

The Evolution of Authorship: Work Made by Code*

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Hi, it's great to be here. I want to thank Jane and June for the invitation and for what's turning out to be a really wonderful collection of comments and thoughts.

When I first started thinking about the problem that computer authors might present for copyright law, I thought I was thinking about a uniquely twenty-first century problem. As it turns out, though, computer authorship is sort of an old problem for copyright law, with a history that goes back to the early days of computing.

In 1956, two mathematicians named Martin Klein and Douglas Bolitho programmed a Datatron digital computer to compose Tin Pan Alley songs. "Last spring," Dr. Klein wrote in the June 1957 issue of *Radio Electronics Magazine*, "we set out to prove that if human beings could write popular music of poor quality at the rate of a song an hour, we could write it just as bad with a computing machine but faster."¹ Much faster, as it turned out. A Datatron could write four thousand songs an hour.² The only problem that Klein and Bolitho encountered in their digital composing project was that the Copyright Office refused registration for "Push Button Bertha," one of Datatron's many compositions. The reason the Office gave at the time was that no one had ever before tried to register a piece of music written by a machine. The rejection, for which the Office didn't offer—and couldn't have offered—any statutory basis, revealed a deep-seated if unspoken assumption that authors are necessarily human.³

Klein's article in *Radio Electronics Magazine* featured a flowchart of the Datatron's composing process.⁴ The program employed six rules: three were derived from a study of a year's worth of top 100 songs from *Variety* magazine;

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1. Martin L. Klein, *Syncopation in Automation*, RADIO-ELECTRONICS, June 1957, at 36.

2. *Id.*

3. By 1973, which brought publication of the first *Compendium of U.S. Copyright Office Practices*, that assumption had become explicit. See U.S. COPYRIGHT OFFICE, COMPENDIUM OF COPYRIGHT OFFICE PRACTICES (FIRST) § 2.8.3 (1st ed. 1973) (stating that works are not copyrightable if they do not "owe their origin to a human agent").

4. *Id.*

the other three came from Mozart's rules for writing melodies. The first note chosen by the program corresponded to a number from zero through nine on a random number table. If the chosen note satisfied all six rules, it was retained in the computer's memory; subsequent notes were also chosen randomly and then tested against the rules. The program continued to choose, test, and store notes until a composition that satisfied all of the rules was completed. The algorithm was obviously rudimentary, but it was early proof of concept for generative code, and it marked the beginning of a computer music movement that would reach a peak decades later in the work of programmer-musicians like David Cope.⁵

In 1965, Register of Copyrights Abraham Kaminstein identified the question of computer authorship as one of three major problems confronting the Copyright Office.⁶ A number of people filed copyright registrations that year for works at least partly authored by computers, and the Office found itself at a loss for how to deal with the situation. Fast forward to 1974: With the computer revolution gaining momentum, Congress created the National Commission on New Technological Uses of Copyrighted Works (CONTU) to study the intersection of copyright law and new technologies. Among the specific topics CONTU was asked to study was the creation of new works with computer assistance.

When CONTU published its Final Report in 1978, it recommended that no changes be made to existing copyright law to accommodate new works created with computers.⁷ The Commission raised and quickly dismissed the possibility that works could be created independently by computers. It concluded three things: that computers were nothing more than inert tools of creation, that the development of artificial intelligence was too speculative to worry about, and that there was no reasonable basis for concluding that a computer in any way contributes authorship to a work produced through its use.⁸

In 1986, the Congressional Office of Technology Assessment (OTA) revisited the question of computer authorship.⁹ The OTA's report was critical of CONTU's conclusion that computers are inert tools of creation like cameras or typewriters.¹⁰ The report emphasized the increasing sophistication of computer programs and the interactive nature of computing, raising the possibility that computers in some

5. In the 1980s, Cope's EMI (Experiments in Musical Intelligence) program produced complex and aurally convincing compositions in the style of classical composers like Mozart and Chopin. See DAVID COPE, *VIRTUAL MUSIC: COMPUTER SYNTHESIS OF MUSICAL STYLE* 93–108 (2001).

