.N.Y. 1942) (noting Marks's argument that its renewal copyright "covered only the lyrics" of the song, and the music "entered the public domain" because Loraine "was alive during the last year of the original . . . term and did not make application for a renewal copyright in the music").

170. Courts have shown a consistent concern for protecting "dominant authors" against pesky idea-bearing interlopers who attempt to bootstrap ownership of the dominant author's work. *See, e.g.*, Childress v. Taylor, 945 F.2d 500, 507 (2d Cir. 1991) (noting a concern about "spurious claims by those who might otherwise try to share the fruits of the efforts of a sole author of a copyrightable work"); Erickson v. Trinity Theatre, Inc., 13 F.3d 1061, 1063, 1072 (7th Cir. 1994) (denying the co-authorship claim of an actor in a theatre company who claimed that "many decisions about what was to be included [in the work] were made during rehearsals" and noting that the actor's mere suggestion "that [the primary author] include a passage from Macbeth and an introduction to the play does make him a joint author").

171. *See* Edward B. Marks Music Corp. v. Jerry Vogel Music Co., 140 F.2d 266, 267 (2d Cir. 1944); *see also* H.R. REP. NO. 94-1476, *supra* note 166, at 120.

172. Davis v. Blige, 505 F.3d 90, 101 (2d Cir. 2007) ("[A] co-owner cannot unilaterally grant an exclusive license."); 1 NIMMER ON COPYRIGHT § 6.11 (noting prohibition on one co-owner granting an exclusive license without consent of other co-owners).

173. 2 PATRY ON COPYRIGHT § 5:20 (noting that "under the 1976 Act, [the works produced by the second authors in the *Marks* and *12th Street Rag* cases] would be treated as

a "composite work."[174] One may therefore infer congressional intent to return to the acquainted co-authors rule of *Levy v. Rutley* when the contributions to the alleged joint work could stand on their own but together form an interdependent whole. The next Section considers whether the same legislative intent extends to "inseparable" joint works.

a) Merger of Inseparable Contributions Without Collaboration?

The logic behind the 1976 Act revisions applies most aptly to *interdependent* works created non-collaboratively, where the contributions to the resulting work can be separated into distinct (copyrightable) components. At least at the time of the 1976 Act's passage, the only conceivable "inseparable" works arose from active collaboration between putative co-authors.[175] There do not appear

derivative works"); H.R. REP. NO. 94-1476, *supra* note 166, at 120 (characterizing a motion picture that incorporates preexisting elements as a "derivative work").

174. Neither the 1909 Copyright Act nor the 1976 Act defined the term "composite work" but both acts referred to the term. *See* Copyright Act of 1909 §§ 3, 4, 23, 24 (mentioning, without defining, "composite works"); § 3 ("The copyright upon composite works or periodicals shall give to the proprietor thereof all the rights in respect thereto which he would have if each part were individually copyrighted under this Act."); 17 U.S.C. § 304 (2018) (referring to "periodical, cyclopedic, or other composite work"). Commentators note that, under the 1976 Act, the term "encompasses works such as periodicals and encyclopedias that embody contributions from several different authors," but before 1976 the term was more broadly understood to mean all works composed of parts which are "clearly discrete and readily capable of being used or are 'intended to be used separately and whose only unity is that they are bound together.' " *See* GOLDSTEIN ON COPYRIGHT, § 6.3.2(b) (2005); Alfred H. Wasserstrom, *Copyrighting of Contributions to Composite Works: Some Attendant Problems*, 31 NOTRE DAME L. REV. 381, 391–92 n.57 (1956).

175. Judge Posner may have supplied one applicable hypothetical, albeit for the purpose of demonstrating that where the participants do intend to collaborate, it should not be necessary that their uncombined contributions have been separately copyrightable, so long as the combination results in an original work of authorship:

> The contents of a comic book are typically the joint work of four artists-the writer, the penciler who creates the art work . . . , the inker . . . who makes a black and white plate of the art work, and the colorist who colors it. The finished product is copyrightable, yet one can imagine cases in which none of the separate contributions of the four collaborating artists would be. The writer might have contributed merely a stock character (not copyrightable, . . .) that achieved the distinctiveness required for copyrightability only by the combined contributions of the penciler, the inker, and the colorist, with each contributing too little to have by his contribution alone carried the stock character over the line into copyright land.

Gaiman v. McFarlane, 360 F.3d 644, 659 (7th Cir. 2004). But if the contributors did not collaborate—for example, if Judge Posner's writer penciler, inker, and colorist, each furnished his or her contribution at different times and unbeknownst to each other—there would be no joint work because the participants are not acquainted with one another, and no individual

to be any 1909 Act cases involving asynchronous contributions to an "inseparable" joint work. The dearth of examples makes sense: as discussed above, it is difficult to envision how two or more contributors could interweave elements, none of which separately constitute copyrightable expression, without actively collaborating.[176] Congress therefore did not need to consider the ramifications of requiring that co-authors of an "inseparable" work evince contemporaneous intent to merge their contributions with the specific contributions of their co-authors: the existence of collaboration implies that the co-authors knew of each other's individual contributions to the "joint design" and contemporaneously intended to merge their contributions into an inseparable whole.[177]

Section IV.B argues that the introduction of the generative machine (through which the machine's designer and the machine's user can each supply non-copyrightable contributions through their code or instructions, without necessarily collaborating with each other) may realize the previously nonexistent possibility of non-collaboratively created "inseparable" works. Without genuine collaboration between the machine's designer and its user,[178] the 1976 Act's requirement of contemporaneous intent to merge specific contributions may deny joint work status to the outputs of such machines unless the machine's designer had knowledge of the specific contribution supplied by the machine's user. And because in many cases the individual contributions of designer and user may be insufficient to justify a claim of sole authorship,[179] the denial of joint work status to these outputs would leave them "authorless."

works of authorship either. Assuming, of course, that the individual contributions of the penciler, inker, and colorist would not qualify as derivative works of which each creator retains sole authorship, the combined product and its components would all be "authorless."

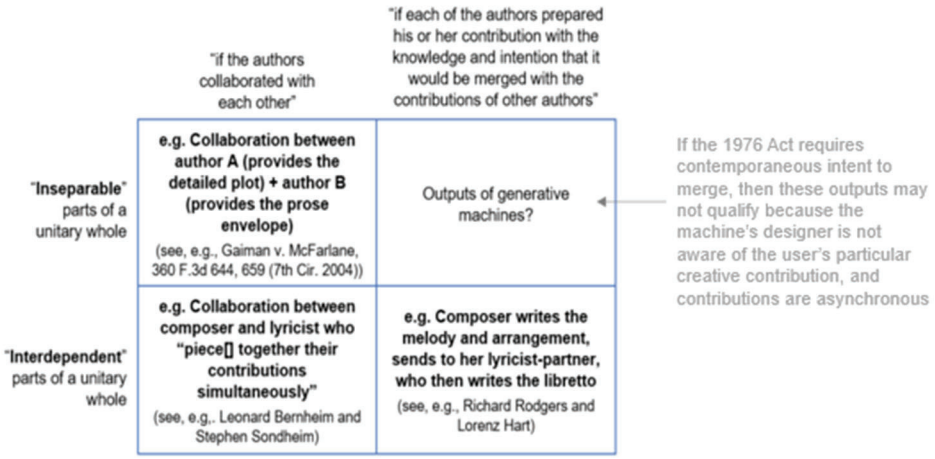
176. *See supra* notes 132–134 and accompanying text.

177. MacNeill v. Yates, 2010 U.S. Dist. LEXIS 57731, at *8 (M.D. Fla. 2010) ("[A]uthors who collaborate must also do so with the requisite intent to combine their efforts — although it is hard to imagine collaborators who would not possess such an intent.") (quoting H.R. REP. NO. 94-1476, at 120 (1976)).

178. In some instances, the machine's designers and users collaborate with each other and therefore generate a traditional "inseparable" joint work. *See infra* note 213 (describing the "Next Rembrandt" project).

179. *See infra* Section IV.A (describing the class of "authorless" outputs).

Figure 3: Computer-enabled outputs as non-collaboratively produced "inseparable" works?



b) The Implications of Collaboration Between Co-Authors

By contrast, if the initiator of our hypothetical short story[180] and an invited successor had in fact collaborated, so that they worked together on the ending, and revised the beginning in light of the ending, their finished story would be a classic "inseparable contributions" joint work. If collaboration is a necessary condition to the creation of an inseparable joint work,[181] is it also a sufficient condition? Or does the law also pose requirements as to the nature of each collaborator's contribution? What if the initiator prompted her collaborator: "Let's write a story about a sheep." They talk it through; the initiator, never much of a literary stylist, contributing key plot ideas, and the collaborator fleshing out the ideas in splendid prose.[182] Both intend to produce a joint work, but the initiator's ideas, without her collaborator's "prose envelope," would not qualify as a work of authorship. If the contributors have intended to collaborate, or at least contemporaneously strive toward a common design (i.e., creative plan) and reciprocally influence each other's contributions, the statute does not clearly require that each input justify a stand-alone copyright.

180. *See supra* note 127 and accompanying text.

181. At least in the "analog" context. *See infra* notes 341–344 (suggesting that the outputs of partially-generative machines could be non-collaboratively produced "inseparable" joint works).

182. *See* Gaiman v. McFarlane, 360 F.3d 644, 659 (7th Cir. 2004), discussed *supra* note 134.

Collaborating co-authors "labor together to unite ideas with form";[183] the statute's provision for "inseparable" parts implies that each collaborator may situate anywhere along the broad spectrum from ideas to expression so long as the combined result yields an original work of authorship. The statutory definition[184] does not imply that the contributors must have been 'authors' of original works before commencing their collaboration; if the result of their intermingled efforts is an original work of authorship, then the contributors are 'authors' of the whole.

Case law, particularly in the Second Circuit, however, has glossed the statutory definition to require that each contribution be independently copyrightable,[185] at least where one party, usually the "dominant author,"[186] disclaims intent to collaborate. A requirement of independent copyrightability may make sense with respect to interdependent contributions, but conflicts with the statute's express recognition that contributions may be inseparable. It may make more sense to characterize the Second Circuit's standard as meaning only that "the coauthor's contribution must be the product of authorship, i.e., expression,"[187] rather than that "a coauthor . . . must be able to obtain a copyright on his or her separate contribution."[188] So understood, were the Little Prince's participation in a work's elaboration limited to "Draw me a sheep!"[189] he would not be a co-author because his command constitutes an

183. 1 NIMMER ON COPYRIGHT § 6.07 (2017).

184. 17 U.S.C. § 101 (2018) (defining "joint work" as "a work prepared by two or more authors with the intention that their contributions be merged into inseparable or interdependent parts of a unitary whole").

185. *See, e.g.*, Childress v. Taylor, 945 F.2d 500, 507 (2d Cir. 1991) ("It seems more consistent with the spirit of copyright law to oblige all joint authors to make copyrightable contributions."); 2 PATRY ON COPYRIGHT § 5:16 (providing several examples of district court opinions from the Second and Ninth Circuits holding that independently copyrightable contributions are required).

186. 16 Casa Duse, LLC v. Merkin, 791 F.3d 247, 261 (2d Cir. 2015).

187. Huurman v. Foster, 2010 U.S. Dist. LEXIS 61454, at *12 (S.D.N.Y. June 21, 2010) ("[T]he author must provide more than merely an idea for the joint work, as it is well-established that 'a copyright does not protect an idea, but only the expression of an idea.' ") (quoting Kregos v. Associated Press, 3 F.3d 656, 663 (2d Cir. 1993)).

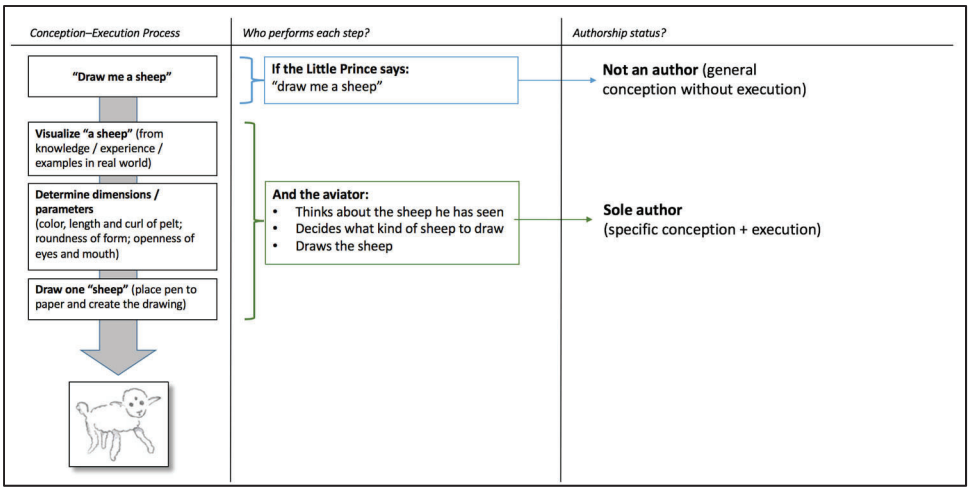
188. Patry argues that courts have misread *Childress*, which actually stood for the basic proposition that each coauthor must contribute some protectable expression: "By 'copyrightable' Judge Newman meant only to say that the coauthor's contribution must be the product of authorship, i.e., expression. He did not mean that in order to be a coauthor one must be able to obtain a copyright on his or her separate contribution." 2 PATRY ON COPYRIGHT § 5:15; *see* Justin Hughes, *Actors as Authors in American Copyright Law*, forthcoming B.U. L. REV. (citing 2 PATRY ON COPYRIGHT § 5:15). *C.f.* sources cited *supra* note 146.

189. *See supra* note 14.

idea rather than an expression.[190] But were the Little Prince to further develop the idea into an expression by virtue of working together with the aviator, then the intermingling of ideas and form should make both joint authors of the whole.[191]

Before applying these principles to the world of computer-enabled outputs, we summarize our analysis of traditional principles through the following charts.

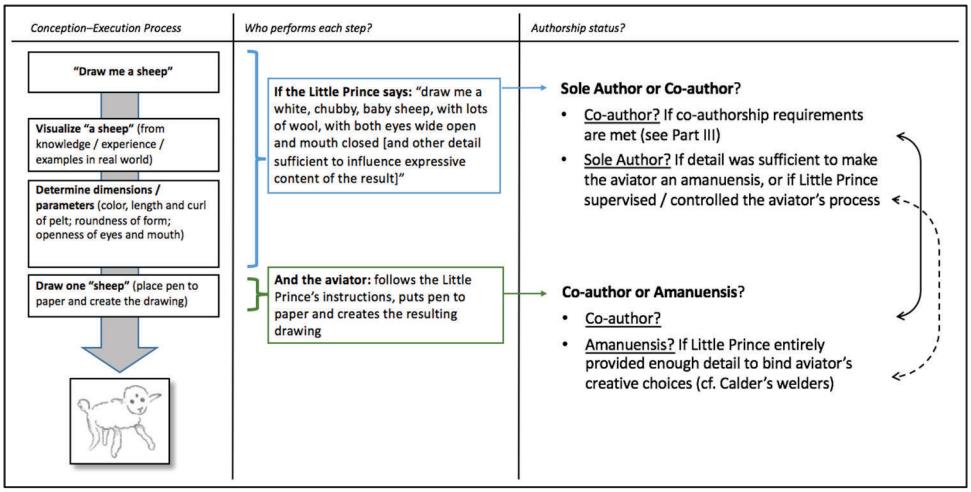
Figure 4: "Draw Me A Sheep" (Example 1, as written by St. Exupéry)



190. *See* Latimer v. Roaring Toyz, Inc., 550 F. Supp. 2d 1345, 1356–57 (M.D. Fla. 2008) (rejecting a claim of authorship because the putative coauthor, who claimed to be a "collaborator," had simply provided the primary author with the "idea or concept" for the work, and because his "ideas, conveyed to the author of the copyrighted work, were not copyrightable").

191. *Cf.* Erickson v. Trinity Theatre, Inc., 13 F.3d 1061, 1070 (7th Cir. 1994) (noting Nimmer's "de minimis" view, which posits that if two authors collaborate, with one contributing only uncopyrightable plot ideas and another incorporating those ideas into a completed literary expression, the two authors should be regarded as joint authors of the resulting work, but noting that Nimmer's view is not "consistent with one of the Act's premises: ideas and concepts standing alone should not receive protection" and that "contribution of an idea is an exceedingly ambiguous concept"). *Erickson*'s critique of Nimmer fails to recognize that the act of collaboration transforms what might be separately unprotectable components into a copyrightable whole.

Figure 5: "Draw Me A Sheep" (Example 2: If the Little Prince had provided specific instructions)



III. AUTHORSHIP OF COMPUTER-ENABLED OUTPUTS

This Part applies the "analog" principles of authorship identified in Part II to the context of machine-enabled outputs. Section III.A queries whether recent developments in artificial intelligence pose a novel problem for copyright law and for authorship doctrine. It concludes that while computer scientists and artists have made great strides in the field of "computational creativity," today's generative machines do not earn the mantle of authorship because they are, at best, "faithful agents" of the humans who interact with them. Thus, generative machines should be examined through the lens of copyright's previous treatment of tools and amanuenses, explored previously in Sections II.A and II.B. Section III.B turns to the more appropriate question of how to allocate authorship among the human creators who interact with generative machines. It presents a taxonomy of generative machines: from ordinary tools, to partially-generative machines, to fully-generative machines, and investigates the authorship implications of each category. Because the attribution of authorship in the context of partially-generative machines is the least clear, Section III.C provides a deeper investigation of partially-generative machines and addresses how the conception-plus-execution model of authorship (presented in Part II) applies to the different human participants who interact with these machines.

A. THE PROBLEM(?) OF ARTIFICIAL INTELLIGENCE

1. The Wrong Question: Machine "Authorship"

> *'The Elephant is the most intelligent of animals because he does exactly what we tell him to' wrote the great American humorist, Will Cuppy. And there are many philosophers and workers in the field of Artificial Intelligence who have talked themselves into a position from which they can no longer see the cutting edge of the joke.*[192]

Recent developments in the field of artificial intelligence have stimulated public excitement about the technology's potential. Artificial intelligence, defined as the "science of programming cognitive abilities into machines,"[193] may be "the new electricity"[194]—a technological development that will have a "transformational impact" on almost every aspect of human activity.[195] Various forms of artificial intelligence increasingly pervade our homes,[196] our businesses,[197] our governments,[198] and our social lives.[199] Surprising

192. Guy Robinson, *Book Review, Artificial Intelligence and Natural Man by Margaret A. Boden*, 54 PHIL. 130, 130 (1979).

193. *Why AI Is the 'New Electricity'*, KNOWLEDGE@WHARTON (Nov. 7, 2017), http://knowledge.wharton.upenn.edu/article/ai-new-electricity/ [perma.cc/B8LR-LPF5].

194. *Id.*

195. *Id.* ("AI has advanced to the point where it has the power to transform every major sector in coming years.").

196. *See OK, House, Get Smart: Make the Most of Your AI Home Minions*, WIRED, May 16, 2017, https://www.wired.com/2017/06/guide-to-ai-artificial-intelligence-at-home/ [perma.cc/J8KY-3DC3] ("If you're not already having conversations with a cylindrical speaker sitting on the kitchen counter, you will be soon. AI-powered devices like Amazon Echo and Google Home are poised to invade tens of millions more households this year.").

