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The Perception Machine

Our Photographic Future between the Eye and AI

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Notes

Preface

This short photo essay, introducing in a visual form the key themes of my book while aiming to enact what it means to live in a media-dirty world, is made up of collages which combine my own and found images. Image credits and references:

Page ix: (1) Image from *Ophthalmodouleia: Das ist Augendienst*, the first Renaissance manuscript on ophthalmic disorders and eye surgery, published in 1583 by German physician Georg Bartisch (1535–1607), considered by many to be the “father of modern ophthalmology,” <https://publicdomainreview.org/collection/images-from-johann-zahn-s-oculus-artificialis-1685>. (2) Still from a promotional film titled *To New Horizons* from General Motors. The film was created to promote their “Highways and Horizons” exhibit at the 1939–1940 New York World’s Fair. “The film presents a vision of the future, namely of 1960 seen through the eyes of those living in 1940, and imagines the world of tomorrow which the narrator describes as ‘A greater world, a better world, a world which always will grow forward,’” <https://publicdomainreview.org/collection/to-new-horizons-1940>. (3) Collage from randomly selected photos from my cell phone, made with the Gandr app.

Page x: (1) Still from my *Neuromatic* video, featuring a reworking, through a GAN algorithm, of images of eyes and brains taken from the Wellcome Collection, and annotated by myself with a memelike slogan and typeface.

Page xi: (1) *Back to the Future* meme made for the 2020 pandemic—and updated by myself for 2021. (2) No-photography symbol found on the Internet. (3) Curtain for the theater performance of the *Back to the Future* musical staged at the Adelphi Theatre in London in December 2021, photo by myself. (4) Collage from randomly selected photos from my cell phone, made with the Gandr app.

Page xii: (1) Johann Zahn, two images from *Oculus artificialis teledioptricus sive telescopium* (The long-distance artificial eye, or telescope) (Herbipoli [Wurzburg]: Quirini Heyl, 1685–1686), part I, <https://publicdomainreview.org/collection/images>

-from-johann-zahn-s-oculus-artificialis-1685. (2) Indoor dome security camera, found image. (3) Image of Abraham Lincoln as a matrix of pixel values, in Thomas Smits and Melvin Wevers, "The Visual Digital Turn: Using Neural Networks to Study Historical Images," *Digital Scholarship in the Humanities* 35, no. 1 (January 2020), 197. (4) Collage from randomly selected photos from my cell phone, made with the Gandr app.

Page xiii: (1) Collage from randomly selected photos from my cell phone, made with the Gandr app. (2) Quote from Vilém Flusser, *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011), 127.

Page xiv: (1) Still from my *Neuromatic* video.

Page xv: (1) Fundus photo from my eye examination at Boots, London. (2) No-profile icon from mobile applications; found image.

Page xvi: (1) Stills from my *Neuromatic* video. (2) Meme from *Know Your Meme* online encyclopedia, submitted by My Little Pony: Friendship is Magic.

Page xvii: (1) Poem generated by an AI algorithm (seemingly trained on a poetry database), in response to a one-word prompt offered by myself—"perception." Poem Pavilion, UK, designed by Es Devlin, Expo Dubai 2020, October 1, 2021–March 31, 2022. (2) Surgeon and assistant performing cataract surgery on a patient and various surgical instruments, tables XXXVIII–XXXIX from *A Medicinal Dictionary* (1743–1745), <https://publicdomainreview.org/collection/denis-diderot-letter-on-the-blind>.

Introduction

1. As the Samsung website described it, "Designed with a unique contour-cut camera to create a revolution in photography—letting you capture cinematic 8K video and snap epic stills, all in one go" (<https://www.samsung.com/uk/smartphones/galaxy-s21-ultra-5g/>).

2. Tomáš Dvořák and Jussi Parikka, eds., *Photography Off the Scale: Technologies and Theories of the Mass Image* (Edinburgh: Edinburgh University Press, 2021).

3. Lev Manovich, "Introduction: How to See One Billion Images," in *Cultural Analytics* (Cambridge, MA: MIT Press, 2020).

4. Lev Manovich speaking at "Scales, Collections, and Quantities," launch event for Parikka and Dvořák's book, Zoom, March 25, 2021.

5. Andrew Dewdney, *Forget Photography* (London: Goldsmiths Press, 2021).

6. Ariel Goldberg and Yazan Khalili, "We Stopped Taking Photos," *e-flux Journal*, no. 115 (February 2021), <https://www.e-flux.com/journal/115/374500/we-stopped-taking-photos/>

7. Yanai Toister, *Photography from the Turin Shroud to the Turing Machine* (Bristol: Intellect, 2020), 53.

8. *Ibid.*

9. Benjamin H. Bratton, *The Stack: On Software and Sovereignty* (Cambridge, MA: MIT Press, 2016).

10. Dipesh Chakrabarty, *The Climate of History in a Planetary Age* (Chicago: University of Chicago Press, 2021), 78. Chakrabarty postulates that “the planet,” which he equates with the Earth Systems, should become a key category of the humanities, replacing the human-centric “globe,” “world,” and “earth.”

11. Amanda Lagerkvist, “Existential Media: Toward a Theorization of Digital Thrownness,” *New Media and Society* 19, no. 1 (2017): 96. Lagerkvist has developed this concept in her follow-up book, *Existential Media: A Media Theory of the Limit Situation* (Oxford: Oxford University Press, 2022). She suggests there that existential media “constitute the antinomies of the modern human situation, and they therefore require responsivity and responsibility. In our present datafied world, it is thus a truism to say that media matter. Yet this fact is now greatly magnified, as contemporary life finds itself perched on the limits” (3). Lagerkvist anchors her leading concept in the work of philosopher Karl Jaspers, but she also seeks resonances for its (unwitting) reverberations in the work of many media scholars, including John Durham Peters, Sarah Pink, and broadly conceived “communication theory.” In the book she goes so far as to postulate that “our media have always been existential—a fact that has not been sufficiently recognized in media research” (64).

12. See Joanna Zylińska, *AI Art: Machine Visions and Warped Dreams* (London: Open Humanities Press, 2020).

13. Lagerkvist, “Existential Media,” 106.

14. As Steve F. Anderson put it, “we are witnessing—and participating actively in—a remarkable transition in visual culture, the root of which lies in the evolving relationship between data and images.” Anderson, *Technologies of Vision: The War between Data and Images* (Cambridge, MA: MIT Press, 2017), 4.

15. Vilém Flusser, *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011), 49.

16. See Roland Barthes, *Camera Lucida*, trans. Richard Howard (New York: Hill and Wang, 1981); Pierre Bourdieu, *Photography: A Middle-Brow Art*, trans. Shaun Whiteside (Stanford: Stanford University Press, 1990); and Susan Sontag, *On Photography* (New York: Farrar, Straus and Giroux, 1977).

17. See Claude E. Shannon and Warren Weaver, *The Mathematical Theory of Communication* (Urbana: University of Illinois Press, 1949).

18. Vilém Flusser's renowned books on photography are *Towards a Philosophy of Photography*, trans. Anthony Mathews (London: Reaktion Books, 2000), and *Into the Universe of Technical Images*. I am referring here, in turn, to his *Does Writing Have a Future?*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011).

19. Henri Bergson, *Matter and Memory*, trans. Nancy Margaret Paul and W. Scott Palmer (London: George Allen & Unwin, 1911), vii.

20. *Ibid.*, 3.

21. Anderson, *Technologies of Vision*, 230.

22. Lagerkvist, *Existential Media*, 3.

23. Borrowing from Lewis Mumford's description of a society as a "megamachine," in *Anti-Oedipus* Gilles Deleuze and Félix Guattari position both capitalism and society as machines. They outline their nested model of machinic organization, whose underlying logic they understand to be cybernetic, in the following terms: "The social machine . . . has men for its parts, even if we view them with their machines, and integrate them, internalize them in an institutional model at every stage of action, transmission, and motricity. Hence the social machine fashions a memory without which there would be no synergy of man and his (technical) machines." Deleuze and Guattari, *Anti-Oedipus*, trans. Robert Hurley, Mark Seem, and Helen R. Lane (Minneapolis: University of Minnesota Press, 1983), 141.

24. In her introduction to the poignantly titled *The Camera as Actor: Photography and the Embodiment of Technology* (London: Routledge, 2021), Amy Cox Hall claims that "the photographer is increasingly intertwined with the machine" (16). She describes the multiplicity of early camera technologies, from Fox Talbot's "mousetrap" cameras that popularized the negative process through to stereo cameras, imaging devices designed for use in outer space, and Harold Edgerton's repatronic camera developed to photograph atomic bomb explosions as "machinic enterprises" (17). She also points out, importantly for my argument here, that "the digital is bringing our attention back to the machine" (19).

25. As Goldberg and Khalili put it in "We Stopped Taking Photos," "The role of images in consolidating power could be evidenced by the desire by some to stop the production or circulation of images: no photography at a checkpoint; arresting journalists; a right-wing mob knocks over video cameras, then attacks a whole pile of equipment—the crowd around them cheers, stomping on the idea of information that operates against their delusions."

26. *Ibid.*

27. Paul Virilio, *The Vision Machine*, trans. Julie Rose (Bloomington: Indiana University Press, 1994), 22.

28. Reflecting on the loss of this modernist delimitation, Dipesh Chakrabarty points out: "Facing the planetary . . . requires us to acknowledge that the communicative

setup within which humans saw themselves as naturally situated through categories like earth, world, and globe has now broken down, at least partially. Many traditions of thought, including some religious ones, may have considered the earth-human relationship special; with regard to the planet, though, we are no more special than other forms of life" (*The Climate of History in a Planetary Age*, 98).

29. Virilio, *The Vision Machine*, 59.

30. *Ibid.*, 36.

31. Joanna Zylinka, *Nonhuman Photography* (Cambridge, MA: MIT Press, 2017).

32. I first proposed the concept of "eco-eco-punk" in Joanna Zylinka, "Eco-eco-punk: Mediating the Anthropocene with Nam June Paik," in *Media Ecology: Revisiting TV Garden* (Gyeonggi-do: Nam June Paik Art Center, 2021) (published in English and Korean). Some of the theoretical material from that earlier essay has been reworked for this volume. I have been using the "eco-eco crisis" formulation in my previous works, but the phrase was originally proposed by Tom Cohen in "Introduction: Murmurations—'Climate Change' and the Defacement of Theory," in Cohen, ed., *Telemorphosis: Theory in the Era of Climate Change*, vol. 1 (Ann Arbor: Open Humanities Press, 2012), 13–42.

33. Presenting a gritty and dystopian vision of the future, cyberpunk is the original sci-fi genre exploring high-tech heroism in a society on the verge of civilizational collapse, spawning a number of subsequent variants. Steampunk offers a more romanticized response to the threat of civilizational collapse, foregrounding the retrofuturistic aesthetic inspired by the steam engine technology of the early industrial era. Biopunk is a subgenre of cyberpunk that focuses on the biotechnological aspects of the societal transformation (including bioaugmentation and genetic engineering)—and not so much on information technology. Greenpunk is a technophilic movement centered on individuals using, and being affected by the use of, DIY renewable resources, recycling, and repurposing. Ecopunk focuses on infrastructure, production cycles, trade, and trying to make a living in an ecologically depleted world.

34. James Patrick Kelly and John Kessel, "Introduction: Hacking Cyberpunk," in Kelly and Kessel, eds., *Rewired: The Post-Cyberpunk Anthology* (San Francisco: Tachyon Publications, 2007), xii.

35. I first outlined these ideas around my use of artistic and other images in my theoretical work in "Nonhuman Photography: Andrew Dewdney Interviews Joanna Zylinka for unthinking.photography," The Photographers' Gallery, February 11, 2019. I am grateful to Andrew for the provocation and prompt.

36. Maurizio Lazzarato, "After Cinema," in Peter Szendy with Emmanuel Alloa and Marta Ponsa, eds., *The Supermarket of Images* (Paris: Gallimard / Jeu de Paume, 2020), 155.

37. *Ibid.*, 150.

Chapter 1

An earlier and shorter version of this chapter, prefaced by the opening of chapter 2, came out in Joanna Zylińska with Goldsmiths Media, eds., *The Future of Media* (London: Goldsmiths Press, 2022).