6. REGISTER OF COPYRIGHTS, *SIXTY-EIGHTH ANNUAL REP. OF THE REGISTER OF COPYRIGHTS* 4 (1966) ("The Copyright Office was confronted with three major problems during the fiscal year as a result of the constantly expanding development and use of computers: registration for computer programs, computer authorship, and automation in the Copyright Office.").

7. NAT'L COMM'N ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, *FINAL REPORT* 44 (1978), <http://eric.ed.gov/PDFS/ED160122.pdf> [<https://perma.cc/9ASG-HNDF>].

8. *Id.*

9. U.S. OFFICE OF TECH. ASSESSMENT, *INTELLECTUAL PROPERTY RIGHTS IN AN AGE OF ELECTRONICS AND INFORMATION* (1986), <https://www.princeton.edu/~ota/disk2/1986/8610/8610.PDF> [<https://perma.cc/RN5U-HY3H>].

10. *Id.* at 72.

instances should be regarded as co-creators.¹¹

While it's true that robots don't yet run the world, computer systems dedicated to particular tasks have continued to get smarter and more independent over time. Some of these systems are designed to produce works that fall under the rubric of algorithmic or generative art. Practitioners of generative art take a systems-approach to artistic production, removing their own personalities from the creative process and ceding control to self-executing algorithms. Often, these artists employ computers to run their algorithms, but sometimes they don't. Sometimes they compose algorithmically by hand, challenging traditional constructs of artistic inspiration by highlighting the rule-bound nature of human creativity. As Anne Balsamo has pointed out, the term "computer" was originally coined to describe human beings, an irony that many of us don't appreciate.¹² The first "computers" were actually female clerical workers who operated mechanical adding machines.

In the realm of popular culture, procedural generation techniques are being used more and more in the design of computer games.¹³ These techniques promise the development of the endless game, where the user never runs out of levels to complete or terrain to explore because the game itself is generating new content as it's being played. In the generative art domain, an AI program called AARON provides a good basis for discussing the problems and possibilities associated with computer authorship. AARON's underlying code was written by Harold Cohen beginning in 1973. Cohen, an art professor at the University of California, San Diego, spent the next thirty years of his career refining AARON's code and basically "teaching" AARON about color, representation, and form.¹⁴ AARON's works, which are generated autonomously by Cohen's program, have been exhibited in galleries around the world and are on permanent display at the Computer [History] Museum in Boston.¹⁵ As Cohen revised AARON's code over time, AARON's output evolved stylistically from representation to abstraction—the type of developmental arc that one might expect of a human artist. Indeed, it was Cohen, through AARON's changing code, who redefined the outer bounds of AARON's artistic capacity.

There's certainly no question that Harold Cohen is the author of AARON's code and that AARON's code is copyrightable as a literary work.¹⁶ That's a completely

11. *Id.* at 70.

12. ANNE BALSAMO, *TECHNOLOGIES OF THE GENDERED BODY: READING CYBORG WOMEN* (Duke Univ. Press 1995); see OXFORD ENGLISH DICTIONARY, <http://www.oed.com/view/Entry/37975?redirectedFrom=computer#eid> [perma.cc/Z2KU-ZVTC] (last visited Jan. 26, 2016) (defining "computer" as "a person who makes calculations or computations; a calculator, a reckoner; spec. a person employed to make calculations in an observatory, in surveying, etc.").

13. See KUMAR ASHOK, *ALGORITHMIC AND ARCHITECTURAL GAMING DESIGN: IMPLEMENTATION AND DEVELOPMENT* 24 (2012) (explaining the increasing complexity of computer-generated aspects in games today).

14. See, e.g., STUART MEALING, *COMPUTERS AND ART* 34–37 (2002); PAMELA MCCORDUCK, *AARON'S CODE: META-ART, ARTIFICIAL INTELLIGENCE, AND THE WORK OF HAROLD COHEN* (1991).