197. *See* Erik Brynjolfsson & Andrew McAfee, *The Business of Artificial Intelligence*, HARV. BUS. REV., July 2017, https://hbr.org/cover-story/2017/07/the-business-of-artificial-intelligence [perma.cc/BP58-9Q4M] (describing "artificial intelligence, particularly machine learning" as "[t]he most important general-purpose technology of our era" and noting that "[i]n the sphere of business, AI is poised [to] have a transformational impact" on "manufacturing, retailing, transportation, finance, health care, law, advertising, insurance, entertainment, education, and virtually every other industry").

198. *See* Cary Conglianese & David Lehr, *Regulating by Robot: Administrative Decision Making in the Machine-Learning Era*, 105 GEORGETOWN L.J. 1147, 1151–53 (2017) (noting "[m]achine learning uses by defense, homeland security, and criminal law enforcement authorities," and arguing that "many aspects of public administration could undoubtedly benefit from the application of machine-learning algorithms").

199. *How Artificial Intelligence Is Edging Its Way Into Our Lives*, N.Y. TIMES, Feb. 12, 2018, https://www.nytimes.com/2018/02/12/technology/artificial-intelligence-new-work-summit.html [perma.cc/XFM6-Z8KX] (noting how Facebook is "applying artificial intelligence to ward off bad actors and keep its platform free of toxicity" by using "image classifier algorithms that find and automatically remove nude photos and videos" from the social network); James Jackson, *How a Matchmaking AI Conquered (and Was Exiled) from Tinder*,

accomplishments by artificially intelligent machines, like the defeat of the world's best Go player,[200] or the creation of a new conversational language between experimental chat bots,[201] have led us to anticipate the advent of what was once the stuff of science fiction: the thinking machine.[202] But there is ample cause for skepticism: rapid advancements in artificial intelligence do not necessarily signal the coming of robots capable of replacing human ingenuity, creativity, or innovation.[203] Despite impressive developments in practical artificial intelligence (artificial intelligence designed for a narrow specific purpose, like business analytics, language translation, etc.), the idea of true machine thought, guided by the sort of "intrinsic motivation" that drives all human behavior, may still be far off.[204]

VICE: MOTHERBOARD (Nov. 6, 2017), https://motherboard.vice.com/en_us/article/8x5vqx/how-a-matchmaking-ai-conquered-and-was-exiled-from-tinder [perma.cc/S599-VLAG] (describing the use of "AI and deep learning programs to . . . play matchmaker for humans").

200. Christopher Moyer, *How Google's AlphaGo Beat a Go World Champion*, ATLANTIC, Mar. 28, 2016, https://www.theatlantic.com/technology/archive/2016/03/the-invisible-opponent/475611/ [perma.cc/AW2A-SYKY] (describing how "the strongest Go player in the world, Lee Sedol" lost a series of Go matches to Google's AI-powered AlphaGo machine).

201. Tony Bradley, *Facebook AI Creates Its Own Language in Creepy Preview of Our Potential Future*, FORBES, July 31, 2017, https://www.forbes.com/sites/tonybradley/2017/07/31/facebook-ai-creates-its-own-language-in-creepy-preview-of-our-potential-future/#53d8b5b9292c [perma.cc/P8E8-CUF4] ("Facebook shut down an artificial intelligence engine after developers discovered that the AI had created its own unique language that humans can't understand.").

202. Isaac Asimov, *Robot Dreams*, *in* ROBOT DREAMS (REMEMBERING TOMORROW) 23, 24 (1986) (describing a robot that uses a "positronic brain pattern remarkably like that of a human brain," capable of dreaming).

203. Ron Miller, *Artificial Intelligence Is Not As Smart As You (Or Elon Musk) Think*, TECHCRUNCH (July 25, 2017), https://techcrunch.com/2017/07/25/artificial-intelligence-is-not-as-smart-as-you-or-elon-musk-think/ [perma.cc/BUR8-T7GH] (noting the "there is a tendency for us to assume that if the algorithm can do x, it must be as smart as humans" and that in reality, artificial intelligence is "not really like human intelligence at all").

204. Jean-Christophe Baillie, *Why AlphaGo Is Not AI*, IEEE SPECTRUM, Mar. 17, 2016, https://spectrum.ieee.org/automaton/robotics/artificial-intelligence/why-alphago-is-not-ai [perma.cc/XZT5-J446] (noting that while "the rapid advances of deep learning and the recent success of this kind of AI at games like Go are very good news," "something similar" to human-like "intrinsic motivation," the desire to "explore" and "try" which is driven by "some kind of intrinsic curiosity" "is needed inside [an AI] system to drive its desire to . . . structure the information of the world" and "create meaning"); *id.* (noting that in "today's AI programs" "all the meaning is actually provided by the designer of the application: the AI . . . doesn't understand what is going on and has a narrow domain of expertise").

Artificial intelligence, as a concept, as a practical field of computer science, and as a challenge to legal norms, is far from new.[205] Since the 1980s, legal commentators have contemplated how intellectual property law might deal with AI,[206] and the legal academy has developed a substantial body of commentary on the concept of automated "creativity" and its potential impact on intellectual property rights.[207] In the field of copyright law, commentators have hotly debated whether creative machines can be "authors," and whether the creations of such a "machine author" should be legally protected by existing copyright regimes.[208] Examples of "creative machines" abound: programmers have trained algorithms to create news reports,[209] musical

205. *Why AI Is the 'New Electricity'*, *supra* note 193 ("[E]ven though there's a perception that AI was a fairly new development, it has actually been around for decades."). Alan Turing's 1950 paper, Computing Machinery and Intelligence, famously proposed the question "[c]an machines think?" and proposed a test through which scientists could identify a thinking machine. *See generally* A. M. Turing, *Computing Machinery and Intelligence*, LIX MIND 433 (1950).

206. Pamela Samuelson, *Allocating Ownership Rights in Computer-Generated Works*, 47 U. PITT. L. REV. 1185, 1186–87 (1986) ("As 'artificial intelligence' (AI) programs become increasingly sophisticated in their role as the 'assistants' of humans in the creation of a wide range of products—from music to architectural plans to computer chip designs to industrial products to chemical formulae—the question of who will own what rights in the 'output' of such programs may well become a hotly contested issue."). The United States Copyright Office first contemplated the concept of computer-generated works in 1965. *See* Miller, *supra* note 25, at 1044–47 (noting that in 1965 the office identified "[t]he crucial question" to be "whether the 'work' is basically one of human authorship, . . . or whether the traditional elements of authorship in the work . . . were actually conceived and executed not by a man but by a machine") (quoting U.S. COPYRIGHT OFF., ANN. REP. REG. COPYRIGHTS 68 at 7 (1966)).

207. *See, e.g.*, Bridy, *supra* note 3; Ralph D. Clifford, *Intellectual Property in the Era of the Creative Computer Program: Will The True Creator Please Stand Up?*, 71 TUL. L. REV. 1675 (1997); Miller, *supra* note 25; Denicola, *supra* note 4; Ryan Abbott, *Artificial Intelligence, Big Data and Intellectual Property: Protecting Computer-Generated Works in the United Kingdom*, *in* RESEARCH HANDBOOK ON INTELLECTUAL PROPERTY AND DIGITAL TECHNOLOGIES (Tanya Aplin, ed.) (forthcoming 2020); James Grimmelmann, *There's No Such Thing as a Computer-Authored Work—And It's a Good Thing, Too*, 39 COLUM. J.L. & ARTS 403 (2016); Bruce E. Boyden, *Emergent Works*, 39 COLUM. J.L. & ARTS 377 (2016); Andrew J. Wu, *From Video Games to Artificial Intelligence: Assigning Copyright Ownership to Works Generated by Increasingly Sophisticated Computer Programs*, 25 AIPLA Q.J. 131 (1997); Timothy L. Butler, Note, *Can a Computer be an Author? Copyright Aspects of Artificial Intelligence*, 4 HASTINGS COMMUNS. & ENT. L.J. 707 (1981).

208. *See, e.g.*, Bridy, *supra* note 3, at 21–27 (considering various definitions of "creativity" and whether machines could ever emulate it); *id.* (assuming that a "generative software program" can be the "author-in-fact" of a copyrighted work, and questioning in whom the law should vest ownership of such a work).

209. *See Robot Writes LA Times Earthquake Breaking News Article*, BBC NEWS (Mar. 18, 2014), http://www.bbc.com/news/technology-26614051 [perma.cc/YKK9-PQ47] (noting how a programmer "created an algorithm that automatically generates a short article when an earthquake occurs" and can also "generate stories about crime in the city"); Samantha Goldberg, *Robot Writers and the Digital Age*, AM. JOURNALISM REV. (Nov. 25, 2013),

compositions,[210] entire books,[211] "original" works of visual art,[212] and works of visual art modeled after the styles of great artists of history.[213] Such examples have led many commentators to assume that copyright is entering a "digitally induced crisis" brought on by the coming problem of "AI authorship" and "procedurally generated works"—outputs of generative machines designed to create works and to mimic human creativity.[214] But the concept of "machine

http://ajr.org/2013/11/25/computer-might-replace-robot-journalism-digital-age/ [perma.cc/VTQ6-5599] (noting the work of two startups, Narrative Science and Automated Insights, which have "developed sophisticated computer programs that analyze large amounts of data and automatically generate news stories").

210. A team of programmers in Spain created a computer they call "Iamus" which composes pieces of contemporary classical music in score form, using a set of training data composed of other compositions of the same genre. *See* Sylvia Smith, *Iamus: Is this the 21st century's answer to Mozart?*, BBC NEWS (Jan. 3, 2013), http://www.bbc.com/news/technology-20889644 [perma.cc/W95Q-46JF]. Iamus creates a piece of music at the push of a button—the programmers need only supply the machine with an intended piece duration and instrumentation. *Id.* Other researchers are designing algorithms to create more varied types of music. *See* Alex Marshall, *From Jingles to Pop Hits, A.I. Is Music to Some Ears*, N.Y. TIMES, Jan. 22, 2017, https://www.nytimes.com/2017/01/22/arts/music/jukedeck-artificial-intelligence-songwriting.html [perma.cc/VMY6-N8TC] (noting the efforts of Jukedeck, an online product which allows users to create unique pieces of music by inputting basic parameters using a neural network trained with musical examples, and charges users $21.99 to use the outputted track, and similar efforts by Google).

211. A marketing professor at INSEAD has "developed a small arsenal of algorithms capable of automatically generating textbooks, crossword puzzles, poems and books on topics ranging from bookbinding to cataracts." *See* Bianca Bosker, *Philip Parker's Trick for Authoring Over 1 Million Books; Don't Write*, HUFFINGTON POST (Feb. 11, 2013), https://www.huffingtonpost.com/2013/02/11/philip-parker-books_n_2648820.html [perma.cc/T4M7-S7W2].

212. Harold Cohen developed a painting machine ("AARON"), trained with "lists of object/body elements and the relationships between them" and other fundamental rules of form which it then uses to generate works of "still life and portraits of human figures without photos or other human input" which are not predictable by their programmer. *See* Richard Moss, *Creative AI: The Robots That Would Be Painters*, NEW ATLAS (Feb. 16, 2015), https://newatlas.com/creative-ai-algorithmic-art-painting-fool-aaron/36106/ [perma.cc/38E9-R8SH]; Bridy, *supra* note 3, at 24 (noting that "Harold Cohen doesn't 'use' AARON to paint in the same way that he would 'use' a paintbrush to paint; AARON paints").

213. A team at JWT, a marketing agency, created a machine to create the "Next Rembrandt," a painting in the style of the artist. *See* Tim Nudd, *Inside 'The Next Rembrandt': How JWT Got a Computer to Paint Like the Old Master*, ADWEEK (June 27, 2016), http://www.adweek.com/brand-marketing/inside-next-rembrandt-how-jwt-got-computer-paint-old-master-172257/ [perma.cc/B4BZ-35ZM]; *see also ING Presents: The Next Rembrandt*, http://www.nextrembrandt.com [https://perma.cc/7RS4-RM6V] (last visited Sept. 10, 2019).

214. Bridy, *supra* note 3, at 27.

authorship" reflects what we hope[215] (or fear)[216] artificial intelligence will eventually become more than what it is today. Today's artificial intelligence is "not really like human intelligence at all."[217] Even the most sophisticated AI systems are, at their core, convoluted logical labyrinths designed to approximate narrow slices of human intelligence through "brute-force computational strength."[218]

The idea that a machine could be an "author" of a work must rest on the assumption that a machine is capable of carrying out the required elements of authorship: conception and execution. But today's machines are fundamentally sets of processes designed by humans to accomplish specific tasks.[219] Their outputs may appear to be "creative" and may even be aesthetically equivalent to works produced by human authors,[220] but to attribute a work's expressive

215. *See* IAIN M. BANKS, CONSIDER PHLEBAS (1987) (describing a post-scarcity, utopian society led by highly advanced benevolent artificial intelligence or "Minds").

216. *See* Rory Cellan-Jones, *Stephen Hawking Warns Artificial Intelligence Could End Mankind*, BBC NEWS (Dec. 2, 2014), http://www.bbc.com/news/technology-30290540 [perma.cc/6GCN-HSY5] ("[AI] would take off on its own, and re-design itself at an ever increasing rate . . . . Humans, who are limited by slow biological evolution, couldn't compete, and would be superseded.") (quoting Professor Stephen Hawking).

217. Miller, *supra* note 203 ("The analogy that the brain is like a computer is a dangerous one, and blocks the progress of AI.") (quoting Pascal Kaufmann); *see also* Nick Ismail, *True AI Doesn't Exist Yet . . . It's Augmented Intelligence*, INFO. AGE (Sept. 11, 2017), http://www.information-age.com/true-ai-doesnt-exist-augmented-intelligence-123468452/ [perma.cc/4P9V-6Y5Z] (noting that "[w]hile many companies claim to provide 'AI-driven' solutions, in reality they're leveraging machine learning techniques at best, developing . . . augmented intelligence" and noting that "IBM . . . agrees with this definition, and believes today's technologies are more data-driven than ever but aren't yet advanced enough to think for themselves").

218. Miller, *supra* note 203 (describing the victory of Google's AlphaGo over Lee Sedol as "more about training algorithms and using brute-force computational strength than any real intelligence," noting that "training an algorithm to play a difficult strategy game isn't intelligence, at least as we think about it with humans," and further noting that Google's AlphaGo "actually couldn't do anything else but play Go on a standard 19 x 19 board . . . the AlphaGo team admitted . . . that had there been even a slight change to the size of the board, 'we would have been dead' ") (quoting Former MIT robotics professor Rodney Brooks).

219. *See* Bridy, *supra* note 3, at 10, 22 ("An intelligent programmer or team of programmers stands behind every artificially intelligent machine. People create the rules, and machines obediently follow them—doing . . . only whatever we order them to perform, and nothing more.").

220. *Machine Creativity Beats Some Modern Art*, MIT TECH. REV., June 30, 2017, https://www.technologyreview.com/s/608195/machine-creativity-beats-some-modern-art/ [perma.cc/DL6S-ZSBT] (describing a test to determine "how humans react to . . . machine-generated art" which tested human-generated Abstract Expressionist paintings against similar paintings generated by a machine, and found that in some cases "viewers had a hard time telling the difference").

value to the machine that physically generated that work is to indulge in a fiction.[221] One should not reason backward from the apparent equivalence of the output to assume equivalence of the creative processes.

Any apparent "creativity" in a machine's output is directly attributable either to the code written by the programmers who designed and trained the machine, or to the instructions provided by the users who operate the machine. No machine is itself a *source* of creativity. Even if the output of the machine surprises the humans who programmed, trained, or operated the machine by producing an unanticipated output that *appears* to be the result of some unseen creative force, one should not jump to the conclusion that the machine has earned the title of "author." Every unanticipated machine output arises directly from some human instruction programmed into the machine. The machine's designer might write a complex web of code that instructs the machine to analyze a data set, "learn" patterns, and then utilize those patterns to create outputs. The designer might also program randomness to vary the machine's outputs and its processes.[222] But the resulting output, even if unique and completely unpredictable, is the direct result of the machine's *process*, which, in turn, is inevitably the brainchild of some human developer or user.[223]

Copyright law has already developed a principle to deal with creative exploits that involve the articulation of a detailed creative process by a primary actor, and the fulfillment of that process by a secondary actor. As Section II.B showed, authors may delegate creative tasks to amanuenses without losing their status as sole authors. When those amanuenses act as "faithful agents"—operating under the broad control of and within the scope of the authority delegated by the author-principal—copyright law is content to ignore the contributions of the amanuenses and instead recognize the principal-creator as the sole author. When a principal-author defines tasks for an agent-amanuensis in "specific detail,"[224] exercising a "high degree of control" over

221. *See* Clifford, *supra* note 207, at 1685–86 (discussing the ill-defined concept of the "author" and concluding that the word is a "term of art" and that "for now" the author of a computer-enabled work "cannot be the computer").

222. *See* BEN GOERTZEL, THE STRUCTURE OF INTELLIGENCE: A NEW MATHEMATICAL MODEL OF MIND 12 (1993) (a "computer which involves chance as well as the precise following of instructions" is called a "stochastic computer").

223. Artists have relied on process-based composition since well before the recent fervor over "generative art" and "computational creativity." *See supra* note 105 (describing process-based art).

224. *See* Andrien v. S. Ocean Cty. Chamber of Commerce, 927 F.2d 132, 135 (3d Cir. 1991).

the process of creation,[225] the principal-author's sole authorship remains undisturbed despite the physical execution of the creative process by the agent. The agent-amanuensis becomes an author in her own right only if she embarks upon a "frolic of [her] own,"[226] acting "entirely without"[227] the influence of the principal-author.

The broader principle behind amanuensis doctrine holds that an agent's acts under the creative control and direction of a principal are the authorial acts of the principal, not of the agent.[228] Today's machines, of course, are incapable of embarking upon "frolics of [their] own."[229] *Every* action, step, or calculation made by a machine is the product of the precise articulation of commands by a human programmer or machine-operator (including

225. Lindsay v. The Wrecked and Abandoned Vessel R.M.S. Titanic, 1999 WL 816163, at *4–5 (S.D.N.Y. Oct. 13, 1999).

226. Joel v. Morison [1834] EWHC KB J39 (Eng.).

227. Geshwind v. Garrick, 734 F. Supp. 644, 649 (S.D.N.Y. 1990).

228. This principle is distinct from the work-for-hire doctrine, which is constrained in application to employees acting "within the scope of [their] employment" and to persons conducting one of nine statutorily enumerated types of work "specially ordered or commissioned," and which embraces the employer or commissioner of a work completed by another as "a legal fiction." *See* 17 U.S.C. § 101 (2018); Catherine L. Fisk, *Authors at Work: The Origins of the Work-for-Hire Doctrine*, 15 YALE J.L. & HUMAN. 1, 4 (2003). The agency-law principle behind the amanuensis doctrine, unlike the work-for-hire doctrine, upholds the principal-author's claim as the author-in-fact *and* the author-in-law—not because of any employment relationship between principal-author and agent-amanuensis, but because of the imputation of the agent-amanuensis's acts to the author-principal.