1. Quoted in Philip McCouat, “Early Influences of Photography on Art,” *Journal of Art in Society* (2012–2015), <http://www.artinsociety.com/pt-1-initial-impacts.html>
2. Naomi Rosenblum claims that “only in the three primary industrial powers—England, France, and the United States—was this group able to sustain the investment of time and energy necessary to develop the medium technically and in terms of significant use.” Rosenblum, *The World History of Photography*, 3rd ed. (New York: Abbeville Press, 1997), 23.
3. McCouat, “Early Influences of Photography on Art.”
4. Geoffrey Batchen, *Burning with Desire: The Conception of Photography* (Cambridge, MA: MIT Press, 1997), 93.
5. Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990), 10.
6. See Batchen, *Burning with Desire*.
7. Rebecca Solnit, *River of Shadows: Eadweard Muybridge and the Technological Wild West* (London: Penguin, 2004), 81.
8. See Walter Benjamin, *On Photography*, trans. Esther Leslie (London: Reaktion Books, 2015); Susan Sontag, *On Photography* (New York: Farrar, Straus and Giroux, 1977); Solnit, *River of Shadows*.
9. See Ariella Aïsha Azoulay, *Potential History: Unlearning Imperialism* (London: Verso, 2019); Jonathan Beller, *The Message Is Murder: Substrates of Computational Capital* (London: Pluto Press, 2017); Andrew Dewdney, *Forget Photography* (London: Goldsmiths Press, 2021).
10. Batchen, *Burning with Desire*, 207.
11. *Ibid.*, 208–211.
12. *Ibid.*, 208.
13. Roland Barthes, *Camera Lucida*, trans. Richard Howard (New York: Hill and Wang, 1981).
14. See Joanna Zylińska, *Nonhuman Photography* (Cambridge, MA: MIT Press, 2017), 113.
15. Batchen, *Burning with Desire*, 216.

16. Ibid., 214.
17. Vilém Flusser, *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011), 6.
18. Ibid., 6.
19. See Mark Poster, "An Introduction to Vilém Flusser's *Into the Universe of Technical Images* and *Does Writing Have a Future?*," in Flusser, *Into the Universe of Technical Images*, ix–xxv.
20. Flusser, *Into the Universe of Technical Images*, 60.
21. Nancy Roth, "The Photographer's Part," *Flusser Studies* 10 (November 2011): 14.
22. Ibid.
23. Poster, "An Introduction," xviii–xix.
24. Flusser, *Into the Universe of Technical Images*, 4.
25. Vilém Flusser, *Towards a Philosophy of Photography*, trans. Anthony Mathews (London: Reaktion Books, 2000), 21.
26. Ibid., 29.
27. Ibid., 29–30.
28. Ibid., 30. Google AI researcher Blaise Aguera y Arcas has explained:

The flexibility of code allows us to make cameras that do much more than producing images that can pass for natural. Researchers like those at MIT Media Lab's Camera Culture group have developed software-enabled nontraditional cameras (many of which still use ordinary hardware) that can sense depth, see around corners, or see through skin; Abe Davis and collaborators have even developed a computational camera that can "see" sound, by decoding the tiny vibrations of houseplant leaves and potato chip bags. So, Flusser was perhaps even more right than he realized in asserting that cameras follow programs, and that their software has progressively become more important than their hardware. Cameras are "thinking machines."

Aguera y Arcas, "Art in the Age of Machine Intelligence," AMI at *Medium*, February 23, 2016, <https://medium.com/artists-and-machine-intelligence/what-is-ami-ccd936394a83#.9r2o4bgvq>
29. Kenneth Goldsmith, "It's a Mistake to Mistake Content for Content," *Los Angeles Review of Books*, June 14, 2015, <https://lareviewofbooks.org/article/its-a-mistake-to-mistake-content-for-content/>
30. Flusser, *Towards a Philosophy of Photography*, 49.
31. Ibid., 49.
32. Ibid., 50.

33. Elle Hunt, "Faking It: How Selfie Dysmorphia Is Driving People to Seek Surgery," January 23, 2019, *The Guardian*, <https://www.theguardian.com/lifeandstyle/2019/jan/23/faking-it-how-selfie-dysmorphia-is-driving-people-to-see-surgery>
34. Daniel Rubinstein and Katrina Sluis, "A Life More Photographic: Mapping the Networked Image," *Photographies* 1, no. 1 (March 2008): 17–18.
35. Flusser, *Into the Universe of Technical Images*, 132.
36. Elizabeth A. Kessler, "Review of Joanna Zylińska's *Nonhuman Photography*," *CAA Reviews*, February 11, 2019, doi: 10.3202/caa.reviews.2019.18
37. Flusser, *Into the Universe of Technical Images*, 17.
38. *Ibid.*, 19.
39. *Ibid.*, 38, 9.
40. *Ibid.*, 9.
41. *Ibid.*, 32.
42. *Ibid.*, 59.
43. *Ibid.*
44. *Ibid.*, 60.
45. Dayna Tortorici, "Infinite Scroll: Life under Instagram," *The Guardian*, January 31, 2020, <https://www.theguardian.com/technology/2020/jan/31/infinite-scroll-life-under-instagram>
46. Flusser, *Into the Universe of Technical Images*, 66.
47. See *ibid.*, 109.
48. Flusser's implicit use of the composting metaphor in his nature—culture—waste—nature cycle has affinities with Donna Haraway's use of the term "compost." Since 2016, "compost" has played an increasingly important role in her organicist and messy ontology of "humusities." See Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham: Duke University Press, 2016), 32. She writes there: "Staying with the trouble requires making oddkin; we require each other in unexpected collaborations and combinations, in hot compost piles. We become-with each other or not at all" (4).
49. Flusser, *Into the Universe of Technical Images*, 93.
50. *Ibid.*
51. *Ibid.*
52. *Ibid.*, 94.

53. *Ibid.*, 127.
54. *Ibid.*, 45.
55. *Ibid.*, 44.
56. *Ibid.*, 28, emphasis added.
57. Amanda Lagerkvist, "Existential Media: Toward a Theorization of Digital Thrownness," *New Media and Society* 19, no. 1 (2017): 96.
58. *Ibid.*, 56.
59. *Ibid.*, 49.
60. Vilém Flusser, *Does Writing Have a Future?*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011), 21.
61. *Ibid.*
62. *Ibid.*, 120.
63. David Trend, *The End of Reading: From Gutenberg to Grand Theft Auto* (Frankfurt am Main: Peter Lang, 2010), 19.
64. *Ibid.*, 28.
65. *Ibid.*, 28–29.
66. Maryanne Wolf, "Skim Reading Is the New Normal. The Effect on Society Is Profound," *The Guardian*, August 25, 2018, <https://www.theguardian.com/commentisfree/2018/aug/25/skim-reading-new-normal-maryanne-wolf>. See also Maryanne Wolf, *Reader Come Home: The Reading Brain in a Digital World* (New York: Harper, 2018).
67. Jean M. Twenge, Gabrielle N. Martin, and Brian H. Spitzberg, "Trends in U.S. Adolescents' Media Use, 1976–2016: The Rise of Digital Media, the Decline of TV, and the (Near) Demise of Print," *Psychology of Popular Media Culture* 8, no. 4 (2019): 342.
68. *Ibid.*, 332.
69. Maryanne Wolf, "There's a Crisis of Reading among Generation Z," *Pacific Standard*, April 29, 2019, <https://psmag.com/ideas/theres-a-crisis-of-reading-among-generation-z>
70. Wolf, "Skim Reading Is the New Normal." See also Ziming Liu, "Digital Reading," *Chinese Journal of Library and Information Science* (English edition) (2012): 86.
71. Wolf, "Skim Reading Is the New Normal."
72. See Trend, *The End of Reading*, 11.

73. Vilém Flusser, *The Holy See: An Extract from The Last Judgment: Generations* (Pittsburgh and New York: Flugschriften, 2019), 13.
74. *Ibid.*, 17.
75. Trend, *The End of Reading*, 10.
76. *Ibid.*, 17.
77. See Nicholas Carr, *The Shallows: How the Internet Is Changing the Way We Think, Read and Remember* (London: Atlantic Books, 2010)
78. Only an excerpt from this work has been published in English so far. See Flusser, *The Holy See*.
79. Flusser, *The Holy See*, 17–18.
80. Rodrigo Maltez-Novaes, “Translator’s Introduction” to Flusser, *The Holy See*, 7–9.
81. Trend, *The End of Reading*, 2.
82. *Ibid.*, 10.
83. Theodor W. Adorno, *Aesthetic Theory* (London: Athlone Press, 1997), 143.
84. Harun Farocki, *Eye/Machine* I, II and III. DVD (Video Data Bank, 2001).
85. Flusser, *Into the Universe of Technical Images*, 46–47.
86. See <https://www.youtube.com/watch?v=FV42ocdV6ZA>
87. Derrida in Bernard Stiegler and Jacques Derrida, *Echographies of Television* (London: Polity, 2002), 142–143.
88. *Ibid.*, 143.
89. *Ibid.*, 142.
90. *Ibid.*
91. Flusser, *Into the Universe of Technical Images*, 28.
92. Project used and quoted with the student’s permission.
93. <https://www.psychologytoday.com/gb/blog/what-shapes-film/201311/3-reasons-why-were-drawn-faces-in-film>; https://www.researchgate.net/publication/221513968_Are_people_drawn_to_faces_on_webpages
94. Flusser, *Towards a Philosophy of Photography*, 32.
95. Trevor Paglen, “Invisible Images (Your Pictures Are Looking at You),” *New Inquiry*, December 8, 2016, <https://thenewinquiry.com/invisible-images-your-pictures-are-looking-at-you/>

96. Trend, *The End of Reading*, 134.

97. "Interview with Marvin Heiferman," included as part of the Seeing Through Photographs course, MoMA, available on Coursera (undated, accessed June 20, 2020).

Chapter 2

1. Victoria Fu in Behzad Farazollahi, Bjarne Bare, and Christian Tunge with Susanne Østby, eds., *Why Photography* (Milan: Skira, 2020), 77.

2. In DL Cade, "Photography as We Know Is Changing, and It's Your Job to Change with It," *Petapixel*, November 8, 2019, https://petapixel.com/2019/11/08/photography-as-we-know-is-changing-and-its-your-job-to-change-with-it/?mc_cid=947c856268&mc_eid=5bb11290a7.

3. *Ibid.*

4. *Ibid.*

5. Trevor Paglen, "Artist's Notes" for the exhibition *A Study of Invisible Images*, September 8–October 21, 2017, Metro Pictures, New York. There are clear resonances between Paglen's aesthetico-political philosophy and Virilio's earlier argument developed in *The Vision Machine* (trans. Julie Rose, Bloomington: Indiana University Press, 1994), especially Virilio's recognition that the perception of the environment is now being shared "between the animate (the living subject) and the inanimate (the object, the seeing machine)" (59–60). Virilio's concept of "seeing machines," and his idea that "sightless vision" (62) is at the heart of the vision machine, have been formative for Paglen's project.

6. Paglen did four postings for the Fotomuseum Winterthur blog under the overall title "Is Photography Over?" This quote comes from posting 2, "Seeing Machines," which develops ideas raised in the first posting ("Is Photography Over?"), March 13, 2014, https://www.fotomuseum.ch/en/explore/still-searching/articles/26978_seeing_machines

7. Félix Nadar, *When I Was a Photographer*, trans. Eduardo Cadava and Liana Theodoratou (Cambridge, MA: MIT Press, 2015), 3.

8. Refik Anadol, *Archive Dreaming*, 2017, <https://refikanadol.com/works/archive-dreaming/>

9. See Daniel Rubinstein and Katrina Sluis, "A Life More Photographic: Mapping the Networked Image," *Photographies* 1, no. 1 (March 2008): 9–28.

10. Anthony McCosker and Rowan Wilken, *Automating Vision: The Social Impact of the New Camera Consciousness* (London: Routledge, 2020).

