
Note

The Advent of Effortless Expression: An Examination of the Copyrightability of BCI-Encoded Brain Signals

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INTRODUCTION

“Some of the most seminal developments in copyright law have been driven by technological change. . . . [I]t is necessary to reconcile technology with pre-electronic principles of law.”¹ Judge Sweet’s proposition—that Congress and the judiciary must attempt to harmonize new technologies with deep-seated legal doctrines²—is axiomatic. Indeed, more than a century before Judge Sweet wrote his dissent in *Matthew Bender & Co. v. West Publishing Co.*, the Supreme Court in *Burrow-Giles Lithographic Co. v. Sarony* considered whether Congress had the constitutional right to grant copyright protection to a photograph.³ Justice Miller, writing for a unanimous Court, noted that the question was “not free from difficulty.”⁴ Appellants in *Burrow-Giles* argued that, contrary to Article I, Section 8 of the United States

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1. *Matthew Bender & Co. v. W. Publ’g Co.*, 158 F.3d 693, 710 (2d Cir. 1998) (Sweet, J., dissenting).

2. *See id.*

3. 111 U.S. 53, 55 (1884).

4. *Id.* at 56.

Constitution,⁵ a photograph was neither “a writing nor the production of an author”⁶ and accordingly was not eligible for copyright protection.⁷

The Court was not convinced.⁸ It reasoned that because the Copyright Acts of 1790 and 1802—each having been penned “by the men who were contemporary with [the Constitution’s] formation”⁹—enables Congress to grant copyright protection to “maps, charts, designs, engravings, etchings, cuts, and other prints, it is difficult to see why Congress cannot make [photographs] the subject of copyright [protection] as well.”¹⁰ The Court liberally construed the constitutional meaning of “[w]ritings”¹¹ to encompass all “literary productions of those authors . . . by which the ideas in the mind of the author are given visible expression.”¹² The Court postulated that “[t]he only reason why photographs were not included in the extended list in the act of 1802 is probably that they did not exist.”¹³ The Court therefore found the Constitution “broad enough to cover an act authorizing copyright of photographs, so far as they are representatives of original intellectual conceptions of the author.”¹⁴

Photography would not be the last technology the judiciary would confront in the copyright context. Innumerable technologies have emerged since the Supreme Court decided *Burrow-Giles* in 1884. Courts and Congress have had to consider whether, *inter alia*, motion pictures,¹⁵ mass-produced utilitarian articles,¹⁶ and computer programs¹⁷ are eligible for copyright protection. They will undoubtedly need to consider whether works created in virtual reality environments are eligible for the same protection.¹⁸ The courts and Congress

5. U.S. CONST. art. I, § 8, cl. 8 (“The Congress shall have [the] Power . . . [t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries . . .”).

6. 111 U.S. at 56.

7. *See id.*

8. *See id.* at 58 (“We entertain no doubt that the Constitution is broad enough to cover an act authorizing [the] copyright of photographs.”).

9. *Id.* at 57.

10. *Id.*

11. *See* U.S. CONST. art. I, § 8, cl. 8.

12. *Burrow-Giles*, 111 U.S. at 58.

13. *Id.*

14. *Id.*

15. *See* *Edison v. Lubin*, 122 F. 240 (3d Cir. 1903).

16. *See, e.g., Mazer v. Stein*, 347 U.S. 201 (1954).

17. *See, e.g., Apple Comput., Inc. v. Franklin Comput. Corp.*, 714 F.2d 1240 (1983).

18. *See* Crystal Nwaneri, *Ready Lawyer One: Legal Issues in the Innovation of Virtual Reality*, 30 HARV. J.L. & TECH. 601, 619 (2017) (“Although [virtual reality]

have made clear that, so long as the works derived from new technologies constitute original expressions that are fixed to a copy, such works are eligible for copyright protection.¹⁹

But one additional, implicit requirement for statutory copyright eligibility may yet exist: the original expression must be fixed to a copy—that is, given physical permanence and perceptibility²⁰—by the hand²¹ of the author at some point during the creative process. An author who thinks about sufficiently original expression but does not write, type, or speak that expression into the world cannot seek a copyright for her “unexpressed expression” because such “unexpressed expressions” are merely thoughts.²² Indeed, “unexpressed expressions” become copyrightable expressions when the author fixes them to a tangible medium.²³ And, throughout human history, fixation—whether by writing, speaking into a recording device, coding software, or issuing a command to a computer program—has required physical labor. In other words, creative thoughts (i.e., expressions) are generated in the brain’s neural networks,²⁴ and its motor cortex coordinates the movements required to write or speak²⁵ (i.e., fix) the creative thoughts to a tangible medium. Authors have never been able to fix their expressions by thought alone. “The writings which are to be protected are *the fruits of intellectual labor*,”²⁶ and those fruits have

environments are new, it is likely that virtual materials will be copyrightable because the various three-dimensional representations displayed in [virtual reality] will constitute . . . subject matter [eligible for] copyright protection.”).

19. See *infra* Part I.B (describing these basic requirements).

20. See, e.g., *United States v. Moghadam*, 175 F.3d 1269, 1273 (11th Cir. 1999) (“The concept of fixation suggests that works are not copyrightable unless reduced to some tangible form.”); *infra* Part I.B.3 (describing the “embodiment” and “duration” requirements of fixation).

21. By this, the Author means that copyrightable expression enters this world through some degree of physical labor by the author, whether that labor is speaking, writing, or coding the expression onto the fixed medium.

22. Cf. *infra* Part I.B.3 (explaining the “fixation” requirement for copyright protection).

23. Copyright Act of 1976, 17 U.S.C. § 102(A).

24. See Alison Koontz, *The Circuitry of Creativity: How Our Brains Innovate Thinking*, CALTECH LETTERS (Mar. 12, 2019), <https://caltechletters.org/science/what-is-creativity> [<https://perma.cc/Z3CU-GGFG>] (detailing the neurological mechanisms behind the origination of creative thought).

25. See CHARLES WATSON, MATTHEW KIRKCALDIE & GEORGE PAXINOS, *THE BRAIN* 58 (2010).

26. *Feist Publ’ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 346 (1991) (quoting *Trade-Mark Cases*, 100 U.S. 82, 94 (1879)).

always blossomed through the author's motor cortex and, by extension, her hand²⁷—until now.

Brain-computer interfaces (BCIs) will be among the first devices to challenge the implicit assumption that copyrightable expression must be fixed at the direction of the motor cortex.²⁸ BCIs will effectively abridge the traditional, biological process of expression by directly receiving thoughts from neural networks, decoding those thoughts, and digitally recording—i.e., “fixing”—them to a digital device.²⁹ BCIs, which were initially defined as “communication system[s] that [do] not depend on the brain's normal output pathways of peripheral nerves and muscles,”³⁰ are, in essence, “new output channel[s] for the brain.”³¹ For the first time, “the fruits of intellectual labor” need not blossom through the author's hand. With BCIs, humans will possess the means to express and fix their thoughts *without* the direction of the motor cortex, and, so long as these BCI-fixed thoughts are sufficiently original, they would seemingly qualify for copyright protection under modern copyright doctrine.³² The Copyright Act of 1976³³ and the Constitution,³⁴ of course, do not explicitly address granting

27. See Alex Norris, *Creativity*, DORRIS MCCOMICS (Oct. 21, 2013), <https://dorrismccomics.com/post/64681231561> [<https://perma.cc/FX8M-X4MD>] (illustrating the birth of creative expression through the author's hand).

28. One may argue that the emergence of artificial intelligence has already challenged this implicit assumption. See generally Andres Guadamuz, *Artificial Intelligence and Copyright*, WIPO MAG. Oct. 2017, at 14, 19, https://www.wipo.int/export/sites/www/wipo_magazine/en/pdf/2017/wipo_pub_121_2017_05.pdf [<https://perma.cc/RS5C-QBR9>] (“[G]iven enough computing power, soon we may not be able to distinguish between human-generated and machine-generated content. . . . [I]f and when we do get there, we will have to decide what type of protection, if any, we should give to emergent works created by intelligent algorithms with little or no human intervention.”).

29. See Jerry J. Shih, Dean J. Krusienski & Jonathan R. Wolpaw, *Brain-Computer Interfaces in Medicine*, 87 MAYO CLINIC PROCS. 268, 271 fig.2 (2012) (detailing the basic components and functions of BCIs).

30. Jonathan R. Wolpaw, Niels Birbaumer, William J. Heetderks, Dennis J. McFarland, P. Hunter Peckham, Gerwin Schalk, Emanuel Donchin, Louis A. Quatrano, Charles J. Robinson & Theresa M. Vaughan, *Brain-Computer Interface Technology: A Review of the First International Meeting*, 8 IEEE TRANSACTIONS ON REHAB. ENG'G 164, 165 (2000) (emphasis omitted).

31. *Id.*

32. See *infra* Part I.B.

33. This act, codified at 17 U.S.C. §§ 101–122, has been the operative copyright statute since its enactment.

34. The Constitution states that “[t]he Congress shall have [the] Power . . . [t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries. . . .” U.S. CONST. art. I, § 8, cl. 8.

protection to works generated through this novel avenue of expression, and whether either authority even *contemplates* granting protection to BCI-encoded brain signals is quite unlikely. The preliminary question of whether BCI-encoded brain signals *even qualify* as expression—under any definition of the word—is similarly shrouded in uncertainty. Ultimately, the advent of BCI technology will challenge the fundamental assumptions underlying modern copyright doctrine and burden the judiciary with difficult questions that Congress must ultimately answer.³⁵

This Note consults the history of copyright, its philosophical underpinnings and justifications, and judicial opinions addressing new technologies in the context of copyright protection to predict how Congress and the courts will address the implications of BCI technology for U.S. copyright doctrine. Moreover, because BCI technology fundamentally alters the traditional process of expression, this Note seeks to determine what constitutes expression—at its most basic level—within the common and constitutional understandings of the word. This Note ultimately recommends that although BCI-encoded brain signals qualify for protection under the Copyright Act of 1976, they should not be copyrightable *unless* Congress implements an exceptional effort requirement. This requirement would grant copyright protection to BCI-encoded brain signals only after the author edits or polishes them to remove the spontaneous thoughts and neuronal noise³⁶ that a BCI device would capture alongside otherwise discernable and copyrightable expression. The Author will argue that this effort requirement is necessary to bring BCI-encoded brain signals within the ambit of copyright because, under our constitutionally authorized utilitarian regime,³⁷ the cost of creating a new work of authorship must be sufficiently higher than the cost of its reproduction if that work is to qualify for copyright protection.³⁸ The cost of creating a work composed of BCI-encoded brain signals alone *is not* sufficiently higher than the cost of reproducing that work, and a grant of

35. See *Sony Corp. of Am. v. Universal City Studios, Inc.*, 464 U.S. 417, 456 (1984) (“It may well be that Congress will take a fresh look at this new technology, just as it so often has examined other innovations in the past. But it is not our job to apply laws that have not yet been written.”); *Am. Broad. Cos. v. Aereo, Inc.*, 573 U.S. 431, 463 (2014) (Scalia, J., dissenting) (“[Courts] are in no position . . . to foresee the path of future technological development. Hence, the proper course is not to bend and twist the [Copyright] Act’s terms . . . but to apply the law as it stands and leave to Congress the task of deciding whether the Copyright Act needs an upgrade.” (citations omitted)).

36. See *infra* Part II.C.2.

37. See *infra* Part I.C.1.

38. See *infra* Part II.B.

copyright protection to such signals accordingly does not advance the utilitarian objectives of U.S. copyright law.³⁹

Part I describes the nature and mechanics of BCI technologies, details the Copyright Act's requirements for copyright protection, and examines the history, justifications for, and theoretical underpinnings of copyright protection. Part II initially dissects the term "expression" to determine whether BCI-encoded brain signals fall under any acceptable definition of the word. It subsequently analyzes whether granting copyrightable status to BCI-encoded brain signals advances the goals of the U.S. copyright regime. Then, Part II illustrates certain practical problems that would accompany a determination that BCI-encoded brain signals are copyrightable. Finally, Part III recommends that Congress introduce an exceptional "effort requirement" that authors of BCI-encoded brain signals must satisfy before their encoded signals may qualify for copyright protection.

