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Haptic Processing: How the Shutter Button Shapes Photography

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The goal of this essay is to explore the haptics of taking photographs in the digital age. More specifically, I examine the evolving relationship between the body and imaging technologies. The body must, somehow, interact with the camera shutter, whether the shutter is a simple mechanical door or an electrical timing network switch. Human intention has to activate the switch via a button, even if this intention is complicated: since 2012, mobile phones can take photos using voice commands, relieving the need to physically touch the shutter button. One does not necessarily need to use the fundamental levers often associated with taking a photo: shoulder, elbow, wrist, finger. What is lost and gained by these new proximities to technology, these new haptics? A photographer's decision to press the shutter is part of what Henri Cartier-Bresson (and more recently Teju Cole) calls the "decisive moment," and this still holds. A serendipitous compression of speed, luck, and feeling helps congeal a photo, whether film or digital. I employ the physiological and kinesiological hand function mechanisms and concepts, especially those of Lynette A. Jones, Susan J. Lederman, and David J. Linden, alongside media studies ideas, especially those of Marshall McLuhan, Friedrich Kittler, David Parisi, and Mark Paterson, to explore an undertheorized processing that takes place when the shutter button is touched. The shutter button is an important yet largely overlooked component in today's media ecosystem, a component that tethers mind and body, material surfaces and deeper layers of the epidermis; and, crucially, the shutter button is bound by, especially, sight ability. The shutter button is interface, prosthesis, metaphor, and locus of desire. The process of pressing the shutter button, old as it is, still matters.

Introduction

The shutter button deserves its own exploration as medial interface. Whether the button is a digital circle on a mobile phone's screen or a raised alloy spring-loaded physical button, this actuator has, for well over a hundred years, enabled photographers to decide on their own decisive moment.[1] Photography as a cultural, technological, and media field along with the camera itself (as a whole unit) has been richly studied for some time;[2] however, in this essay, I spend time theorizing the shutter button as an overlooked component in today's media ecosystem, a component that tethers mind and body, material surfaces and deeper layers of the epidermis. The shutter button is interface, prosthesis, metaphor, and locus of desire.

The body must, somehow, interact with the camera shutter, whether the shutter is a simple mechanical door or an electrical timing network switch. Via intention, a person has to activate the switch, even if this intention is complicated. In 2016, Linda Geddes reported in *Nature* that Ian Burkhart had regained control over his right hand and fingers using technology that transmits his thoughts directly to his hand muscles, bypassing his spinal injury.[3] This is the first account of limb reanimation. Since 2012, mobile phones gained the capability to take photos using voice commands, relieving the need to physically touch the shutter button.[4] New algorithms, computational controls, and digital sensor technologies have effectively turned once skilled operations such as determining focus, aperture, and shutter speed into aesthetic options.[5] One does not necessarily need to use the body's fundamental

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[1] Teju Cole reminds us that Henri Cartier-Bresson's original title to his well-known 1952 book *The Decisive Moment* was "Images a la Sauvette," or images taken on the sly. Cole goes on quote the street photography Alex Webb who says that Cartier-Bresson may have discussed the exact, decisive moment when the shutter button is pressed, but he also said, "It is the photo that takes you," a statement that accords with media studies ideas that media is just around the corner from photography's usual center. See, Teju Cole, "On Photography: Perfect and Unrehearsed," *New York Times*, November 11, 2015. https://www.nytimes.com/2015/11/15/magazine/perfect-and-unrehearsed.html?rref=collection/column/on-photography&action=click&contentCollection=magazine&region=stream&module=stream_unit&version=latest&contentPlacement=4&pgtype=collection&_r=0

[2] See classic studies such as Barthes, Benjamin, Berger, Flusser, and Sontag, and also, Teju Cole, Charlotte Cotton, Todd Gustavson, Kaja Silverman, and Liz Wells.