229. *See* Ana Ramalho, *Will Robots Rule The (Artistic) World?: A Proposed Model For The Legal Status of Creations by Artificial Intelligence Systems*, 21 J. INTERNET L. 1, 13 (2017) (noting that artificially intelligence machines are not capable of exercising "judgement" or "self-criticism," cannot "imagine things [they have] never seen," and lack "(at least for now) certain intention and content states like belief and desire, which could inform . . . imagination and/or creativity"). Professor Ramalho argues that, as a matter of U.S. copyright law, artificially intelligent machines cannot be authors because they lack the "intention or purpose to create." *Id.* at 6; *see also id.* at 4 (citing Feist Publ'ns v. Rural Tel. Serv. Co., 499 U.S. 340, 346–47 (1991) (noting that an author must prove "those facts of originality, of intellectual protection, of thought, and conception")). We do not endorse the view that authorship requires the putative author to claim that she had the "purpose to create." *See* Ginsburg, *supra* note 6, at 1085 (arguing against the proposition that "intent to create" or "intent to be an author" is a requirement of authorship). *But see* David Nimmer, *Copyright in the Dead Sea Scrolls: Authorship and Originality*, 38 HOUS. L. REV. 1, 159, 205 (2001) (noting that "intent is a necessary element of the act of authorship" and that the plaintiff "must intend to author in order for a work of authorship to emerge"). However, we nonetheless conclude that today's machines cannot be considered authors because they act solely by virtue of the precise commands provided by their human programmers or users. *See supra* notes 22–24; BRINGSJORD & FERRUCCI, *supra* note 22, at xxiv ("As we uncover reasons for believing that human creativity is in fact beyond the reach of computation, we will be inspired to nonetheless engineer systems that dodge these reasons and appear to be creative.").

programmed randomness). Machines are, in essence, perfect agents of the humans who design and use them. They require no supervision, because they are by their very nature incapable of deviating from the instructions given to them.[230]

This line of reasoning prompts the inevitable question: at what point will a machine be able to be a principal-author in its own right? At what level of technological sophistication will a machine become capable of going off on a "frolic of [its] own" and creating a work "entirely without"[231] the instructions of a human programmer?[232] We expect that these questions—which implicate the elusive concepts of "free will" and the underpinnings of human consciousness—will be the subject of a continuing debate well beyond the scope of copyright law.[233] But for the purposes of this Article, it should suffice to note that today's machines, and those of foreseeable tomorrows, are entirely subservient to the humans who delineate their instructions and tasks. Rejecting the idea of "machine authorship" requires no novel twists of doctrinal logic: as long as machines follow our instructions, they are incapable of being more than obedient agents in the service of human principals.

230. Innovations in machine-learning and other forms of "artificial intelligence" which have enabled computer scientists to design self-programming and self-modifying code do not change this conclusion. A machine capable of self-modification or self-improvement is simply a set of processes on top of which programmers have designed a set of meta-processes—algorithms which analyze the machine's processes and find ways to improve them by experimenting with code variations until an optimal set of instructions have been identified. George Dvorsky, *How Artificial Superintelligence Will Give Birth To Itself*, GIZMODO (July 23, 2014) https://io9.gizmodo.com/how-artificial-superintelligence-will-give-birth-to-its-1609547174 [https://perma.cc/K6W5-92BW] (noting the possibility of AI that can "develop[] its internal cognitive functions").

231. *Geshwind*, 734 F. Supp. at 649.

232. *See* ITALO CALVINO, THE USES OF LITERATURE 13 (Patrick Creagh trans. 1982) ("The true literature machine will be one that itself feels the need to produce disorder, as a reaction against its preceding production of order: a machine that will produce avant-garde work to free its circuits when they are choked by too long a production of classicism."); *see also* Denicola, *supra* note 4, at 282–83 ("Perhaps inevitably, some computer-generated works will one day be created at the instigation of the computer itself.").

233. *See generally* JUDEA PEARL & DANA MACKENZIE, THE BOOK OF WHY: THE NEW SCIENCE OF CAUSE AND EFFECT (2018) (outlining a vision for how artificial intelligence machines could be programmed to "think" through causal reasoning, which would provide them with human-level intelligence); NICK BOSTROM, SUPERINTELLIGENCE: PATHS, DANGERS, STRATEGIES (2015) (arguing that if scientists succeeded in developing human-level artificial intelligent machines, these machines would quickly exceed human levels of cognitive performance and become "superintelligences" with their own "instrumental goals" like self-preservation and cognitive enhancement).

2. Machine Learning and the "Black Box" Problem

The development of sophisticated generative machines utilizing machine-learning techniques like "deep learning" does not change this analysis. Modern research in artificial intelligence focuses on creating "learning" machines—machines that develop their "intelligence" and abilities by analyzing vast amounts of data and deriving general principles through which they can improve their ability to accomplish tasks.[234] Developing a "learning" model is a fundamentally different process from developing a "non-learning" or "expert system" machine: learning models are designed to look for patterns in data, to experiment with different procedural pathways, and to derive general pattern-based principles and use those principles to improve their ability to accomplish particular paths. In other words, "the machine essentially programs itself."[235]

Thus, rather than carefully programming a machine to follow defined sets of rules (i.e., look for a particular word, e.g., "sheep" in an input instruction, search for that word in an image database, and then reproduce that image), the programmer of a "learning" model might simply provide a machine with a

234. *See* Michael L. Rich, *Machine Learning, Automated Suspicion Algorithms, and the Fourth Amendment*, 164 U. PA. L. REV. 871, 886 (2016) ("[M]achine learning tends to create models that are so complex that they become 'black boxes,' where even the original programmers of the algorithm have little idea exactly how or why the generated model creates accurate predictions."). These "learning" techniques depart from other AI techniques sometimes referred to as "expert system" development, through which "machines [are] given voluminous lists of rules, then tasked with drawing conclusions by recombining those rules." Cliff Kuang, *Can A.I. Be Taught to Explain Itself?*, N.Y. TIMES, Nov. 21, 2017, https://www.nytimes.com/2017/11/21/magazine/can-ai-be-taught-to-explain-itself.html [perma.cc/NG5W-R6BC].

235. Will Knight, *The Dark Secret at the Heart of AI*, MIT TECH. REV., Apr. 11, 2017, https://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/ [perma.cc/3QV2-LZQJ] ("Instead of a programmer writing the commands to solve a problem, the program generates its own algorithm based on example data and a desired output. The machine-learning techniques that would later evolve into today's most powerful AI systems followed the latter path: the machine essentially programs itself."). Note, however, that while some commentators and tech evangelists claim that these machines "program[] [themselves]," sophisticated machine-learning algorithms are nonetheless carefully designed, rigorously trained, and closely supervised by their programmers. *See id.* For example, the Google programmers who programmed a "deep learning" algorithm to recognize cats in YouTube videos noted that they "never told [the algorithm] during the training, 'This is a cat' " and that the algorithm "basically invented the concept of a cat." *See Google's Artificial Brain Learns To Find Cat Videos*, WIRED (June 26, 2012), https://www.wired.com/2012/06/google-x-neural-network/ [perma.cc/TJS9-YKF6]. However, the programmers carefully designed the algorithm with a variety of advanced machine-learning techniques, and "trained" the algorithm repeatedly in order to achieve the desired result. *See* Quoc V. Le et al., *Building High-level Features Using Large Scale Unsupervised Learning*, *in* PROCEEDINGS OF THE 29TH INTERNATIONAL CONFERENCE ON MACHINE LEARNING 507 (John Langford & Joelle Pineau eds., 2012), https://ai.google/research/pubs/pub38115 [perma.cc/2WWX-E9DP].

"training" dataset and "tune" the machine until it can derive useful patterns from that dataset and determine how to successfully implement them (i.e., provide the machine a dataset with pairs of images and descriptions, prompt the machine to identify patterns between the images and their patterns until the machine derives some general idea of what a "sheep" looks like, and then ask the machine to generate an image of a "sheep" according to that general form). The programmers of these machines often prioritize accuracy over explainability: instead of devising machines with carefully designed processes, they program the machines to develop their own processes and generalizations in ways that quickly become too complex and multi-dimensional for human programmers to comprehend.[236] Thus, the resulting algorithms suffer from what some AI researchers refer to as the "black-box problem"—their models are "so complex" that "even the original programmers of the algorithm have little idea exactly how or why the generated model" can so accurately perform its task.[237]

But the use of more sophisticated "learning" models which we may not precisely understand or supervise—as opposed to more heavily programmed and interpretable "expert systems"—does not change our initial conclusion that machines are not "creative." The only difference between a "learning" machine and a programmed machine is that the "learning" machine is partially self-tuning—it can develop and improve its own internal processes and can thus develop procedures, the precise intricacies of which elude our understanding. But the machine still proceeds through a process fundamentally controlled by its programmers—the programmers determine what the machine should do ("problem definition"), what to include in the model's "training set" (data collection and cleaning), what the model should look for in its training set (its "input parameters" and its "outcome variables"),

236. *See* Zachary Chase Lipton, *The Myth of Model Interpretability*, KD NUGGETS (Apr. 2015) https://www.kdnuggets.com/2015/04/model-interpretability-neural-networks-deep-learning.html [perma.cc/8FCK-S5EW] ("To get accuracy rivaling other approaches, typically hundreds or thousands of decision trees are combined together in an ensemble. If we want just a single decision tree, this may come at the expense of the model's accuracy. And even with one tree, if it grows too large, it might cease to be interpretable.").

237. *See* Rich, *supra* note 234, at 886 ("[W]hen an algorithm is interpretable, an outside observer can understand what factors the algorithm relies on to make its predictions and how much weight it gives to each factor. Interpretability comes at a cost, however, as an interpretable model is necessarily simpler—and thus often less accurate—than a black box model.").

how the machine should seek to optimize itself (its "loss function"), and when the machine should spring into action.[238]

The "black-box problem" is similarly irrelevant to the authorship question. Machines are tools of their programmers or of their users, and *understanding* or *explainability* is not a prerequisite for authorial control of a tool. Jackson Pollack's understanding of the forces of gravity and inertia are irrelevant to his ability to claim authorship over his drip paintings. The photographer need not understand how her digital camera transforms photons into digital image files to "control" the camera and thus maintain an authorial claim to her photographs. And Alexander Calder need not fully understand the intricacies of metal welding to claim authorship over his monumental sculptures, even though he requires expert welders to produce them.

Copyright's long acceptance of the use of tools and amanuenses is the most appropriate lens through which to deal with the potential problems of machine creation. As we have shown, copyright doctrine is content to ignore the generative role of cameras or art workers, and instead to recognize the authorship claims of the human "master minds" who stand behind them. As Pouillet noted almost a century and a half ago, "[t]he human intelligence, even in the domain of art, can produce nothing without material assistance"[239]—and a human is no less an author if her "help be a tool, a machine, [or] another's hand."[240] The operative principle behind the "master mind" concept of authorship is the recognition that an author may "outsource" the processes of execution to a machine or another human and remain the author as long as she maintains primary control of that process—in Pouillet's words, as long as "it is . . . the thought of the artist which directs the instrument,—which guides and inspires the material means."[241] Artificially intelligent machines, therefore, do not usurp human authorship as long as humans sufficiently "control" them. Since we have posited that computers cannot run off on a "frolic of their own," some humans will wield the requisite control; the question is whether the reins are in the hands of the machine's designers or its users.

238. For a helpful explanation of the process of using advanced machine learning models, see generally David Lehr & Paul Ohm, *What Legal Scholars Should Learn About Machine Learning*, 51 U.C. DAVIS L. REV. 653 (2017).

239. Pouillet on Photography, *supra* note 35, at 599.

240. *Id.*

241. *See* discussion of "master mind" theory, *supra* Sections II.A and II.B; Pouillet on Photography, *supra* note 35, at 599; Grimmelmann, *supra* note 207, at 408 ("If an author, for her own convenience, decides to automate some of the steps by programming a computer, copyright should not look any less generously upon her.").

B. THE RIGHT QUESTION: SEARCHING FOR THE HUMAN AUTHOR

If machines are not the "authors" of their outputs, then one must ask whether the humans who design and operate those machines are the authors of those outputs. Until the modern era, this question has been straightforward—the human agent responsible for *using* the tool or machine, not the designer of the tool or inventor of the machine, is the author of its output. As Pouillet put it: "though man's help be a tool, a machine, another's hand, he does not the less produce a work of art[; the tool] leaves to the artist, to its fullest extent, the labor of the mind."[242]

Humans who use cameras or other tools are clearly the authors of the works which they use those tools to create, both because those humans *control* the tools ("guide[] and inspire[] the material means") and because those humans use those tools to express their own ideas ("sentiment, mind, taste"—"the apparatus . . . leaves to the artist, to its fullest extent, the labor of the mind").[243] The contribution of the machine's designer is a necessary predicate to the creation of the image, and the camera itself accomplishes much of the executional process. But the camera is a perfect tool for its user—the better the camera, the better it is at producing the image that captures what its user seeks to convey.

The introduction of generative machines—machines which themselves produce works, or which substantially aid in the creation of works—challenges this assumption. A *user* of a generative machine is not necessarily the author of the output, especially when the *designer*[244] of the machine exercises more

242. Pouillet on Photography, *supra* note 35, at 599. This conception of user as controller/author also appears in the Final Report the National Commission on New Technological Uses of Copyrighted Works (CONTU). *See* NAT'L COMM'N ON NEW TECH. USES OF COPYRIGHTED WORKS FINAL REPORT 44 (1978) (comparing computers to cameras, typewriters, and other inert tools of creation, and concluding that the author of a computer-generated work is the person who employs the computer). But eight years later, the Congressional Office of Technology Assessment (OTA) explicitly disagreed with CONTU's conclusion that computer programs were simply "inert tools of creation" and noted that "[i]f machines are in any sense co-creators, the rights of programmers and users of programs may not be easily determined within the present copyright system." *See* OFFICE OF TECH. ASSESSMENT, 99TH CONG., INTELLECTUAL PROPERTY RIGHTS IN AN AGE OF ELECTRONICS AND INFORMATION 72 (1986).

243. Pouillet on Photography, *supra* note 35, at 599.

244. "Designer" refers to the individual (or set of individuals) who prepare the machine for use. Thus, the "designer" of a machine could be the individual who builds the machine's algorithms (in the case of an "expert system") or the person who trains a generative machine learning model so that it can produce a set of results. In many contexts, the individual responsible for training a machine-learning algorithm will have the most influence on the algorithm's outputs. *See, e.g.*, Sobel, *supra* note 20, at 48 ("Much as human creators learn from

creative influence over the resulting work than might the designer of an ordinary tool (like a camera). The idea of a generative machine implies that the machine is *more* than a tool through which the user expresses her own ideas. Unlike ordinary tools, whose outputs reflect the creative contributions of their users, the outputs of generative tools may reflect the creative contributions of the tool's designer, or may reflect the intertwined creative contributions of the designer and the user.

The next Sections describe the spectrum of generative machines and lay out three categories of generative machines: "ordinary tools," "partially-generative machines," and "fully-generative machines." "Ordinary tools"—machines which rely solely on the creative contributions of their users, and for which the creative contributions of the machines' designers are minimal, nonexistent, or not apparent in the resulting work—form one end of the spectrum. "Fully-generative machines"—machines that rely entirely on the creative contributions of their *designers* and do not require any creative choices made by the users (who simply turn the machine on or tell it to "create")—form the other end of the spectrum. "Partially-generative machines"—machines that combine the creative contributions of both the user and the designer of the tools, those creative contributions being inseparably fused in the resulting work—form the center of the spectrum.[245]

1. *"Ordinary" Tools: Those Whose Outputs Reflect the Creative Contributions of Their Users*

In one sense, society develops more and more sophisticated tools with the purpose of enabling the users of those tools to do less and less. New technologies help human creators accomplish their goals more quickly or more

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the works of their human predecessors, a technology called 'machine learning' allows today's AI to emulate works of human authorship after being provided with many examples. Depending on the data on which it is trained, an AI could learn to generate prose, paintings, motion pictures, musical compositions, and so on."). Several copyright scholars have focused on copyright-law issues arising from the dependence of modern machine-learning systems on "training data" which include copyrighted material. *See generally id.* (discussing the application of fair use doctrine to the use of copyrighted material to train AI systems); Amanda Levendowski, *How Copyright Law Can Fix Artificial Intelligence's Implicit Bias Problem*, 93 WASH. L. REV. 579 (2018) (discussing how copyright may create or promote biased AI systems by preventing programmers from freely using copyrighted material to train their systems).

245. Professor Bruce Boyden proposed a similar spectrum defined by whether the resulting work reflects "fixed inputs" or "the content of the program written by the programmer" or by "progressive inputs" or "the content input by a downstream user of the program." *See* Boyden, *supra* note 207, at 383–91. But Boyden takes a different approach to this problem, which would ask whether each putative author conveyed a "meaning or message" apparent in the resulting work. *See id.* at 393–94.

efficiently, or even accomplish otherwise impossible creative outputs. Adobe Photoshop's Content-Aware Patch tool—which allows users to remove unwanted elements from digital images with the click of a button[246]—saves photographers the painstaking task of airbrushing unwanted elements (or unwanted people) out of otherwise desirable photographs. AutoCAD, a "software application . . . that enables computer-aided design (CAD) and drafting" is widely used by architects, designers, constructional professionals, and artists to "conceptualize ideas, produce designs and drawings" and schematics.[247] AutoCAD allows its users to avoid the detailed calculations necessary to drafting designs, which before AutoCAD may have involved "using an old-school drafting desk and a t-square" and "comput[ing] technical calculations with calculators and mathematical tables"—a process which took days or weeks.[248]

What, then, is the difference between relatively primitive author tools like the pantograph—an "ingenious tool for copying and resizing images" that "dates [back] to at least the 1600's"[249]—and more sophisticated tools like Photoshop or AutoCAD? To put the question differently: do these tools give us cause to question Pouillet's basic assumption: "though man's help be a tool, a machine, another's hand, he does not the less produce a work of art" when the putative author uses a tool that does *more* than Pouillet could ever have imagined machines capable of doing? While more sophisticated "ordinary" tools may autonomously accomplish tasks that previously required the application of the author's hand (think, for example, of Photoshop's automatic airbrushing feature), this increased role does not mean that the users of these tools no longer "guide[] and inspire[]" them or that the tools do not "leave[] to the artist, . . . the labor of the mind." It is still the user of the tool who

246. *Content-Aware Patch and Move*, ADOBE HELPX (Feb. 15, 2017), https://helpx.adobe.com/photoshop/using/content-aware-patch-move.html [perma.cc/EB3Y-96TE] ("The Patch tool is used to remove unwanted image elements. The Content-Aware option in the Patch tool synthesizes nearby content for seamless blending with the surrounding content.").

247. Luke Kennedy, *A Brief History of AutoCAD*, SCAN2CAD (Jan. 5, 2014), https://www.scan2cad.com/tips/autocad-brief-history/ [perma.cc/226S-U7QK].

248. *Id.* AutoCAD has been hailed as the "greatest advance in construction history" and users tout many benefits including calculation error reduction and the enablement of more complex and ambitious design projects. *See CAD - The Greatest Advance in Construction History*, ARCHITECTS' J. (Dec. 5, 2012), https://www.architectsjournal.co.uk/cad-the-greatest-advance-in-construction-history/1996442.article [perma.cc/9MBZ-5PQV].

249. Kevin McGuire, *Using the Pantograph*, WOOD NEWS, https://www.highlandwoodworking.com/woodworking-tips-1104apr/pantograph.html [perma.cc/JXR8-CHKG] (last visited Apr. 4, 2018).

directs the tool's accomplishment of its task and entirely forms the conception that will determine the expressive content of the result.

2. *Fully-Generative Machines: Those Whose Outputs Reflect the Creative Contributions of Their Designers*

On the other hand, computer scientists also seek to create machines that can create "on their own"—machines designed not to aid the human creator, but to mimic or replace her. These machines are "fully-generative," or capable of producing individual outputs with only minimal user input.