I. BCI TECHNOLOGY AND THE CONTEMPORARY COPYRIGHT CLIMATE

An investigation of BCI technology and its implications in the copyright context requires a brief overview of the fundamentals of both. Section A details the development, underlying mechanisms, and deployment of modern BCI technology. Section B examines the basic constitutional and statutory requirements any work of authorship must satisfy to assume copyright protection. Section C discusses the historical and theoretical underpinnings of the U.S. copyright system. The assertion that BCI technology poses a challenge to contemporary copyright becomes apparent with an understanding of the relevant foundational concepts.

A. BCI TECHNOLOGY

In 1973, after conducting a study to evaluate the "feasibility and practicality of utilizing the brain signals in a man-computer dialogue,"⁴⁰ Professor Jacques Vidal suggested that a computer could gather the information contained in electroencephalographic (EEG) signals and use that information to issue commands to an external apparatus, thereby allowing the person from which the EEG signals were gathered to control an external device.⁴¹ "Using computer-generated

39. See *infra* Part II.B.

40. Jacques J. Vidal, *Toward Direct Brain-Computer Communication*, 2 ANN. REV. BIOPHYSICS & BIOENGINEERING 157, 157-58 (1973).

41. See *id.* at 157.

visual stimulation and sophisticated signal processing,” Vidal demonstrated that EEGs “could provide a communication channel by which a human could control the movement of a cursor through a two-dimensional maze.”⁴² Vidal coined the term Brain Computer Interface to describe this type of system.⁴³ Such a system of “man-machine communication,” Vidal explained, ultimately could “provide a direct link between the inductive mental processes used in solving problems and the symbol-manipulating, deductive capabilities of the computer.”⁴⁴ Vidal suggested that the existence of such a system “would indeed elevate the computer to a genuine prosthetic extension of the brain.”⁴⁵ Although Vidal’s suggestions may have seemed far-fetched in 1973, he nonetheless prophesied in his study that “such a feat is potentially around the corner.”⁴⁶

Although “the dream of being able to control one’s environment through thoughts”⁴⁷ existed only in the realm of science fiction in 1973, technological advancements have permitted BCIs to round Vidal’s proverbial corner. Vidal’s dream of BCI becoming a “genuine prosthetic extension of the brain” has, or has nearly, manifested. Researchers and practitioners have primarily used BCIs, currently defined as “computer-based system[s] that acquire[], analyze[], and translate[] brain signals into output commands in real time,”⁴⁸ to provide means of communication and “improve the quality of life for people severely disabled by neuromuscular impairments.”⁴⁹ Indeed, these practical medical applications of BCI caused one researcher writing in 2000 to opine that “the principal reason for . . . interest in BCI development [is] the possibilities it offers for providing new augmentative

42. Wolpaw et al., *supra* note 30.

43. Jacques J. Vidal, UCLA, <http://web.cs.ucla.edu/~vidal/vidal.html> [<https://perma.cc/974A-B5F4>] (“During the seventies, Vidal coined the expression Brain Computer Interface for his current research project, a part of a large, government sponsored futuristic research in biocybernetics and human-machine interaction.”).

44. Vidal, *supra* note 40, at 158.

45. *Id.*

46. *Id.* at 157.

47. Shih et al., *supra* note 29, at 268.

48. Dennis J. McFarland & Jonathan R. Wolpaw, *Brain-Computer Interface Use Is a Skill that User and System Acquire Together*, PLOS BIOLOGY, July 2018, at 1, 1.

49. Hyun J. Baek, Min Hye Chang, Jeong Heo & Kwang Suk Park, *Enhancing the Usability of Brain-Computer Interface Systems*, COMPUTATIONAL INTEL. & NEUROSCIENCE, June 2019, at 1, 2 (describing the various impairments that can be aided with the use of BCIs including “amyotrophic lateral sclerosis (ALS), brainstem stroke, cerebral palsy, or spinal cord injury”).

communication technology to those who are paralyzed or have other severe motor disabilities.”⁵⁰

A basic understanding of the human motor control system and BCI operation reveals why the technology has significant implications for copyright in addition to medicine. An unimpaired individual interacts and communicates with his or her world through “motor control processes that use neuromuscular systems to activate and coordinate muscle movements. An individual’s intent triggers the activation of a specific brain area, sending signals through the peripheral nervous system to muscles that perform the movement necessary to complete the intended task.”⁵¹ BCIs restore motor and communicative functions in impaired persons by acquiring brain signals that would otherwise travel from the motor cortex to the peripheral nervous system,⁵² analyzing those acquired signals, and translating them into commands that are routed to an output device.⁵³ Present-day BCIs thus are akin to an alternative peripheral nervous system.

BCIs typically consist of four components: (1) signal acquisition; (2) feature extraction; (3) feature translation; and (4) device output.⁵⁴ Signal acquisition is the measurement, digitization, and transmission of brain signals from a sensor—located either on the scalp or intracranially—to a computer.⁵⁵ Feature extraction “is the process of analyzing the digital signals to distinguish pertinent signal characteristics (ie [sic], signal features related to the person’s intent) from extraneous content and representing them in a compact form suitable for translation into output commands.”⁵⁶ In a copyright context, the feature extraction component of a BCI may remove neuronal noise⁵⁷ as

50. Wolpaw et al., *supra* note 30.

51. Baek et al., *supra* note 49, at 1.

52. See generally Alessandra Donato, *Peripheral Nervous System*, QUEENSL. BRAIN INST., <https://qbi.uq.edu.au/brain/brain-anatomy/peripheral-nervous-system> [<https://perma.cc/VKC5-THJA>] (“Our nervous system is divided [in] two components: the central nervous system (CNS), which includes the brain and spinal cord, and the peripheral nervous system (PNS), which encompasses nerves outside the brain and spinal cord. . . . If we consider the entire nervous system as an electric grid, the central nervous system would represent the powerhouse, whereas the peripheral nervous system would represent long cables that connect the powerhouse to the outlying cities (limbs, glands and organs) to bring them electricity and send information back about their status.”).

53. Shih et al., *supra* note 29, at 269.

54. *Id.* at 270.

55. See *id.* at 270–71.

56. *Id.* at 271.

57. “Neuronal noise” is a term that encompasses the “[r]andom and unpredictable fluctuations and disturbances that are not part of a signal.” A. Aldo Faisal, Luc P.J.

distinguishable from the “signal features related to the person’s [creative or authorial] intent.”⁵⁸ Feature translation is the process by which “[t]he resulting signal features are . . . passed to the feature translation algorithm, which converts the features into the appropriate commands for the output device.”⁵⁹ Finally, device output is the process by which the feature-signals-turned-commands “operate the external device, providing functions such as letter selection, cursor control, robotic arm operation, and so forth.”⁶⁰

Although BCIs often measure and utilize sensorimotor rhythms (SMRs)⁶¹ generated in the sensorimotor cortex,⁶² the mechanisms and rapid advancement⁶³ of BCI give reason to believe that such devices could one day measure and utilize brain signals that are antecedent to SMRs in the biological process of expression.⁶⁴ In other words, BCIs could foreseeably measure *the brain signals representing creative thought itself* rather than the signals generated to physically express that thought (i.e., SMRs). Indeed, one group of researchers recently published a study that describes their successful attempt to “train a recurrent neural network to encode . . . sentence-length sequence[s] of neural activity into . . . abstract representation[s], and then to decode th[ose] representation[s], word by word, into . . . English sentence[s].”⁶⁵ Studies like these, in addition to other recent

Selen & Daniel M. Wolpert, *Noise in the Nervous System*, 9 NATURE REV. NEUROSCIENCE 292, 292 (2008). Neuronal noise might account for variability in motor commands and, consequently, movement. *See id.* at 298.

58. Shih et al., *supra* note 29.

59. *Id.* at 272.

60. *Id.*

61. *See* McFarland & Wolpaw, *supra* note 48. SMRs contain information about “movement, imagined movement, or preparation for movement.” *Id.*

62. *See, e.g.*, Han Yuan & Bin He, *Brain-Computer Interfaces Using Sensorimotor Rhythms: Current State and Future Perspectives*, 61 IEEE TRANSACTIONS ON BIOMEDICAL ENG’G 1425, 1426 (2014).

63. Indeed, the BCI systems of today “a few years ago were in the realm of science fiction.” Shih et al., *supra* note 29, at 276.

64. *See id.* at 269 (“In principle, any type of brain signal could be used to control a BCI system.”). *See generally* Roger E. Beaty, Yoed N. Kenett, Alexander P. Christensen, Monica D. Rosenberg, Mathias Benedek, Qunlin Chen, Andreas Fink, Jiang Qiu, Thomas R. Kwapil, Michael J. Kane & Paul J. Silvia, *Robust Prediction of Individual Creative Ability from Brain Functional Connectivity*, 115 PROC. NAT’L ACAD. SCI. 1087 (2018) (identifying the neural networks specific to creativity).

65. Joseph G. Makin, David A. Moses & Edward F. Chang, *Machine Translation of Cortical Activity to Text with an Encoder-Decoder Framework*, 23 NATURE NEUROSCIENCE 575, 575 (2020).

advancements in BCI research and development,⁶⁶ suggest that BCIs of the future will not be limited to therapeutic and rehabilitative applications; rather, they will be able to acquire the brain signals representing creative thought at their neurological origin, digitize them, and store those digitized, machine-readable signals on an external device.⁶⁷ Assuming these digitized brain signals are sufficiently original, the Copyright Act of 1976⁶⁸ ostensibly will grant protections to such thoughts despite them never manifesting as traditional expression.

B. BASIC COPYRIGHT REQUIREMENTS

The Copyright Act of 1976 provides that “[c]opyright protection subsists . . . 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.”⁶⁹ The Act further explains that “[i]n no case does copyright protection for an original work

66. On August 28, 2020, billionaire tech entrepreneur Elon Musk unveiled and exhibited his Neuralink device, a “wireless brain-computer interface” that promises to “ultimately fuse humankind with artificial intelligence.” Tina Bellon, *Three Little Pigs: Musk’s Neuralink Puts Computer Chips in Animal Brains*, REUTERS (Aug. 28, 2020, 11:16 AM), <https://www.reuters.com/article/us-tech-neuralink-musk/musks-neuralink-venture-promises-to-reveal-a-working-brain-computer-device-idUSKBN25O2EG>. “Musk wants Neuralink to do far more than treat specific health conditions. He sees the technology as an opportunity to build a widely available brain-computer interface for consumers, which he thinks could help humans keep pace with increasingly powerful artificial intelligence.” Rebecca Heilweil, *Elon Musk Is One Step Closer to Connecting a Computer to Your Brain*, VOX (Aug. 28, 2020, 7:00 PM), <https://www.vox.com/recode/2020/8/28/21404802/elon-musk-neuralink-brain-machine-interface-research>.

67. See Shih et al., *supra* note 29 (illustrating the digitized, machine-readable binary form into which an external device encodes acquired brain signals). The device on which the digitized, machine-readable signals are stored could perhaps decompile the machine-readable signals into a human-readable source code form. See EREZ METULA, *MANAGED CODE ROOTKITS: HOOKING INTO RUNTIME ENVIRONMENTS* 42 (2011) (“[A] decompiler . . . transfers compiled [binary code] to corresponding high-level source code.”); Daniel Lin, Matthew Sag & Ronald S. Laurie, *Source Code Versus Object Code: Patent Implications for the Open Source Community*, 18 SANTA CLARA COMPUT. & HIGH TECH. L.J. 235, 238 (2002) (“Source code has been described as a computer program written in a high level human readable language.”). The author could subsequently edit the human-readable source code in the same way she would edit a word document. See generally *Source Code: What Exactly Is It?*, IONOS (July 2, 2020), <https://www.ionos.com/digitalguide/websites/web-development/source-code-explained-definition-examples/> [<https://perma.cc/4D3C-YW6Z>] (explaining the use of advanced text editors, which can simplify source code projects by providing various tools such as syntax highlighting).