11. *Ibid.*, 3, emphasis in the original.
12. *Ibid.*
13. *Ibid.*, 4.
14. Joanna Zylińska, *Nonhuman Photography* (Cambridge, MA: MIT Press, 2017).
15. In *Life after New Media: Mediation as a Vital Process* (Cambridge, MA: MIT Press, 2012), Sarah Kember and I have proposed the concept of mediation as “a key trope for understanding and articulating our being in, and becoming with, the technological world, our emergence and ways of intraacting with it, as well as the acts and processes of temporarily stabilizing the world into media, agents, relations, and networks” (xv, emphasis in the original).
16. See Martin Hand, *Ubiquitous Photography* (Cambridge: Polity Press, 2012).
17. See Sarah Kember, “Ambient Intelligent Photography,” in Martin Lister, ed., *The Photographic Image in Digital Culture*, 2nd ed. (Abingdon, UK: Routledge, 2013), 56–76.
18. Matthew Cobb, *The Idea of the Brain: The Past and Future of Neuroscience* (London: Profile Books, 2020), Kindle edition.
19. *Ibid.*
20. *Ibid.*
21. In Teodora Cosman, “The Metaphors of Photography and the Metaphors of Memory—Artistic Reflections on an Album of Family Photographs,” *Philobiblon* 17, no. 1 (2012): 268–291.
22. *Ibid.*, 274.
23. Rosalind Krauss states that “every photograph is the result of a physical imprint transferred by light reflections onto a sensitive surface. The photograph is thus a type of icon, or visual likeness, which bears an indexical relationship to its object. Its separation from true icons is felt through the absoluteness of this physical genesis, one that seems to short-circuit or disallow those processes of schematization or symbolic intervention that operate within the graphic representations of most paintings.” Krauss, “Notes on the Index: Seventies Art in America,” *October* 3 (1977): 75.
24. Adam Harvey, “On Computer Vision,” *Umbau*, no. 1: “Political Bodies” (2021), Karlsruhe University of Arts and Design (HfG), <https://umbau.hfg-karlsruhe.de/posts/on-computer-vision>.
25. Cobb, *The Idea of the Brain*, emphasis added.
26. Marvin Heiferman, “Introduction,” in Heiferman, ed., *Photography Changes Everything* (New York: Aperture/Smithsonian, 2012), 16

27. Ibid., 20.
28. See Vilém Flusser, *Towards a Philosophy of Photography*, trans. Anthony Mathews (London: Reaktion Books, 2000).
29. Vilém Flusser, *Does Writing Have a Future?*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011), 7.
30. Ibid.
31. Gerhard Richter, *Afterness: Figures of Following in Modern Thought and Aesthetics* (New York: Columbia University Press, 2011), 15.
32. Hubertus von Amelunxen, "Photography after Photography: The Terror of the Body in Digital Space," in von Amelunxen et al., eds, *Photography after Photography: Memory and Representation in the Digital Age*, trans. Pauline Cumbers (Munich: G+B Arts, 1996), 119.
33. Richter, *Afterness*, 23.
34. See the catalog published on the occasion of the "postphotography" exhibition *From Here On*, presented at Arts Santa Monica in Barcelona, Spain, and then at Rencontres d'Arles in 2013: Joan Fontcuberta et al., *From Here On: PostPhotography in the Age of Internet and the Mobile Phone* (Barcelona: RM Verlag, 2013).
35. Liz Wells, "The Limits of Critical Thought about Post-photography," in Wells, ed., *Photography: A Critical Introduction*, 2nd ed. (London: Routledge, 2000), 343.
36. Fred Ritchin, *After Photography* (New York: W. W. Norton, 2009), 183.
37. See Camila Moreiras, "Joan Fontcuberta: Post-photography and the Spectral Image of Saturation," *Journal of Spanish Cultural Studies* 18, no. 1 (2017): 58.
38. Joan Fontcuberta, *The Post-Photographic Condition* (Montreal: Le mois de la photo à Montréal, 2015), 6.
39. Moreiras, "Joan Fontcuberta," 57.
40. Ibid.
41. See Robert Shore, *Post-Photography: The Artist with a Camera* (London: Laurence King, 2014).
42. My formulation also differs from the term "softimage" offered, very much in a post-photographic vein, by Ingrid Hoelzl and Rémi Marie in their book of that name, whereby "the image is not only part of a programme, but it contains its own 'operation code': It is a programme in itself." While I value, and concur with, many of Hoelzl and Marie's analytical insights about the current state of the digital image and its operative agency, my own goal is to examine the force of photographic acts and actions upon us and the world (the latter partly being formed by us through

photographic images), rather than the agential objecthood of the digital image within the computational system of which it is part (i.e., the image become software). In Ingrid Hoelzl and Rémi Marie, *Softimage: Towards a New Theory of the Digital Image* (Bristol, UK: Intellect, 2015), 132.

43. Cobb, *The Idea of the Brain*.

44. William J. Mitchell, *The Reconfigured Eye: Visual Truth in the Post-Photographic Era* (Cambridge, MA: MIT Press, 1992), 3.

45. *Ibid.*, 6–7.

46. *Ibid.*, 18.

47. The phrase is a transposition of John Cage's response, offered in Milan in 1959, to someone enquiring about whether Cage's *Fontana Mix* was still be to considered music: "You must not call it music, if this expression hurts you." See the website of the You Must Not Call It Photography If This Expression Hurts You project: <http://youmustnotcallit.photography/index.html>

48. Andrew Dewdney, *Forget Photography* (London: Goldsmiths Press, 2021), 3.

49. *Ibid.*, 28.

50. Ariella Aisha Azoulay, *Potential History: Unlearning Imperialism* (London: Verso, 2019); Jonathan Beller, *The World Computer: Derivative Conditions of Racial Capitalism* (Durham: Duke University Press, 2021); Tina Campt, *Listening to Images* (Durham: Duke University Press, 2017); Mark Sealy *Decolonising the Camera: Photography in Racial Time* (London: Lawrence & Wishart, 2019).

51. Dewdney, *Forget Photography*, 189.

52. *Ibid.*, 196.

53. *Ibid.*, 189.

54. *Ibid.*, 13.

55. Harvey, "On Computer Vision."

56. *Ibid.*

57. David Campany interviewed by Duncan Wooldridge, "Tomorrow's Headlines Are Today's Fish and Chip Papers: Some Thoughts on 'Response-ability,'" in Ben Burbridge and Annabella Pollen, eds., *Photography Reframed: New Visions in Contemporary Photographic Culture*, 2019 edition (London: Bloomsbury Visual Arts, 2019), 32.

58. See Vilém Flusser, *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011).

59. Trevor Paglen, “Is Photography Over?” posting on a blog for Fotomuseum Winterthur, March 3, 2014, https://www.fotomuseum.ch/en/explore/still-searching/articles/26977_is_photography_over

Chapter 3

An earlier and much shorter version of this chapter, together with the accompanying images, was first published as an electronic artbook: Joanna Zylińska, *Perception at the End of the World, or How Not to Play Video Games* (Pittsburgh and New York: Flugschriften, 2020).

1. *The Last of Us*, one of the most highly rated and best-selling games of all time, was created by developers Naught Dog for the game console PlayStation 3 in 2013. It was remastered for PlayStation 4 in 2014 and subsequently became known as *The Last of Us Remastered*. This is the version of the game I played, but for the sake of simplicity, I will be referring to *The Last of Us* from now on. In 2020, in the middle of the Covid-19 pandemic, Naught Dog released a sequel, *The Last of Us Part II*. A TV series based on the game premiered on HBO in 2023.

2. Jonathan Crary, *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge, MA: MIT Press, 1999), 3.

3. Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990), 5.

4. Crary, *Suspensions of Perception*, 3.

5. Norman Bryson, “The Gaze in the Expanded Field,” in Hal Foster, ed., *Vision and Visuality* (Seattle: Bay Press, 1988), 107.

6. With this, my argument differs from the one outlined by Winfried Gerling, for whom “The practices of the screenshot and photography in computer games must be differentiated by use and function. If the screenshot is more the spontaneous capture or documentation of a temporary status of the computer for various goals such as retaining the settings in a program, a glitch (disturbance), or a constellation on a website, then photography in the computer is more a photographic activity. Its goal is to retain a specific theme: a situation or a scene.” Gerling, “Photography in the Digital,” *Photographies* 11, no. 2–3 (September 2, 2018): 157. Gerling’s article is fascinating in its tracing of the legacy of the game screenshot back to earlier screen capture techniques in medical and technical photography, but it seems less convincing in imposing such a strict caesura between setting-capture and image-capture, without really taking cognizance of the rich array of artistic practices that playfully veer between screenshotting, in-game photography—and, indeed, the taking of actual photographs of a screen with a camera. The shared kinesthetic aspect of all three, on the level of both the character and the player, is significant for my argument here, even if it manifests itself differently in each case.

7. Matteo Bittanti, "The Art of Screenshoot-ing: Joshua Taylor, Videogame Photographer," in *Mister Bit—Wired IT*, December 24, 2011; <http://blog.wired.it/misterbit/2011/12/24/the-art-of-screenshoot-ing-joshua-taylor-videogame-photographer.html>

8. Cindy Poremba, "Point and Shoot: Remediating Photography in Gamespace," *Games and Culture* 2, no. 1 (2007): 50.

9. See Seth Giddings, "Drawing with Light: Simulated Photography in Videogames," in Martin Lister, ed., *The Photographic Image in Digital Culture*, 2nd ed. (Abingdon, UK: Routledge, 2013), 46.

10. This is the explanation of Damian Martin's technique as provided by the games website *Kotaku*: "I use a DLP projector connected up to a console or PC and a projection screen. . . . I then photograph the game as it's projected on the screen using two different 35mm cameras and a very high ISO black and white film stock. The reason for this is that photographing a game from a screen would mean the image is broken down into RGB pixels creating a 'screendoor' effect across the image making it obviously digital. The interaction of the soft DLP image and the heavy grain of the 3200 ISO film stock I use is what creates the strange reality of the images—our minds automatically fill in the detail that the grain suggests, making the image feel more real than it does in the game." Rich Stanton, "These Photographs Make Video Game Worlds Look Real," *Kotaku*, March 22, 2018, <https://www.kotaku.co.uk/2018/03/22/these-photographs-make-video-game-worlds-look-real>

11. Wasim Ahmad, "It May Be Art, but In-Game Images Aren't 'Photography'," *Fstoppers*, March 24, 2017, <https://fstoppers.com/originals/it-may-be-art-game-images-arent-photography-170382>

12. Matteo Bittanti, "Interview: Gareth Damian Martin: The Aesthetics of Analogue Game Photography," *GameScenes*, February 4, 2018, <https://www.gamescenes.org/2018/04/interview-gareth-damian-martin-the-aesthetics-of-analogue-game-photography.html>

13. It was "Shooting Virtual Cities: In-Game Photography Workshop," held on July 7, 2018. I am grateful to Gareth Damian Martin for the inspiration the workshop provided me with—and for bearing with me when I didn't know how to hold a game controller properly.

14. See Vilém Flusser, *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011), 6.

15. Rune Klevjer, "Enter the Avatar: The Phenomenology of Prosthetic Telepresence in Computer Games," in Hallvard Fossheim, Tarjei Mandt Larsen, and John Richard Sageng, eds., *The Philosophy of Computer Games* (London: Springer, 2012), 17–38. Accessed as a preprint on the author's academia.edu page. I am grateful to Agata Zarzycka for pointing me toward Klevjer's work.

16. For example, in the foreword to David Marr's *Vision*, which is key a reference point in the computer vision field, Shimon Ullman writes: "The book describes a general framework proposed by Marr for studying and understanding visual perception" (xvii). In David Marr, *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information* (Cambridge, MA: MIT Press, 1990).
17. Marr, *Vision*, 3.
18. Ibid.
19. Beau Lotto, *Deviante: The Science of Seeing Differently* (London: Weidenfeld & Nicolson, 2017), Kindle edition.
20. The concept of "naturecultures," signaling a mutually constitutive relationship in the world's ecologies between what Western epistemology has designated as separate domains of "nature" and "culture," arguably organizes the whole of Haraway's oeuvre, but one text where it features particularly prominently is *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Prickly Paradigm Press, 2003).
21. Hal Foster, preface to Foster, *Vision and Visuality*, ix.
22. Ibid., ix.
23. Bryson, "The Gaze in the Expanded Field," 107, emphasis added.
24. Foster, preface to *Vision and Visuality*, x.
25. Martin Jay, "Scopic Regimes of Modernity," in Foster, *Vision and Visuality*, 7.
26. Crary, *Techniques of the Observer*, 14.
27. He writes: "'Light, color, movement,' 'the movement of light,' 'the quick projection of light impulses,' 'light and time,' 'a time form'—such phrases reflect the specific interests of individual filmmakers but taken together they specify film's 'true essence' in terms appropriate to the avant-garde's 'mystique of purity': 'light-space-time continuity in the synthesis of motion,' in Moholy-Nagy's neat formulation." William C. Wees, *Light Moving in Time: Studies in the Visual Aesthetics of Avant-Garde Film* (Berkeley: University of California Press, 1992), 12–13.
28. Ibid., 13.
29. Kjetil Rødje, "Lens-Sense: On Seeing a World as Sensed by a Camera," *Screening the Past*, no. 43 (April 2018), http://www.screeningthepast.com/2018/02/lens-sense-on-seeing-a-world-as-sensed-by-a-camera/#_ednref11
30. Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (New York: Modern Library, 1944), 362.