Harold Cohen, a pioneer in the field of computer-generated art, devised a painting machine ("AARON"), which creates paintings on demand, but without any specific instruction from its creator.[250] Cohen programmed AARON with painting techniques that allow the machine to mix paint and apply paint to canvas, and provided AARON with enough knowledge of basic object forms to allow the machine to be able to "paint still life and portraits of human figures without photos or other human input as reference."[251] Cohen saw AARON as an extension of himself—he once noted that he wanted to be the "first artist in history to have a posthumous exhibition of new work."[252] The machine is not a tool "in the traditional sense"[253] because AARON creates without Cohen's guidance (at least, after Cohen has sufficiently programmed

250. *See* Harold Cohen, *AARON, Colorist: from Expert System to Expert*, AARONSHOME.COM (Oct. 2006), http://www.aaronshome.com/aaron/publications/urbana-final.doc [perma.cc/MY5V-9SE8] ("AARON makes most of its images at night, while I'm asleep."); Ramalho, *supra* note 229, at 3 (2017) ("AARON will create different paintings, but it will not be able to change its style unless it is programmed to do so. It needs to be fed knowledge and experience to be able to produce works. AARON needs to know the things it depicts in its art, which is done through a generative system—a set of abstract rules that specify the anatomy of the human body.").

251. *See* Moss, *supra* note 212. More recently, the artist and Stanford researcher Robbie Barrat used generative adversarial neural networks to create a series of "AI-generated nudes"—abstract images of "amorphous masses of flesh" that have been compared to the works of Francis Bacon and William Untermohlen. *See* Rahel Aima, *Draw Me Like One of Your French AI-Generated Nudes*, RHIZOME (Apr. 18, 2018), http://rhizome.org/editorial/2018/apr/18/blobs-of-flesh-categorized-as-human/ [perma.cc/W9FD-K6DA] (commenting on Barrat's work and noting that Barrat does not "modify by hand what [his] AI outputs" and that "Barrat is only willing to alter the instructions and not the output").

252. Harold Cohen, *Towards a Diaper-Free Autonomy*, AARONSHOME.COM (Aug. 4, 2017), http://www.aaronshome.com/aaron/publications/index.html [perma.cc/VH8S-C59C].

253. Bridy, *supra* note 3, at 21 (noting that "generative software [like Harold Cohen's AARON]" is not "an author's tool in the traditional sense; unlike a pen or a paintbrush, or even a camera, generative software has a verbal or visual vocabulary of its own and the ability to compose a range of distinct works from that vocabulary by independently applying a system of rules").

it): AARON creates images by itself, often while Cohen is asleep, and it does not require any instruction as to *what* it should paint[254] or what colors it should use.[255] Other programmers have developed similar machines designed to generate poetry, short stories, and musical compositions.[256]

As we have shown, however, the ability of these machines to generate outputs on their own does not justify the logical leap to the concept of "machine authorship": even Cohen admits that AARON's autonomy "doesn't extend to exercising judgment about what it's doing."[257] Even the most sophisticated generative machines—those that employ adversarial neural networks to generate outputs[258]—are no more than complex sets of algorithmic instructions whose abilities are entirely attributable to how programmers train them with input data, and how programmers instruct them to analyze that input data. But these machines nevertheless pose difficult questions regarding the identification of a human author:

- Does Cohen "execute" the paintings that AARON generates? If so, does Cohen's executional stake in AARON's creative process stem from his programming and training of the machine, or simply from his act of supplying the machine with paints and a power source and flipping the on/off switch? In the latter instance, does Cohen cede too much control over the execution of AARON's paintings to forces outside of his control (like Chapman Kelley may have done with *Wildflower Works*)?

254. Cohen, *supra* note 250.

255. *Id.* (noting AARON's capabilities as a "colorist").

256. Bridy, *supra* note 3, at 15–18 (discussing Ray Kurzweil's Cybernetic Poet and BRUTUS, an artificially intelligent "silicon author able to generate stories" created by Selmer Bringsjord and David Ferrucci in 2000); *see supra* note 210 (describing two music generation systems).

257. Cohen, *supra* note 250.

258. Generative adversarial neural networks models consist of two neural networks that work together to "bootstrap the learning process." *Machine Creativity Beats Some Modern Art*, MIT TECH. REV., June 30, 2017, https://www.technologyreview.com/s/608195/machine-creativity-beats-some-modern-art [perma.cc/MRQ4-RQ6P]. Programmers might train the first network to recognize images of a specific type. For example, programmers might show the network thousands of paintings and label each painting according to its genre. Programmers might instruct the network to look for basic patterns in each painting, which might be indicative of its style category, and to adjust and refine its assumptions about the characteristics of a particular style by sorting through the set of training images. The second network would then generate random images and show them to the first network, which either "recognizes them as representing a particular artistic style or rejects them." *Id.* Through trial-and-error and multiple repetitions, the second network "learns what the first network recognizes as art" and eventually "learns to produce images that match specific styles." *Id.*

- If AARON produces a painting with color combinations and forms which surprise Cohen, can Cohen claim to have "conceived" of the paintings simply by training AARON to paint in a specific way? In other words, can Cohen claim that his creation of a generative machine with a range of potential outputs (some of which he might not actually imagine at the time of the machine's creation) is just like the videogame programmer's creation of a piece of software with a range of potential audiovisual outputs?

The analog world principles identified in Section II.D may provide some answers. As noted in that Section, copyright law does not always require an author to hold in her mind a precise mental image of the work she sets out to create. The essence of the conception requirement is the formulation of a complete *creative plan* for the work. A direct connection between the key aesthetic elements of the work—its contents, form, or compositional structure—and the author's pre-fixation conception is not required as long as those expressive elements flowed directly from the author's creative plan or conception.

Thus, the designers of fully-generative machines, such as AARON, which create works without further intervention or input from their users, can be the authors of the resulting outputs. These designers fully formulate a creative plan, manifested in the machines' algorithms and processes, which will directly lead to the creation of expressive content. The lack of a direct connection between the designers' minds and the expressive aesthetic content of the fully-generative machines' output does not destroy the designers' authorship claims any more than the lack of a direct connection between the nature photographers' minds and the expressive aesthetic content of their works destroys those photographers' ability to claim authorship over their images. The designer of the fully-generative machine thus meets the "conception" requirement of authorship. And as long as those designers, by designing the tool's algorithms, or training a "learning" generative model to produce outputs, *control* the inner workings of the system, they have also *executed* the resulting works.

This conclusion remains true even if the designers of fully-generative machines have no chance to "adopt" the unanticipated expressive elements which result from the machines they build: for example, if their machines produce outputs after being sold to another user, or after the death of the

designer.[259] Our examination of the photography examples shows that authorship status attaches to the wildlife photographer at the *moment of creation*—even if the photographer is not present when the camera fixes the image, she remains the author because of her executional stake in the work's creation.[260] Harold Cohen is the "author"—in the copyright sense, at least—of *all* the outputs of AARON at the time they emerge from the machine.[261]

At first blush, it might seem strange that the designer of a fully-generative machine could be the author of the works that emerge from the machine, even if those works come into being after the end of the designer's life. One might argue that the concept of posthumous authorship in copyright makes little sense because a creator who dies *before* a work comes into being has no opportunity to "sign off" on the finished work—to ratify the finished product as a suitable expression of the putative author's mental conception. But we should not so hastily assume that the author's post-fixation ratification is

259. Cohen, *supra* note 252 (jokingly expressing a desire to be the "first artist in history to have a posthumous exhibition of new work"). The concept of posthumous authorship may seem strange, but technological advancements have created similar situations before. For example, the development of artificial insemination has enabled men to conceive children after their death. *See* Brianne M. Star, *A Matter of Life And Death: Posthumous Conception*, 64 LA. L. REV. 613, 613–14 (2004) (noting the developments that have led to the problem of "posthumous conception," how this development challenges "the validity of paternity and inheritance laws," and the state-level legislative solutions, including the 2001 statute passed by the Louisiana state legislature allowing "most posthumously conceived children [to] attain legal status and inheritance rights"). Applied to copyright law, the possibility of a machine's designer posthumous authorship results in abbreviated durations of the life-plus-70 copyright term. 17 U.S.C. § 302(a) (2018). Cohen died in 2016. *See* William Grimes, *Harold Cohen, a Pioneer of Computer-Generated Art, Dies at 87*, N.Y. TIMES, May 6, 2016, https://www.nytimes.com/2016/05/07/arts/design/harold-cohen-a-pioneer-of-computer-generated-art-dies-at-87.html [perma.cc/JDR9-FY8P]. If AARON creates a painting in 2066, and we assume that Cohen is the author of the work (because the machine is "fully-generative"), then the work will receive protection for only 20 years. If AARON produces a work in 2087, it will fall into the public domain *ab initio*.

260. *See supra* Section II.D (arguing that authorship in a photograph attaches at the moment of creation, whether or not the photographer-author is aware of the contents or has the opportunity to "adopt" the image after fixation).

261. Before Cohen died, his practice was to "start AARON running before [he went] to bed at night" and to "review" the "hundred and fifty originals . . . the following morning," and "figure out which ones to print." Cohen, *supra* note 252. Thus, Cohen discarded many of AARON's creations, declining to "adopt" them as his own work. But while the disavowal of a work by a creator may mean that the work cannot be attributed to that creator as the artist, see 17 U.S.C. § 106A(a)(2) (2018) (granting the author of a "work of visual art" the right to "prevent the use of his or her name as the author" in certain circumstances), the disavowal does not mean that the creator is any less the "author"—in a copyright-law sense—of the work. *See infra* notes 262–267 and accompanying text (discussing the relevance of post-fixation ratification to authorship).

necessary to bring a work within the scope of copyright protection. Authors often decline to ratify the works they create: a photographer might capture hundreds of images and publish only one, discarding the rest as unworthy;[262] a painter might spend years generating sketches and figure studies before producing a final masterpiece. But even when authors explicitly disavow their disappointing works or early drafts, they remain the "authors" of those works or drafts (in a copyright-law sense) and retain the exclusive rights to prevent others from reproducing or displaying their works.[263] The nature photographer's decision not to publish most of her images does not mean that a third party who obtains her negatives (or memory cards) by rummaging through her garbage may freely exploit the disavowed works. Authorship attaches at the moment of creation and fixation—the author's post-fixation approval or rejection of a work does not change the work's status under the Copyright Act.

By contrast, ratification and post-fixation "sign off" may be relevant when an author employs the help of an amanuensis to execute her work. As we have noted, the relationship between artist and amanuensis is a principal-agent relationship: an artist-principal, like Alexander Calder, employs an amanuensis-agent, like the expert welders at Segre Iron Works, and specifies a specific task for the amanuensis-agent to complete.[264] Within the scope of her delegated authority, the amanuensis may exercise *some* creative autonomy and may apply her expertise to the task at hand. When the artist reviews the completed work,

262. The photographer need not "adopt" the photographs post-fixation in order to be their author—the photographer's authorship of her photographs attaches at the time of fixation. *See supra* Sections II.D & III.B.2.

263. Unfinished works are still covered by the Copyright Act as works of authorship—even if those works are abandoned. *See* Mass. Museum of Contemporary Art Found., Inc. v. Buchel, 593 F.3d 38, 47, 65 (1st Cir. 2010) (extending the Visual Artists Rights Act's protection of an artist's moral rights in original works of authorship to "unfinished creations that are 'works of [visual] art' within the meaning of the Copyright Act" even if the "artist becomes unhappy part-way through the project and abandons [the work]"); *see also* Daniel Grant, *Artistic Paternity: When and How Artists Can Disavow Their Work*, OBSERVER (July 28, 2016), http://observer.com/2016/07/artistic-paternity-when-and-how-artists-can-disavow-their-work/ [perma.cc/MSC4-ZD9D] (noting a dispute which arose when Frank Stella "placed some damaged artwork outside for trash pick-up only to find the work placed on exhibition at a Manhattan art gallery several months later," and subsequently sued for the return of his work under 17 U.S.C. § 106A); *id.* (noting that Richard Prince "ripped up" 500 of his early works and "put them in garbage bags" but remained the "legal copyright holder for [the discarded works]" that were eventually found and sold to a number of galleries and museums, and thus retained the right to "refuse[] to allow any of their images to be reproduced in books or catalogues").

264. *See* Knight, *supra* note 118 ("If he says it isn't right, we do it over and over again until he's pleased with it.") (quoting Frank Pisani, the foreman at Segre Iron Works).

the artist's ratification or disapproval of the work may constitute a determination of whether the amanuensis-agent operated within the boundaries of the delegated authority. If the artist rejects the work of the amanuensis on the grounds that the amanuensis did not properly follow the artist's instruction, then that rejection may mean that the artist is neither the author in the art-world sense (i.e., the rejected draft work cannot be sold as the work of the artist) *nor* the author in the copyright-law sense. If the amanuensis produced the work outside the scope of her delegated authority, then the amanuensis—not the artist-principal—may be the author of the rejected draft work.[265] But if the amanuensis hews to the author's commands, and the artist *still* rejects the work simply because the work did not turn out to be as aesthetically pleasing as the artist hoped, then the artist's rejection could *not* mean that she is no longer the author of the rejected or disavowed draft work. Instead, the artist's rejection of a work duly created by the obedient amanuensis is functionally the same as the artist's rejection of a work created by her own hand.

Author ratification, or post-fixation "sign off," therefore is relevant only in situations in which the putative author needs to affirm that the work has been created under her executional control. The putative author's ability to reject the work of an amanuensis, or to demand revisions, may not alone suffice to establish that the putative author sufficiently controlled the work's execution,[266] but when other indicia of control are present, author ratification can affirm that the task-assigner did in fact "mastermind" the work by verifying that the amanuensis did what the artist-principal wanted her to do.[267] Applying these precepts to fully-generative machines, we understand that when an artist like Harold Cohen builds a machine such as AARON, capable of producing new works without any creative input from the person who operates the

265. In these situations, the work produced by the amanuensis may be a derivative work based on the instructions of the principal artist, if the principal artist's instructions meet the qualifications for a standalone work of authorship. If so, and if the rejected derivative work were considered infringing (the artist having revoked her permission to create it), then the principal artist could prevent the amanuensis' exploitation of the unauthorized derivative work. *See* 17 U.S.C. § 103(a) (2018) ("[P]rotection for a work employing preexisting material in which copyright subsists does not extend to any part of the work in which such material has been used unlawfully.").

266. *See* Geshwind v. Garrick, 734 F. Supp. 644 (S.D.N.Y. 1990) (holding that a task assigner who asked an artist to create a 15-second animated sequence was not the author of the resulting work, even though the task assigner had retained the right to approve the artist's work and to demand revisions).

267. *See* Lindsay v. Wrecked & Abandoned Vessel R.M.S. Titanic, 1999 WL 816163, at *5 (S.D.N.Y. Oct. 13, 1999) (noting that the director had "screened the footage at the end of each day to 'confirm that he had obtained the images he wanted' ").

machine (other than turning it on), there exists no doubt that the machine is faithfully carrying out the executional commands of the machine's designer; as Cohen's agent, AARON is incapable of going off "on a frolic of his own." Moreover, AARON's outputs are all incipient from the moment Cohen programmed and trained the machine, and no third-party intervention will alter them. Thus, the inability of the designer to ratify or "sign off" on the works produced by the machine is not a valid reason to deny that designer's authorship of the resulting work—even if the work is produced after the author's death. In these circumstances, the designer remains the output's "author," whether he is across the room, across town, or across the River Styx.

3. Partially-Generative Machines: Those Whose Outputs Reflect a Combination of the Creative Contributions of Designer and User

The final (and most problematic) category of generative machines are "partially-generative"—machines whose outputs reflect the creative contributions of both the designer and the user. These machines do not wholly generate the expressive content of the resulting works, but instead rely on the creative contributions of users. French artist and computer scientist Patrick Tresset developed a drawing machine he calls "Paul" which takes a photograph of a human subject, processes the image, and uses a robotic arm to generate a portrait sketch of the subject.[268] Tresset cannot anticipate Paul's outputs—they depend on the image captured by its camera—but all of Paul's sketches share expressive elements with Tresset's own artistic style: messy lines, dark shading, and sharp contrasts:

268. P. A. Tresset & F. Fol Leymarie, *Sketches by Paul the Robot*, COMPUTATIONAL AESTHETICS IN GRAPHICS, VISUALIZATION, AND IMAGING (2012), http://doc.gold.ac.uk/~ma701pt/patricktresset/wp-content/uploads/2015/03/p17-tresset.pdf [perma.cc/54B2-SKUE].

Figure 6: Paul's sketches[269]

Tresset programmed Paul's drawings to emulate his own; they share a common aesthetic, technique, and style attributable directly to Tresset. But, importantly, while the programmer has determined the drawings' form, he has not selected their subjects:[270] the person who operates the machine decides who the drawings will depict, and to some extent how the subject will appear (facial expression; framing of the image). This operator, of course, may in many instances be Tresset himself. But the operator could easily *not* be Tresset. Suppose Tresset sells Paul and its purchaser uses the drawing machine to create portraits of her closest friends. The purchaser asks her friends to pose in front of Paul and wait while the machine generates drawings of each of them. Neither human participant—Tresset nor the operator—is *solely* responsible for the expressive content in the resulting drawings. Both participants have

269. *Id.*

270. Admittedly, neither do the wildlife photographers in the hypotheticals above—and neither does Harold Cohen, who may train AARON with basic forms, but does not tell AARON what to paint. But here, some other creator fills the "gap" between what Tresset determines and the resulting work (by supplying the subject of the drawings). We are content to conclude that wildlife photographers author their works even without entirely determining their contents because the natural or random forces fill the "gap" between what those photographers determine (i.e., the lens, the focus, the framing, etc.) and what the photographs depict. And we are content to conclude that Cohen is the author of AARON's outputs because the randomness Cohen programmed into his machine makes uncertainty as to what AARON will depict a part of the process. But when another human being, whose creative decisions are relevant to the work's final form, fills that "gap," we must more carefully question whether the first creator (here, Tresset) can claim to be the sole author of the resulting work.

contributed creatively to the result—Tresset contributed his general artistic style, and the user contributed the application of this style to a particular subject. The contributions of both participants have merged, inseparably, in the resulting drawings.[271]

Consider a different example of a partially-generative tool: Google's AI Duet, which lets users "play a duet with [a] computer."[272] Google's engineers invite users to "play some notes" on a digital keyboard, and implement a machine learning algorithm trained to "respond to [the user's] melody."[273] AI Duet generates a somewhat unpredictable accompaniment to the user's melody, and simulates the effect of an improvisational piano duet (although not very well).[274] The user's melody is her own creation, but who is the author of the accompaniment? Like Paul's drawings, the final melody is a product of both the engineers who "trained" A.I. Duet's learning algorithm,[275] and the user who inputs the melody to which A.I. Duet responds. The contributions of both participants have thus merged inseparably—the designers supply the machine with basic musical knowledge, which the user then summons into action by supplying a melodic line.

Partially-generative machines create several difficult authorship questions:

- Who—the user of the machine, or the designer of the machine—is the person responsible for the creative plan that determined the work's expressive content? We have noted that the designers of fully-

271. In this hypothetical, Tresset and the user would not be able to claim co-authorship of a "joint work" for lack of mutual collaborative intent (i.e., Tresset is not aware of the user's contribution to the final work, and thus cannot have the intent to merge his contributions with those of the user). *See supra* Section II.F (discussing co-authorship doctrine).

272. Yotam Mann, *AI Duet: A Piano That Responds to You*, GOOGLE: AI EXPERIMENTS (May 2017), https://experiments.withgoogle.com/ai/ai-duet [perma.cc/A863-VS2B].

273. *Id.* (noting that AI Duet is powered by machine learning).