15. LINDA CANDY & ERNEST EDMONDS, *EXPLORATIONS IN ART AND TECHNOLOGY* 270 (2012).

16. See *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240, 1249 (3d Cir. 1983) (holding that the source and object code of computer programs are copyrightable literary works).

uncontroversial copyright proposition. But is Cohen also properly regarded as the author of AARON's paintings? He doesn't lift a finger to create them, after all, and he can't even predict precisely what they'll look like. In copyright terms, he doesn't "fix" the works in a tangible medium of expression, and the act of fixation, as we know, is one defining attribute of authorship under the Copyright Act.¹⁷ Can we say that AARON's code is the author of AARON's paintings? If so, what does that mean for their copyrightability?

As we've heard already this morning, who or what can be an author for purposes of the Copyright Act is ultimately a constitutional question. Congress has constitutional authority to create exclusive rights in the *writings* of *authors*.¹⁸ And historically, courts have construed these words liberally, but always with reference to human genius or intellect. Going back to the early cases, we get the image of the author as maker or originator in *Burrow-Giles Lithographic Co. v. Sarony*.¹⁹ In *Bleistein v. Donaldson Lithographing Co.*, the author is figured as the embodiment of a unique personality that mystically passes into a work as it is created.²⁰

Our contemporary law of authorship comes from the Supreme Court's decision in *Feist Publications, Inc. v. Rural Telephone Service Co., Inc.*²¹ Under *Feist*, a protectable work has to be original in the sense that it's not copied and has to show some creative spark, whatever that means.²² Maybe creativity in copyright law is like obscenity in First Amendment law—hard to define precisely but you know it when you see it. As Michael Madison has argued, "*Feist* represents the apotheosis of copyright law as creativity law."²³ The definition of creativity is critical, then, to the question of copyright for computer-created works. If we define creativity as a quintessentially human faculty, then computers can never be authors, and we can basically stop there. But if we define creativity alternatively as a set of traits or behaviors, then maybe creativity can be coded.

One critique of artificial intelligence going back to the days of Charles Babbage's Analytical Engine is that computers don't originate anything; they just follow orders.²⁴ As Babbage's collaborator Lady Ada Lovelace famously said, "The analytical engine has no pretensions whatever to originate anything. It can do only whatever we know how to order it to perform."²⁵ In Lovelace's formulation,

17. See *Cnty. 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.")

18. U.S. CONST. art I, § 8, cl. 8.

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

20. See *Bleistein v. Donaldson Lithographing Co.*, 188 U.S. 239 (1903).

21. See *Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., Inc.*, 499 U.S. 340 (1991).

22. *Id.* at 363 ("This time-honored tradition does not possess the minimal creative spark required by the Copyright Act and the Constitution.")

23. Michael J. Madison, *Beyond Creativity: Copyright as Knowledge Law*, 12 VAND. J. ENT. & TECH. L. 817, 829 (2010).

24. Computer History Museum, "The Babbage Engine" (last visited Mar. 9, 2016), <http://www.computerhistory.org/babbage/engines/> [<https://perma.cc/GC7G-9SU9>].

25. Richard Taylor, *Note G.*, in *SCIENTIFIC MEMOIRS, SELECTED FROM THE TRANSACTIONS OF FOREIGN ACADEMIES OF SCIENCE AND LEARNED SOCIETIES, AND FROM FOREIGN JOURNALS* 722 (1837).

creativity is implicitly defined as the ability to do the unexpected or to deviate from rules. Some people think computers can do this if their code incorporates elements of randomness, so that they make choices about composition that are governed at least in part by chance. This is the position that computer scientist David Levy takes in *Robots Unlimited*.²⁶

Interestingly, AI researchers tend to set a higher bar for creativity than the Supreme Court set in *Feist*. They define creativity in ways that invoke the patent law standards of novelty and usefulness. For Margaret Boden, creativity is the ability to come up with ideas or artifacts that are new, surprising, and valuable.²⁷ Roger Schank and Christopher Owens define it as the ability to use an object, technique, or tool to solve a problem in a useful and previously undiscovered way.²⁸ These definitions resonate more with patent's high standards for inventors than they do with the low standard for authors announced in *Feist*.²⁹