31. Alexander Sekatskiy has argued that Bergson's snapshots should really be interpreted as film stills, a shift which allows for a subsequent redemption of photography as a more dynamic and "lively" medium, rather than a mere deadly record of sliced life. Sarah Kember and I made this point in *Life after New Media: Mediation as a Vital Process* (Cambridge, MA: MIT Press, 2012), 78–79. See also Alexander Sekatskiy, "The Photographic Argument of Philosophy," *Philosophy of Photography* 1, no. 1 (2010): 83.
32. See Gilles Deleuze, *Cinema 1: The Movement-Image*, trans. Hugh Tomlinson and Barbara Habberjam (London: Athlone Press, 1986).
33. Gilles Deleuze and Félix Guattari, *What Is Philosophy?*, trans. Hugh Tomlinson and Graham Burchell (New York: Columbia University Press, 1994), 208.
34. *Ibid.*
35. Kember and Zylinska, *Life after New Media*, 75.
36. See Patricia Pisters, *The Neuro-Image: A Deleuzian Filmphilosophy of Digital Screen Culture* (Stanford: Stanford University Press, 2012).
37. Rebekah Modrak observes that several early theories of vision, developed, among others, by Plato and Euclid, already hinted at a more dynamic process, positing that light particles "were projected out of the eye onto objects," with the eye actively creating the image. This latter model is indeed much closer to our current understanding of perception and vision. Rebekah Modrak with Bill Anthes, *Reframing Photography: Theory and Practice* (London: Routledge, 2011), 4.
38. Joseph Anderson and Barbara Fisher, "The Myth of Persistence of Vision," *Journal of the University Film Association* 30, no. 4 (Fall 1978): 3.
39. *Ibid.*, 6, emphasis added.
40. *Ibid.*
41. Max Wertheimer, "Experimentelle Studien über das Sehen von Bewegung," *Zeitschrift für Psychologie* 61 (1912): 161–265.
42. Cited in Joseph Anderson and Barbara Anderson (née Fisher), "The Myth of Persistence of Vision Revisited," *Journal of Film and Video* 45, no. 1 (Spring 1993): 7.
43. This is a phenomenon described as beta movement. It is a cognate phenomenon to "phi motion," a concept introduced by Wertheimer in his 1912 paper. Anderson and Anderson offer their own term for what became known as beta movement, arguing as follows: "Since we know that the individual pictures of a motion picture are not really moving, and that our perception of motion is therefore an illusion, and since we *now* know that the effect has nothing to do with persistence of vision or phi movement, we suggest that henceforth the phenomenon of motion in the motion picture be called by the name used in the literature of perception: *short-range*

apparent motion" ("The Myth of Persistence of Vision Revisited," 10). They also indicate that human perception cannot distinguish between *apparent* short-range motion and *actual* motion in the natural world. "To the visual system, the motion in a motion picture *is* real motion," they claim (10).

44. Marc Sommer and Robert Wurtz, "Influence of the Thalamus on Spatial Visual Processing in Frontal Cortex," *Nature* 444 (2006): 374–377.

45. *Ibid.*, 374.

46. Julia Layton, "How Does the Brain Create an Uninterrupted View of the World?," *HowStuffWorks.com*, November 15, 2006, <https://science.howstuffworks.com/life/steady-view.htm>

47. *Ibid.*

48. *Ibid.* Photographer Brian Dilg has challenged any ongoing attempts to see human vision as photographic. Drawing on the latest research in the neurophysiology of perception, Dilg has argued that, unlike a camera, we do not look at a scene once but rather look around it, with our eyes jumping in rapid movements known as saccades. We thus "have a dynamic view, not a camera's fixed perspective." What's more, our gaze is "constantly changing, and we never stop updating our view. Cameras, on the other hand, 'look' once and record the entire scene in a single, static frame." Our vision "is actually a collage of quick snapshots," as what we see is a fluid, constantly updated stream of images. This process is extremely selective, focusing on certain sections of the image stream, comparing them with past ones to make memories—and envisaging some future ones to make predictions. As a result of this frantic activity, "we miss a great deal of what's happening in the present." For Dilg, photography's greatest strength lies in being able to see differently from us—and "to show us what we've missed." Brian Dilg, *Why You Like This Photo: The Science of Perception* (London: Octopus, 2018), Kindle edition.

49. "The Brain Is the Screen: An Interview with Gilles Deleuze," in *The Brain Is the Screen: Deleuze and the Philosophy of Cinema*, ed. Gregory Flaxman (Minneapolis: University of Minnesota Press, 2000), 366.

50. Lotto, *Deviate*.

51. Anderson and Fisher, "The Myth of Persistence of Vision," 7.

52. Richard L. Gregory, *Eye and Brain: The Psychology of Seeing* (Princeton, NJ: Princeton University Press, 1997), 5th ed., 79.

53. David J. Chalmers, "Facing Up to the Problem of Consciousness," *Journal of Consciousness Studies* 2 (1995): 200–219.

54. As argued by Joseph and Barbara Anderson ("The Myth of Persistence of Vision Revisited," 7),

Theories such as Werthiemer's [*sic*] which emphasize a central fusion process were reflected in early film literature, but with little understanding of the physiological mechanisms involved. Frederick A. Talbot, for example, in *Moving Pictures: How They Are Made and Worked* offered an account of this central fusion variation of the persistence of vision theme. The cinematographer, according to Talbot, takes advantage of a "deficiency" of the human eye: "This wonderful organ of ours has a defect which is known as 'visual persistence'." (Talbot 3) Talbot provided one of the most colorful explanations of this so-called defect: "The eye is in itself a wonderful camera. . . . The picture is photographed in the eye and transmitted from that point to the brain. . . . When it reaches the brain, a length of time is required to bring about its construction, for the brain is something like the photographic plate, and the picture requires developing. In this respect the brain is somewhat sluggish, for when it has formulated the picture imprinted upon the eye, it will retain the picture even after the reality has disappeared from sight." (Talbot 4)

According to Talbot, then, each two contiguous images blend or fuse together in the brain, allowing for the perception of smooth, continuous movement. He further compares the brain to a then-contemporary apparatus for slide projection, known as a "dissolving lantern," by means of which one view is "dissolved" into another. (Talbot 5)

55. As Gregory puts it, "Perhaps we won't fully understand the visual brain before we design and make a machine with sophisticated vision" (Gregory, *Eye and Brain*, 79).

56. Two contrasting accounts of visual perception are predominant in the cognitive sciences: the theory of inferential perception, premised on cognitivist thinking, whereby the subject establishes a relationship between the environment and the percept by means of a rational inference, i.e., interpretation, and the theory of direct perception, one that involves a more direct grasping of the relationship between the percept and the information provided by the stimulus. This second theory is the one known as "ecology of perception." Even though I am explicitly identifying with the latter, I do not think the two need to be positioned as strict opposites. In other words, I do not think ecological perception needs to remain completely free from cognitive input for my overall position and argument to stand.

57. Johann Wolfgang von Goethe, *Theory of Colours*, trans. Charles Easdale (1840; Cambridge, MA: MIT Press, 1970), x.

58. Jonathan Crary, "Modernizing Vision," in Foster, *Vision and Visuality*, 34.

59. We should make a sideways nod here to Maurice Merleau-Ponty's phenomenology of perception and the perceiving body, although we also need to be mindful of Bryson's critique of what he sees as corporeal simplification in Merleau-Ponty, with the body positioned as the center from which one looks out onto the world, and not a dynamic agent co-constituted by the living matter around it. See Bryson, "The Gaze in the Expanded Field," 120. However, the metaphysical intimations of Merleau-Ponty's phenomenology of perception, and of his model of the human, are the principal reason for why my journey through theories of perception and vision bypasses his work here—even though I do of course acknowledge Merleau-Ponty's

enormous influence on disciplines such as philosophy of mind, cognitive science, and environmental philosophy.

60. Alva Noë, *Action in Perception* (Cambridge, MA: MIT Press, 2004); Shaun Gallagher, *How the Body Shapes the Mind* (Oxford: Oxford University Press, 2005).

61. See James J. Gibson, *The Perception of the Visual World* (Boston: Houghton Mifflin, 1950).

62. James J. Gibson, *The Ecological Approach to Visual Perception* (Boston: Houghton Mifflin, 1979), 187. This paragraph and the next one have been reworked from my book *Nonhuman Photography* (Cambridge, MA: MIT Press, 2017).

63. Anderson and Anderson, "The Myth of Persistence of Vision Revisited," 11.

64. Modrak, *Reframing Photography*, 10.

65. *Ibid.*, 11.

66. *Ibid.*

67. Lyle Rexer, *The Critical Eye: Fifteen Pictures to Understand Photography* (Bristol, UK: Intellect, 2019), 59.

68. "Anthropocene, Capitalocene, Chthulucene: Donna Haraway in Conversation with Martha Kenney," in Heather Davis and Etienne Turpin, eds., *Art in the Anthropocene: Encounters among Aesthetics, Politics, Environments and Epistemologies* (London: Open Humanities Press, 2015), 258.

69. Crary, *Techniques of the Observer*, 53.

70. Klevjer, "Enter the Avatar," 32.

71. See Donald D. Hoffman, "Conscious Realism and the Mind-Body Problem," *Mind and Matter* 6, no. 1 (2008): 87–121.

72. See Hanneke Grootenboer, *Treasuring the Gaze: Intimate Vision in Late Eighteenth-Century Eye Miniatures* (Chicago: University of Chicago Press, 2012), 82–88.

73. Klevjer, "Enter the Avatar," 3.

74. Rodchenko and Moholy-Nagy were involved in photographic experiments aimed at displacing human vision by adopting the viewpoint of bird or insect. These radical new viewpoints amounted to what Moholy-Nagy described as a "New Vision," which the new society in the then nascent modern era required, according to his revolutionary intimations. I have read Seers's *Human Camera* project, in which she takes photos with her mouth, as enacting the inherently photographic nature of life itself (see Zylinska, *Nonhuman Photography*, 75–77).

75. Giddings, "Drawing with Light," 42.

76. Rexer, *The Critical Eye*, 59.
77. Nanna Verhoeff, *Mobile Screens: The Visual Regime of Navigation* (Amsterdam: Amsterdam University Press, 2012), 15.
78. *Ibid.*, 13.
79. I am grateful to Sebastian Möring for making this point to me.
80. Poremba, "Point and Shoot," 2.
81. As Lotto argues, "The world exists. It's just that we don't see it. We do not experience the world as it is *because our brain didn't evolve to do so.*" He then adds that "our brains developed not to see reality but just to help us survive the constant flood of intermixed stimuli that would be impossible to process as discrete pieces of information, if it were even possible for them to appear that way." For Lotto, perception is not an end in itself: he argues that we perceive so that we can move. Also, (eye) movement, "combined with a constant search for difference," is the fundamental condition of sight (Lotto, *Deviate*, introduction, Kindle edition).
82. See chapter 3, "Photography after the Human," in Zylinska, *Nonhuman Photography*.
83. See Joanna Zylińska, *The End of Man: A Feminist Counterapocalypse* (Minneapolis: University of Minnesota Press, 2018).
84. Dom Phillips, "Brazil Using Coronavirus to Cover Up Assaults on Amazon, Warn Activists," *The Guardian*, May 6, 2020, <https://www.theguardian.com/world/2020/may/06/brazil-using-coronavirus-to-cover-up-assaults-on-amazon-warn-activists>
85. Dominic Rushe and Michael Sainato, "Amazon Posts \$75bn First-Quarter Revenues but Expects to Spend \$4bn in Covid-19 Costs," *The Guardian*, April 30, 2020, <https://www.theguardian.com/technology/2020/apr/30/amazon-revenues-jeff-bezos-coronavirus-pandemic>

Chapter 4

An earlier version of this chapter was published as "Beyond Machine Vision: How to Build a Non-Trivial Perception Machine," *Transformations*, no. 36 (2022), special issue on "Artificial Creativity" edited by Bo Reimer and Bojana Romnic.