274. Comparing AI Duet with a real piano duet bolsters the argument that artificial intelligence is, at least in its current form, far from reproducing human ingenuity. *Compare* Payette Forward, *Google AI Duet with Keyboard*, YOUTUBE (Feb. 17, 2017), https://www.youtube.com/watch?v=QiMWnOPMzb0 [perma.cc/3BMC-55MM] *with* Herbie Hancock & Chick Corea, *Recording of Concert in Frankfurt, Germany*, YOUTUBE (Feb. 18, 1978), https://www.youtube.com/watch?v=2zir6HqjDMo&t=1413s [perma.cc/C273-5MHU].

275. *See* Google Developers, *A.I. Experiments: A.I. Duet*, YOUTUBE (Nov. 15, 2016), https://www.youtube.com/watch?v=0ZE1bfPtvZo [perma.cc/V2Q7-4BZK] ("If I was trying to make A.I. Duet with more traditional programming, I'd have to write out lots of rules. Like if someone plays a C, then maybe respond [sic] by going up to a G. . . . I'd basically be creating this map to tell the computer how to make these decisions. . . . This experiment approaches the problem differently, using machine learning, specifically neural networks. We played the computer tons of examples of melodies. Over time, it learns these fuzzy relationships between notes and timings, and builds its own map based on the examples it's given.").

generative machines may be the authors of the resulting works even if they do not have any pre-fixation mental image of what the machines will create (see discussion of AARON and fully-generative machines, above). But we have also noted that, with respect to partially-generative machines, both designer and user contribute creatively to the final work. Does the user's provision of a creative contribution interrupt the designer's authorship claim to everything her machine creates?

- Does the user of the partially-generative machine "control" it in such a way that allows that user to claim to have executed the resulting work? On the one hand, the programmers of these machines are primarily responsible for *how* the machine works and thus might be the parties who "guide and inspire" the means of creation. But on the other hand, the users of these machines may, in some circumstances, exercise control over the machine by supplying the requisite inputs or by harnessing the machine's processes in order to create a particular result—and thus might control the process of creation in the same way that a user controls a sophisticated digital camera.
- If the person responsible for the conception of the work (who might be the user) is not the person responsible for the execution of the work (who might be the designer), can either of them claim to be the author of the result? Are they co-authors? Or is the work "authorless"?

As a preliminary matter, copyright's rules regarding co-authorship may restrict the ability of the designer and the user to claim that the resulting work is a "joint work" if the two participants neither know each other nor collaborate contemporaneously. This Article reexamines the requirements of co-authorship in Section IV.B. But assuming no co-authorship, the crucial inquiry is how to allocate the essential elements of authorship (conception and execution) to the participants involved. As discussed, only a creator who participates in both processes—contributing mentally to the conception of the work, and contributing physically to the execution of the work—can claim sole authorship.

The above questions reduce to two essential inquiries: First, at what point does a user's input become significant enough to justify departing from the rule that the designer of the machine (like the wildlife photographer) is necessarily the author of the result? In other words, what is the distinction between a fully-generative machine and a partially-generative machine? Second, at what point does the user exert control over a generative machine? The following Section examines these questions.

C. AUTHORSHIP AND PARTIALLY-GENERATIVE MACHINES

1. Distinguishing Between Fully- and Partially-Generative Machines: Can the Upstream Creator Claim Ownership of All Resulting Outputs?

a) Describing the Distinction

The fundamental difference between fully- and partially-generative machines must be the scope of possible creative decisions supplied by the machine's user. As we have shown, the outputs of fully-generative machines—those which can create works on their own, with minimal user input—are the works of the machine's designer. Because the designer of the machine sets up a process which will lead to the creation of the work without the contribution of any other creative forces, the designer will be the author of the end result, even if that author has little specific conception of what will come out of the machine.[276] And the *user* of such a machine, who simply turns the machine on, has no authorship stake in the result, and merely fulfills a limited step in the designer's creative plan. Consider, again, Naruto Version Three: Slater sets up his camera in the Sulawesian jungle, sets it on an autotimer which will snap the shutter at predetermined time intervals, and then leaves the scene. If Slater instead hired an apprentice and, after setting up the camera, instructed the apprentice to wait beside the camera and snap the shutter at the same predetermined time intervals, Slater would not forfeit his authorship claim, and the apprentice would not become the author.[277] Similarly, the designer of a machine—who sets up the entire process of creation—does not lose her authorship claim simply because she allows someone else (a user) to press the initiating button.

This logic still applies even if the user has some limited choices while operating the machine. Consider, for example, some basic music generation algorithms. JukeDeck is a software system that "brings artificial intelligence to music composition and production" and uses "deep neural networks to understand music composition at a granular level."[278] JukeDeck prompts users to input basic parameters like tempo, genre, instrumentation, duration, and climax, and then produces a musical work based on the defined parameters.[279] JukeDeck's users need not supply a melody, a key signature, or a chord structure—JukeDeck's neural network generates these aspects of the

276. *See supra* Section III.B.2 (discussing fully-generative machines).

277. The apprentice could be compared to Sarony's cameraman, who operated the camera but did not become the author of the resulting picture. *See* Farley, *supra* note 2, at 434.

278. *About*, JUKEDECK, https://www.jukedeck.com/about [perma.cc/H8C5-MX8Z] (last visited Apr. 6, 2018).

279. *Id.*

compositions itself. Its users supply nothing that even approaches a protectable "expression"—defining the tempo or genre of a musical composition may influence the type of composition generated, but it does not determine the expressive content of the output.

We might think of JukeDeck as another fully-generative machine, like Harold Cohen's AARON. That the user can choose from a range of parameters should not make a difference. Consider a simplified version of JukeDeck, which allows users to choose only the genre of the resulting piece (i.e., classical, rock, or jazz). The user's genre selection does not mean that the user exercises any influence over the conception or the execution of the result. This simplified version of JukeDeck is essentially three music generation algorithms jammed into a single box: by choosing one of three genres, the user is choosing which of three machines (i.e., the classical music generator, the rock generator, or the jazz generator) to activate. That this user springs the machine into action by choosing which genre-machine to activate should not disturb the conclusion that the machine's designer is the sole author of the result. And introducing additional options (i.e., allowing the user to choose tempo, genre, instrumentation, etc.) should similarly not change the analysis.

This logic, however, must have a limit. At some point, the user's choices when operating the machine will interrupt the designer's claim of authorship of the machine's outputs. Consider a modified version of Naruto Version Three: Slater sets up a camera in a public wildlife reserve by pointing it at a grove of trees where macaque monkeys often congregate, and offers visitors the opportunity to approach the camera, wait for macaques to wander through the scene, and snap a photograph at the moment of their choosing. While Slater has certainly supplied *some* creative influence over the resulting photographs (by framing the image and selecting the type of lens, etc.), the originality inherent in the resulting images is mostly attributable to the visitors who snap the photographs.[280] A visitor who waits by the camera and then snaps the shutter at what she perceived to be the perfect moment, capturing an image of a troop of macaques congregating in the grove, has a strong claim

280. In this situation, Slater might argue that he is at least a co-author due to his creative contributions to the result (framing the image and selecting the type of lens). But simply supplying the equipment does not make one a co-author, and Slater may not be able to claim that the resulting photograph is a "joint work" unless he collaborated with the visitor who ultimately pushed the button. *See* Nottage v. Jackson [1883] 11 QBD 627; *infra* Part IV (discussing co-authorship doctrine).

of authorship in the image because that user supplied an essential element of originality in a photograph: originality in timing.[281]

Similarly, if a user of a generative machine exercises some creative influence over the expressive contents of the resulting work, then it would be inappropriate to assume that the designer of the machine is the sole author of the result. The user's creative contribution interrupts the designer's authorship claim. One might frame this conclusion in terms of *conception*: because the designer of the machine has built it to require the creative contribution of an end-user, the designer of the machine cannot claim to have conceived of each of the potential results. In other words, the designer's creative plan (or conception) is *incomplete* without the creative contributions of the user. Herein lies a crucial (and difficult) question: at what point does the user of a generative machine exercise sufficient influence over the result to interrupt the authorship claim of the machine's designer? At what point does the machine's designer rely *too much* on the contribution of the end-user, such that the designer's creative plan for the work is incomplete? And, finally, does the user's interruption make her the (or "an") "author" of the output?

b) Prior Judicial Approaches to This Question

Some courts have considered similar questions in deciding cases involving generative machines. In *Torah Soft Ltd. v. Drosnin*,[282] the plaintiff designed a computer program for "Bible code research"—the enterprise of "foretell[ing] future events" by examining a "code . . . revealed by finding words and phrases

281. Mannion v. Coors Brewing Co., 377 F. Supp. 2d 444, 453 (S.D.N.Y. 2005) (describing originality in timing). Note, however, that this logic might break down if Slater pointed his camera at a subject that did not vary with the passage of time. For example, consider a museum curator who installs a Polaroid camera directly in front of a sculpture, fixes the camera in place and adjusts the room's lighting to create a perfect image of the artwork, and invites visitors to press the camera's shutter button to produce an image of the statue to take home as a memento. Each visitor who presses the camera's shutter button will produce an identical image. Like Sarony's apprentice, who may have chosen the precise timing of the famous Oscar Wilde photograph but who did not "compose" the image, the visitors would not become authors simply by pressing the camera's button. Because the camera is fixed in place, the visitors may influence only the *timing* of the photograph, which will not influence the content of the resulting image. And like Sarony himself, who "produced the [Oscar Wilde] photograph" by "posing the said Oscar Wilde in front of the camera," the person who set up the museum's camera would be the author of the photograph because she is entirely responsible for the content of the resulting images. *See* Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 60 (1884). Therefore, the authorship question might depend on the elements of originality reflected in the result, and to whom those elements are attributable.

282. Torah Soft Ltd. v. Drosnin, 136 F. Supp. 2d 276 (S.D.N.Y. 2001).

which appear in the [Hebrew] Bible at equidistant letter skips."[283] The software, "in response to an end-user's input of a particular term, sift[ed] through [a] Database [of Biblical texts], reorganize[d] it according to its algorithm, and then create[d] a matrix" of Bible code in which the search term appeared.[284] The software's results were "repeatable whenever the input is identical. . . . That is to say, each time an end-user inputs the phrase 'Yitzhak Rabin,' the Software [would] produce the same matrix."[285] The court sought to determine, *inter alia*, whether the user of the software, who "merely inputs a word or phrase which the Software searches for in the Database,"[286] could claim ownership over the software's output. The court held that the user of the Bible code software could not claim ownership of the outputs.[287] The court noted:

> Although the matrixes [produced when a particular user inputs a particular search team] do not appear either in the Software or the Database, they are 'fixed' insofar as the output is repeatable whenever the input is identical. . . . [A]n end-user's role in creating a matrix is marginal. . . . Creating a matrix is unlike the creative process used in many computer art programs, which permit an end-user to create an original work of art in an electronic medium. . . . [U]sers of such programs often supply the lion's share of the creativity to create the screen display. . . . By contrast, an end-user of the Software merely inputs a word or phrase which the Software searches for in the Database. Thus, the Software does the lion's share of the work.[288]

In *Rearden, LLC v. Walt Disney*,[289] by contrast, the plaintiff (Rearden) owned the "MOVA Contour Program," a program used in filmmaking that "precisely captures and tracks the 3D shape and motion of a human face," thus "captur[ing] an actor's performance frame-by-frame" and creating output files which filmmakers can use "for many different applications, such as 'retargeting' the actor's face onto another real or fictional face."[290] Rearden claimed that the defendants used its program to create several films, including *Beauty and the Beast*, *Deadpool*, and a *Terminator* franchise film, and that it did not

283. *Id.* at 280.
284. *Id.* at 283.
285. *Id.*
286. *Id.*
287. *Id.* at 283. The court eventually held that the outputs were not sufficiently original to merit protection. *See id.* at 292 (granting the defendant's motion for summary judgment after noting that the "[p]laintiff has failed to satisfy its burden of proving that the Software's outputs of Bible code finds, as displayed in the matrixes, contain protectable expression").
288. *Id.* at 283.
289. Rearden, LLC v. Walt Disney, 293 F. Supp. 3d 963 (N.D. Cal. 2018).
290. *Id.* at 967.

authorize the studios to use its programs. Rearden claimed that because "the MOVA Contour program performs substantially all the operations in creating the [film] output," Rearden, as the owner of the program, is the "author of the output"—that is, of the footage produced using the technology.[291]

The District Court for the Northern District of California focused on the language from *Torah Soft*,[292] noting that "Rearden must adequately plead that the MOVA Contour program does the 'lion's share' of the creating and that the end-user's role in creating the final product is marginal" in order to prove ownership of the output.[293] The court ultimately found that the studios, not the creator of the program, authored the outputs:

> The court does not find it plausible that the MOVA Contour output is created by the program without any substantial contribution from the actors or directors. Unquestionably, the MOVA program does a significant amount of work . . . . But this cannot be enough, since all computer programs take inputs and turn them into outputs. . . . Here, Rearden must allege that the MOVA program has done . . . "the lion's share of the creativity" in creating the outputs. . . . Here, unlike in *Torah Soft*, where the user merely inputs a word into the program, MOVA Contour's user inputs a two dimensional camera capture that may range from [an actor's] facial expressions . . . to the [actor's] subtle and dynamic motions.[294]

The courts in *Torah Soft* and *Rearden* seemed to analyze two issues simultaneously: first, whether the outputs of the programs in question "reflect[] the program's contents," and second, whether the program or the user does the "lion's share of the work" to create the output.[295] But the courts' analyses trained on the question identified above: whether the user's contribution was necessarily limited (as it was in *Torah Soft*), or whether the user's contribution constituted the "lion's share of the creativity"[296] and thus superseded the authorship claim of the designer of the program (as was the case in *Rearden*).

But the *Torah Soft*/*Rearden* test deals primarily with the distinction between (i) ordinary tools—whose outputs reflect only the creative contributions of the

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291. *Id.* at 969.

292. The court also referred to a Ninth Circuit case on a similar issue, which drew its reasoning from *Torah Soft*. *See* Design Data Corp. v. Unigate Enter. Inc., 847 F.3d 1169 (9th Cir. 2017).

293. *Rearden*, 293 F. Supp. 3d at 970–71.

294. *Id.* at 971.

295. *Id.* at 970 (quoting *Design Data*, 847 F.3d at 1173).

296. *Id.*

user (as was the case in *Rearden*), and (ii) fully-generative machines—whose outputs reflect only the creative contributions of the machine's designer (as would have been the case in *Torah Soft*).[297] In these cases, it seems simple to allocate authorship to either the machine designer or the user: the outputs will entirely reflect the creative plan of either the machine's designer (*Torah Soft*) or the user (*Rearden*). The *Torah Soft/Rearden* test does not, therefore, provide much guidance to determine the distinction between (i) fully-generative machines—whose outputs reflect only the creative contributions of the machine's designer, and (ii) partially-generative machines—whose outputs reflect a *combination* of the creative contributions of designer and user.

For example, the *Torah Soft/Rearden* test does not help determine the proper author of Paul's portrait sketches.[298] As noted, these drawings reflect the contributions of both designer and user: Tresset (Paul's creator) has programmed the machine to draw, and the user contributes the human subject, determining not only the identity of the human subject, but the expression on the subject's face and how the subject's face is framed within the sketch. To the extent that Tresset's style appears in the resulting drawings, this style does "reflect the program's contents," and Tresset's machine does "the lion's share of the work" to apply this style to whatever image the user supplies to the machine. But the resulting work, as a whole, does not "reflect the program's contents" because the particular faces depicted in the sketches are not inherent within the machine itself.

c) Approaches to the Distinction Between Fully and Partially Generative Machines

How, then, should we approach the question of whether the user's participation in the creative process interrupts the authorship claim of the machine's designer? One potential distinction is whether the user supplies anything *new* to the machine, or whether the output is necessarily a rearrangement of elements already within the machine. One might argue that, if the output of a generative machine is composed solely of elements inherent within the machine, then the machine is fully-generative (and thus its designer is the author of the outputs). This approach mirrors the approach in the videogame cases discussed in Section II.E, in which the courts suggested that

297. As noted above, the *Torah Soft* court found that the Bible code matrices were not sufficiently original to merit copyright protection. *See* Torah Soft v. Drosnin, 136 F. Supp. 2d 276, 292 (S.D.N.Y. 2001).

298. *See supra* note 268 and accompanying text (discussing "Paul," a drawing machine created by Patrick Tresset).

the videogame player does not interrupt the designer's authorship claim by simply rearranging elements stored within the game and composed by a game's designer.

But even within the context of videogames, this logic only goes so far. Minecraft, for example, a game which invites the player to "make things out of virtual blocks, from dizzying towers to entire cities"[299] supplies its players with basic building blocks which they can use to create an infinite array of structures, cities, or vessels. "Nearly everyone who plays Minecraft, or even watches someone else do so, remarks on its feeling of freedom: All those blocks, infinities of them! Build anything you want! Players have re-created the Taj Mahal, the U.S.S. Enterprise from 'Star Trek,' the entire capital city from 'Game of Thrones.' "[300] Few would argue that a player who spends years using Minecraft to imagine and construct her dream mansion (complete with guest house, pool, bowling alley, and four-car garage) would not be the "author" of the resulting model, or that the programmer of Minecraft would have any authorial stake in the resulting work. However, each of these results is "implicit" in the game itself—the players of the game do not introduce any unanticipated elements into the game, but simply rearrange the pre-existing blocks to generate their own creations. It seems odd to extend the logic of the videogame cases to situations in which the players recombine elements of a game in a way that reflects a substantial amount of player creativity.[301]

One could even argue that the user of Microsoft Word simply recombines and rearranges elements (letters, fonts, formatting styles, etc.) which already exist within the program. Of course, few (if any) would argue that the logic of the videogame cases could apply to Microsoft Word—a person who types and formats a Word document is the author (or one of the authors) of the resulting document.

Asking whether the downstream user of a machine contributes something *new* to the machine's creative process therefore cannot be the operative question. That approach fails because a user can exercise sufficient creativity by combining and recombining elements that already exist in the machine.

299. Clive Thompson, *The Minecraft Generation*, N.Y. TIMES MAG., Apr. 14, 2016, https://www.nytimes.com/2016/04/17/magazine/the-minecraft-generation.html [perma.cc/7A3Y-Y7PB] ("Blocks can be attached to one another to quickly produce structures. Players can also combine blocks to 'craft' new items.").

300. *Id.*; *see also* Boyden, *supra* note 207, at 387 (noting that modern videogames may be distinguishable from the videogames that formed the basis of the videogame cases from the 1980s because modern games allow users slightly more creative autonomy).

301. *See supra* note 125 (discussing whether the logic of *Stern* and the other videogames cases should apply to modern videogames).

There is no categorical difference between users who supply new *content* to a machine (i.e., Paul's users supply the drawing machine with a new human subject to draw) and users who supply new and unanticipated *arrangements* of elements that already exist within a program.

This Article proposes a more effective test: when the upstream creator's decisions define and bound the downstream creator's role, the downstream creator does not disrupt the upstream creator's claim of authorship.[302] In these circumstances, the upstream creator has effected a limited delegation of creative control to the downstream creator, who simply completes the upstream creator's creative plan by making a relatively foreseeable choice—pushing a button, choosing between a limited set of parameters or settings, or moving a joystick to proceed through a simple videogame. But when the upstream creator's creative plan for the work does not limit the downstream user's creative autonomy, and instead relies on the downstream creator to endow the work with additional (and unforeseeable) creative content, the upstream creator cannot claim to be the sole author of the resulting work because she has not crafted a complete creative plan for the work's production.