When AI researchers approach the challenge of making computers creative, they avoid getting bogged down in philosophical debates about the nature of creativity. They focus instead on programming computers to make things that pass for creative, artifacts that people recognize as songs or paintings or poems. It's a sort of Turing Test for creativity. If you can't tell the difference between a painting by AARON and a painting by a human, then we can say that AARON's painting exhibits creativity. We might not say that AARON is creative, but we can say that AARON's painting exhibits creativity.

But does copyright law require *human* creativity? The Copyright Act doesn't say anywhere that an author has to be human, and there's really no case law directly on point.³⁰ Nevertheless, there seems to be an assumption, maybe driven by practical and historical considerations, that authorship means human authorship.³¹ The 1965 Register of Copyrights Annual Report frames the question precisely in terms of the human-computer divide.³² If a human creates a work, it's copyrightable. If a machine creates it, then it's not. The CONTU report does the same thing: unless there's minimal human creative effort, there's no protection.³³

26. DAVID LEVY, *ROBOTS UNLIMITED: LIFE IN A VIRTUAL AGE* (2005).

27. MARGARET BODEN, *THE CREATIVE MIND: MYTHS AND MECHANISMS* (2004).

28. Roger Schank & Christopher Owens, *The Mechanics of Creativity*, in *THE AGE OF INTELLIGENT MACHINES* 395 (Raymond Kurzweil ed., 1991).

29. See 35 USC §§ 101–103 (setting forth the standards for patentability).

30. After these remarks were delivered, while this article was in the editorial process, a federal district court ruled in the now-famous “monkey selfie” case that “the Copyright Act does not ‘plainly’ extend the concept of authorship or statutory standing to animals” and that animals cannot be authors for purposes of copyright law. *Naruto v. Slater*, No. 15-CV-04324-WHO, 2016 WL 362231, at *3 (N.D. Cal. Jan. 28, 2016).

31. See *id.* (finding an implied rule in the fact that “[t]he Supreme Court and Ninth Circuit have repeatedly referred to ‘persons’ or ‘human beings’ when analyzing authorship under the Act”).

32. REGISTER OF COPYRIGHTS, *SIXTY-EIGHT ANNUAL REP. OF THE REGISTER OF COPYRIGHTS* 5 (1966) (“The crucial question appears to be whether the ‘work’ is basically one of human authorship, with the computer merely being an assisting instrument, or whether the traditional elements of authorship in the work (literary, artistic, or musical expression or elements of selection, arrangement, etc.) were actually conceived and executed not by man but by a machine.”).

33. NAT’L COMM’N ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, *FINAL REPORT*

The OTA report, a little bit later in time, dodges the question: we know that these works would be copyrightable if they were done by people, but we don't know what to do with them if they're done by computers.³⁴

Although there are no cases directly on point, there are a number of really peculiar cases that deal with text putatively authored by divine or extraterrestrial beings, writing through a human medium or amanuensis.³⁵ Invariably the courts in these cases have held that the work in question has to be attributed to a human author.³⁶ Confronted with two litigants, both of whom take for granted that the work in question is copyrightable, courts in these cases tend to decide that the author and owner of the copyright is whoever actually wrote the work down, defaulting to the principle that fixation is a reliable indicator of authorship.³⁷

What the anthropocentric view of authorship elides, however, is that copyright law already accommodates a notion of non-human authors; they're called corporations. Under the work-made-for-hire doctrine, which is a legal fiction, a corporate employer is considered the legal author of a work of which it is not the author-in-fact.³⁸ The statute could have been written to create an assignment by operation of law from an employee-author to her corporate employer, thus maintaining in principle a human monopoly on authorship, but it wasn't. It was written to allow a corporate employer to be treated *ab initio* as the author of a work created by its human employee.