68. 17 U.S.C. §§ 101–122.

69. *Id.* § 102(a).

of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.”⁷⁰ Sections 102(a)–(b) supply four basic requirements that a work must satisfy to qualify for copyright protection: (1) “work of authorship;” (2) originality; (3) fixation; (4) idea/expression dichotomy.⁷¹

1. Work of Authorship

Copyright protection subsists only in “works of authorship.” Although the Copyright Act of 1976 does not define a “work of authorship,”⁷² § 102(a) states that “[w]orks of authorship include . . . (1) literary works; (2) musical works, including any accompanying words; (3) dramatic works, including any accompanying music; (4) pantomimes and choreographic works; (5) pictorial, graphic, and sculptural works; (6) motion pictures and other audiovisual works; (7) sound recordings; and (8) architectural works.”⁷³ Although § 102(a)’s list of categories is exhaustive, the categories are fairly broad.⁷⁴ Types of “literary works” subject to copyright protection are not limited to novels or other traditional works of literature, but rather include “works . . . expressed in . . . words, numbers, or other verbal or numerical symbols or indicia, regardless of the nature of the material objects . . . in which they are embodied.”⁷⁵ Software, for example, is a literary work for copyright purposes.⁷⁶ Although the categories enumerated in § 102(a) are implicitly broad,⁷⁷ Congress possesses the constitutional power to protect other *explicit* categories of potentially protectable works through either an amendment to the Copyright Act of 1976 or the enactment of a new statute.⁷⁸ For now, any work seeking copyright

70. *Id.* § 102(b).

71. *Id.* § 102(a)–(b).

72. *See id.* § 101.

73. *Id.* § 102(a).

74. *See* Pamela Samuelson, *Evolving Conceptions of Copyright Subject Matter*, 78 U. PITT. L. REV. 17, 51 (2016) (“[T]he [Copyright] Act [of 1976] defines enumerated subject matter categories broadly enough so that many unforeseeable creations . . . have generally fit quite comfortably within the 1976 Act categories.”).

75. 17 U.S.C. § 101.

76. *Comput. Assocs. Int’l, Inc. v. Altai, Inc.*, 982 F.2d 693, 702 (2d Cir. 1992) (“While computer programs are not specifically listed as part of [§ 101’s definition of ‘literary works’], . . . Congress intended them to be considered literary works.” (citing H.R. Rep. No. 94-1476, at 54 (1976), *reprinted in* 1976 U.S.C.C.A.N. 5659, 5667)).

77. *See* Samuelson, *supra* note 74.

78. *See, e.g., supra* notes 3–8 and accompanying text.

protection must fit, however loosely, into one of the categories enumerated in § 102(a).⁷⁹

2. Originality

Although the Copyright Act of 1976 defines many of the key terms used throughout its provisions, “originality” is noticeably absent.⁸⁰ The courts have determined that “originality” requires only “independent creation⁸¹ plus a modicum of creativity.”⁸² The Supreme Court has also offered guidance as to what qualifies as an original work. In *Burrow-Giles*, the Court found originality in a photograph that was “entirely from [the author’s] mental conception, to which he gave visible form by posing [his subject] in front of the camera, selecting and arranging the costume, . . . arranging the subject,” and ultimately producing the photograph at issue.⁸³ The expression embodied in the photograph, the Court stated, showed the photograph “to be an original work of art, the product of the plaintiff’s intellectual invention.”⁸⁴ Later, in *Mazer v. Stein*, the Court more precisely stated that a protectable work “must be original, that is, the author’s tangible expression of his ideas.”⁸⁵ A robust description of originality comes not from the Supreme Court, but from the Second Circuit in *Alfred Bell & Co. v. Catalda Fine Arts, Inc.*:

79. See R. Anthony Reese, *Copyrightable Subject Matter in the “Next Great Copyright Act,”* 29 BERKELEY TECH. L.J. 1489, 1489 (2014) (“Currently, the 1976 Copyright Act protects a very broad range of subject matter, though its reach is not unlimited. Perfume, for example, falls outside all of the categories of subject matter protected in the current statute.”); Samuelson, *supra* note 74, at 91 (“Congress may have intended to provide a modest amount of room for common law expansion of copyright subject matter . . . but there are good reasons to doubt that Congress intended to enable all manners of unenumerated subject matters . . . to be incorporated into the copyright regime.”).

80. See 17 U.S.C. § 101.

81. It is important to note that “[i]t is possible . . . to obtain a copyright in a work that is identical to an earlier work, so long as the author did not copy from the earlier work, either consciously or subconsciously.” *Copyright Basics*, U. MICH. LIBR., <https://guides.lib.umich.edu/copyrightbasics/copyrightability> [https://perma.cc/XPP3-ERSV] (last updated June 17, 2020); see also *Calhoun v. Lillenas Publ’g*, 298 F.3d 1228, 1232–33 (11th Cir. 2002) (“[I]n the realm of copyright, identical expression does not necessarily constitute infringement. Just as two paintings of the same subject in nature may appear identical, the two paintings’ origins may be of independent creation.” (footnotes omitted)).

82. *Feist Publ’ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 346 (1991) (footnote added) (citing *Trade-Mark Cases*, 100 U.S. 82, 94 (1879)).

83. *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 60 (1884).

84. *Id.*

85. *Mazer v. Stein*, 347 U.S. 201, 214 (1954).

“Original” in reference to a copyrighted work means that the particular work “owes its origin” to the “author.” . . . It is clear, then, that nothing in the Constitution commands that copyrighted matter be strikingly unique or novel. . . . All that is needed to satisfy both the Constitution and the statute is that the “author” contributed more than a “merely trivial” variation, something recognizably “his own.” Originality in this context “means little more than a prohibition of actual copying.”⁸⁶

Indeed, the Supreme Court has instructed judges not to consider even the artistic merit of an author’s work in determining whether it is sufficiently original to qualify for copyright protection.⁸⁷ “A copyist’s bad eyesight or defective musculature, or a shock caused by a clap of thunder, may yield sufficiently distinguishable variations” to qualify a work as original.⁸⁸

A provision of works that the courts have determined qualify for copyright protection will better illuminate the originality requirement. Works that have qualified for copyright protection include: a “panned and scanned” adaptation of a movie and its soundtrack;⁸⁹ a reduced-size copy of Rodin’s *Hand of God*;⁹⁰ and a reference guide for the fashion, advertising, and visual productions industries containing 800 pages of names and contact information.⁹¹ These independently created works all possessed the “extremely low” requisite level of creativity⁹² to qualify for copyright protection. Originality is an indisputably low bar for an author to hurdle.⁹³

86. 191 F.2d 99, 102–03 (2d Cir. 1951) (footnotes omitted) (quoting *Burrow-Giles*, 111 U.S. at 57–58; then quoting *Chamberlin v. Uris Sales Corp.*, 150 F.2d 512, 513 (2d Cir. 1945); and then quoting *Hoague-Sprague Corp. v. Frank C. Meyer Co.*, 31 F.2d 583, 586 (E.D.N.Y. 1929)).

87. See *Bleistein v. Donaldson Lithographic Co.*, 188 U.S. 239, 251–52 (1903) (“It would be a dangerous undertaking for persons trained only to the law to constitute themselves final judges of the worth of pictorial illustrations outside of the narrowest and most obvious limits. At the one extreme some works of genius would be sure to miss appreciation. . . . At the other end, copyright would be denied to pictures which appealed to a public less educated than the judge.”).

88. *Alfred Bell & Co.*, 191 F.2d at 105.

89. *Maljack Prods., Inc. v. UAV Corp.*, 964 F. Supp. 1416, 1426 (C.D. Cal. 1997), *aff’d sub nom. Batjac Prods. Inc. v. GoodTimes Home Video Corp.*, 160 F.3d 1223 (9th Cir. 1998).

90. *Alva Studios, Inc. v. Winninger*, 177 F. Supp. 265, 267 (S.D.N.Y. 1959).

91. *Le Book Publ’g, Inc. v. Black Book Photography*, 418 F. Supp. 2d 305, 307 (S.D.N.Y. 2005).

92. See *Feist Publ’ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 345 (1991).

93. See RONALD A. CASS & KEITH N. HYLTON, *LAWS OF CREATION: PROPERTY RIGHTS IN THE WORLD OF IDEAS* 105 (2013) (“If the bar [for originality] in patent is perhaps too low, in copyright it is nearly resting on the floor.”).

3. Fixation

“Copyright protection subsists . . . in original works of authorship *fixed* in any tangible medium of expression . . .”⁹⁴ Section 101 provides:

A work is “fixed” in a tangible medium of expression when its embodiment in a copy or phonorecord, by or under the authority of the author, is sufficiently permanent or stable to permit it to be perceived, reproduced, or otherwise communicated for a period of more than transitory duration. A work consisting of sounds, images, or both, that are being transmitted, is “fixed” for purposes of this title if a fixation of the work is being made simultaneously with its transmission.⁹⁵

It further defines “copies” as “material objects . . . in which a work is fixed by any method now known or later developed, and from which the work can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine.”⁹⁶ Further, “[t]he term ‘copies’ includes the material object . . . in which the work is first fixed.”⁹⁷ It is important to note that a work of authorship is “created” the moment it is fixed to a copy.⁹⁸

The courts have determined that fixation has two requirements: an “embodiment requirement” and a “duration requirement.”⁹⁹ A work satisfies the embodiment requirement if it is “placed in a medium such that it can be perceived, reproduced, etc., from that medium.”¹⁰⁰ For example, the audiovisual effects video games generate meet the embodiment requirement—despite the games creating “new” images each time one plays them¹⁰¹—because they are “permanently embodied in a material object, the memory devices, from which [they] can be perceived with the aid of the other components of the game.”¹⁰² A work satisfies the duration requirement if it remains embodied in a medium for “more than [a] transitory duration,” i.e., at

94. 17 U.S.C. § 102(a) (emphasis added).

95. *Id.* § 101.

96. *Id.*

97. *Id.*

98. *Id.* (“A work is ‘created’ when it is fixed in a copy or phonorecord for the first time; where a work is prepared over a period of time, the portion of it that has been fixed at any particular time constitutes the work as of that time, and where the work has been prepared in different versions, each version constitutes a separate work.”).

99. *See* *Cartoon Network LP v. CSC Holdings, Inc.*, 536 F.3d 121, 127 (2d Cir. 2008).

100. *Id.*

101. *See* *Williams Elecs., Inc. v. Artic Int’l, Inc.*, 685 F.2d 870, 874 (3d Cir. 1982).

102. *Id.* (quoting *Stern Elecs., Inc. v. Kaufman*, 669 F.2d 852, 855–56 (2d Cir. 1982)).

least more than a few seconds.¹⁰³ “Writing a work on paper or on a computer hard drive, recording a work on tape, and sculpting a work out of marble (or ice!) all satisfy this requirement [of being fixed]. An unrecorded improvisation . . . would not satisfy this requirement.”¹⁰⁴

4. Idea/Expression Dichotomy

Section 102(b) prohibits an author from receiving copyright protection for “any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.”¹⁰⁵ This provision codified the common law principle known as the “idea/expression dichotomy.”¹⁰⁶ The idea/expression dichotomy first appeared in the seminal case *Baker v. Selden*.¹⁰⁷

In *Baker*, “the plaintiff Selden wrote and obtained copyrights on a series of books setting out a new system of bookkeeping.”¹⁰⁸ The books described the plaintiff’s bookkeeping system and included various forms “with ruled lines and headings” for use in his system.¹⁰⁹ Defendant Baker published account books that utilized forms similar to those included in the plaintiff’s books, and the plaintiff subsequently filed suit for copyright infringement.¹¹⁰ He alleged that the “ruled lines and headings, given to illustrate the system, are a part of the book” and that accordingly “no one can make or use similar ruled lines and headings, or ruled lines and headings made and arranged on substantially the same system, without violating the copyright.”¹¹¹

On appeal, the Supreme Court faced the question of “whether the exclusive property in a system of book-keeping can be claimed, under the law of copyright, by means of a book in which that system is explained?”¹¹² It ultimately concluded that the “copyright of a book on book-keeping cannot secure the exclusive right to make, sell, and use

103. See *Cartoon Network LP*, 536 F.3d at 128–29; see also *Advanced Comput. Servs. of Mich., Inc. v. MAI Sys. Corp.*, 845 F. Supp. 356, 363 (E.D. Va. 1994) (“[I]f a computer is turned off within seconds or fractions of a second of the [software] loading, the resulting RAM representation of the program would be too ephemeral to be considered ‘fixed’ or a ‘copy’ under the [Copyright] Act.”).