1. Andreas Broeckmann, "Optical Calculus," paper presented at the conference "Images Beyond Control," FAMU, Prague, November 6, 2020 (online), 1: 1–7. What I am doing here may seem to go against Broeckmann's call to use the concept of the machine "only sparingly," and not to extend it beyond specific apparatuses to larger symbolic and social systems. Yet I believe there is an affinity between our positions when it comes to the rationale for what we do. Our respective projects

are both underpinned by an ethical injunction to make knowledge that matters, knowledge that remains anchored in specific affordances—and that can tell us something meaningful about us *and* the world. For me, however, it is through a radical conceptual expansion of the concept of the machine, with its nested layers of meanings, that we may approach this goal (rather than through its sparing and overcautious use). This is because machinic operations are not just metaphorical: there is a materiality to their different layers and functions. See also Andreas Broeckmann, “The Machine as Artist as Myth,” *Arts* 8, no. 25 (2019): 1–10; doi: 10.3390/arts8010025. I am grateful to Andreas for our discussion about these issues, and for sharing his texts with me.

2. See Leonardo Impett, “The Image-Theories behind Computer Vision,” paper presented at #DHNord2020 “The Measurement of Images,” MESHS, updated on November 2020, 10, https://www.meshs.fr/page/the_image-theory_behind_computer_vision. There are some affinities between my approach in this chapter and Impett’s statement that the algorithms of computer vision have an ideology, and, more importantly, a philosophy—even if both this ideology and this philosophy tend to remain latent in the dominant scholarship on computer vision.

3. David Hubel and Torsten Wiesel, “Receptive Fields of Single Neurons in the Cat’s Striate Cortex,” *Journal of Physiology* 148 (1959): 589.

4. *Ibid.*, 575.

5. See David Marr, *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information* (Cambridge, MA: MIT Press, 1982), 4.

6. Shimon Ullman, foreword to Marr, *Vision*, xvii.

7. The sense of perception as information processing which does not necessarily lead to the creation of subjective experience is adopted in the opening pages of Brian Rogers’s *Perception: A Very Short Introduction* (Oxford: Oxford University Press, 2017, Kindle edition), with perception being defined as a set of processes that “allow us to extract information from the patterns of energy that impinge on our sense organs.” Rogers prefers this definition to the everyday understanding of perception as “our experience of seeing, hearing, touching, tasting, and smelling objects and individuals in the surrounding world.”

8. It was the second most popular category in its research database featuring work on AI, with over 800 papers on September 23, 2020:

Research in machine perception tackles the hard problems of understanding images, sounds, music and video. In recent years, our computers have become much better at such tasks, enabling a variety of new applications such as: content-based search in Google Photos and Image Search, natural handwriting interfaces for Android, optical character recognition for Google Drive documents, and recommendation systems that understand music and YouTube videos. Our approach is driven by algorithms that benefit from processing very large,

partially-labeled datasets using parallel computing clusters. A good example is our recent work on object recognition using a novel deep convolutional neural network architecture known as Inception that achieves state-of-the-art results on academic benchmarks and allows users to easily search through their large collection of Google Photos. The ability to mine meaningful information from multimedia is broadly applied throughout Google. (<https://research.google/pubs/?area=machine-perception>)

9. See *ibid.*

10. J. Y. Lettvin et al., "What the Frog's Eye Tells the Frog's Brain," *Proceedings of the Institute of Radio Engineers* 47 (1959): 1950.

11. Algorithmia, "Introduction to Computer Vision: What It Is and How It Works," Algorithmia blog, April 2, 2018, <https://algorithmia.com/blog/introduction-to-computer-vision>

12. David Chalmers, "What Is Conceptual Engineering and What Should It Be?," *Inquiry: An Interdisciplinary Journal of Philosophy*, published online September 16, 2020, <https://doi.org/10.1080/0020174X.2020.1817141>, page number refers to the preprint from the author's website, 2.

13. Heinz von Foerster, "Perception of the Future and the Future of Perception," *Instructional Science* 1, no. 1 (1972): 31.

14. *Ibid.*, 33.

15. *Ibid.*, 40.

16. *Ibid.*

17. *Ibid.*, 41.

18. The concept of "incomputables," derived from the work of mathematician Gregory Chaitin, is premised on the following understanding of computation outlined by Luciana Parisi in "The Alien Subject of AI," *Subjectivity* 12 (2019): 27–48: "Computation involves a performative compression of random quantities (or incomputables) entering the general infrastructure of algorithmic patterning. It is here that machine learning becomes the subjective aim of artificial reasoning insofar as the computational manner of generating learning comes to constitute the machine's structure of being as denaturalising the very image of automated thought" (30). Chaitin's framework of "experimental axiomatics," explains Parisi, involves "the ingression of contingency . . . in causality," whereby "randomness or incomputables, infinite varieties of infinities, become the causal condition of computational processing" (40).

19. See Vilém Flusser, *Towards a Philosophy of Photography*, trans. Anthony Mathews (London: Reaktion Books, 2000), 26–30, 82–92; Vilém Flusser, *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011), 19.

20. Von Foerster, "Perception of the Future and the Future of Perception," 43.
21. See Jonathan Crary, *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge, MA: MIT Press, 1999).
22. Adrian Daub, *What Tech Calls Thinking: An Inquiry into the Intellectual Bedrock of Silicon Valley* (New York: Farrar, Straus and Giroux, 2020, Kindle edition).
23. Ibid.
24. Daub is quite blunt in his assessment: "The tech industry we know today is what happens when certain received notions meet with a massive amount of cash with nowhere else to go" (ibid.).
25. Ibid.
26. Parisi, "The Alien Subject of AI," 32.
27. Ibid., 30.
28. Parisi writes, "Chaitin explains that computation is defined by the tendencies of information to increase in size. Like the infinite counting of numbers, there is no end to information. Deductive reasoning therefore cannot sufficiently describe what happens in the logical thinking of machines. From this standpoint, one can suggest that incomputables—as infinite varieties of infinities (or randomness)—delineate the trajectory of computation from and towards infinity. This already implies that computation as the current mode of instrumentalisation of reasoning does not directly correspond to the material-historical constitution of media or the practical knowledge" (ibid., 48).
29. Ibid., 38.
30. In making this strategic distinction, I am mindful of Humberto Maturana and Francisco J. Varela's intimation developed in *Autopoiesis and Cognition: The Realization of the Living* (Dordrecht: Reidel, 1972) that perception is *already* a form of cognition—although cognition for them stands for more than pure thought. Indeed, they conceptualize both perception and cognition as distinctly biological phenomena.
31. George N. Reeke Jr. and Gerald M. Edelman, "Real Brains and Artificial Intelligence," *Daedalus* 117, no. 1 (Winter 1988): 143.
32. The concept of "neural networks" was introduced by two researchers at the University of Chicago, Warren McCulloch and Walter Pitts, in 1944. Neural networks kept falling in and out of favor in AI research through the last century but came into their own with the recent developments in machine learning.
33. Reeke and Edelman, "Real Brains and Artificial Intelligence," 145.
34. Ibid., 153.

35. See Donald D. Hoffman, *The Case against Reality: How Evolution Hid the Truth from Our Eyes* (Cambridge, MA: MIT Press, 2019).

36. As they argue, “It is clear that the notion of information preexisting in the world must be rejected. The essential requirement for learning, logic, and the other mental functions that are the usual subjects of AI research is the prior ability to categorize objects and events based on sensory signals reaching the brain. The variety of sensory experiences is both vast and unique for each individual. The categories themselves are not present in the environment but must be constructed by each individual according to what is adaptive for its species and its own particular circumstances. The a priori specification of rules for categorization, applicable to all individuals and all contexts, is precluded by the complexity, variability, and unpredictability of the macroscopic world. To make matters worse, the categories constructed by an organism cannot be fixed but must constantly change in response to new experiences and new realities in its part of the environment. The only way categories constructed in this individualistic manner can be validated is by constant coupling back to the world through behavior” (Reeke and Edelman, “Real Brains and Artificial Intelligence,” 155).

37. “Phenotypically, Darwin III has three sensory modalities: vision, touch, and kinesthesia (or ‘joint sense’). It may have one or two eyes with lateral and vertical orbital motions, and one or more arms with multiple joints, each controlled by motor neurons in specified repertoires.” Gerald M. Edelman and George N. Reeke Jr., “Is It Possible to Construct a Perception Machine?,” *Proceedings of the American Philosophical Society* 134, no. 1 (March 1990): 48.

38. *Ibid.*, 36.

39. *Ibid.*, 37. As they put it, “categorization can be seen in essence as an adaptive mapping of the external world onto impoverished representations of itself within a perceptual system” (*ibid.*).

40. *Ibid.*

41. Reeke and Edelman, “Real Brains and Artificial Intelligence,” 157.

42. Tim Ingold, “Beyond Biology and Culture: The Meaning of Evolution in a Relational World,” *Social Anthropology* 12, no. 2 (2004), 209–221.

43. *Ibid.*, 213.

44. *Ibid.*, 216.

45. Ingold explains: “And if you ask how biological and cultural factors are distinguished, they will say that the former are genetically transmitted, whereas the latter are transmitted by such non-genetic means as imitation or social learning. Thus, despite their initial denials, biology is tied to genes after all, as indeed the logic of neo-Darwinism requires. The implied essentialisation of biology as a constant of

human being, and of culture as its variable and interactive complement, is not just clumsily imprecise. It is the single major stumbling block that up to now has prevented us from moving towards an understanding of our human selves, and of our place in the living world, that does not endlessly recycle the polarities, paradoxes and prejudices of western thought" (ibid., 217).

46. As Claudio Celis Bueno and María Jesús Schultz Abarca point out, drawing on Bernard Stiegler's philosophy, "The 'bracketing off' of inherited prejudice to perceive reality 'in itself' is an illusion that conceals the fact that technology permanently modifies our internal senses of perception and memory. Naked human vision too is always already machine vision. Human vision, like machinic vision, depends on the surfaces of inscription that function as an external faculty of imagination." Celis Bueno and Schultz Abarca, "Memo Akten's *Learning to See*: From Machine Vision to the Machinic Unconscious," *AI and Society* (2020), <https://doi.org/10.1007/s00146-020-01071-2>

47. Alex Hern, "Google's Solution to Accidental Algorithmic Racism: Ban Gorillas," *The Guardian*, January 12, 2018, <https://www.theguardian.com/technology/2018/jan/12/google-racism-ban-gorilla-black-people>

48. In Tom Simonite, "The Best Algorithms Struggle to Recognize Black Faces Equally," *Wired*, July 22, 2019, <https://www.wired.com/story/best-algorithms-struggle-recognize-black-faces-equally/>

49. Safia Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism* (New York: New York University Press, 2018, Kindle edition).

50. Ibid.

51. "Layers of Abstraction: A Pixel at the Heart of Identity," <https://shinjitoya.com/space-art-tech/>

52. @Dantley on Twitter, September 19, 2020.

53. Noble, *Algorithms of Oppression*.

54. In Mitra Azar, Geoff Cox, and Leonardo Impett, "Introduction: Ways of Machine Seeing," *AI and Society* 36 (2021): 1093–1104, <https://doi.org/10.1007/s00146-020-01124-6>. The special issue of the journal *AI and Society* titled "Ways of Machine Seeing," edited by Azar, Cox, and Impett, explores the problems of (and with) machine vision through a multidisciplinary framework. Departing from John Berger's proposition, made in his canonical *Ways of Seeing* (London: British Broadcasting Corporation and Penguin Books, 1972), 10, that "every image embodies a way of seeing," it explores how "machines, and, in particular, computational technologies, change the way we see the world."

55. Maturana and Varela themselves did not posit such a shift, but it was subsequently accomplished, building on their ideas, by sociologist Niklas Luhmann.