Because we already have a copyright doctrine that accommodates non-human authors, maybe that's a logical place to look for a solution to the problem of computer authors. Maybe we can treat computer-authored works as works made for hire. This solution has, I think, two virtues: First, it allows us to avoid what I think is a category mistake of treating the programmer as the author-in-fact of works that are actually composed by code. Second, it avoids the problem of vesting legal rights in a machine, which we all know is impracticable.

New Zealand essentially takes this approach. Its copyright law expressly defines and protects computer-generated works and vests ownership of copyright in the "person by whom the arrangements necessary for the creation of the work are undertaken."³⁹ Other common law countries—for example, the United Kingdom, Hong Kong, and India—take the same approach.⁴⁰ Maybe not surprisingly, civil

111 (1978), <http://eric.ed.gov/PDFS/ED160122.pdf> [<https://perma.cc/9ASG-HNDF>].

34. U.S. OFFICE OF TECH. ASSESSMENT, INTELLECTUAL PROPERTY RIGHTS IN AN AGE OF ELECTRONICS AND INFORMATION 69 (1986), <https://www.princeton.edu/~ota/disk2/1986/8610/8610.PDF> [<https://perma.cc/XUV3-E979>].

35. See, e.g., *Penguin Books U.S.A., Inc. v. New Christian Church of Full Endeavor, Ltd.*, No. 96 Civ. 4126, 2000 WL 1028634 (S.D.N.Y. July 25, 2000). For a full discussion of the "psychographic work" cases, see Annemarie Bridy, *Coding Creativity: Copyright and the Artificially Intelligent Author*, 2012 STAN. TECH. L. REV. 1, 18–20 (2012).

36. *Penguin Books*, 2000 WL 1028634.

37. *Id.* at *14.

38. 17 U.S.C. § 101 (defining "work made for hire").

39. Copyright Act 1994 cl 5(2)(a) (N.Z.), <http://www.legislation.govt.nz/act/public/1994/0143/latest/DLM345899.html> [<https://perma.cc/8NCF-567P>].

40. See Copyright, Designs and Patents Act, 1988, c. 1, § 9(3) (U.K.); Copyright Ordinance,

law countries with a strong moral rights orientation in their copyright systems—for example, France, Germany, Greece, Switzerland, and Hungary—reject the notion of non-human authorship completely.⁴¹

I'll close by saying that because U.S. copyright law is grounded in the protection of economic rather than moral rights, it's not inconsistent with first principles to recognize authorship in non-natural persons. Congress could amend the definition of work made for hire in section 101 to include works prepared autonomously by computers, and I don't think that would be terribly alien to or inconsistent with the existing structure of the work made for hire doctrine. There may be policy reasons not to proliferate copyrights in this way, but as a doctrinal matter it wouldn't be beyond the pale. Thanks.

(2007) Cap. 528, § 11(3) (H.K.); Indian Copyright Act, 1957, § 2(d)(vi), Acts of Parliament, 1957 (India).

41. See CODE DE LA PROPRIÉTÉ INTELLECTUELLE [C.P.I.] art. L113 (Fr); URHEBERRECHTSGESETZ [UrhG] [COPYRIGHT ACT], Sept. 9, 1965, BUNDESGESETZBLATT [BGBl] 1 at 1273 (Ger.); Nomos (1993: 2121) Πνευματική Ιδιοκτησία, Σιγνενικά Δικαιώματα και Πολιτιστικά Θέματα [Copyright, Related Rights and Cultural Matters], Φίλλο Εφημερίδος Της Κιvernίσεως [P.H.E.K.] 1993, Α:25 (Greece); LOI FÉDÉRALE DU 9 OCTOBRE 1992 SUR LE DROIT D'AUTEUR ET LES DROITS VOISINS [LDA] [FEDERAL LAW OF OCTOBER 9, 1992 ON COPYRIGHT AND NEIGHBOURING RIGHTS] Oct. 9, 1992, SR 231.1 (Switz.); 1999. évi LXXVI. szerzői jogról szóló (Act No. LXXVI of 1999 on Copyright) (Hung.).