104. *Copyright Basics*, *supra* note 81.

105. 17 U.S.C. § 102(b).

106. *Oracle Am., Inc. v. Google Inc.*, 750 F.3d 1339, 1354 (Fed. Cir. 2014).

107. *Id.* at 1355 (citing *Baker v. Selden*, 101 U.S. 99, 101 (1879)).

108. *Id.* (citing *Baker*, 101 U.S. at 100).

109. *Id.*

110. *Id.*

111. *Id.* (citing *Baker*, 101 U.S. at 101).

112. *Baker*, 101 U.S. at 101.

account-books prepared upon the plan set forth in such book.”¹¹³ The Court, comparing the work at issue to “a work on mathematical science,” declared that “copyright . . . cannot give to the author an exclusive right to the methods of operation which he propounds.”¹¹⁴ The Court noted that although copyright protects the plaintiff’s particular explanation or description of his bookkeeping system, “it does not prevent others from using the system described therein.”¹¹⁵ The Court further found that “if it is necessary to use the forms Selden included in his books to make use of the accounting system, that use would not amount to copyright infringement.”¹¹⁶

Since *Baker*, courts have routinely held that “copyright protects only an author’s expression of an idea and not the idea itself.”¹¹⁷ An author accordingly may not copyright the idea of a knight saving a damsel in distress; she may only copyright her own expression of, or “take” on, that idea. The idea/expression dichotomy also prevents authors from copyrighting historical facts and the theories in which they are used.¹¹⁸ “Expression makes the idea unique, specific, and therefore the property of its creator.”¹¹⁹

Although the doctrine is clear in its intent to leave facts, theories, and the like to the public domain,¹²⁰ distinguishing an idea from expression can be deceptively difficult. Section 101 unhelpfully excluded “idea” and “expression” from its enumerated definitions.¹²¹ Congress intentionally left it to the courts to draw the line between idea and expression: “Section 102(b) in no way enlarges or contracts the scope of copyright protection under the present law. Its purpose is to restate

113. *Id.* at 104.

114. *Id.* at 103.

115. *Oracle*, 750 F.3d at 1355 (citing *Baker*, 101 U.S. at 104).

116. *Id.*

117. *Landsberg v. Scrabble Crossword Game Players, Inc.*, 736 F.2d 485, 488 (9th Cir. 1984) (citing *Mazer v. Stein*, 347 U.S. 201, 217–18 (1954)).

118. *See, e.g., Hoehling v. Universal City Studios, Inc.*, 618 F.2d 972, 974 (2d Cir. 1980) (“[T]he scope of copyright in historical accounts is narrow indeed, embracing no more than the author’s original expression of particular facts and theories already in the public domain.”).

119. Jon M. Garon, *Normative Copyright: A Conceptual Framework for Copyright Philosophy and Ethics*, 88 CORNELL L. REV. 1278, 1290 (2003).

120. “The term ‘public domain’ refers to creative materials that are not protected by intellectual property laws such as copyright, trademark, or patent laws. The public owns these works, not an individual author or artist. Anyone can use a public domain work without obtaining permission.” *Welcome to the Public Domain*, COPYRIGHT & FAIR USE: STAN. U. LIBR., <https://fairuse.stanford.edu/overview/public-domain/welcome/> [<https://perma.cc/4N3E-FU3S>].

121. *See* 17 U.S.C. § 101.

... that the basic dichotomy between expression and idea remains unchanged."¹²² Difficulty distinguishing idea from expression might arise where a work blends fact and fiction or where it incorporates a narrow idea that can only be expressed in a limited number of ways. In the latter case, the idea and expression merge, and expression of the narrow idea is uncopyrightable.¹²³

In the former case, or where expression is simply difficult to discern from the underlying idea, courts may employ an abstraction test pioneered by Judge Learned Hand in *Nichols v. Universal Pictures Corp.*¹²⁴ Although initially applied to determine whether a movie infringed the copyright of a similarly themed play, the test is useful to determine the boundary between idea and expression:

Upon any work, . . . a great number of patterns of increasing generality will fit equally well, as more and more of the incident is left out. The last may perhaps be no more than the most general statement of what the play is about, and at times might consist only of its title; but there is a point in this series of abstractions where they are no longer protected, since otherwise the playwright could prevent the use of his "ideas," to which, apart from their expression, his property is never extended.¹²⁵

The test essentially instructs the factfinder to envision a work of authorship as a series of layers of abstraction. An idea underlies each work; it is the foundation of that work. The topmost layer is the literal text of a work; such text represents the author's expression. In between these two layers are paraphrases and summaries of the work. The courts and factfinders are charged with determining which layer separates expression from idea and granting copyright protection only to those works (or elements of works) constituting expression.¹²⁶

BCI-encoded brain signals can hypothetically satisfy the four basic statutory requirements for copyright protection. Brain signals representing creative, original expression are potentially protectable

122. H.R. REP. NO. 94-1476, at 57 (1976), as reprinted in 1976 U.S.C.C.A.N. 5659, 5670.

123. This principle is called the "merger doctrine." *Welcome to the Public Domain*, supra note 120; see also *Morrissey v. Procter & Gamble Co.*, 379 F.2d 675, 678 (1st Cir. 1967) ("When the uncopyrightable subject matter is very narrow, so that 'the topic necessarily requires,' if not only one form of expression, at best only a limited number, to permit copyrighting would mean that a party or parties, by copyrighting a mere handful of forms, could exhaust all possibilities of future use of the substance.") (citation omitted) (quoting *Sampson & Murdock Co. v. Seaver-Radford Co.*, 140 F. 539, 541 (1st Cir. 1905)).

124. *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 121 (2d Cir. 1930).

125. *Id.*

126. *Id.* ("In such cases we are rather concerned with the line between expression and what is expressed.").

as “literary works” the moment they are decoded and fixed to a device in a machine-readable format.

C. HISTORY OF AND JUSTIFICATIONS FOR COPYRIGHT

The American copyright system is predicated on theories of (1) utilitarianism and (2) moral right. Although the former theory predominates American justifications for copyright protection,¹²⁷ the U.S. Copyright Office has recognized that elements of the latter theory, which predominates European justifications for copyright protection,¹²⁸ form at least a partial basis for certain protections in the U.S. copyright system.¹²⁹ A grant of copyright protection to BCI-encoded brain signals—or *any* work of authorship—should accord with and advance the goals of the underlying theories supporting the U.S. copyright regime.

1. Utilitarianism

“[U]tilitarianism is the dominant purpose of American copyright law.”¹³⁰ Indeed, Article I, Section 8, Clause 8 (the “Intellectual Property Clause”) of the Constitution authorizes Congress to enact copyright legislation “[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”¹³¹ Copyright protection fulfills this purpose by “provid[ing] the incentive of exclusive rights for a limited duration to authors to motivate them to create culturally valuable works.”¹³² According to the utilitarian theory, “[w]ithout this incentive, . . . authors might not invest the time, energy, and money necessary to create these works because they might be copied cheaply and easily by free riders, eliminating authors’ ability to profit from their works.”¹³³

The Founding Fathers were not the first to provide copyright protection on a utilitarian basis. The Statute of Anne¹³⁴—predating the

127. See *infra* Part I.C.1.

128. See *infra* Part I.C.2.

129. See U.S. COPYRIGHT OFF., AUTHORS, ATTRIBUTION, AND INTEGRITY: EXAMINING MORAL RIGHTS IN THE UNITED STATES 5 (2019) (“The Copyright Office believes that the U.S. moral rights patchwork continues to provide important [copyright] protections . . .”).

130. Jeanne C. Fromer, *An Information Theory of Copyright Law*, 64 EMORY L.J. 71, 74 (2014).

131. U.S. CONST. art I, § 8, cl. 8.

132. Fromer, *supra* note 130.

133. *Id.* at 74–75.

134. An Act for the Encouragement of Learning 1710, 8 Ann., c. 21 (Gr. Brit.).

American Revolution by sixty-seven years—“vest[ed] the Copies of printed Books in the authors . . . for the Encouragement of learned Men to compose and write useful Books.”¹³⁵ The Founders undoubtedly looked to this statute while developing America’s constitutional basis for copyright protection.¹³⁶ In fact, writing to the president of the Continental Congress in 1783, American poet and diplomat Joel Barlow petitioned for Congress to pass a statute similar to the Statute of Anne, arguing that without such a statute, “we are not to expect to see any works of considerable magnitude, (which must always be works of time & labor), offered to the Public till such security is given.”¹³⁷ The Continental Congress listened; just as the Statute of Anne granted authors a twenty-one-year exclusive right to print “Books already printed” and a fourteen-year exclusive right to print “Books already composed and not printed and published,”¹³⁸ the Founders included in the Constitution a clause empowering Congress to grant a limited monopoly to the author of a work.¹³⁹ James Madison later stated that “[t]he utility of this power will scarcely be questioned. The copyright of authors has been solemnly adjudged, in Great Britain, to be a right of common law;”¹⁴⁰ and so our Founders adjudged copyright to be a utilitarian tool in America as well.

The judiciary is, of course, acutely aware of the Constitution’s utilitarian basis for copyright protection, and it frequently invokes the Intellectual Property Clause to rationalize its decisions. In *Mazer v. Stein*, for example, the Supreme Court explicitly recognized the utilitarian philosophy underlying American copyright doctrine to explain in part its decision to find a useful article¹⁴¹ copyrightable:

The economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors in “Science and useful Arts.” Sacrificial days

135. *Id.*

136. See Oren Bracha, *The Adventures of the Statute of Anne in the Land of Unlimited Possibilities: The Life of a Legal Transplant*, 25 BERKELEY TECH. L.J. 1427, 1429–30 (2010) (“The early American statutory framework closely followed the Statute of Anne, and for a long period of time, it appeared to change relatively little.”).

137. Letter from Joel Barlow to the President of the Continental Congress (1783), in 4 PAPERS OF THE CONTINENTAL CONGRESS 369, 371 (1789).

138. 8 Ann. c. 21.

139. See U.S. CONST. art I, § 8, cl. 8; see also 17 U.S.C. §§ 301–305 (detailing the duration of copyright protection a work may receive).

140. THE FEDERALIST NO. 43, at 220 (James Madison) (Ian Shapiro ed., 2009).

141. “A ‘useful article’ is an article having an intrinsic utilitarian function that is not merely to portray the appearance of the article or to convey information.” 17 U.S.C. § 101.

devoted to such creative activities deserve rewards commensurate with the services rendered.¹⁴²

Courts and Congress should always consider the constitutionally prescribed utilitarian basis for copyright when deciding whether a work is copyrightable.