56. Maturana and Varela, *Autopoiesis and Cognition*, 136.
57. Ingold, "Beyond Biology and Culture," 218.
58. Ibid.
59. John Armitage, "Accelerated Aesthetics: Paul Virilio's *The Vision Machine*," *Angelaki* 2, no. 3 (1997): 203.
60. John Johnston, "Machinic Vision," *Critical Inquiry* 26 (Autumn 1999): 32.
61. Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (New York: Public Affairs, 2019, Kindle edition).
62. Ibid.
63. Leif Wetherby, "Data and the Task of the Humanities," in Creative AI Lab, ed., *001: Aesthetics of New AI* (London: Serpentine Galleries, October 2020), 47.
64. Ibid.
65. Pharmacology, a concept derived from Jacques Derrida ("The Pharmakon" in *Dissemination*, trans. Barbara Johnson [Chicago: University of Chicago Press, 1981], 95–119), became operative in many of Stiegler's later works, which were devoted to the analysis of the conditions of computational capitalism—and of the socioeconomic misery this particular political formation had brought about. Importantly, Stiegler's work was not just diagnostic: he was committed to finding openings within, and passages through, the desperation and nihilism enacted by the automatic decision-making and the disindividuation of the human under those political and economic conditions. As he put it, "From such a perspective the question of innovation must be taken very seriously—and not just treated as an ideological discourse based on the storytelling of marketing. Innovation clearly has a real economic function: it evidently constitutes a production of negentropy. But what has now become obvious is that this negentropy produced in the short term generates far higher entropy in the long term. The whole question of organology and its pharmacology in the neganthropic field resides in the fact that the *pharmakon* can be toxic and curative only to the extent (and in the excess) that it is both entropic and negentropic." Bernard Stiegler, *Automatic Society*, vol. 1: *The Future of Work*, trans. Daniel Ross (Cambridge: Polity Press, 2017), 100.
66. Ibid., 9, 7.
67. Ariella Aisha Azoulay, *Potential History: Unlearning Imperialism* (London: Verso, 2019), 4.
68. Ibid., 5.
69. Michael Hardt and Antonio Negri, *Empire* (Cambridge, MA: Harvard University Press, 2000), xii.

70. <https://recognitionmachine.vandalist/>

71. Azoulay, *Potential History*, 8.

72. I am grateful to Mark Amerika for this poetic-philosophical formulation, offered to me as a question following my talk at the “Artificial Creativity” conference, Malmö University, Sweden, November 19–20, 2020 (online).

Chapter 5

1. Deleuze develops the argument about the force of cinema and its ability to shift our perception in many of his works, including *Cinema 1* (London: Athlone Press, 1986) and *Francis Bacon: The Logic of Sensation* (London: Continuum, 2003). John Johnston points out that it is in the latter book, which engages with Bacon’s paintings, that Deleuze highlights photography’s inability to enact the deterritorialization of vision. The French philosopher sees the photographic medium as too banal and too static. Photography’s flatness (and hence weakness) is presented by Deleuze—and, in his reading, by Bacon—not only in relation to cinema but also to painting: “photographs operate by either resemblance or convention, analogy or code; in either case, they are not a means of seeing but are themselves what we see, and we end up seeing only them. . . . More to the point, unlike painting, photographs cannot produce an intensity of sensation or, rather, cannot produce differences within sensation.” John Johnston, “Machinic Vision,” *Critical Inquiry* 26 (Autumn 1999): 34. My reading of photography is very different from Deleuze’s. I have previously discussed it in chapter 3 of *Life after New Media: Mediation as a Vital Process*, co-written with Sarah Kember (Cambridge, MA: MIT Press, 2012). This chapter does not therefore spend time on countering Deleuze’s position, but rather delves straight into the photography-cinema nexus while seeing the relationship between the two media as less oppositional—and as enabling a more hybrid novel practice to emerge from this relationship.

2. The “radical opposition” between film understood in terms of the “being there” of the thing, and photography understood in terms of it “having been there,” was proposed by Roland Barthes in “The Rhetoric of the Image,” in *Image, Music, Text*, trans. Stephen Heath (New York: Hill and Wang, 1977), 45.

3. Maurizio Lazzarato, “After Cinema,” in Peter Szendy with Emmanuel Alloa and Marta Ponsa, eds., *The Supermarket of Images* (Paris: Gallimard / Jeu de Paume, 2020), 150.

4. David Green and Joanna Lowry, foreword to Green and Lowry, eds., *Stillness and Time: Photography and the Moving Image* (Brighton: Photoworks; Photoforum, 2006), 7.

5. This proposition was made by Gusztáv Hámos, Katja Pratschke, and Thomas Tode in “Viva Photofilm: Moving / Non-moving,” trans. Finbarr Morrin, text written for

the program of *PhotoFilm!*, a screening event held on March 5–13, 2010, at Tate Modern, London, and organized by Tate Modern, the Goethe-Institut London, and the CCW Graduate School, University of the Arts, London.

6. Ingrid Hoelzl and Rémi Marie, *Softimage: Towards a New Theory of the Digital Image* (Bristol, UK: Intellect, 2015), 23.

7. *Ibid.*, 12.

8. *Ibid.*, 17.

9. Lazzarato, “After Cinema,” 150.

10. *Ibid.*, 150–151.

11. *Ibid.*, 151.

12. *Ibid.*, 152.

13. David Green, “Marking Time: Photography, Film and Temporalities of the Image,” in Green and Lowry, *Stillness and Time*, 20.

14. See Lazzarato, “After Cinema,” 155.

15. Griselda Pollock, “Dreaming the Face, Screening the Death: Reflections for Jean-Louis Schefer on *La Jetée*,” *Journal of Visual Culture* 4, no. 3 (2005): 291.

16. See Joanna Zylińska, *The End of Man: A Feminist Counterapocalypse* (Minneapolis: University of Minnesota Press, 2018); and the accompanying photofilm, *Exit Man* (2018).

17. Hámos, Pratschke, and Tode, “Viva Photofilm.”

18. Janet Harbord, *Chris Marker: La Jetée* (London: Afterall Books, 2009), 2.

19. Nadine Boljkovac, “Book Review: *La Jetée*,” *Studies in European Cinema*, published online May 24, 2019, doi: 10.1080/17411548.2019.1621720.

20. Chris Darke, *La Jetée* (London: BFI and Palgrave, 2016), 84.

21. Boljkovac, “Book Review: *La Jetée*.”

22. Harbord, *Chris Marker*, 4.

23. *Ibid.*

24. <https://bengrosser.com/projects/computers-watching-movies/>

25. Hámos, Pratschke, and Tode, “Viva Photofilm.”

26. Sy Taffel’s essay “Automating Creativity,” which includes a documentary made by the author (using automated software to produce the film’s soundtrack), explores

ways in which “Digital automation is . . . central to enabling forms of contemporary creative media production.” Taffel also explores how the progressing use of automation in creative practice can be “a potential source of concern surrounding precarity and the future of employment in the creative industries” (in *Screenworks*, September 2019, <https://doi.org/10.37186/swrks/10.1/2>).

27. Chris Marker, “Interview,” *Film Comment* 39, no. 4 (2003): 40, special edition “Around the World with Chris Marker: Part II Time Regained.”

28. See Joanna Zylińska, *Nonhuman Photography* (Cambridge, MA: MIT Press, 2017), 51, 63, 126.

29. Steven Humblet, “Interview with Marc De Blicck,” in Humblet, ed., *Off Camera* (Amsterdam: Roma Publications, 2021), ix.

30. Steven Humblet, editorial text, in Humblet, *Off Camera*, xiv.

31. We can borrow here, among others, from the work of Rosi Braidotti. In her book *The Posthuman* (Cambridge: Polity Press, 2013), Braidotti outlines an agenda for “post-human Humanities,” a discipline premised on a radical reinvestment in critical thought and a creative engagement with technology. She writes: “The image of thought implied in the post-anthropocentric definition of the Human . . . stresses radical relationality, that is to say non-unitary identities and multiple allegiances. As this shift occurs in a globalized and conflict-ridden world, it opens up new challenges in terms of both post-secular and post-nationalist perspectives. . . . Against the prophets of doom, I want to argue that technologically mediated post-anthropocentrism can enlist the resources of bio-genetic codes, as well as telecommunication, new media and information technologies, to the task of renewing the Humanities. Posthuman subjectivity reshapes the identity of humanistic practices, by stressing heteronomy and multi-faceted relationality, instead of autonomy and self-referential disciplinary purity” (144–145).

32. For an expansion of this idea see Donna Haraway, “Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective,” *Feminist Studies* 14, no. 3 (Autumn 1998): 575–599.

33. The optic flow refers to the apparent flow of objects experienced by the observer in their visual field as they move through space. See James J. Gibson, *The Perception of the Visual World* (Boston: Houghton Mifflin, 1950).

34. See Zylińska, *Nonhuman Photography*, 42–43, 53, 191; and Kember and Zylińska, *Life after New Media*, 75.

35. <https://thispersondoesnotexist.com/>

36. See chapter 7 in Joanna Zylińska, *AI Art: Machine Visions and Warped Dreams* (London: Open Humanities Press, 2020).

37. All these are names of deep-learning generative models using neural networks, which are algorithms partially modeled on the neural architecture of the human or animal brain. A GAN (generative adversarial network) is a generative technology using two neural networks positioned as opponents, with one generating convincing outputs, the other assessing them. GPT (generative pre-trained transformer) is a natural language model that generates human-like text using statistical probability. Originally applied to text, GPTs are now also embedded into more complex models that generate images. Diffusion is a two-stage model that introduces noise into the dataset and then attempts to recover the original data by attempting to reverse the diffusion process. CLIP (contrastive language-image pre-training) is a model trained on image-text pairs which is then used to categorize images and predict text that relates to them. The latest models that generate images (as well as generating public interest and anxiety) usually combine several models as part of their architecture.

38. Young cited in A. Ploin, R. Eynon, I. Hjorth, and M. A. Osborne, *AI and the Arts: How Machine Learning Is Changing Artistic Work*, report from the Creative Algorithmic Intelligence Research Project (Oxford: Oxford Internet Institute, University of Oxford, 2022), 24.

39. *Ibid.*, 37.

40. As I explained in *AI Art*, “the term *parergon*, referring to a supplementary remark, additional material or ornament whose function is merely to embellish the main work (i.e., the *ergon*), has been immortalised in art theory by Jacques Derrida. In his reading of Kant’s *Critique of Judgement* included in *The Truth in Painting*, Derrida takes issue with the idea of a self-contained nature of the work of art, conveyed by the belief in its supposed intrinsic value and beauty, by literally bringing the work’s framing into the picture. ‘A parergon comes against, beside, and in addition to the ergon, the work done [*fait*], the fact [*le fait*], the work, but it does not fall to one side, it touches and cooperates within the operation, from a certain outside. Neither simply outside nor simply inside’ (Derrida 1987, 54). The supposedly secondary function of the framing, be it literal or conceptual, is argued to be actually foundational to the artwork’s existence and recognition as an artwork, as its very existence delineates and preserves the artwork’s identity. For Derrida, a work of art is therefore never self-contained, it always depends on its parerga—frames, ornaments, commentaries—if it is to be recognised in its proclaimed uniqueness and singularity” (95).

41. The sound files came from the following sources: <https://freesound.org/people/miastodzwickow/sounds/127244/> (miastodzwickow); <https://freesound.org/people/PhonosUPF/sounds/487266/> (PhonosUPF); <https://freesound.org/people/ITheRealGooglekatClaire/sounds/496602/> (ITheRealGooglekatClaire).

42. Gene Kogan and Ikkchung, “Neural Synthesis, Feature Visualization, and Deep-Dream Notes,” *GitHub* (2017), <https://github.com/ml4a/ml4a-guides/blob/master/notebooks/neural-synth.ipynb>.

43. In 2015 Google released a computer vision program called DeepDream, which I discuss further in chapter 6. Designed by Alexander Mordvintsev and using a convolutional neural network, it operated by attempting to identify and enhance patterns in images, leading to the algorithm “noticing” human eyes or puppies in any regular image—because these were the things the program most often “saw” in its training phase.

44. Safia Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism* (New York: New York University Press, 2018); Joy Buolamwini and Timnit Gebru, “Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification,” *Proceedings of Machine Learning Research* 81 (2018): 1–15, <http://proceedings.mlr.press/v81/buolamwini18a/buolamwini18a.pdf>; Virginia Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (New York: Macmillan Press, 2018); Catherine D’Ignazio and Lauren F. Klein, *Data Feminism* (Cambridge, MA: MIT Press, 2020).