To determine whether the upstream creator has sufficiently "bounded" the downstream creator's role, one might ask whether the upstream creator *could have anticipated* what the downstream user would do to "complete" the work.[303] If it was possible for the designer of the machine to anticipate *every* potential

302. For example, the programmers of the videogames addressed in Stern Elecs, Inc. v. Kaufman, 669 F.2d 852 (2d Cir. 1982), and its progeny sufficiently bound the roles of their downstream users, whose movement of the game console's joysticks and whose navigation through the relatively simple games was foreseeable and anticipated by the programmers and thus part of their "creative plans."

303. This approach may create some tension with the wildlife photographer hypotheticals addressed above. In Section II.D.2, this Article noted that such a photographer need not have *any* aesthetic pre-execution conception of what her camera would capture. One might argue that Zapruder could not have anticipated that his attempt to film "home videos" of the presidential parade would end up capturing the assassination of President Kennedy—yet he remained the author of the footage. To use a more extreme example, if in Naruto Version Three Slater's auto-timed camera ended up snapping a photograph of an alien invasion of Sulawesi, one might *still* recognize that Slater is the author of the resulting footage even though he could not have anticipated the result. In situations involving only a single creator (the sole creative contributor), one can assume that the creator (like the nature photographer) is the author even if she did not anticipate the resulting work, because she has fully formulated the creative plan for the work (and any unanticipated variation is attributable to nature, or in the case of Cohen's AARON, some combination of randomness and the complexity of the machine). But when another potential author (the downstream user) has supplied some creative input, we must investigate whether that author's contribution has disrupted the first author's claim, i.e., whether the first author's creative plan for the work was incomplete.

resulting work, the designer can claim that her creative plan encompassed each of the resulting works. But if the designer of the machine, at the time of her participation in the creative process, could *not* have anticipated how the user of the machine would complete the work, then the designer cannot claim sole authorship[304] of any of the resulting works because these resulting works were not entirely the product of the designer's creative plan, which must have been incomplete without the creative contribution supplied by the user.[305] This test would *not* inquire whether the machine's designer *actually* anticipated the result[306]—such an approach would be impossible to administer (because the designer could always *claim* to have anticipated a particular result).[307]

The proposed *possible anticipation* test is consistent with the result of the early videogames cases: with simple videogames like Space Invader or Pacman (which the courts in the videogame cases considered), it would have been entirely possible for the games' designers to have anticipated any of the resulting audiovisual sequences. The test would also encompass more complex games, such as Tetris or Candy Crush, because the programmers *could have* anticipated any given output of the game when they designed the game (even if the programmers did not in fact anticipate a particular output). But this test would deny authorship to the programmers of Minecraft, who, due to the vastly increased possibilities for player intervention within the game, would be

304. For a discussion of whether the designer can claim co-authorship with the machine's user, see *infra* Part IV.

305. Note that this approach is consistent with the "master mind" concept of authorship introduced in Part II. In other words, the designer of the fully-generative machine is the "master mind" of the resulting work even though she left the final generation of the work to a user empowered to choose between a foreseeable range of potential inputs or instructions (i.e., input that could be *anticipated* by the designer). But the designer of the machine is *not* the "master mind" of the work if she designed a machine that would necessarily produce results that the designer could not have anticipated, because the range of potential user inputs is similarly impossible to anticipate.

306. This actual anticipation approach is similar to another potential approach: whether the machine has a finite number of potential outputs. If the machine's outputs are infinite in scope, then it would be impossible for the designer of the machine to have *actually anticipated* each potential output. But this quantitative approach does not help to explain the videogame cases, assuming that the range of potential arrangements of pre-existing audiovisual components in a videogame is infinite.

307. Admittedly, the proposed *possible anticipation* approach may pose its own administrability problems. The purpose of this Article is not to propose a bright-line rule, but instead to elucidate a principle—consistent with the "analog" authorship principles of "conception" and "execution" outlined in Part II—sufficient to clarify the necessary distinction between fully-generative machines (whose outputs are presumptively works of authorship attributable to the machine's designer) and partially-generative machines (whose outputs may be works of sole authorship attributable to the machine's user, works of joint authorship, or "authorless").

unable at the time of their participation in the creative process (when they designed the game) to anticipate what the game's players would build. Like the programmers of Microsoft Word, who cannot anticipate all the works that users will create using the word processing program, the designers of Minecraft provide a set of pre-defined elements, but players can combine those elements in ways the programmers neither expect nor determine. This approach would similarly deny authorship to Tresset—the creator of Paul, the drawing machine. Because Tresset cannot anticipate which faces Paul will sketch, Tresset cannot claim to be the author of the resulting drawing (assuming, of course, that someone other than Tresset operates Paul and chooses the subject to depict).

2. Dealing with Partially-Generative Machines: Who Executes the Work?

The conclusion that a machine is partially-generative (and thus that the designer of the machine cannot claim sole authorship of the resulting works) does not necessarily mean that the *user* of the machine is the author of the resulting work. One might safely conclude that the user of such a machine *conceived of* the resulting work, because the user provides some unanticipated contribution to the machine to create the result (otherwise, the machine would be fully-generative and authorship of the result would go to the machine's designer). But conception supplies only half of the authorship equation. The user of such a machine can claim authorship of the result only if that user sufficiently controlled the process through which the work came into being. If the user does control this process, then the user has both conceived of and executed the resulting work, and is therefore the sole author of the resulting work just like the user of an "ordinary tool." Moreover, as discussed previously in this Article, a contributor who supplies only conception cannot "adopt" the resulting work if that creator plays no part in the execution of the work.[308]

There may be some tension between the assertion that a photographer "controls" her camera (and thus executes the work that the camera produces) and the assertion that the user of a generative machine (that she did not create), who provides the conception for the resulting work, does not "control" the machine and thus does not "execute" the resulting work. In other words, the photographer is capable of "controlling" her camera by simply manipulating the camera's user interface (its buttons and dials) and pointing the camera in a specific direction—the complexity of the process that occurs inside the camera, and the photographer's comprehension of that complexity, are not relevant to whether the photographer *executes* the work that the camera

308. *See supra* Section II.D.1.

physically produces. So why should the user of a more sophisticated generative machine, like a generative machine-learning model, not also "control" that model when she turns it on and supplies it with instructions?

The key to this distinction is that the photographer, by operating the camera, *inevitably controls how* the camera operates, and thus *executes* the work. A camera, in other words, is not *self-operating*—the user must instigate every movement and function the camera accomplishes. The photographer might point a camera in a particular direction, choose a particular time of day during which to take a photograph, focus the camera or use an autofocus function, and select the right moment at which to click the shutter (or implement a timed shutter feature). To be sure, these are *expressive* acts, but they are also acts of *execution*—acts which necessarily define how the work will come into physical being.[309] And even though some photographers are considerably less involved in this process (think, for example, of a photographer who uses only point-and-click disposable cameras), these photographers are still closely involved with the process of execution: they define *what* the camera captures, and *when*. The physical involvement of the human being in operating the camera will always determine *how* the camera captures an image. Even if two people, with two identical cameras, have identical *conceptions* of what they wish to capture, their individual operation of their cameras will always result in two distinct images—two separate and individual executional processes.[310] As Judge Learned Hand observed in 1921, "no photograph, however simple, can be unaffected by the personal influence of the author, and no two will be absolutely alike."[311]

Users of generative machines, however, might not have to fulfill any of these executional functions in order to generate an output. Suppose the Little Prince buys a general-purpose drawing machine and commands it to "Draw me a sheep." He will have furnished a general idea that the machine will convert into a drawing without any further participation from the imperious

309. Without these acts of execution, the user of the machine cannot claim that the machine is her "agent" because she has not influenced *how* the machine carries out its tasks. *See supra* notes 59–70 (characterizing the author-amanuensis or author-tool relationship as one of agency, and noting that the author-principal must influence the agent's execution in order to claim ownership over the result).

310. *Cf.* Ron Risman, *How Two Photographers Unknowingly Shot the Same Millisecond in Time*, PETAPIXEL (Mar. 7, 2018), https://petapixel.com/2018/03/07/two-photographers-unknowingly-shot-millisecond-time/ [perma.cc/6FW8-9YYP] (noting how two photographers inadvertently captured strikingly similar images of a wave crashing against a lighthouse in New Hampshire). *But see id.* (noting that the images were "slightly different").

311. Jewelers' Circular Pub. Co. v. Keystone Pub. Co., 274 F. 932, 934 (1921).

little boy. The Little Prince's instruction might influence *what* the machine seeks to portray, but the instruction does not influence *how* the machine converts that general idea into a final work.[312] Two users who provide identical instructions to the general-purpose drawing machine will necessarily receive the same result—unless, of course, the machine is programmed to vary its outputs randomly. But in such a case, the variation in the output would be attributable not to differences in what the users did, but to a decision by the machine's designer.

Consider, for example, someone who uses Google Translate to translate this Article from English into French. The user inserts the text of the Article into to the Google Translate website, which in its latest form,[313] uses a sophisticated machine-learning model to translate the text into French. By simply supplying the text, the user exercises no influence over *how* Google's algorithm translates it into French.[314] The programmers of the Google Translate algorithm, who are responsible for training the neural network to understand both the English and French languages, entirely control the process through which the resulting work (the translated article) comes into being. Two users who input the same text into Google Translate will get the same result, and neither user can tweak Google's algorithm to create a different output given the same input. Google Translate does not provide any user-defined parameters for users to change *how* the translation algorithm works; users cannot ask the algorithm to favor certain phrasings or resolve

312. We might compare this situation to the creation of the "Next Rembrandt" by a team of art historians and computer scientists using a generative machine. The process of creating the "Next Rembrandt" involved a single team of scientists and art historians who influenced both the *what* and the *how*—and thus these scientists should be considered, collectively, the authors of the resulting painting. *See supra* note 213 (describing the "Next Rembrandt" project).

313. Recently, Google has used a neural network to improve its Google Translate service. Rather than "program[ming] into the computer all of the grammatical rules of [each language], and then the entirety of definitions contained in the [lexicon]," the use of neural networks attempts to "produce multidimentional maps of the distances, based on common usage, between one word and every single other word in the language"—"[t]he machine is not 'analyzing' the data the way that we might, with linguistic rules that identify some of them as nouns and others as verbs. Instead, it is shifting and twisting and warping the words around in the map. . . . Some of the [developments in Google's translation system were] not done in full consciousness. [The researchers] didn't know themselves why they worked." Gideon Lewis-Kraus, *The Great A.I. Awakening*, N.Y. TIMES MAG., Dec. 14, 2016, https://www.nytimes.com/2016/12/14/magazine/the-great-ai-awakening.html [perma.cc/4LCL-5CTK].

314. *See supra* discussion of Nottage v. Jackson [1883] 11 QBD 627 (Eng.) (holding that a party who instructed a hired photographer to take the picture of an Australian cricketer did not become the author of the resulting photograph because the photographer was the "originator in the *making* of the [work]") (emphasis added).

translational ambiguities in a particular way.[315] Because the Google Translate users exercise *no* control over how the translation works (i.e., how their general idea, to produce a translation of this Article, becomes a final work), they do not execute the final work and thus cannot claim authorship over it.[316]

Accordingly, one might argue that Paul[317] is an "ordinary tool" (rather than a "generative machine") because, at a functional level, Paul does exactly what a camera does: the operator points the machine at a subject, and the machine captures an image of that subject and generates a hard-copy depiction. To be sure, there is a fundamental difference between Paul and an "ordinary" camera: "ordinary" cameras do not contribute any creative content to the images they produce, while Paul's sketches reflect the aesthetic creativity of the machine's designer. Cameras are creatively passive—or "essentially completely transparent in conveying the meaning of the [photographer] from author to audience"[318]—and Paul is creatively active: its outputs always reflect the creativity (Tresset's style) programmed into the machine. Not all cameras, however, are completely passive. Some digital cameras use filters or image-processing technology to add aesthetic elements or simulated objects to photographs in real-time.[319] At least one camera application allows users to apply a "sketch" filter to their images, to produce a result that looks similar to the drawings that Paul creates.[320] One might argue that such a camera application—which modifies images to look like a hand-drawn sketch or changes the background of an image—is functionally equivalent to Paul. Both produce images that reflect the creative contributions of the designer of the

315. *See Google Translate*, GOOGLE, https://translate.google.com/ [perma.cc/QH8V-LMR9] (last visited July 31, 2019).

316. Google is similarly not the author of the resulting translation, because while Google's engineers may be responsible for *how* the algorithm produces the work, these engineers lack any conception of the content of the resulting work. Thus, Google Translate is a "partially generative" machine because it relies on its users to determine its output, and its designers cannot anticipate the outputs. *See supra* Section III.C.1 (discussing the difference between a "fully generative" machine and a "partially" generative machine); *infra* Part IV (discussing the "authorless" work and how automated translations fall into this category).

317. *See supra* notes 268–271 and accompanying text (describing Paul, the generative machine that generates sketches of human subjects in the style of Tresset, Paul's creator).

318. Boyden, *supra* note 207, at 385.

319. *See, e.g.*, Mallory Locklear, *Snapchat's new filters make your photo backgrounds look surreal*, ENGADGET (Sept. 25, 17), https://www.engadget.com/2017/09/25/snapchat-filters-make-backgrounds-look-surreal/ [perma.cc/PRL8-DSGQ] (describing a recently implemented feature of the app Snapchat which "allow[s] [users] to switch the real sky out [of their photographs] for something entirely different including a starry night, a sunset, one with a brewing storm or a sky with rainbows").

320. *See* Pixelab, *Sketch Camera*, GOOGLE PLAY APP STORE, https://play.google.com/store/apps/details?id=gr.pixelab.sketch&hl=en_US [perma.cc/MPG2-FX3J] (last visited Mar. 9, 2019) ("Sketch Camera" is an app suitable for photo editing).

tool (the application developer or Tresset) and the user of the tool (who directs the tool towards a particular subject for image capture).

In each of the above scenarios—when a user employs Paul to create a sketch of her friend, when that same user takes a picture of her friend with an ordinary camera, or when she uses a modified camera application to create a sketch-style image of her friend—the user both conceives of the content of the work, and wields the tool under her control. Like the amateur photographer described above, Paul's user influences both *what* the machine depicts and *how* it will create the image. While the user does not have any influence over Paul's algorithm, the user contributes acts of execution by framing the subject and by defining compositional elements like the subject's distance from the camera and the subject's expression. Two different users who attempt to use Paul to create two identical images of the same human subject (thus acting on an identical *conception*) will produce two different resulting images because of the differences in *how* the user positions the subject in front of Paul's camera (differences in the *execution*). Therefore, the sketches that Paul produces are works of sole authorship, attributable to the person who employs the machine to create the sketch.[321]

To be sure, determining whether the user of a machine sufficiently "executed" the resulting work may require some difficult line-drawing. Consider, for example, one of Google's latest product innovations: an autonomous camera called Google Clips.[322] Clips "is designed to look like a camera" and "has been trained to recognize facial expressions, lighting, framing, and other hallmarks of nice photos" and "familiar faces," can be "affixed to your jacket, set on a tabletop, carried in your palm or placed anywhere with a view," and "watches the scene, and when it sees something that looks like a compelling shot, . . . captures a 15-second burst picture."[323] The user must simply place Clips in a particular location and activate the device. Is the user's placement of the camera in a particular location an act of *execution*? The device's programmers, not the user, are responsible for some of the other elements one typically associates with photographic authorship, such

321. If, instead, Tresset designed his machine to create sketches from uploaded digital image files (rather than from images captured by the machine's camera), then Paul's outputs might be "authorless." The users who supply the image files would not "execute" the works; they have no influence over how Paul converts the image files into sketches.

322. Google, *A new angle on your favorite moments with Google Clips*, KEYWORD BLOG (Oct. 4, 2017), https://www.blog.google/topics/hardware/google-clips/ [perma.cc/2X3B-9TBU].

323. Farhad Manjoo, *The Sublime and Scary Future of Cameras With A.I. Brains*, N.Y. TIMES, Feb. 27, 2018, https://www.nytimes.com/2018/02/27/technology/future-cameras-ai-brains.html?smid=pl-share [perma.cc/46AE-99TG] Clips may present problems similar to those raised by security camera footage. *See supra* note 102.

as lighting, and, crucially, timing. The user does, however, frame and define the potential subjects of the resulting photographs—by placing the camera in a particular location, e.g., a kitchen counter or the handlebars of one's bicycle, the user essentially "points" the camera at a set of potential subjects. If a user placed the Clips device high atop a ledge in New York's Grand Central Terminal for 3 hours, Clips might "decide" to take a series of photographs at opportune times, when the lighting was just right, or when the framing of the crowds below made for a compositionally balanced picture. Is such a scenario materially different from a photographer who places an ordinary camera atop the same ledge and instructs it to take photographs at three-minute intervals for three hours? In the latter scenario, one may comfortably say that the photographer is the author of the photographs because she *executed* the pictures (by setting up the camera and setting the shutter timer). But in the former, one might feel less comfortable recognizing the user as an author—she has neither manipulated the camera's settings (i.e., focus, aperture, or shutter speed), nor is she responsible for the timing of the photograph. "Point and shoot" may together make one an author, but can the same be said about point without shoot?

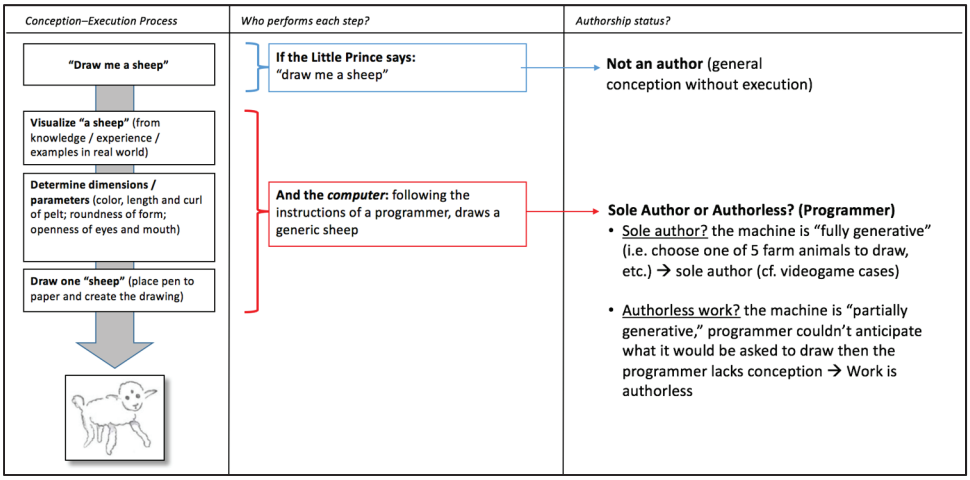
To answer these difficult questions, one might return to a basic definition of "execution." To satisfy the execution requirement, the person claiming authorship must be responsible for controlling the basic steps that will lead to the *manifestation of the key expressive elements of the work*. The executional significance of the users' acts may depend on what exactly is expressive about the resulting work. In other words, the execution inquiry might begin by analyzing what the expressive elements of the work are, and only then proceed to determine who is responsible for the executional acts that led to the creation of those elements. This is the same analysis that allows us to conclude that the user, not the programmer, of a picture produced on Microsoft Paint is responsible for the picture's execution—while Microsoft Paint's software developers are certainly responsible for the work's physical existence (i.e., the effects of the different brush or pencil tools, or the available colors), the *expressive elements* of the work are traceable directly to the user.