2. Moral Right

Utilitarianism, however, is not the universal basis for granting copyright protection. The predominant justification for copyright in Europe, for example, is founded on a philosophy of natural rights,¹⁴³ and associated with this philosophy are particular moral rights.¹⁴⁴ Moral rights are “certain non-economic rights that are considered personal to an author.”¹⁴⁵ Among these rights are “the right of an author to be credited as the author of their work (the right of attribution), and the right of an author to prevent prejudicial distortions of their work (the right of integrity).”¹⁴⁶ The theory of moral right protects such interests because, according to its proponents, an author’s work is more than just that; it is “his spiritual child’ . . . an outgrowth of his soul.”¹⁴⁷ As such, it is worthy of protection.

Modern moral right justifications for copyright largely originated in the teachings of Hegel and Kant.¹⁴⁸ According to Kant, “[i]f something is internal to the person, such as one’s body parts or personality, it cannot be alienated.”¹⁴⁹ Thus, in Kant’s view, an author’s “words are a continuing expression of his inner self,” part and parcel to his very person.¹⁵⁰ Kant therefore believed an author’s right to communicate his expression and right to contract for its dissemination were inalienable personal rights.¹⁵¹ Thus, assuming a Kantian view of authorship, works are not only worthy of protection from, *inter alia*, distortion

142. *Mazer v. Stein*, 347 U.S. 201, 219 (1954).

143. *See, e.g.*, Garon, *supra* note 119, at 1285.

144. *Id.* at 1300–01.

145. U.S. COPYRIGHT OFF., *supra* note 129, at 6.

146. *Id.*

147. Dane S. Ciolino, *Rethinking the Compatibility of Moral Rights and Fair Use*, 54 WASH. & LEE L. REV. 33, 35 (1997).

148. Christopher S. Yoo, *Rethinking Copyright and Personhood*, 2019 U. ILL. L. REV. 1039, 1041.

149. Neil W. Netanel, *Copyright Alienability Restrictions and Enhancement of Author Autonomy: A Normative Evaluation*, 24 RUTGERS L.J. 347, 359 (1993).

150. *Id.* at 374.

151. *Id.* at 374–76; *see also id.* at 359–60 (“Man cannot dispose over himself because he is not a thing; he is not his own property . . . [I]t is impossible to be a person and a thing, the proprietor and the property.”) (quoting IMMANUEL KANT, LECTURES ON ETHICS 165 (L. Infield trans., J. MacMurray rev. ed., 1930)).

and misattribution, but title and rights to those works are also inalienable as a part of an economic transaction.¹⁵² Hegel built on Kant's position but diverged in one significant way: Hegel believed that while an author's mental processes were a part of the self, the right to reproduce the results of those processes *was* alienable and subject to economic transaction.¹⁵³

Although "[t]he fundamental overriding purpose of United States copyright law is social utility[,]"¹⁵⁴ Congress has passed legislation that bears the mark of moral right justification.¹⁵⁵ The Visual Artists Rights Act of 1990 (VARA) protects an artist's "rights of attribution" and "integrity."¹⁵⁶ The rights that VARA protects mirror those protected by the internationally adopted Berne Treaty, which the United States adopted in 1989.¹⁵⁷ Legislators and judges therefore *may* support their decisions as to whether a work is copyrightable with references to moral right as embodied in the Berne Treaty and VARA.¹⁵⁸

Part I, through an examination of BCI mechanics and American copyright's basic requirements, history, and philosophical underpinnings, ultimately suggests that BCI-encoded brain signals might qualify for copyright protection. Part II demonstrates that although sufficiently original BCI-encoded brain signals qualify as copyrightable

152. *Id.* at 374–76.

153. *See id.* at 377; *see also* GEORGE W. HEGEL, *PHILOSOPHY OF RIGHT* 52 (T.M. Knox trans., Oxford Univ. Press 1965) (1821) ("The reason I can alienate my property is that it is mine only in so far as I put my will into it. Hence I may abandon . . . anything that I have or yield it to the will of another and so into his possession, provided always that the thing in question is a thing external by nature.").

154. Netanel, *supra* note 149, at 365.

155. *See* Visual Artists Rights Act of 1990, 17 U.S.C. § 106(a).

156. *Id.*

157. *Compare* Berne Convention for the Protection of Literary and Artistic Works, WORLD INTELLECTUAL PROPERTY ORGANIZATION art. 6*bis*, July 24, 1971, 102 Stat. 2853, ("Independently of the author's economic rights, and even after the transfer of said rights, the author shall have the right to claim authorship of the work and to object to any distortion, mutilation or other modification of, or other derogatory action in relation to, the said work, which would be prejudicial to his honor or reputation."), *with* § 106(a) ("[T]he author of a work of visual art . . . shall have the right . . . to claim authorship of that work, and . . . shall have the right to prevent the use of his or her name as the author of the work of visual art in the event of a distortion, mutilation, or other modification of the work which would be prejudicial to his or her honor or reputation.").

158. Such reliance on moral right may be permissible because "solicitude for, and sometimes protection of, creators' moral-rights interests can strengthen utilitarian incentives in copyright." Jeanne C. Fromer, *Expressive Incentives in Intellectual Property*, 98 VA. L. REV. 1745, 1763 (2012).

“expression,”¹⁵⁹ a grant of copyright protection to works composed of such signals does not advance copyright’s utilitarian goals.¹⁶⁰ Part II additionally illustrates practical problems that may arise if Congress deems BCI-encoded brain signals copyrightable.¹⁶¹

II. BCI-ENCODED BRAIN SIGNALS LEGALLY QUALIFY FOR COPYRIGHT BUT DO NOT ADVANCE COPYRIGHT’S GOALS

As discussed in Part I, sufficiently original BCI-encoded brain signals ostensibly qualify for copyright protection by the letter of the U.S. Constitution and the Copyright Act of 1976.¹⁶² But like the photographic technology addressed in *Burrow-Giles*,¹⁶³ whether the U.S. Constitution or the Copyright Act of 1976 contemplates granting copyright protection to BCI-encoded brain signals is a question “not free from difficulty.”¹⁶⁴ Indeed, “the scientific principle on which [BCI technology] rests, and the chemicals and machinery by which it is operated, have all been discovered long since the statute [and Constitution] w[ere] enacted.”¹⁶⁵ The fact that BCI will—for the first time in human history—permit individuals to circumvent the motor cortex during the formation of creative expression renders the question of copyrightability peculiarly difficult to answer.¹⁶⁶ Indeed, BCI-encoded brain signals blur the line between mere thought and traditional, copyrightable expression. Section A of this Part investigates whether BCI-encoded brain signals constitute expression under any constitutionally or commonly permissible construction of the word. Section B considers whether a grant of copyright protection to BCI-encoded brain signals accords with the justification for—and advances the goals of—U.S. copyright doctrine. Section C details the practical problems that arise from a determination of copyrightability for BCI-encoded brain signals. For the purpose of the analyses furnished in this Part, this Note assumes that BCIs (1) capture and encode brain signals instantaneously and (2) possess virtually limitless storage capacity.

159. See *infra* Part II.A.

160. See *infra* Part II.B.

161. See *infra* Part II.C.

162. See *supra* Parts I.A–B.

163. See *supra* notes 3–14 and accompanying text.

164. *Burrow-Giles Lithographic Co. v. Saroncy*, 111 U.S. 53, 56 (1884).

165. *Id.* at 58.

166. See *supra* Part I.A.

A. BCI-ENCODED BRAIN SIGNALS QUALIFY AS “EXPRESSION”

The Copyright Act of 1976 exclusively grants copyright protection “to the expression of an idea—not the idea itself.”¹⁶⁷ Despite the axiomatic nature of the idea/expression dichotomy in U.S. copyright doctrine,¹⁶⁸ “courts and commentators . . . [have] never define[d] or clarif[ied] what exactly they mean by the terms ‘idea’ and ‘expression.’”¹⁶⁹ But the advent of BCI technology and an entirely novel, artificial alternative to traditional avenues of “expression” necessitates a more precise construction of the word and its essential components. Scrutiny of several sources ultimately reveals that, under most constructions of the word, BCI-encoded brain signals *are* expression.

1. Common Construction

United States courts have increasingly consulted dictionaries to determine the ordinary meaning of undefined statutory language; dictionaries therefore have become authoritative sources on the common construction of words.¹⁷⁰ Because the Constitution and the Copyright Act of 1976 fail to define “expression,” dictionaries offer a reliable definition of the term.¹⁷¹ Merriam-Webster primarily defines “expression” as “an act, process, or instance of representing in a medium.”¹⁷² BCI-encoded brain signals qualify as “expression” under this definition. Brain signal acquisition, translation, and routing together undoubtedly constitute a “process.”¹⁷³ Because this process acquires brain signals *representing* creative thought, digitizes them, and stores those digitized, machine-readable signals on an external digital device¹⁷⁴ (i.e., a medium¹⁷⁵), BCI-encoded brain signals constitute “expression” according to Merriam-Webster’s definition.

Black’s Law Dictionary alternatively defines “expression” as “[w]ritings, speech, or actions that show a person’s ideas, thoughts,

167. *Mazer v. Stein*, 347 U.S. 201, 217 (1954); *see also supra* Part I.B.4.

168. Richard H. Jones, *The Myth of the Idea/Expression Dichotomy in Copyright Law*, 10 PACE L. REV. 551, 563 (1990).

169. *Id.* at 565.

170. *See* Pamela Hobbs, *Defining the Law: (Mis)using the Dictionary to Decide Cases*, 13 DISCOURSE STUD. 327, 330 (2011).

171. *See* U.S. CONST. art. I, § 8, cl. 8; 17 U.S.C. § 101.

172. *Expression*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/expression> [<https://perma.cc/FF3K-D5EF>].

173. *See* Shih et al. *supra* note 29, at 270–72 (describing BCI systems as a series of processes).

174. *See supra* Part I.A.

175. *See supra* note 94 and accompanying text (indicating that digital devices qualify as tangible mediums of expression).

emotions, or opinions.”¹⁷⁶ BCI-encoded brain signals are neither “speech” nor “actions.” They do, however, represent creative “thoughts.” Whether BCI-encoded brain signals constitute “expression” under this definition therefore turns on whether the encoded signals are “writings.” A “writing,” according to Black’s, is

[a]ny intentional recording of words in a visual form, whether in handwriting, printing, typewriting, or any other tangible form that may be viewed or heard with or without mechanical aids. . . . This includes . . . electronic documents on computer media . . . and any other media on which words can be recorded.¹⁷⁷

Whether BCI-encoded brain signals qualify as “writings”—and consequently “expression”—under Black’s definition depends upon the realities and limitations of BCI technology. Thought encoded by a BCI that passively captures SMRs (or antecedent signals) likely would not qualify as “writings” because, although the user could render the resulting recording in a visual form with mechanical aid, the recording itself would not have been *intentional*. Conversely, thoughts encoded by a BCI that captures brain signals at the command of the user *would* be intentional recordings and, therefore, “writings” as such. BCI-encoded brain signals accordingly qualify as “expression” under Black’s more narrow definition *only if* the BCI encodes brain signals at the deliberate command of the user.

2. Constitutional Construction

Although the Constitution does not explicitly address—much less define—“expression” in the copyright context, it undoubtedly provides the basis for protection of “expression” rather than “ideas.” According to the Supreme Court, “copyright’s idea/expression dichotomy strikes a definitional balance between the First Amendment and the Copyright Act by permitting free communication of facts while still protecting an author’s expression.”¹⁷⁸ *Burrow-Giles Lithographic Co. v. Sarony* also makes clear that “writings,” as referenced and made protectable in the Constitution’s Intellectual Property Clause,¹⁷⁹ are “the literary productions of . . . authors, . . . includ[ing] all forms of writing, printing, engravings, etching, &c., by which the ideas in the mind of the author are given visible *expression*.”¹⁸⁰ Although the Constitution itself

176. *Expression*, BLACK’S LAW DICTIONARY (11th ed. 2019).

177. *Writing*, *id.*

178. *Harper & Row, Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 556 (1985) (alteration in original) (quoting *Harper & Row, Publishers, Inc. v. Nation Enters.*, 723 F.2d 195, 203 (2d Cir. 1983)).

179. *See* U.S. CONST. art I, § 8, cl. 8.