45. Pollock, “Dreaming the Face,” 287.

46. *Ibid.*, 294.

47. *Ibid.*, 301.

48. *Ibid.*

49. *Ibid.*, 304.

50. *Ibid.*, 302.

51. Robert Azzarello cited in Nicole Seymour, *Bad Environmentalism: Irony and Irreverence in the Ecological Age* (Minneapolis: University of Minnesota Press, 2018), 25.

52. Seymour, *Bad Environmentalism*, 25.

53. See *ibid.*, 3.

54. *Ibid.*, 23.

55. Astounded by GPT-3’s results, on April 15, 2022, Steven Johnson published a gushing piece in the *New York Times Magazine* titled “A.I. Is Mastering Language. Should We Trust What It Says?” It led to linguist Emily Bender penning a rather sobering response, “On NYT Magazine on AI: Resist the Urge to Be Impressed,” *Medium*, April 18, 2022, in which she challenged the claim, made by both impressionable journalists and the company behind GPT-3, Open AI, that the model had “mastered” language. She explained that this supposed “mastery” amounted to GPT-3 having “been programmed to produce strings of text that humans who speak that language find coherent”—itself not an insignificant achievement, but one that was far from showing signs of what we humans understand as intelligence. Bender also warns us against conflating the model’s apparent textual coherence with understanding and trustworthiness. “Just because that answer was correct doesn’t mean

the next one will be,” she points out, while signaling that it is our mental labor of endowing the model with human traits and establishing an intersubjective relationship with it that make it (seem to be) a credible conversational partner.

56. Ian Bogost, “Generative Art Is Stupid,” *Atlantic*, January 13, 2023, <https://www.theatlantic.com/technology/archive/2023/01/machine-learning-ai-art-creativity-emptiness/672717/>.

57. Harbord, *Chris Marker*, 16.

58. *Ibid.*, 25–26.

59. Vilém Flusser, “Photography and History,” in *Writings*, ed. Andreas Ströhl, trans. Erik Eisel (Minneapolis: University of Minnesota Press, 2002), 128.

60. *Ibid.*, 127.

61. Harbord, *Chris Marker*, 26.

62. Flusser, “Photography and History,” 130.

63. *Ibid.*, 126.

64. Daniel A. Chávez Heras, “Spectacular Machinery and Encrypted Spectatorship,” *APRJA* 8, no. 1 (2019): 176.

65. Ben Burbridge, *Photography after Capitalism* (London: Goldsmiths Press, 2020), 74.

66. Chávez Heras, “Spectacular Machinery and Encrypted Spectatorship,” 180.

67. Katrina Sluis, “Collaborating with Machines,” *Photoworks* 21 (2014): 156.

Chapter 6

1. See Jason N. Pitt et al., “WormBot, an Open-Source Robotics Platform for Survival and Behavior Analysis in *C. elegans*,” *GeroScience* 41, no. 6 (2019): 961–973, doi: 10.1007/s11357-019-00124.

2. In *Back to the Future* (1985, dir. Robert Zemeckis).

3. John Tagg, “Mindless Photography,” in J. J. Long, Andrea Noble, and Edward Welch, eds., *Photography: Theoretical Snapshots* (London: Routledge, 2008), 21.

4. See https://www.nasa.gov/topics/universe/features/cobe_20th.html

5. Vasily Zubarev, “Computational Photography Part I: What Is Computational Photography?,” *dpreview*, June 3, 2020, <https://www.dpreview.com/articles/9828658229/computational-photography-part-i-what-is-computational-photography/2>. Zubarev explains further: “That’s how any mobile camera works today. At least the top ones.

Buffering allows implementing not only zero shutter lag, which photographers begged for so long, but even a negative one. By pressing the button, the smartphone looks in the past, unloads 5–10 last photos from the buffer and starts to analyze and combine them furiously. No need to wait till the phone snaps shots for HDR or a night mode—let’s simply pick them up from the buffer, the user won’t even realize. In fact, that’s how Live Photo is implemented in iPhones, and HTC had it back in 2013 under a strange name Zoe.”

6. Sy Taffel, “Google’s Lens: Computational Photography and Platform Capitalism,” *Media, Culture and Society* 43, no. 2 (2021): 237–255.

7. Matthew Cobb, *The Idea of the Brain: The Past and Future of Neuroscience* (London: Profile Books, 2020, Kindle edition).

8. Cobb points out that the very idea of sensation involving a physical change to the bodily substrate goes back to the seventeenth century. Evident in the notion of “impression,” it conveyed the belief “that perception involves a physical trace, altering the shape or function of the nerves, through some kind of pressure” (ibid.).

9. Ibid.

10. Ibid.

11. Bence Nanay, “Mental Imagery,” in Edward N. Zalta, ed., *The Stanford Encyclopedia of Philosophy* (Winter 2021 edition), <https://plato.stanford.edu/archives/win2021/entries/mental-imagery/>.

12. Referring to a dialogue on the language of metaphysics between Aristos and Polyphilos in Anatole France’s *The Garden of Epicurus*, Derrida posits: “The primitive meaning, the original, and always sensory and material, figure . . . is not exactly a metaphor. It is a kind of transparent figure, equivalent to a literal meaning (*sens propre*). It becomes a metaphor when philosophical discourse puts it into circulation. Simultaneously the first meaning and the first displacement are then forgotten. The metaphor is no longer noticed, and it is taken for the proper meaning. A double effacement. Philosophy would be this process of metaphorization which gets carried away in and of itself.” Jacques Derrida, *Margins of Philosophy*, trans. Alan Bass (Chicago: University of Chicago Press, 1982), 211.

13. Ibid., 213.

14. See Ron Chrisley, “Philosophical Foundations of Artificial Consciousness,” *Artificial Intelligence in Medicine* 44 (2008): 119–137; Giorgio Buttazzo, “Artificial Consciousness: Utopia or Real Possibility?,” *Computer* 34 (2001): 24–30, 0.1109/2.933500; Antonio Chella and Riccardo Manzotti, *Artificial Consciousness* (London: Imprint Academic, 2017).

15. Antonio Damasio, *The Feeling of What Happens: Body, Emotion and the Making of Consciousness* (San Diego: Harcourt, 1999), 4.

16. Ibid., 125.
17. Ibid., 9.
18. Ibid.
19. Ibid.
20. Ibid.
21. Ibid., 11.
22. <https://ai.googleblog.com/2015/06/inceptionism-going-deeper-into-neural.html>
23. Christian Szegedy et al., “Going Deeper with Convolutions,” eprint from arXiv:1409.4842, submitted September 17, 2014, 1.
24. Min Lin, Qiang Chen, and Shuicheng Yan, “Network In Network,” *CoRR*, abs/1312.4400, 2013. In Network In Network, the general linear model of perception “is replaced with a ‘micro network’ structure which is a general nonlinear function approximator. In this work, we choose multilayer perception [i.e., an algorithm used for supervised learning of binary classifier] as the instantiation of the micro network, which is a universal function approximator and a neural network trainable by back-propagation” (1).
25. Damasio, *The Feeling of What Happens*, 171.
26. Ibid., 126.
27. Ibid., 148.
28. Ibid., 24.
29. Ibid., 16.
30. Ibid., 122.
31. Benjamin Libet et al., “Time of Conscious Intention to Act in Relation to Onset of Cerebral Activity (Readiness-Potential)—The Unconscious Initiation of a Freely Voluntary Act,” *Brain* 106, no. 3 (1983): 623–642; and Benjamin Libet, “Unconscious Cerebral Initiative and the Role of Conscious Will in Voluntary Action,” *Behavioral and Brain Sciences* 8, no. 4 (1985): 529–566.
32. Damasio, *The Feeling of What Happens*, 127.
33. Anil Seth states that “we generally experience ourselves as being continuous and unified across time. We can call this the subjective stability of the self.” Seth, *Being You: A New Science of Consciousness* (London: Faber & Faber, 2021, Kindle edition).
34. Quoted in Ben Lindbergh, “Making Sense of the Science and Philosophy of ‘Devs,’” *The Ringer*, April 10, 2020, <https://www.theringer.com/tv/2020/4/10/21216149/devs-hulu-quantum-physics-philosophy-alex-garland>

35. Seth, *Being You*.

36. Seth argues: “The perceptual experience of volition is a self-fulfilling perceptual prediction, another distinctive kind of controlled—again perhaps a controlling—hallucination. . . . Experiences of volition are useful for guiding *future* behaviour, just as much as for guiding *current* behaviour [as] our sense of free will is very much about feeling we ‘could have done differently.’ . . . The feeling that I could have done differently does *not* mean that I actually could have done differently. Rather, the phenomenology of alternative possibilities is useful because in a future similar, but not identical, situation I might indeed do differently” (ibid.).

37. For Seth, “what we experience as causality is a perceptual inference, in the same way that all our perceptions are projections of our brain’s structured expectations onto and into our sensory environment—exercises in the beholder’s share.” This leads him to posit that “the self is another perception, another controlled hallucination, though of a very special kind. From the sense of personal identity—like being a scientist, or a son—to experiences of having a body, and of simply ‘being’ a body, the many and varied elements of selfhood are Bayesian best guesses, designed by evolution to keep you alive” (ibid.).

38. Ibid.

39. Ibid.

40. See Giulio Tononi and Gerald M. Edelman, “Consciousness and Complexity,” *Science* 282, no. 5395 (1998): 1846–1851.

41. Seth, *Being You*.

42. Ibid.

43. Paul Virilio, *The Vision Machine*, trans. Julie Rose (Bloomington: Indiana University Press, 1994), 61.

44. Ibid., 59.

45. Bluecore website, <https://www.bluecore.com/blog/pulling-back-curtain-value-predictive-technology/>

46. Ibid.

47. Quoted in Eric Siegel, “When Does Predictive Technology Become Unethical?,” *Harvard Business Review*, October 23, 2020, <https://hbr.org/2020/10/when-does-predictive-technology-become-unethical>.

48. Quoted in Scott Prevost, “Making Visual Search Smarter: How AI Understands Creative Intent,” *Petapixel*, March 29, 2021, <https://petapixel.com/2021/03/29/making-visual-search-smarter-how-ai-understands-creative-intent/>.

49. Ibid.

50. Taffel, "Google's Lens," 9.
51. Nick Montfort, *The Future* (Cambridge, MA: MIT Press, 2017), xii.
52. John Naughton, "Forget Zuckerberg and Cook's Hypocrisy—It's Their Companies That Are the Real Problem," *The Guardian*, February 6, 2021, <https://www.theguardian.com/commentisfree/2021/feb/06/mark-zuckerberg-tim-cook-facebook-apple-problem>.

Chapter 7

This chapter was developed from a short piece, "Loser Images: A Feminist Proposal for Post-Anthropocene Visuality," that I wrote for Harriet Harriss and Naomi House, eds., *Design Studio*, vol. 4: *Working at the Intersection: Architecture after the Anthropocene* (London: RIBA Publishing, 2022).

1. See the BBC Radio 5 podcast *What Planet Are We On?* (2020–ongoing) and Ireland's RTÉ reality TV show, *What Planet Are You On?* (2019–2020).
2. Nick Montfort, *The Future* (Cambridge, MA: MIT Press, 2017), 35.
3. Liam Young, ed., "Machine Landscapes: Architectures of the Post Anthropocene," special issue of *Architectural Design*, no. 257 (January-February 2019).
4. Dipesh Chakrabarty, *The Climate of History in a Planetary Age* (Chicago: University of Chicago Press, 2021), 78.
5. Gayatri Chakravorty Spivak, "Planetaryity," in *Death of a Discipline* (New York: Columbia University Press, 2003), 72.
6. Ibid.
7. Ibid., 93.
8. Nigel Clark and Bronislaw Szerszynski, *Planetary Social Thought: The Anthropocene Challenge to the Social Sciences* (London: Polity, 2020), 1.
9. Barnosky et al. cited in *ibid.*, 6.
10. Clark and Szerszynski, *Planetary Social Thought*, 7.
11. Ibid., 8.
12. Martin Guinand, Eva Lin, and Bruno Latour, "Coping with Planetary Wars," *e-flux Journal*, no. 114 (December 2020), <https://www.e-flux.com/journal/114/366104/coping-with-planetary-wars/>.
13. Yuk Hui, "For a Planetary Thinking," *e-flux Journal*, no. 114 (December 2020), <https://www.e-flux.com/journal/114/366703/for-a-planetary-thinking/>.