Returning to the Clips example: If the photograph's expressive content is traceable primarily to its placement, i.e., to its positioning on a ledge above a crowded train station, then perhaps the user who placed the camera there *executed* the photograph because her placement was the source of the photograph's expressive content. But if the photograph's timing primarily supplies its expressive content, for example, i.e., to the camera's capturing the

user's infant child's adorable smile, then perhaps the user's claim is weaker.[324] And if the user cannot establish that she executed the resulting image, the user similarly cannot "adopt" the expressive elements of the image as her own. In such a scenario, the image may be "authorless."[325]

The following figures summarize the framework discussed above for allocating authorship in machine-enabled works:

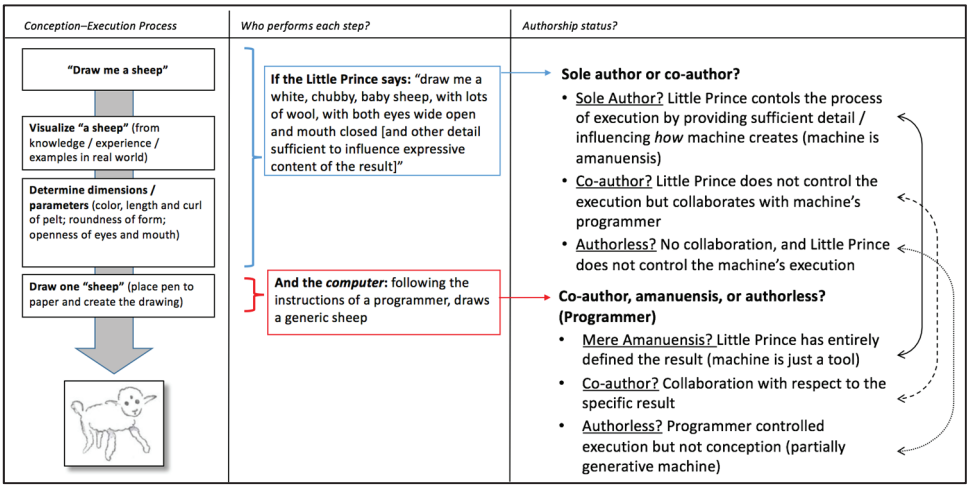
Figure 7: "Draw Me A Sheep" (Example 3: If the Little Prince had provided general instructions to a machine)



324. One might object that this solution is not administrable: how are courts to identify the expressive content of a particular work? While this approach certainly relies on some difficult line drawing, these types of questions are questions of fact and are thus suitable for resolution by judges or juries.

325. We will return to the concept of "authorless" works in the next Section.

Figure 8: "Draw Me A Sheep" (Example 4: If the Little Prince had provided specific instructions to a machine)



IV. THE AUTHORLESS OUTPUT

A. WHAT COMPUTER-ENABLED WORKS ARE "AUTHORLESS"?

Our approach delineates three categories of generative machines. Machines designed to create outputs which reflect *only* the creative contributions of the users are "ordinary" tools, and we should treat them in the same way we treat cameras, word processing programs, and other mechanical or digital adjuncts to the creative process. Machines which, instead, are capable of producing outputs with minimal user input are "fully-generative" in that their outputs necessarily flow from the creative contributions of the machines' designers—who, accordingly, are the authors of the resulting works, even if someone other than the machine's designer operates the machine. And machines which produce outputs reflecting the creative contributions of *both* the designer and the user are "partially-generative" in that the machines do not wholly generate the expressive content of the resulting works, but instead rely on the contributions of users.

If the user of the machine supplies her creative contribution without influencing *how* the machine translates that contribution into a final work, then the user does not *execute* the final work and thus cannot claim authorship.[326] And assuming that such a machine is truly "partially-generative"—i.e., that the designer of the machine cannot anticipate the resulting work without any prior knowledge of what the user will input into the machine—the designer of the

326. A person who supplies a fully formed conception, but does not *execute* how that conception comes into physical being, cannot claim authorship over the result. *See supra* notes 81–88 (discussing *Kelley*).

machine may also fail to satisfy the authorship test. This designer might claim to have executed the work, because she defined and controlled the process through which the work came into being. But without being able to anticipate the user's role, the designer cannot claim to have generated a complete creative plan for the work. Therefore, neither designer nor user would have a sufficient authorship claim.

But such a situation does not necessarily result in the work being "authorless." As shown in Part II, creators may combine their individual contributions to create a "joint work" even if their contributions, standing alone, would not rise to the level of authorial contributions.[327] But co-authorship doctrine does not allow for merger standing alone: at least for inseparable joint works,[328] co-authors must, at the time of each individual's creation, be aware of and influenced by each other's specific contributions. And in many cases involving partially-generative machines, the designer of the machine may *not* be aware of the (necessarily asynchronous) contribution of the user.

Therefore, there is a possibility of a set of "authorless" outputs that come into being through the participation of two or more non-collaborating actors, neither of whom have a sufficient claim of authorship. These outputs are not necessarily "machine authored" or "computer generated": as the Article has shown, machines (in their current form) are not capable of authorship.[329] These works are authorless because of the *lack of any author*, not because their authors are machines. Therefore, the existence of a human authorship requirement, often discussed in the literature surrounding computer-enabled works,[330] is irrelevant to the inquiry.

The musical accompaniments produced by Google's A.I. Duet, for example, may be authorless. The designers of the machine, who are fully responsible for training the machine's neural network with musical examples and tuning the algorithm, cannot claim to be the authors of the result because their creative plan for the work is incomplete: they cannot anticipate what the user will input into the program, and therefore the user's creative autonomy disrupts their authorship claim. And the users of the machine do not *execute* the musical accompaniment because the users do not control *how* A.I. Duet

327. *See supra* note 134 (discussing Gaiman v. McFarlane, 360 F.3d 644 (7th Cir. 2004)).

328. *See supra* Section II.F.4.

329. *See supra* Section III.A (discussing and rejecting the concept of machine authorship).

330. *See, e.g.*, Bridy, *supra* note 3, at 8 (discussing the human authorship requirement); Clifford, *supra* note 207, at 1682 (same); Miller, *supra* note 25, at 1060–67 (same); Denicola, *supra* note 4, at 265–69 (same).

analyzes the user-supplied melody and produces an accompanying musical line.

Similarly, the translations produced through translation algorithms may be authorless. The designers of the algorithm are responsible for *how* the algorithms convert text from one language to another, but cannot anticipate what the resulting work will be at the time of their participation in the creative process. And the users of the algorithm may supply the text to translate, but they do not influence *how* the algorithm translates the text. No matter how eloquent or accurate the translation, it will lack a human author.

Consider another hypothetical: a newspaper pays a technology company to develop a machine that will convert raw news agency reports into articles reflective of the newspaper's journalistic style.[331] The technology company will use the articles in the newspaper's archive to train the machine to emulate the writing style used by the newspaper, enabling the machine to convert a basic report of facts into an article reflecting the newspaper's reportorial and editorial biases.[332] If the editors of the newspaper simply supply the machine with a raw news report they purchase from a news agency, the editors do not control *how* the machine converts that report into the final publishable news article. Thus, the editors are not the authors of the output. Similarly, the programmers who create the machine do not have any conception of the expressive content of the output—it would be impossible for the programmers to anticipate the content of the resulting articles at the time of their participation in the process (i.e., when they program the machine). Unless the programmers and editors collaborate with respect to a specific resulting article (for example, if the programmers built the machine and worked with the editors to process a particular news report into a stylized article), the resulting outputs will be "authorless."[333]

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331. Newspapers often rely on raw news reports from news agencies, like Reuters, to provide the source material for their articles. *See* Paul Clough, *Measuring Text Reuse in the News Industry*, *in* COPYRIGHT AND PIRACY: AN INTERDISCIPLINARY CRITIQUE 247, 249–50 (Lionel Bently, Jennifer Davis & Jane C. Ginsburg, eds. 2010).

332. Note that this hypothetical is similar, although not identical to, the examples of machine-generated news reports mentioned earlier. *See supra* note 209. The existing examples of machine-generated news reports may not be "authorless" because the users of these machines may exercise control over *how* the machines work, and therefore these users may be conceptually equivalent to the users of sophisticated cameras (who are the authors of the photographs they produce).

333. As noted in note 312, *supra*, the "Next Rembrandt" is an example of a machine-enabled work created through a collaboration involving the designers of the machine and the people who use that machine to create a specific result. Because the scientists and art historians

Finally, consider the popular music service Pandora.[334] Users of Pandora create "stations" by providing Pandora with an artist, song, or composer whose music they enjoy. Pandora then generates a playlist of songs related to the users' input, and allows users to indicate whether they approve or disapprove of each song Pandora selects. Pandora's algorithm "crunches users' interests" to learn about each user's preferences, and uses the resulting knowledge to improve the playlists it generates.[335] Because the users do not control *how* Pandora processes their inputs (and because Pandora adds to those inputs by supplementing expressed user preferences with preference-predictive selections), the users are not the "authors" of the resulting playlists.[336] And Pandora's programmers, the most intuitive candidates for playlist authorship, do not have any conception of what the playlists will contain when they program the algorithm. Therefore, the resulting playlists' selection and arrangement of recorded performances, though they may resemble copyrightable compilations, are "authorless."

At first blush, the concept of an "authorless" output may seem novel—these products appear to possess sufficient "originality" to fall within the domain of copyright. But the *process* of creation, and not just the *result*, is relevant to the authorship inquiry.[337] Works like Chapman Kelley's *Wildflower*

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who created the "Next Rembrandt" collaborated with each other, the resulting painting is not "authorless."

334. PANDORA, https://www.pandora.com/ [perma.cc/Z8CX-XA2Y] (last visited July 31, 2019).

335. Tyler Gray, *Pandora Pulls Back the Curtain On Its Magic Music Machine*, FAST COMPANY (Jan. 21, 2011), https://www.fastcompany.com/1718527/pandora-pulls-back-curtain-its-magic-music-machine [perma.cc/PX3B-WUPQ].

336. To be clear, the playlists may be copyrightable (if sufficiently authored) as a compilation. *See* 17 U.S.C. § 103 (2018) ("The copyright in a compilation . . . extends only to the material contributed by the author of such work, as distinguished from the preexisting material employed in the work, and does not imply any exclusive right in the preexisting material."); § 101 (defining "compilation" as "a work formed by the collection and assembling of preexisting materials or of data that are selected, coordinated, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship"). The copyrightability of music playlists is uncertain. *See* Marc A. Fritzsche, *Copyrightability of Music Compilations and Playlists: Original and Creative Works of Authorship?*, 6 PACE INTELL. PROP. SPORTS & ENT. L.F. 258, 260 (2016) (noting that in the U.S., "it remains uncertain whether the act of compiling songs or arranging a playlist fulfills" the basic criteria of originality set out in Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340 (1991)). However, we assume that the playlists are copyrightable as compilations for the purposes of this argument.

337. *See* Ralph D. Clifford, *Random Numbers, Chaos Theory, and Cogitation: A Search for the Minimal Creativity Standard in Copyright Law*, 82 DENV. U. L. REV. 259, 271–72 (2005) (noting that "[i]n addressing copyrights and whether sufficient intellectual creativity is contained within the work, the primary focus should be on the product, although the process used to

Works and Kurant's termite mounds[338] may be "authorless" not because the *product* falls outside the subject matter of copyright, but because the *process* behind their creation was not sufficiently authorial.[339]

One might argue that copyright authorship doctrine should evolve in order to allow this class of machine-enabled "authorless" outputs to come within the scope of copyright. In the next Section, we investigate potential revisions to copyright doctrine that would permit the more relaxed definition of authorship necessary to include "authorless" machine-enabled outputs within the scope of copyright.

B. REEXAMINING AUTHORSHIP DOCTRINE TO AVOID THE CLASSIFICATION OF MACHINE-ENABLED OUTPUTS AS "AUTHORLESS"

As shown in Section IV.A, a machine-enabled output will be authorless when: (i) The designer of the machine, who programs and trains the machine and thus is responsible for *how* the machine executes its third party-given task, lacks adequate *conception* of the resulting output; (ii) the user of the machine, who employs the machine to produce the output, lacks any control over *how* the machine works, and thus lacks any role in the resulting work's *execution*; and (iii) the designer of the machine and the user of the machine are not co-authors because they have not contemporaneously collaborated to produce the output. Rather, the designer of the machine neither knows who the user is, nor what task she will assign the machine, and the user, once she has assigned the task, has no influence over its execution. This Section will investigate whether we might narrow or eliminate the class of machine-enabled "authorless" outputs by reinterpreting copyright doctrine to relax the requirements of authorship or co-authorship. This Section does not presume that such a reinterpretation is necessary or desirable—instead, this Section examines whether the Copyright Act *permits* relaxing authorship criteria. Consistently with the 1976 Copyright Act's "unifying theme" of technological neutrality,[340] any reinterpretations of

produce the work is also relevant" and that "[i]f only the product is examined with no examination of methodology of production, it will prove impossible to separate human-generated creative works from those generated by sophisticated computer programs based on autonomous artificial intelligence techniques"). *Cf.* Denicola, *supra* note 4, at 273 ("[A] work's contribution to the public welfare does not seem dependent on the process that produced it.").

338. *See supra* Section II.C (discussing Agnieszka Kurant's art comprised of colored termite mounds).

339. *See supra* notes 81–88 (discussing Kelley v. Chicago Park District, 635 F.3d 290 (7th Cir. 2011)).

340. 4 NIMMER ON COPYRIGHT § 12A.16(b), *supra* note 5.

authorship doctrine must apply equally in the traditional and generative-machine contexts.

If the outputs of partially-generative machines did qualify as "joint works," they would fall into the category of "inseparable" joint works because the contributions of the machine's user and designer cannot be disaggregated into individual expressive contributions.[341] This Article's earlier exploration of joint works in Section II.F suggests that Congress lacked any specific intent regarding *non-collaboratively* created inseparable joint works, largely because it is unlikely to have imagined such creations.[342] However, partially-generative machines offer the possibility of asynchronous combinations of sub-copyrightable contributions into inseparable works.[343] In assigning the machine a task, the user may be contributing no more than ideas, and the machine designer's contribution represents neither a "work" nor sub-copyrightable components (because it exists only in latent form).[344] If Congress did not anticipate "inseparable" joint works produced through a combination of non-copyrightable contributions of multiple unacquainted co-authors, might the definition of joint works nonetheless encompass them?[345] The

341. *See supra* note 133 and accompanying text (defining "inseparable" joint works as works which cannot be disaggregated into individual component parts).

342. *See supra* Section II.F.2 (suggesting that examples of non-collaboratively produced inseparable joint works were rare, and perhaps impossible, before the introduction of sophisticated generative machines).

343. While in the "analog" world, asynchronous creation by definition would require the individual contributors to supply independent and distinct contributions to a joint work, which could then be merged into an "interdependent" whole. *See id.*

344. Note, however, that in the "partially-generative" machine context, the machine's designer will be unable to claim sole authorship because the machine's production of an output will depend on a user's input of some creative contribution that the designer could not have anticipated. If the machine's production of an output does *not* depend on the user's input of some creative contribution—if the machine is capable of producing a work at the push of a button, or after the user has chosen among a set of limited parameters—then the machine, like Harold Cohen's AARON, is "fully-generative" and the machine's output is a work of sole authorship attributable to the machine's designer. *See supra* Section III.C.1 (discussing the difference between fully- and partially-generative machines). The same analysis would apply in the traditional context: for example, the author of the Choose Your Own Adventure books remains the sole author despite offering readers choices about how to arrange the plot elements.

345. In other words, might the 1976 Act's definition of joint works to exclude works created by multiple creators who are unacquainted with one another apply only to joint works of the "interdependent" variety?

unacquainted participants do, after all, intend to merge their contributions, through the aid of the machine, into a "unitary whole."[346]

In support of that contention, the policies against recognizing noncollaborative joint works evoked in Section II.F do not apply to inseparable machine-enabled authorless works.[347] Extending co-authorship to two sequential contributors who are "strangers to each other" would not allow the second author to lay claim to a pre-existing work (because there is no pre-existing work). For the same reason, denying co-authorship to asynchronous unacquainted contributors would not leave each contributor with separately copyrightable contributions to fall back on. Rather, unless Congress revisits concepts of joint authorship in order to allow protection for inseparable contributions by asynchronous unacquainted contributors, then many machine-enabled outputs will not be works of authorship at all.

This enlargement of the universe of co-authors would narrow (but not eliminate) the class of "authorless" computer-enabled works; as long as the user contributed some copyrightable expression, the user and the designer could be co-authors (one supplying the detailed conception, the other supplying the execution, respectively) even if they were "strangers to each other." If the statutory definition can embrace both asynchronous intent and ignorance of fellow contributors, then the machine's programmers and data trainers might qualify as one half of the co-authorship equation, for they intend for unknown future users to employ the machine to produce whatever outputs it enables. The users will not have encountered the programmers and data trainers, and may assign tasks to the machine long after the latter have prepared the machine for others' use, but if the users' definition of the task transcends a mere command ("Draw me a sheep!") and furnishes adequate expressive details (elaborated characteristics of the sheep to be drawn), then they might constitute the other half of the equation, since their employment of the machine manifests their intent to merge their contributions with those of the upstream contributors.

346. Of course, if the contributions must be independently copyrightable, as some Circuits require, few if any outputs of partially-generative machines could be considered joint works. *See* authorities cited *supra* note 185.

347. *See supra* Section II.F.3 (noting that the 1976 Act's legislative repeal of the Second Circuit cases like *Marks* and *12th Street Rag* was motivated by a desire to prevent later authors from "bootstrapping" an ownership stake in a previously created work by claiming that her contribution combined with the existing work to form a "joint work," and noting that Congress's post-1976 Act rule did not cause works to fall outside of copyright because each asynchronous creator could claim sole authorship in her individual contribution).

1. Joint Authorship

Interpreting the statutory definition of joint works to encompass non-collaborative contributions that produce an inseparable unitary whole will not entirely eliminate the class of "authorless" machine-enabled outputs. When creative participants work together to combine individually unoriginal contributions, their collaboration can endow the whole with originality that the parts lacked.[348] But if collaboration supplies the alchemy that turns the combination into authorial precious metal, then absent collaboration, the individual contributions remain uncopyrightable dross. For example, if a user employs a partially-generative machine to create a work, but the user supplies little more than an unprotectable idea to the machine (i.e., "draw me a sheep" or "translate this text from the German") then the user cannot be considered an author (even a co-author) because that user's contribution does not set out a creative plan, and because "collaboration" requires more than merely issuing a command.

Suppose, however, that user follows up her initial command by "tweaking" the results. Like the Little Prince, who rejected the aviator's initial sheep sketches, suppose the user specifies her dissatisfactions with each output and keeps "sending the machine back" to redo the drawing until it produces an image that corresponds to the user's wishes (wishes that may have evolved during the process of image elaboration).[349] In the traditional context, this interaction between the Little Prince and the aviator might suffice to make the former a genuine collaborator, rather than a mere idea-proposer.[350] The final drawing will inseparably merge the pair's contributions. But the peremptory Prince and the long-suffering aviator both are acquainted (though the acquaintance arises from the encounter in which the Little Prince issues his commands) and contemporaneously work together to satisfy the Prince's demands. Moreover, no matter whether the Little Prince's interventions make him a co-author, the aviator's authorship remains a constant.

348. *See* discussion *supra* Section II.F.5.

349. The process described here differs from the relationship of Calder and his welders, *see supra* notes 118–120 and accompanying text, because Calder there provided two-dimensional sketches documenting the intended sculpture.