180. 111 U.S. 53, 58 (1884) (emphasis added).

does not define “expression” in any context, one may accordingly deduce a construction of “expression” from judicial treatment and interpretation of the Constitution.

Because U.S. copyright law is constitutionally related to First Amendment protections, one may apply a First Amendment definition of “expression” in the copyright context. The First Amendment demands that “Congress shall make no law . . . abridging the freedom of speech, or of the press.”¹⁸¹ Courts routinely and collectively refer to these freedoms as the “freedom of expression.”¹⁸² Although “expression” in the First Amendment context explicitly encompasses “speech” and products of “the press,” “[t]he Supreme Court ‘has long recognized that [First Amendment] protection does not end at the spoken or written word,’ but rather extends to other forms of expression.”¹⁸³ The Supreme Court has made clear that other conduct—i.e., not speech or writing per se—becomes expressive when it conveys a message:

If there were no reason for a group of people to march from here to there except to reach a destination, they could make the trip without expressing any message beyond the fact of the march itself. . . . Real “[p]arades are public dramas of social relations, and in them . . . ideas are available for communication and consideration.” . . . Parades are thus a form of expression, not just motion . . .¹⁸⁴

When conduct communicates a message or an idea, it is “expression” within the First Amendment meaning of the word. Although conduct must overcome a heightened bar to qualify for First Amendment *protection*,¹⁸⁵ any conduct that is minimally communicative *at least* qualifies as “expression.” BCI-encoded brain signals easily qualify as “expression” under this First Amendment definition of the term. Although the BCI-encoded brain signals would manifest in a digitized, machine-readable form,¹⁸⁶ they are “expression” under a First

181. U.S. CONST. amend. I.

182. See, e.g., *N.Y. Times Co. v. Sullivan*, 376 U.S. 254, 269 (1964) (“The general proposition that freedom of expression . . . is secured by the First Amendment has long been settled by our decisions.”).

183. Margaret L. Mettler, *Graffiti Museum: A First Amendment Argument for Protecting Uncommissioned Art on Private Property*, 111 MICH. L. REV. 249, 262 (2012) (quoting *Texas v. Johnson*, 491 U.S. 397, 404 (1989)).

184. *Hurley v. Irish-Am. Gay, Lesbian, & Bisexual Grp. of Bos.*, 515 U.S. 557, 568 (1995) (quoting *SUSAN DAVIS, PARADES AND POWER: STREET THEATRE IN NINETEENTH-CENTURY PHILADELPHIA* 6 (1986)).

185. See Mettler, *supra* note 183 (“Not all conduct that is minimally expressive receives First Amendment protection, however. . . . Under the *Spence* test, there must first be ‘[a]n intent to convey a particularized message’ and second, a great likelihood ‘that the message would be understood by those who viewed it.’” (quoting *Spence v. Washington*, 418 U.S. 405, 410–11 (1974) (per curiam))).

186. See *supra* Part I.A.

Amendment construction so long as they communicate some message.¹⁸⁷

Although the Constitution does not define “expression” in the copyright context, judicial interpretation of the Intellectual Property Clause’s reference to “writings” explicitly incorporates “expression.”¹⁸⁸ The oft-quoted *Burrow-Giles* definition of “writings”¹⁸⁹ indicates that any “visible embodiment of an idea” constitutes “expression.”¹⁹⁰ The decision in *Stowe v. Thomas*, which contrasts unprotectable ideas and protectable expression, supports this construction:

The claim of literary property . . . cannot be in the ideas, sentiments, or the creations of the imagination of the poet or novelist as dissevered from the language, idiom, style, or the *outward semblance and exhibition* of them. His exclusive property in the creation of his mind, cannot be vested in the author as abstractions, but only in the *concrete form* which he has given them, and the language in which he has clothed them. When he has sold his book, the only property which [h]e reserves to himself, or which the law gives to him, is the exclusive right to multiply the copies of that particular combination of characters which *exhibits to the eyes of another* the ideas intended to be conveyed.¹⁹¹

BCI-encoded brain signals easily fit within this constitutionally derived definition of “expression”—i.e., the visible embodiment of an embellished idea. So long as BCI-encoded brain signals satisfy copyright’s basic requirements,¹⁹² they qualify as “expression” under this definition.

Common and constitutional constructions of “expression” are liberal in their scope. Despite the fact that BCI technology creates an entirely novel avenue through which thoughts manifest in a physical form, these constructions qualify BCI-encoded thoughts as “expression” in both lay and constitutional contexts.

B. AMERICAN COPYRIGHT’S RAISON D’ÊTRE DOES NOT JUSTIFY COPYRIGHTING BCI-ENCODED BRAIN SIGNALS

Although BCI-encoded brain signals ostensibly qualify as expression capable of satisfying the fundamental requirements necessary for

187. See, e.g., *Universal City Studios, Inc. v. Corley*, 273 F.3d 429, 445–46 (2d Cir. 2001) (“If someone chose to write a novel entirely in computer object code by using strings of 1’s and 0’s for each letter of each word, the resulting work would be no different for constitutional purposes than if it had been written in English.”).

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

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

190. See *Jones*, *supra* note 168, at 554.

191. 23 F. Cas. 201, 206–07 (C.C.E.D. Pa. 1853) (No. 13,514) (emphasis added).

192. See *supra* Part I.B.

copyright protection,¹⁹³ the American copyright system's *raison d'être*¹⁹⁴ does not justify a grant of copyright protection to such signals. Copyright in the United States predominantly rests upon a utilitarian foundation.¹⁹⁵ Congress grants the exclusive rights associated with copyright¹⁹⁶ to authors because, "[w]ithout this incentive, . . . authors might not invest the time, energy, and money necessary to create [culturally valuable] works because they might be copied cheaply and easily by free riders . . ." ¹⁹⁷ Sara Stadler effectively illustrates the problem that U.S. copyright seeks to prevent:

[C]opyright law protect[s] authors of printed works from the harm caused by those who would print and market copies that were interchangeable with the corresponding "originals." Without such protection, unauthorized copies . . . could be reproduced and distributed to the public in the same form as authorized ones. Because [consumers] would assign a roughly equal value to the authorized and unauthorized copies, readers would purchase the cheaper of the two, which, in turn, would lower prices across the board, thus decreasing the profits that otherwise would be enjoyed by the copyright owner. This decrease, in turn, would reduce the incentive to create, thus reducing utility as well.¹⁹⁸

The utilitarian framework therefore assumes: (1) the cost of creating a new work is high; (2) the cost of reproducing that work is low; (3) reproducing that work does not exhaust it in any way; and (4) by granting the author the exclusive rights associated with copyright, she will be able to exclude others from her work and accordingly recoup her investment in the creation of the work.¹⁹⁹

BCI technology undermines at least one assumption underlying the utilitarian justification—namely, that the cost of creating a new work is high. The economic costs of creating a copyrightable work—

193. See *supra* Parts I.B, II.A.

194. See *supra* Part I.C.1.

195. See *supra* Part I.C.1; Fromer, *supra* note 130, at 74. Because utilitarianism dominates American copyright law, this Note only briefly considers BCI-encoded brain signals in a moral right environment. The theory of moral right, unlike the utilitarian basis for copyright, suggests that the author of a work reserves certain non-economic rights because her work *actually expresses* her personality. U.S. COPYRIGHT OFF., *supra* note 129, at 6. A copyright system rooted in Kantian principles undoubtedly grants copyright protection to BCI-encoded brain signals because nothing is more "internal to the person" than their thoughts, and a Hegelian system would also likely protect BCI-encoded brain signals—albeit more narrowly—for the same reason. See *supra* Part I.C.2.

196. See 17 U.S.C. § 106.

197. Fromer, *supra* note 130, at 74–75.

198. Sara K. Stadler, *Forging a Truly Utilitarian Copyright*, 91 IOWA L. REV. 609, 633–34 (2006) (footnote omitted).

199. See JULIE E. COHEN, LYDIA PALLAS LOREN, RUTH L. OKEDIJI & MAUREEN A. O'ROURKE, COPYRIGHT IN A GLOBAL INFORMATION ECONOMY 6 (2015).

i.e., the “cost of expression”—has two components: (1) “the cost of creating the work,” which primarily consists of the time and effort an author invests during the creative process; and (2) the cost of manufacturing copies of the work.²⁰⁰ The production of traditional works of authorship undoubtedly requires *some* degree of both intellectual and physical effort, and whether the production of copies incurs manufacturing costs depends on whether those copies are digital (relatively low cost) or analog (relatively high cost).²⁰¹

BCI technology, however, circumvents the physical effort requirement of creation entirely when it circumvents the motor cortex during the capture and codification of brain signals representing creative thought.²⁰² In addition, because BCI-encoded brain signals are fixed to, readable by, and reproduced through a digital device,²⁰³ the cost of manufacturing copies of the encoded signals is low. The “cost of expression” connected with the creation of BCI-encoded brain signals consists almost exclusively of intellectual labor and, therefore, is remarkably low.

Given the low cost of creating BCI-encoded brain signals, the utilitarian calculus that supports a grant of copyrightability for sufficiently original works of authorship appears not to support a grant of copyrightability to BCI-encoded brain signals. In other words, the “cost of expression” one must invest to create a work through BCI-encoding is sufficiently low such that granting copyright protection to BCI-encoded thoughts would not be “commensurate with the services rendered.”²⁰⁴ Because copyright enforcement is costly, the costs of granting copyright protection to BCI-encoded brain signals outweighs the social and economic benefits derived from such copyright protection.²⁰⁵ Indeed, although not all thoughts are created equal, the brain

200. William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 326–27 (1989).

201. Because BCI-encoded brain signals are recorded on a digital device, this Note assumes that copying such signals would mirror copying software or other digital files and therefore require little effort on behalf of the copyist. *See, e.g.*, Sudip Bhattacharjee, Ram D. Gopal & Lawrence G. Sanders, *Digital Music and Online Sharing: Software Piracy 2.0?*, 46 COMM'NS ACM 107, 107 (2003) (“Rapid advances in Internet connectivity and digital compression technologies have dramatically increased online sharing of digitized material With decreasing data storage cost and higher bandwidth, users are able to send large collections of [digitized goods] via email.”).

202. *See supra* Part I.A.1.

203. *See supra* Part I.A.1.

204. *Mazer v. Stein*, 347 U.S. 201, 219 (1954).

205. *Cf.* Landes & Posner, *supra* note 200, at 331 (explaining that legal rights, particularly with regard to intangibles, are costly to enforce).

constantly produces the signals that constitute thought.²⁰⁶ Some researchers even argue that unconscious thoughts are more important to the creative process than their conscious counterparts.²⁰⁷ A statutory incentive to *think* (i.e., to *create* in a BCI context) therefore appears to be unnecessary because thinking constantly occurs. A utilitarian approach to copyright therefore does not support granting copyrightable status to BCI-encoded brain signals *even if* those signals satisfy the basic requirements of copyrightability.²⁰⁸

C. COPYRIGHTING BCI-ENCODED BRAIN SIGNALS POSES PRACTICAL PROBLEMS

A determination that BCI-encoded brain signals are copyrightable will undoubtedly raise practical problems. Although potential problems abound, this Note specifically addresses issues related to (1) judicial resources and (2) determinability.²⁰⁹

1. Judicial Resources

Because an original work of authorship is created—and therefore protected²¹⁰—the moment it is fixed to a tangible medium of expression,²¹¹ a person using a BCI could potentially create a limitless number of copyrightable works. Indeed, if a BCI passively captures and encodes brain signals representing distinct creative thoughts, *each distinct creative thought is potentially copyrightable*.²¹² If ownership and use of BCIs were to become ubiquitous—like the ownership and

206. See, e.g., Judith N. Mildner & Diana I. Tamir, *Spontaneous Thought as an Unconstrained Memory Process*, 42 TRENDS NEUROSCIENCE 763, 763 (2019) (“In our minds, thoughts unfold continuously and freely.”).