14. Ibid.
15. Spivak, "Planetary," 74.
16. Chakrabarty, *The Climate of History in a Planetary Age*, 75.
17. Brand's original question was "Why Haven't We Seen a Photograph of the Whole Earth Yet?"
18. John Tresch, "Cosmic Terrains (of the Sun King, Son of Heaven, and Sovereign of the Seas)," *e-flux Journal*, no. 114 (December 2020), <https://www.e-flux.com/journal/114/364980/cosmic-terrains-of-the-sun-king-son-of-heaven-and-sovereign-of-the-seas/>.
19. Ibid.
20. Al Gore, "The Digital Earth: Understanding Our Planet in the 21st Century," speech given at the California Science Center in Los Angeles on January 31, 1998, and published as a leaflet by the Open GIS Consortium. This is the captivating vision Gore presented to his audience: "Imagine, for example, a young child going to a Digital Earth exhibit at a local museum. After donning a head-mounted display, she sees Earth as it appears from space. Using a data glove, she zooms in, using higher and higher levels of resolution, to see continents, then regions, countries, cities, and finally individual houses, trees, and other natural and man-made objects."
21. Leon Gurevitch, "Google Warming: Google Earth as Eco-machinima," *Convergence* 20, no. 1 (2014): 89.
22. Ibid., 97.
23. Elizabeth A. Povinelli, *Geontologies: A Requiem to Late Liberalism* (Durham: Duke University Press, 2016, Kindle edition). As Povinelli points out, "it is increasingly clear that the anthropos remains an element in the set of life only insofar as Life can maintain its distinction from Death/Extinction and Nonlife." She lists the following four principles which have been inspired by Karrabing analytics:
 1. Things exist through an effort of mutual attention. This effort is not in the mind but in the activity of endurance.
 2. Things are neither born nor die, though they can turn away from each other and change states.
 3. In turning away from each other, entities withdraw care for each other. Thus the earth is not dying. But the earth may be turning away from certain forms of existence. In this way of thinking the Desert is not that in which life does not exist. A Desert is where a series of entities have withdrawn care for the kinds of entities humans are and thus has made humans into another form of existence: bone, mummy, ash, soil.
 4. We must de-dramatize human life as we squarely take responsibility for what we are doing.

For a discussion of the Povinelli-inspired concept of posthuman gestationality, see Amanda Boetzkes, "Posthuman Planetarity," *The Large Glass: Journal of Contemporary Art, Culture and Theory* 27/28 (2019): 63–66.

24. Ibid.

25. Franco "Bifo" Berardi, introduction to Hito Steyerl, *The Wretched of the Screen* (Berlin: Sternberg Press, 2012), 10.

26. Boetzkes, "Posthuman Planetarity," 62.

27. James Gibson, *The Ecological Approach to Visual Perception* (Boston: Houghton Mifflin, 1979), 148.

28. Ibid., 140.

29. Ibid., 148.

30. In a summary of his best-known book, Noë explains the working of visual perception in the following terms: "If we think of what is visible in terms of projective geometry and artificial perspective, then, however paradoxical it may sound, vision is not confined to the visible. We visually experience much more than that. We experience what is hidden (occluded) and what is out of view. For example, we have a sense of the visual presence of the back of a tomato when we look at one sitting before us, even though the back of the tomato is out of view; and we experience the circularity of a plate, its actual shape, even when, seen from an angle, the circularity itself can't be seen. Or consider your sense of the detail of the scene before your eyes now. You have a sense of the presence [of] the detail; the scene is replete with detail. But it is not the case that you seem to yourself actually to see all the detail; you can no more see every bit of detail in sharp focus and high resolution than you can see the tomato from all sides at once. Just as the back of the tomato shows up in your experience although it is hidden from view, so the detailed scene before you shows up in your experience, although the detail outstrips by far what can be taken in at a glance. The world outstrips what we can take in at a glance; but we are not confined to what is available in a glance." Alva Noë, "Précis of *Action in Perception*," *Philosophy and Phenomenological Research* 76, no. 3 (May 2008): 660.

31. Alva Noë, *Action in Perception* (Cambridge, MA: MIT Press, 2004), 156, emphasis in the original.

32. Ibid., 112.

33. Gibson, *The Ecological Approach to Visual Perception*, 293.

34. Ibid.

35. Ibid. I am building here on the argument proposed by Sarah Kember and me in chapter 3 of *Life after New Media: Mediation as a Vital Process* (Cambridge, MA: MIT Press, 2012).

36. See Vilém Flusser, *Into the Universe of Technical Images*, trans. Nancy Ann Roth (Minneapolis: University of Minnesota Press, 2011).
37. Lukáš Likavčan and Paul Heinicker, "Planetary Diagrams: Towards an Auto-graphic Theory of Climate Emergency," in Tomas Dvořák and Jussi Parikka, eds., *Photography Off the Scale: Technologies and Theories of the Mass Image* (Edinburgh: Edinburgh University Press, 2021), 211.
38. Gibson, *The Ecological Approach to Visual Perception*, 203.
39. Spivak, "Planetary," 72.
40. Mark Dorrian, "The Aerial View: Notes for a Cultural History," *Strates* 13 (2007), <http://journals.openedition.org/strates/5573>. In his piece Dorrian is primarily preoccupied with static images of the solid ground, but his classification fits more than adequately the activity of the mobile drone eye.
41. Ibid.
42. Ibid.
43. Ibid.
44. Ibid.
45. Rachel Handforth and Carol A. Taylor, "Doing Academic Writing Differently: A Feminist Bricolage," *Gender and Education* 28, no. 5 (2016): 629.
46. Sarah Kember and Joanna Zylińska, "Media Always and Everywhere: A Cosmic Approach," in Ulrik Ekman et al., eds., *Ubiquitous Computing, Complexity and Culture* (New York: Routledge, 2016), 225.
47. For an insightful discussion of the use of drones to deliver abortion pills in Poland and map state violence against women in Mexico see Erinne Paisley, "Catching a Glimpse of the Elusive 'Feminist Drone,'" *Dataactive* blog, March 31, 2020, <https://data-activism.net/2020/03/blogpost-catching-a-glimpse-of-the-elusive-feminist-drone/>.
48. Anna Feigenbaum, "From Cyborg Feminism to Drone Feminism: Remembering Women's Anti-Nuclear Activisms," *Feminist Theory* 16, no. 3 (2015): 284.
49. Ibid.
50. Heather McLean, "In Praise of Chaotic Research Pathways: A Feminist Response to Planetary Urbanization," *Environment and Planning D: Society and Space* 36, no. 3 (2018): 547.
51. Ibid.
52. Ibid., 548.
53. Ibid.

54. In my working method here I am indebted to Donna Haraway, especially her *Modest_Witness@Second_Millennium: FemaleMan©_Meets_OncoMouse™* (New York: Routledge, 1997) and *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Prickly Paradigm Press, 2003).
55. McLean, "In Praise of Chaotic Research Pathways," 552.
56. Ewa Majewska, "Feminist Art of Failure, Ewa Partum and the Avant-Garde of the Weak," *Widok / View: Theories and Practices of Visual Culture* 16 (2016), <http://pismowidok.org/index.php/one/article/view/370/918/>, 3.
57. *Ibid.*, 1.
58. Ernst van Alphen, *Failed Images: Photography and Its Counter-Practices* (Amsterdam: Valiz, 2018), 56.
59. *Ibid.*, 12.
60. See Lyle Rexer, *The Edge of Vision: The Rise of Abstraction in Photography* (New York: Aperture, 2013), for an exposition of that alternative view, one that claims that abstraction, with its failure to represent, has been a constitutive aspect of photographic history, and not just a mere aberration.
61. Van Alphen, *Failed Images*, 39.
62. Flusser, *Into the Universe of Technical Images*, 19.
63. Rexer, *The Edge of Vision*, 13.
64. See Sean Cubitt, "The Mass Image, the Anthropocene Image, the Image Commons," in Dvořák and Parikka, *Photography Off the Scale*, 25–40.
65. Hito Steyerl, "In Defense of the Poor Image," *e-flux Journal*, no. 10 (November 2009), <https://www.e-flux.com/journal/10/61362/in-defense-of-the-poor-image/>.
66. Amanda Lagerkvist, *Existential Media: A Media Theory of the Limit Situation* (Oxford: Oxford University Press, 2022), 6.
67. Tereza Stejskalová, "Online Weak and Poor Images: On Contemporary Feminist Visual Politics," in Dvořák and Parikka, *Photography Off the Scale*, 98.
68. Same Engine indexes 19 million images from Reddit, Instagram, and Pinterest. See <https://same.energy/>
69. Majewska, "Feminist Art of Failure," 21.
70. Stejskalová, "Online Weak and Poor Images," 101.
71. Gary Hall, *Pirate Philosophy: For a Digital Posthumanities* (Cambridge: MIT Press, 2016), 140.
72. *Ibid.*

73. Sarah Sharma, "A Manifesto for the Broken Machine," *Camera Obscura* 35, no. 2 (2020): 173.
74. Stejskalová, "Online Weak and Poor Images," 107.
75. Michal Šimůnek, "The Failed Photographs of Photography: On the Analogue and Slow Photography Movement," in Dvořák and Parikka, *Photography Off the Scale*, 152.
76. James Patrick Kelly and John Kessel, "Introduction: Hacking Cyberpunk," in Kelly and Kessel, eds., *Rewired: The Post-Cyberpunk Anthology* (San Francisco: Tachyon Publications, 2007), xii.
77. *Ibid.*, 11.
78. Nam June Paik, interviewed by Nicholas Zurbrugg, Sydney, April 10, 1990, *SCAN+*, no. 3, 14.
79. This point has been elaborated by Lars Movin in "The Zen Master of Video. Nam June Paik: Between Minimalism and Overkill," in *Nam June Paik: Driving Media*, ed. Agnieszka Kubicka-Dzieduszycka and Krzysztof Dobrowolski (Wrocław: WRO Art Center, 2009), 180.
80. Nicole Seymour, *Bad Environmentalism: Irony and Irreverence in the Ecological Age* (Minneapolis: University of Minnesota Press, 2018), 4–5.
81. Graig Uhlin, "Monkeywrenched Images: Ecocinema and Sabotage," *New Review of Film and Television Studies* 18, no. 3 (2020): 321, doi: 10.1080/17400309.2020.1790480. Uhlin's concept of monkeywrenching is borrowed from the practice of ecological sabotage and "involves the destruction of property and infrastructure to defend nature from industrial development." He reappropriates this concept for figurative use, to describe an aesthetic strategy whereby filmmakers adopt a visually destructive or "ugly" look in their work, often purposefully damaging the image or its substrate, for activist purposes. "A monkeywrenched cinema is one that produces an aesthetic suspension or temporal delay in film's depiction of non-human nature as a means of expressing a non-interventionist ethical relation to the world," he suggests (302).

Conclusion

1. See Joanna Zylińska, *Minimal Ethics for the Anthropocene* (Ann Arbor: Open Humanities Press, 2014).
2. See Neil Stephenson, *Snow Crash* (New York: Bantam Books, 1992), a novel in which the idea of the metaverse was first enacted—although in a more explicitly dystopian way—and Dave Eggers, *The Circle* (New York: Knopf, 2013).

3. See Ben Burbridge, *Photography after Capitalism* (London: Goldsmiths Press, 2020).
4. https://www.oculus.com/experiences/quest/2046607608728563/?locale=en_GB
5. The Oculus does have a functionality for storing screenshots from games and other apps, but it was not enabled for this particular “experience,” at least not in January 2022.
6. Maria-Jose Viñas and Mike Carlowicz, “Despite Antarctic Gains, Global Sea Ice Is Shrinking,” *NOAA Climate.gov*, March 5, 2019; updated June 3, 2021, <https://www.climate.gov/news-features/features/despite-antarctic-gains-global-sea-ice-shrinking>.
7. Victoria Ivanova and Kay Watson, *Future Art Ecosystems*, vol. 2, *Art x Metaverse*, ed. Sarah Shin (London: Serpentine Galleries, 2021), 5.
8. See *ibid.*, 19–20.
9. Amanda Lagerkvist, *Existential Media: A Media Theory of the Limit Situation* (Oxford: Oxford University Press, 2022), 221.

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