350. But maybe not: for example, case law generally rebuffs the authorship pretentions of architects' clients who claim co-authorship because they instructed the architect to change the location of the stairs or the closets. *See* Meltzer v. Zoller, 520 F. Supp. 847, 857 (D.N.J. 1981) (holding a plaintiff who had commissioned an architect to design a home, and who had "contributed ideas and made certain changes" to the home's design, was not the "author" of the resulting design because "consultation between client and architect, including . . . coordination of the client's desires in the plans, is typical in the architectural profession").

In situations involving partially-generative machines, the task-assigning user's reiterative issuance or refinement of her instructions to the computer function similarly to the Little Prince's orders, but the analogy to the traditional context otherwise falls short. Here, the user is not acquainted with the programmers and data trainers behind the machine, nor are they contemporaneously working together to satisfy the user's demands. Moreover, while the aviator's authorship of his drawing, with or without the Little Prince's continued input, is not in question, it is not at all clear, for the reasons explored in Part III, that sole or partial authorship of the machine-enabled output can be attributed to the programmers and data trainers. As a result, the machine (or, more correctly, the upstream humans behind it) does not provide an expressive contribution with which the user can merge her arguably expressive input. If neither participant supplies sufficient copyrightable expression, their combination would be copyrightable only if we characterized the iterative process as a collaboration adequate to transform otherwise uncopyrightable inputs into a copyrightable "unitary whole."[351] If the programmers have designed the machine to respond to the user's sequential demands, even though the user does not interact with the programmers, can we call the output the result of a "collaboration"?[352]

To characterize the user's repeated interaction with the machine as a kind of virtual collaboration between the user and the machine's designer strains the 1976 Act's assumptions regarding not only the temporal but also the expressive dimensions of the contributors' interactions. "Collaboration" implies more than the "back and forth" of the iterative process that a "tweakable" program implements; collaborators influence each other's contributions.[353] Even if one participant does not rewrite another's contribution, each participant modifies (or at least considers modifying) her own contribution in light of her co-authors' perceptions, suggestions, or objections. By contrast, a partially-generative machine's recurrent prompts may orient the user's choices, but nothing the user does can alter the pre-

351. *See supra* notes 183–184 and accompanying text (arguing that collaboration transforms insufficient contributions into those capable of supporting the claim of co-authorship).

352. Even if one entertained the possibility that asynchronous contributions might form a joint work so long as each participant intended "at the time [each] writing is done" that his or her contributions would be merged into a unitary whole, the partially-generative machine scenario goes a step farther: the contributors neither decide simultaneously to merge independently expressive contributions (to form an "interdependent" joint work), nor do they work together at the same time to create an expressive work (to form a "inseparable" joint work). The scenario thus corresponds to neither of a coauthor's traditional salient acts.

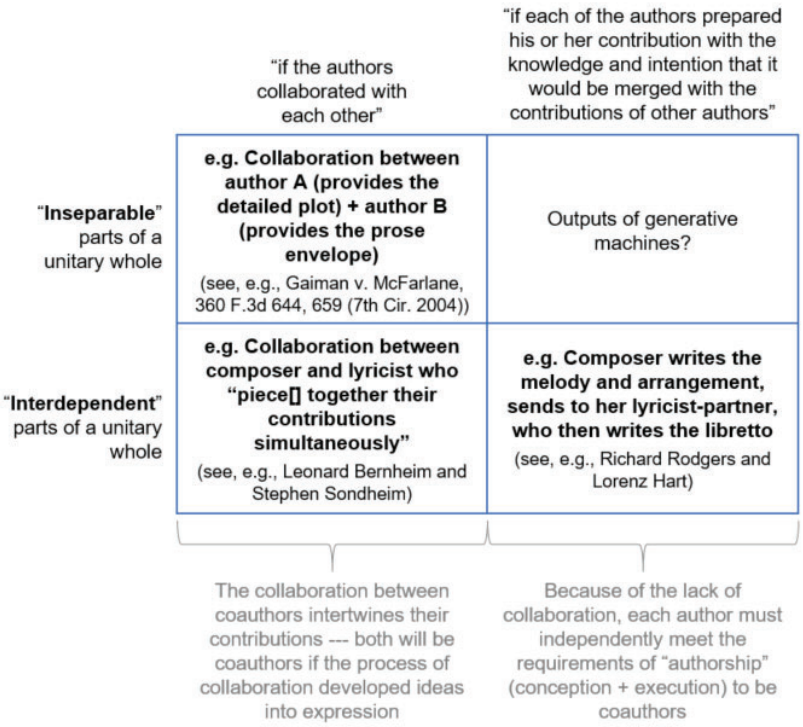
353. *See supra* Section II.F.5 (noting that collaboration implies an intertwining of each contributor's contribution).

determined options the computer offers the user. The user's relationship to the machine resembles that of the reader of a "Choose your own adventure" story. The reader may at multiple points select from among a variety of story lines, but the resulting tale remains confined to the range of possibilities contained within the book.

If one cannot characterize the coordinated creation of an output by the designer of a machine and its user as "collaboration," then both participants necessarily lack the requisite elements of "authorship" if neither has both conceived of and executed the work. It is therefore unlikely that the 1976 Act welcomes interpreting its definition of joint works to encompass the inseparable combination of unacquainted persons' asynchronous non-copyrightable contributions (virtual or otherwise).[354]

354. Moreover, recognizing joint authorship between machine designers and machine users may create administrability problems. Finding joint authorship would mean that both the designer and the user could unilaterally grant non-exclusive licenses to third-parties for the exploitation of the work. *See* Davis v. Blige, 505 F.3d 90, 100 (2d Cir. 2007) ("A co-owner may grant a non-exclusive license to use the work unilaterally, because his co-owners may also use the work or grant similar licenses to other users and because the non-exclusive license presumptively does not diminish the value of the copyright to the co-owners."); Meredith v. Smith, 145 F.2d 620, 621 (9th Cir. 1944) (noting that a "co-owner would have had the right to give permission" for nonexclusive use of a copyrighted work). But a co-owner of copyright who grants a non-exclusive license "is accountable to his co-owner for income gained by the grant of the license." *See Davis*, 505 F.3d at 100. Therefore, if the machine's user is a co-author, then (absent a contractual arrangement with the designer-coauthor) she may not grant a non-exclusive license to use the resulting work without providing compensation to the designer-coauthor. Moreover, neither co-author may grant exclusive licenses to exploit the work without the consent of the other co-author(s). *See id.* at 101 ("[A] co-owner cannot unilaterally grant an exclusive license."). However, many of these issues could be resolved by a license agreement between the machine's designer and user. *Cf.* Miller, *supra* note 25, at 1059 (noting that "the employment relationship and bargaining among the interests involved" may solve difficult problems arising from the unclear apportionment of ownership of copyright in computer-generated works).

Figure 9: Absent collaboration, designer and user must each meet the authorship requirements independently



2. Sole Authorship

For some commentators, in any event, joint works status would not suffice; they would go farther to argue that the user of a generative machine is the *sole* "author" of the resulting work, even if that user contributes very little to the conception and execution of the work.[355] But as we have noted, copyright doctrine is technologically neutral;[356] denominating the user who

355. Denicola, *supra* note 4 at 284 ("If computer-generated works . . . are owned by someone other than the user of the computer—or are not copyrightable at all—it becomes necessary to distinguish situations where the computer is merely a tool of a human creator from those where the computer is itself the creator. This is an obviously difficult, indeed indeterminate, and ultimately pointless endeavor."); *id.* at 286–87 (concluding that "[a] computer user who initiates the creation of computer-generated expression should be recognized as the author and copyright owner of the resulting work"); *see also* Samuelson, *supra* note 206, at 1200–04, 1227–28 (1986) (noting that even though the user may not have contributed sufficient authorship under traditional copyright analysis, policy reasons favor granting authorship to the user who is the "instrument of fixation for the work, that is, the person who most immediately caused the work to be brought into being").

356. 4 NIMMER ON COPYRIGHT § 12A.16(b), *supra* note 5.

merely supplies an idea or a command an "author" would produce anomalous results in the traditional copyright world. Consider the following:

- If X asked Y (a human) to produce a poem in iambic pentameter about the moon, Y would be considered the sole author (assuming the work for hire doctrine does not apply) of the resulting poem because X has supplied no expressive elements.
- But if X asked Z (an algorithm) to produce a poem in iambic pentameter about the moon, X would be considered the author-in-fact, even though X provided no more expression here than she communicated to Y.[357]

Vesting authorship in the task-assigner not only would sidestep the requirement that authors contribute "expression," and not merely "ideas" (i.e., that they furnish an elaborated *conception*); it would also forego the requirement that authors control the process of *execution*. As we have seen, a task-assigner who does no more than give a command does not intervene in the actual production of the output; he leaves it to another human being (for example, the Little Prince's aviator) or to the machine to make all creative choices within the broad contours of the command. But if a user who did not control a generative machine (because that user had no influence over *how* the machine produced its outputs) nonetheless could be the author of the output, then that result would clash with decisions such as *Kelley v. Chicago Parks District*, in which Kelley's authorship claim failed because he did not control the random forces to which the court attributed the work's sole execution.[358]

Therefore, even if authorship claims did not require actual collaboration among an alleged joint work's participants, relaxing that co-authorship criterion would not suffice to anoint authors of many machine-enabled outputs. To achieve that end, it would also be necessary either to abandon the hallmarks of authorship in the traditional copyright world, or to rescind the fundamental principle of technological neutrality in order to create specific rules for machine-enabled authorship.[359] Because Congress has repeatedly

357. For example, if the Google Translate user were considered the author of the resulting translation, then such a user would earn authorship simply by supplying a basic idea (i.e., translate this text into Spanish).

358. *See supra* notes 81–88 (discussing Kelley v. Chicago Park District, 635 F.3d 290 (7th Cir. 2011)).

359. For an argument that technological neutrality is a misguided policy, see generally Greenberg, *supra* note 1 (questioning "the expedience of technological neutrality as embodied by the 1976 Copyright Act" and arguing that technology neutrality is "both suboptimal and often self-defeating" and that "technological discrimination, a combination of neutrality and specificity, can better serve broader copyright and innovation policy goals").

affirmed its policy that basic copyright rules continue to apply to new technological environments,[360] however, this Article does not advocate technologically variable standards of authorship in order to allow that which fails to satisfy the traditional copyright goose to suffice for the generative-machine gander.

V. CONCLUSION: IF NOT COPYRIGHT, THEN WHAT?

This Article has identified four ways to allocate authorship when individuals use machines to create works. First, and most commonly, one might attribute sole authorship to the user of the machine.[361] If a creator utilizes a passive machine—call it an "ordinary tool"—whose designer does not creatively contribute to the content of the resulting work, then that creator-user is necessarily the only author of the work produced through the aid of that machine. In these circumstances, "it is . . . the thought of the artist [—and *only* the artist—] which directs the instrument, which guides and inspires the material means" through which the work comes into being.[362] Therefore, there is no cause to doubt the claim of authorship—even though "the [camera] takes the place, though not entirely, of hand labor," "it leaves to the artist, to its fullest extent, the labor of the mind."

Second, if a person builds a machine capable of producing outputs without any creative contributions supplied by the machine's user or operator, then the designer of such a machine is the author of the machine's outputs.[363] There may be multiple people involved in the construction of these "fully-generative" machines—engineers, coders, and data trainers, for example—but the "designer" of the machine and the author of the resulting output is the

360. *See, e.g.*, 17 U.S.C. § 102(a) (2018) ("Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, *now known or later* developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device.") (emphasis added); § 101 (defining "[t]o perform or display a work 'publicly' " to include the transmission of "a performance or display of the work . . . *by means of any device or process*") (emphasis added); H.R. REP. NO. 94-1476 (noting that 17 U.S.C. § 106 incorporates the technology-neutral definitions in 17 U.S.C. § 101 to avoid "confining the scope of an author's rights on the basis of the present technology") (quoting STAFF OF THE H. COMM. ON THE JUDICIARY, 89TH CONG., COPYRIGHT LAW REVISION, PART 6: SUPPLEMENTARY REP. OF THE REGISTER OF COPYRIGHTS ON THE GEN. REVISION OF THE U.S. COPYRIGHT LAW: 1965 REVISION BILL 14 (Comm. Print 1965)); Greenberg, *supra* note 1 at 1514 ("Among numerous radical changes that Congress adopted in the 1976 Copyright Act was the principle of technological neutrality.").

361. *See supra* Section III.B.1 (discussing "ordinary tools").

362. Pouillet on Photography, *supra* note 35.

363. *See supra* Section III.B.2 (discussing "fully-generative" machines).

individual (or set of individuals) who endowed the machine with the training and the creative raw material requisite to the machine's generation of a "creative" output.

Third, if the machine in question is "partially-generative"—that is, the machine's outputs reflect the creative contributions of both designer and user—then works produced through the use of the machine may be "joint works" if the designer and user collaborate with each other to create the specific result.[364]

But, fourth, if the designer and the user do not collaborate with respect to a specific result—for example, if the designer builds and trains the machine and then sells or licenses it to a user, who employs it without the designer's involvement—and neither contribute expression sufficient to form an "original work of authorship," then the resulting output may be "authorless."[365]

A machine-enabled output will be "authorless" under the following conditions. First, the designer of the machine cannot claim sole authorship of the work. If, however, the designer of the machine can anticipate what the user will do to coax an output out of the machine (for example, if the user has only a limited set of options or parameters to choose from), then the machine is "fully generative" and the designer is the author of the output.[366] Second, the user of the machine does not control the machine's executional process. If the user controls *how* the machine works—rather than simply designating *what* the machine produces—then the machine is just an "ordinary tool" and the user is the sole author of the resulting work because she both *conceived* of the work and *executed* it.[367] Lastly, the designer of the machine and its user do not actually collaborate in real time with respect to the specific work in question.

If a work meets the above criteria, then the work in question is "authorless" even if the work appears indistinguishable from other works which fall under the protection of the Copyright Act. Because no human participant would meet the requirements of "authorship," and because the contributors to the work's creation cannot claim to be collaborative co-

364. *See supra* Section II.F.5 (discussing co-authorship doctrine as applied to the generative-machine context). For example, the scientists and art historians behind the "Next Rembrandt" collaborated closely to both create the generative machine and use the machine to create their new Rembrandt. *See* Nudd, *supra* note 213.

365. *See supra* Section IV.A (discussing "authorless" works).

366. *See supra* Section III.C.1.c) (discussing the distinction between fully- and partially-generative machines).

367. *See supra* Section III.C.2 (discussing the execution element and machines which may be partially-generative).

authors, the work is not a "work of authorship" and thus falls outside of copyright's domain.[368]

This analysis of non-copyrightability may provoke dissatisfaction. After all, if only the *process* through which these otherwise indistinguishable works come into being renders them "authorless," it seems anomalous to treat apparently identical works so differently. One might therefore argue that if the copyright law cannot deem these authorless outputs true works of authorship,[369] then Congress should provide some copyright-like protection notwithstanding the lack of an author.[370] What would be the theoretical basis for a copyright-like regime? Any justification for full or partial copyright protection must rely on instrumentalist theories of intellectual property.[371] (Copyright's other theoretical prong, the natural or personality rights of the author,[372] cannot apply if there is no author.) Instrumentalists might argue that without copyright-like protection, there exist no incentives for machine-creators and

368. *See* 17 U.S.C. § 102(a) (2018) ("Copyright protection subsists . . . in original works of authorship.").

369. For arguments that these outputs should be treated as works of authorship, see, e.g., authorities cited in *supra* note 355.

370. *See, e.g.*, Sam Ricketson, *The 1992 Horace S. Manges Lecture: People or Machines: The Berne Convention and the Changing Concept of Authorship*, 16 COLUM. J.L. & ARTS 1, 36–37, 38 (1991) (arguing against the degradation of the human-centered philosophy of authorship, and suggesting that producers might "obtain strong and effective protection under a neighboring rights or *sui generis* regime"); McCutcheon, *supra* note 122, at Part VIII (2013) (suggesting a *sui generis* regime for protection of "authorless" computer-generated works); *see also* Ramalho, *supra* note 229, at 21–22 (arguing that the outputs of artificially intelligence machines which lack a human author should fall into the public domain, but advocating for the establishment of a "disseminator's right" to "incentivize" those "who disseminate AI creations" similar to the publisher's right in the publication of previously unpublished works in the EU).

371. *See* Rebecca Giblin, *A New Copyright Bargain? Reclaiming Lost Culture and Getting Authors Paid*, 41 COLUM. J.L. & ARTS 369, 373 (2018) ("Instrumentalist theories justify copyright as a way of achieving social and economic aims, putting the public interest at the forefront. [By contrast,] [n]aturalist approaches assume that authors' contributions of intellectual labor or personality give rise to rights to rewards in their own right (and arguably above and beyond the amount necessary to incentivize the work).").

372. *See, e.g.*, ROBERT MERGES, JUSTIFYING INTELLECTUAL PROPERTY 150–53 (2011) (arguing that "efficiency is not capable of serving as a stand-alone foundation for IP rights"); Justin Hughes, *The Philosophy Of Intellectual Property*, 77 GEO. L.J. 287, 330 (1988) (describing the "personality justification" for intellectual property, which "posits that property provides a unique or especially suitable mechanism for self-actualization, for personal expression, and for dignity and recognition as an individual person" and noting that according to this theory, "an idea belongs to its creator because the idea is a manifestation of the creator's personality or self"); Edwin C. Hettinger, *Justifying Intellectual Property*, 18 PHIL. & PUB. AFF. 31, 51 (1989) ("Natural rights to the fruits of one's labor are not by themselves sufficient to justify copyrights . . . though they are relevant to the social decision to create and sustain intellectual property institutions.").

machine-users to invest time and effort in the production of outputs. And without proper incentives, society at large might be deprived of outputs from which it might otherwise derive great and lasting value.

But we should not assume that we need copyright-like protection to stimulate the production of authorless outputs. Absent an author, the premise underlying incentive justifications requires substantiation. One must inquire whether these outputs in fact need the impetus of exclusive rights, or if sufficient incentives already exist, for example higher up the chain, through copyright or patent protection of the software programs, patent protection of the specialized machinery to produce different kinds of outputs, and copyright protection of the database the software consults. Trade secrets and contracts may also play a role in securing the outputs.

That said, these forms of protection lack something that copyright—or a *sui generis* regime for the protection of authorless outputs—would provide: protection directly against copying of the outputs by parties not in privity with the designers or users of the machines. The copyright alternatives this Article has evoked may control *access to the machine*, but will not control third-party *access to the output* created by the machine. In other words, while patent or software-copyright protection might protect against copying a firm's means of producing the output, and trade secret or contract law might constrain a firm's customers' exploitation of the outputs, only copyright-like protection protects the outputs themselves from third-party copying.[373]

The need for copyright-like protection will depend on an analysis of the type of output in question. For example, there may not be an autonomous market for outputs which derive their commercial value from customization (such as bespoke computer-generated music designed to match the narrative peaks and troughs of a film). As to these outputs, extant intellectual property protections of the upstream process and its components may suffice. But commercially free-standing outputs whose value derives from their content (such as computer-generated news reports) may face a high risk of unauthorized third-party exploitation; perhaps their commercial viability depends on some form of copyright-like protection. We can conjure up a variety of scenarios supporting or debunking the call for *sui generis* protection, but without empirical evidence, it would be imprudent (and premature) to seek to design a regime to cover authorless outputs.

373. The producer of the outputs might employ technological protection measures to discourage copying, but the law will not prevent the "hacking" of these safeguards because 17 U.S.C. § 1201 protects only against circumvention of measures that protect "a work protected under this title." Authorless outputs are not "original works of authorship" protected under Title 17.