207. See, e.g., Ap Dijksterhuis & Loran F. Nordgren, *A Theory of Unconscious Thought*, 1 PERSPS. ON PSYCH. SCI. 95, 102 (2006) (“Some necessary conscious activity notwithstanding, it is, in most people’s view, the unconscious that produces truly creative or unique thoughts.”).

208. See *supra* Part I.B.

209. Other practical problems this Note does not address include, *inter alia*, (1) whether an employee’s brain signals captured during employment belong to her employer under the work-for-hire doctrine; and (2) whether brain signals representing thoughts related to another copyrighted work are derivative works or qualify as fair use. These questions deserve (or require) their own articles.

210. See 17 U.S.C. § 302(a) (“Copyright in a work . . . subsists from its creation . . .”).

211. See *supra* note 94 and accompanying text.

212. “[F]ragmentary words and phrases,” however, will not qualify for copyright protection. *CMM Cable Rep, Inc. v. Ocean Coast Props., Inc.*, 97 F.3d 1504, 1519 (1st Cir. 1996) (“It is axiomatic that copyright law denies protection to ‘fragmentary words and phrases’ . . . on the grounds that these materials do not exhibit the minimal level of creativity necessary to warrant copyright protection.” (quoting 1 NIMMER ON COPYRIGHT § 2.01(b)(3))).

use of smartphones today²¹³—the populace would create a virtually infinite number of copyrightable works of authorship *daily*. A steep rise in the creation and dissemination of user-generated images—i.e., potentially copyrightable works of authorship—undoubtedly followed the arrival of social media.²¹⁴ Surely, then, the emergence of a technology that permits an author to create copyrightable works merely by thinking will result in an even more dramatic increase in the number of copyrightable works created daily.

A technology that transforms laypeople to prolific authors could prove problematic for the U.S. Copyright Office²¹⁵ and courts. First, although an author need not register her work for copyright protection to subsist, she *does* need to register it to commence an action for infringement.²¹⁶ If BCI-encoded brain signals are copyrightable, the U.S. Copyright Office and U.S. courts might see an unwieldy increase in registration applications and infringement actions, respectively. This increased activity is problematic for both bodies. For courts, the judicial resources necessary for any litigation are undeniably scarce.²¹⁷ An obligation to entertain copyright infringement cases—which are expensive and lengthy proceedings²¹⁸—for an immeasurable body of

213. See *Mobile Fact Sheet*, PEW RSCH. CTR. (June 12, 2019), <https://www.pewresearch.org/fact-sheet/mobile/> [<https://perma.cc/JK33-8RL8>] (“The share of Americans that own smartphones is now 81%, up from just 35% in Pew Research Center’s first survey of smartphone ownership conducted in 2011.”).

214. See Elizabeth J. Tao, Note, *A Picture’s Worth: The Future of Copyright Protection of User-Generated Images on Social Media*, 24 IND. J. GLOB. LEGAL STUD. 617, 618 (2017) (“Social media users are posting photographs online in extraordinary quantities. As the amount of user content on social media websites increases, a large number of copyrightable photographs are readily accessible and ripe for unauthorized copying” (footnote omitted)).

215. Cf. *Overview of the Copyright Office*, U.S. COPYRIGHT OFF., <https://www.copyright.gov/about/> [<https://perma.cc/F67X-4RU5>] (“[T]he Copyright Office is responsible for administering a complex and dynamic set of laws, which include registration, the recordation of title and licenses, a number of statutory licensing provisions, and other aspects of the 1976 Copyright Act and the 1998 Digital Millennium Copyright Act.”).

216. U.S. COPYRIGHT OFF., CIRCULAR 1, COPYRIGHT BASICS 4 (2019) (“Copyright exists automatically in an original work of authorship once it is fixed in a tangible medium, but . . . for U.S. works, registration . . . is necessary to enforce the exclusive rights of copyright through litigation.”).

217. See Marin K. Levy, *Judicial Attention as a Scarce Resource: A Preliminary Defense of How Judges Allocate Time Across Cases in the Federal Courts of Appeals*, 81 GEO. WASH. L. REV. 401, 405 & n.21 (2013).

218. See Scott Alan Burroughs, *Copyright Litigation: Now More Expensive and with More Delay than Ever Before!*, ABOVE L. (Mar. 13, 2019, 11:14 AM), <https://abovethelaw.com/2019/03/copyright-litigation-now-more-expensive-and-with-more-delay-than-ever-before/> [<https://perma.cc/2GM4-HSER>].

copyrighted works would threaten the courts' very functionality. Regarding the U.S. Copyright Office, its backlog of copyright registration applications exceeded 250,000 at the beginning of 2018.²¹⁹ If BCI-encoded brain signals are copyrightable, the U.S. Copyright office could potentially confront a spike in registration applications and, consequently, growth of its backlog.

2. Determinability

BCI-encoded brain signals, although they may qualify for copyright protection, might suffer from issues of determinability. "Given the physical complexity of what's happening inside your head, it's not easy to trace a thought from beginning to end."²²⁰ In other words, determining *which* BCI-encoded brain signals form the copyrightable expression is "a little like asking where the forest begins. Is it with the first leaf, or the tip of the first root?"²²¹ Although a sufficiently original, encoded combination of brain signals purportedly representing a distinct thought (or stream of consciousness) would be copyrightable, courts—and even authors—might struggle to determine *which* encoded signals form the copyrightable expression.

These determinability issues would arise from (1) neuronal noise²²² and (2) spontaneous thought. Neuronal noise, in a BCI context, might render imprecise the digital output of encoded brain signals. For example, where a BCI captures and encodes brain signals representing the phrase "I like dogs," the neuronal noise within those signals might "contaminate" the phrase such that the phrase no longer reads as "I like dogs"; rather, in its raw digital form, the BCI output might read as "I[jdh] li[ahfhd]k[nf]e do[h]g[h]s."²²³

Even if a BCI is sophisticated enough to read through neuronal noise, spontaneous thought—as opposed to random neuronal fluctuations and disturbances—often infiltrates and interrupts an otherwise concerted stream of consciousness.²²⁴ Spontaneous thought is

219. U.S. COPYRIGHT OFF., ANNUAL REPORT FOR FISCAL 2018, at 6 (2018) <https://www.copyright.gov/reports/annual/2018/ar2018.pdf> [<https://perma.cc/5KBT-JK6F>].

220. Elizabeth Dougherty, *What Are Thoughts Made of?*, MASS. INST. TECH. SCH. ENG'G: ASK AN ENG'R (Apr. 26, 2011), <https://engineering.mit.edu/engage/ask-an-engineer/what-are-thoughts-made-of/> [<https://perma.cc/DLH3-NYS7>].

221. *Id.*

222. See Faisal et al., *supra* note 57 and accompanying text.

223. The bracketed nonsense represents the "random neuronal fluctuations" that are present but not part of a signal.

224. See Matthew A. Killingsworth & Daniel T. Gilbert, *A Wandering Mind Is an Unhappy Mind*, 330 *Sci.* 932, 932 (2010).

“all thought that unfolds effortlessly and unrestrictedly. . . . It includes concepts such as mind wandering, daydreaming, creativity, and dreaming.”²²⁵ One study reported that mind wandering—i.e., “stimulus-independent thought”²²⁶—occurred in 46.9% of study participants.²²⁷ The researchers posited that mind wandering is “the brain’s default mode of operation.”²²⁸ In addition to being the brain’s default mode of operation, mind wandering “is often experienced intermittently during sustained attention tasks.”²²⁹ In a BCI context, encoded brain signals representing concerted creative thought might be interrupted by spontaneous thought (like mind wandering). Returning to the example phrase immediately above, where a BCI captures and encodes brain signals representing the phrase “I like dogs,” that BCI would *also* capture the signals representing spontaneous thought such that the BCI’s output might read “**I like** [what’s for dinner?] **dogs**.”²³⁰ Neuronal noise and spontaneous thought therefore pose a practical problem in the identification of copyrightable elements within BCI-encoded brain signals.

Although BCI-encoded brain signals qualify as copyrightable “expression” under lay and constitutional constructions of the word, a grant of copyright protection to works composed of such signals does not advance copyright’s utilitarian objectives and poses potentially significant practical problems.²³¹ Part III demonstrates that Congress could simultaneously harmonize theoretical discord and reduce the practical consequences arising from a grant of copyrightable status to

225. Mildner & Tamir, *supra* note 206, at 764.

226. Killingsworth & Gilbert, *supra* note 224.

227. *Id.*

228. *Id.*

229. Wendy Hasenkamp, Christine D. Wilson-Mendenhall, Erica Duncan & Lawrence W. Barsalou, *Mind Wandering and Attention During Focused Meditation: A Fine-Grained Temporal Analysis of Fluctuating Cognitive States*, 59 *NEUROIMAGE* 750, 750 (2012).

230. The bracketed language here represents a spontaneous thought interfering with the concerted thought. Spontaneous thoughts that amount to more than “fragmentary words or phrases” may independently qualify for copyright protection and further compound the problem of judicial resources described in Part II.C.1, *supra*. See *Alfred Bell & Co. v. Catalda Fine Arts, Inc.*, 191 F.2d 99, 102, 105 (2d Cir. 1951) (“It is clear . . . that nothing in the Constitution commands that copyrighted matter be strikingly unique or novel. . . . 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.” (emphasis added) (footnotes omitted)); see also *CMM Cable Rep., Inc. v. Ocean Coast Props., Inc.*, 97 f.3d 1504, 1519 (1st Cir. 1996) (describing limitations on the copyrightability of “fragmentary words and phrases”).

231. See *supra* Part II.B.

BCI-encoded brain signals by imposing an effort requirement on authors seeking to protect works of authorship composed of these signals.

III. BCI-ENCODED BRAIN SIGNALS SHOULD NOT BE COPYRIGHTABLE UNLESS CONGRESS INTRODUCES AN EFFORT REQUIREMENT

Although BCI-encoded brain signals constitute expression²³² and are likely copyrightable by the letter of the law,²³³ granting protection to these signals does not advance the utilitarian goals of the U.S. copyright system,²³⁴ and such signals therefore should not be protectable under contemporary copyright law. Congress, however, could institute an exceptional effort requirement that would raise the “cost of expression” of BCI-encoded brain signals and consequently render them copyrightable in a utilitarian framework. An effort requirement would also solve the practical problems described *supra* in Part II.C.

A. AN EFFORT REQUIREMENT IS NECESSARY TO RENDER BCI-ENCODED BRAIN SIGNALS CONSTITUTIONALLY COPYRIGHTABLE

Despite satisfying the basic statutory requirements for copyright protection, BCI-encoded brain signals should not be copyrightable because copyrighting such signals would not achieve the utilitarian objectives²³⁵ of U.S. copyright law. U.S. copyright doctrine is founded on the idea that granting exclusive rights to authors of works will (1) incentivize them to create more works of authorship and (2) enable them to recoup their investments in the creation of works. This utilitarian framework assumes that the “cost of expression”²³⁶ required to create a work of authorship is sufficiently high such that an author will cease to produce additional works *unless* she receives an incentive to create—namely, copyright protection for the works she authored.²³⁷

The cost of expression of creating BCI-encoded brain signals, however, consists *only* of intellectual labor, and that intellectual labor—i.e., thinking—occurs ceaselessly.²³⁸ The cost of expression an author pays to create BCI-encoded brain signals therefore is not

232. *See supra* Part II.A.

233. *See supra* Parts I.B, II.A.

234. *See supra* Part II.B.

235. *See supra* Part I.C.1.

236. *See* Landes & Posner, *supra* note 200.

237. *See supra* Part I.C.2, II.B.

238. *See supra* Part II.B.

sufficiently higher than the cost a copyist incurs to reproduce the work,²³⁹ and so the utilitarian framework of U.S. copyright does not support a grant of copyright protection to BCI-encoded brain signals *despite* their satisfaction of the Copyright Act of 1976's basic requirements.²⁴⁰ In any event, common sense dictates that humans should not receive an incentive to think.

Congress, acting in its capacity to pass laws that advance the utilitarian objectives of the Intellectual Property Clause,²⁴¹ could amend the Copyright Act of 1976 to include an effort requirement—applicable only to BCI-encoded brain signals—that would oblige authors to “polish” their raw BCI-encoded brain signals before such signals qualify for copyright protection. Such a requirement would obligate the authors of BCI-encoded brain signals (1) to remove manually the neuronal noise and spontaneous thoughts²⁴² captured alongside the heart of their intended expression and (2) to identify the beginning and end of the distinct encoded brain signals they wish to copyright. Only after the author has “edited” her BCI-encoded brain signals would the signals qualify for copyright.²⁴³

This proposed effort requirement brings BCI-encoded brain signals within the constitutional confines of copyrightability because it increases the time and effort an author must invest in the creative process—thereby increasing the cost of expression²⁴⁴—before her BCI-encoded thoughts are statutorily copyrightable. The resulting cost of expression associated with producing polished, copyrightable BCI-encoded brain signals would warrant a grant of copyright because—as the utilitarian framework assumes and has been true of traditional works of authorship—the cost of creating the BCI-encoded brain signals would become higher than the cost a copyist would incur to reproduce digitally the encoded signals. The author accordingly would be entitled to the exclusive rights of copyright to encourage her to continue producing and to recoup the statutorily required investment associated with her culturally valuable, polished BCI-encoded brain signals.²⁴⁵

239. See *supra* note 200.

240. See *supra* Parts I.B.1, II.B.

241. See W. Michael Schuster, *Public Choice Theory, the Constitution, and Public Understanding of the Copyright System*, 51 U.C. DAVIS L. REV. 2247, 2253 (2018).

242. See *supra* Part II.C.2.

243. In practice, an author might “edit” her work by removing from the work the machine or human-readable code representing neuronal noise and spontaneous thought.

244. See Landes & Posner, *supra* note 200 and accompanying text.

245. See *supra* Parts I.C.1, II.B.

B. AN EFFORT REQUIREMENT REMEDIES THE PRACTICAL PROBLEMS BCI-ENCODED BRAIN SIGNALS POSE

This proposed effort requirement also solves the practical problems detailed above.²⁴⁶ First, the effort requirement cures the issue of limited judicial resources.²⁴⁷ Because the requirement would condition the copyrightability of BCI-encoded brain signals on the investment of a concerted editorial effort, the incessant production of copyrightable works of authorship would come to a halt. Although the production of *raw* BCI-encoded brain signals would remain incessant, the production of polished, statutorily copyrightable brain signals would be far more limited. Indeed, not everyone who thinks is compelled to invest time or effort into transforming their expressive thoughts into a copyrightable—i.e., registrable and actionable—form. Although the emergence of a new form of copyrightable expression might result in an uptick in copyright registrations and related actions, the U.S. Copyright Office and courts could reallocate their resources to address this effect.

Second, the effort requirement obviously cures issues of determinability.²⁴⁸ Indeed, satisfaction of the effort requirement—i.e., the sufficient condition for receiving copyright for BCI-encoded thoughts—requires *a demonstrated effort to cure issues of determinability*. As proposed *supra*, an author who wishes to copyright her BCI-encoded brain signals must invest the time and effort to remove neuronal noise and spontaneous thoughts and to indicate where her copyrightable expression begins and ends.²⁴⁹ The effort requirement therefore implicitly remedies the determinability issues this Note illustrates.

A congressionally authorized effort requirement represents a practical solution to the issue of copyrightability in the BCI context. The solution not only brings BCI-encoded brain signals within the utilitarian confines of the Constitution's Intellectual Property Clause, but it also eliminates the practical problems that would likely arise if Congress or the judiciary deemed BCI-encoded brain signals copyrightable. Congress might also consider applying this solution to other unorthodox forms of copyrightable expression that require little or no investment to create. Indeed, as technology continues to evolve, BCI assuredly will not be the sole challenger to modern (and future) conceptions of expression.

246. See *supra* Part II.C.

247. See *supra* Part II.C.1.

248. See *supra* Part II.C.2.

249. See *supra* Part III.A.

C. AN EFFORT REQUIREMENT DOES NOT VIOLATE *FEIST*

Critics of this proposed effort requirement may erroneously argue that it does not accord with the Supreme Court's decision in *Feist Publications, Inc. v. Rural Telephone Service Co.*²⁵⁰ Prior to *Feist*, some courts had embraced a "sweat of the brow" theory of copyright that "accepts industry and effort as sufficient to establish originality [and hence copyrightability] even when such effort lacks imagination or judgment."²⁵¹ The Second Circuit crafted "[t]he classic formulation"²⁵² of the "sweat of the brow" theory in *Jeweler's Circular Publishing Co. v. Keystone Publishing Co.*²⁵³ The court, finding copyrightable an alphabetical directory of trademarks,²⁵⁴ explained that "[t]he right to copyright a book upon which one has expended labor in its preparation does not depend upon whether the materials which he has collected . . . show literary skill or originality, either in thought or in language, or anything more than industrious collection."²⁵⁵ It further declared that where an author "produces by his [physical] labor a meritorious composition . . . he may obtain a copyright, and thus obtain the exclusive right of multiplying copies of his work."²⁵⁶ A copyright regime predicated on a "sweat of the brow" theory therefore eschews *originality of content* and embraces *labor of the author* as the preliminary condition a work of authorship must fulfill to qualify for copyright protection.²⁵⁷

The *Feist* Court, however, expressly rejected the "sweat of the brow" theory advanced in *Jeweler's Circular* and any notion that copyright protection merely "was a reward for the hard work" that an author invests in creating a work of authorship.²⁵⁸ The Court, declining to find copyrightable an alphabetized telephone directory, stated that although "[t]he 'sweat of the brow' doctrine had numerous flaws, the most glaring [was] that it extended copyright protection in a compilation . . . to the facts themselves."²⁵⁹ The Court importantly noted that

250. 499 U.S. 340 (1991).

251. Howard B. Abrams, *Originality and Creativity in Copyright Law*, 55 LAW & CONTEMP. PROBS. 3, 8 (1992).

252. *Feist*, 499 U.S. at 352.

253. 281 F. 83 (2d Cir. 1922).

254. *Id.* at 84-85.

255. *Id.* at 88.

256. *Id.*

257. Recall that originality is currently the touchstone of copyrightability. *See supra* Part I.B.2.

258. *Feist Publ'ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 352 (1991).

259. *Id.* at 353.

“[f]acts are never original, so the . . . author can claim originality, if at all, only in the way the facts are presented.”²⁶⁰ According to the Court, “to merit [copyright] protection, the facts *must be selected, coordinated, or arranged* ‘in such a way’ as to render the work as a whole original.”²⁶¹

The *Feist* Court therefore held that where a work of authorship is composed solely of uncopyrightable material, the fact that its author exerted substantial effort to gather the uncopyrightable material embodied in the work does not alone qualify the work for copyright protection. Rather, a work composed of uncopyrightable material becomes copyrightable only after the author “select[s], coordinate[s], or arrange[s]”²⁶²—i.e., edits—the material. And because the “writings which are to be protected are *the fruits of intellectual labor*,”²⁶³ the *Feist* Court’s recognition that an author’s selection, coordination, and arrangement of material may render a work copyrightable demonstrates that selection, coordination, and arrangement are acts of *intellectual labor* rather than *physical labor*.

The effort requirement this Note proposes therefore does not violate the Supreme Court’s decision in *Feist*. The proposed requirement does not ask authors to invest in a work of authorship the type of physical effort that *Feist* expressly dismissed as irrelevant in the copyright context. Rather, because the effort requirement would obligate authors merely to select, coordinate, and arrange their BCI-encoded brain signals,²⁶⁴ it ensures that an author seeking copyright protection for those signals invests into the work comprised of those signals an amount of intellectual labor sufficient to warrant a grant of copyright protection—just as *Feist* requires. *Feist* accordingly does not preclude the imposition of an effort requirement for authors seeking copyright protection for a work composed of BCI-encoded brain signals.

Case law, beyond merely permitting Congress to impose an effort requirement, affirmatively supports the imposition of an effort requirement. In *Estate of Hemingway v. Random House, Inc.*,²⁶⁵ the estate of Ernest Hemingway (1) asserted that it possessed a protectable intellectual property right in Hemingway’s oral conversations with author A.E. Hotchner and (2) alleged that Random House, Inc. infringed Hemingway’s estate’s copyright when it published Hotchner’s

260. *Id.* at 358.

261. *Id.* (emphasis added).

262. *Id.*

263. *Id.* at 346 (quoting Trade-Mark Cases, 100 U.S. 82, 94 (1879)).

264. See *supra* Part III.A.

265. 279 N.Y.S. 2d 51, 54 (N.Y. Sup. Ct. 1967).

accounts of those conversations in a memoir.²⁶⁶ The court—largely tracking the lower court’s reasoning—declined to recognize any property right in mere oral conversation.²⁶⁷ The court observed that “much of the literary value of [a] book arises from its author’s selection and compilation of the conversational materials used, and with his ordering of incidents so as to form a coherent whole.”²⁶⁸ The court, equating oral conversations to “the raw materials of history,”²⁶⁹ refused to recognize any copyright in mere oral conversation.²⁷⁰

The court, by observing that the fruits of an author’s editorial efforts constitute “much of the literary value” of a work, seems tacitly to embrace the imposition of an effort requirement.²⁷¹ The court’s nod to the value of applied editorial effort and subsequent refusal to grant copyright protection to mere conversation indicates that *some degree* of effort is required to render *potentially* copyrightable but otherwise “raw” materials copyrightable. BCI-encoded brain signals—like the conversational material at issue in *Estate of Hemingway*—represent “raw materials” that are ripe for authorial “selection and compilation.”²⁷² Given the issues of determinability from which BCI-encoded brain signals may suffer,²⁷³ a work comprised of such signals would likely derive significant value from an author’s intellectual efforts to remove traces of neuronal noise and spontaneous thought.²⁷⁴ The effort requirement would ensure that an author receives copyright for a coherent work composed of BCI-encoded brain signals rather than a collection of mere “raw material.” Case law therefore supports—rather than prohibits—the imposition of an effort requirement on BCI-encoded brain signals to bring them within the ambit of the U.S. copyright system.

CONCLUSION

This Note seeks to determine whether works produced through BCI devices could qualify for copyright protection under the Copyright Act of 1976 and, more importantly, the Constitution itself. This Note argues that although BCI-encoded brain signals both qualify as

266. *Id.* at 53, 58–60.

267. *Id.* at 60.

268. *Id.* at 59.

269. *Id.* at 61.

270. *Id.*

271. *Id.* at 59.

272. *Id.*

273. *See supra* Part II.C.2.

274. *See supra* Part III.A.

“expression” and satisfy all the basic requirements necessary to secure copyright protection, granting authors exclusive rights over their encoded brain signals does not advance the utilitarian objectives of copyright as mandated by the Constitution. This Note suggests that Congress could amend the Copyright Act of 1976 to include an effort requirement that authors of BCI-encoded brain signals must satisfy to render their encoded brain signals copyrightable in our utilitarian copyright system.

Although this Note focuses on BCI technology, the problems it raises will certainly arise in other contexts. The ceaseless advance of technology will quickly challenge our understanding of the basic precepts that once seemed absolute and upon which our legal system is founded and its protections afforded. Progress and innovation will force lawmakers and judges to evaluate the legality of a technology not by the letter of the law, but rather by its spirit. This Note is demonstrative of that assertion: although our operative law indicates that BCI-encoded thoughts are copyrightable, the Constitution indicates otherwise, for its concern with the form that copyrightable expression assumes is outweighed by its interest in promoting productive engagement with the arts and sciences. So too will other emergent technologies necessitate a return to nuanced scrutiny of our Constitution and its underlying theory.