[3] See Lisa Geddes, *Nature* (April 13, 2016), https://www.nature.com/articles/nature.2016.19749

[4] Wikipedia, "Smartphone," last modified June 16, 2024. https://en.wikipedia.org/wiki/Smartphone#:~:text=The%202012%20Samsung%20Galaxy%20S3,%2Daspherical%20one%2Dgroup%20lens.

[5] Darrin Spoonley, writing in *Fstoppers*, says that besides better autofocus and low-light capabilities, the use of AI enhancements, and lighter/smaller gear, the central change to photography is

levers often associated with taking a photo: shoulder, elbow, wrist, finger, fingertip. What is lost and gained by these new proximities to automated feedback technology, these new haptics that enchain touch, tactile sense, and feedback?[6] In order to answer this question, I examine human sensing through the lens of media studies, and I briefly touch on the history of the shutter button. Then, I explore the hand's ability to sense through a short narrative along these lines: exactly what happens when a photographer's fingertip presses the shutter button? The difficulty in exploring such a small object does not emanate from tracing the history of the camera's components, instead, it comes from incorporating ideas of proprioception, kinesthetics, and haptics into media studies. My task is to close the gap between science, technology, and the humanities ever so slightly, a task that necessarily means that an enormous amount of material, especially in biomechanics, neuroscience, cybernetics, and camera design, will fall outside the scope of this article. Lastly, I theorize the meaning of these mediated activities and how intention and desire are enmeshed with physical media in a way that necessarily raises issues of disability and accessibility, specifically the relationship between touch and vision. Haptic processing is not simply a matter of touch or of intention or of electronic sensing systems; it is about identity.

Media Studies, the Body, and the Shutter Button

Caroline Jones reminds us that Marshall McLuhan's core idea of sensing is that mediating technologies are "extensions" of man, while Friedrich Kittler's idea is that senses are an effect of media. The first mirrors "naturalization," and the second mirrors "technological determinism."[7] Both media scholars get caught up with the body but only insofar as it is either the core of the processing system (McLuhan) or the result of other media (Kittler). Jones uses the event of turning and re-turning to

essentially one of time compression; the amount of time it takes from shutter button to sharing/printing has rapidly shortened so that "sharing in real time" is not only possible, it is expected. See Darrin Spoonley, "A Decade of Evolution: Cameras Now Versus Cameras From 10 Years Ago," *Fstoppers*, November 21, 2023. https://fstoppers.com/gear/decade-evolution-cameras-now-versus-cameras-10-years-ago-649909.

[6] Haptic refers to the "sense of touch, in particular relating to the perception and manipulation of objects using the senses of touch and proprioception" *Oxford English Dictionary* (2015). In terms of media studies, haptic research refers to investigating the crosspoints of objects, bodies, and touch, especially in the case of this essay, how fingertips both give and receive sensory information from imaging devices. I will continue to develop the idea of haptic processing throughout this article, and will refer to media theorists such as Mark Paterson, David Parisi, Jason Edward Archer, and Gerard Goggin.

[7] Caroline Jones, "Senses," *Critical Terms of Literary Study*. Edited by W.J.T. Mitchell and Mark B.N. Hansen (Chicago: Chicago University Press, 2010), 88.

summarize the prisoners' dilemma within Plato's cave; they are unable to see the cause of the shadows:

> The pathway from ignorant blindness to philosophical insight leads through the body: its turning and re-turning, its willed shift from retinal sight to mental image. The unspoken proprioceptive sense–the synthesizing viscera that produce orientation, balance, sensory location in space and time–is what permits the targeted blindness that will produce ultimate enlightenment in the unified, "grounded" philosophical subject.[8]

The event of turning and re-turning are, metaphorically, apt in that the shutter button is often not seen while the photo is being taken. It is felt. The shutter button connects material to "synthesizing viscera." Once a camera (with a viewfinder) is held up to one's face, the hand, fingers, and fingertips are separated from sight, but not separated from insight or thought. Indeed, as Vilém Flusser notes, the goal of the photographer is philosophical and formal: the search for a position (in a room, for example) in which to take a photograph is as much about a "projection into the future," as it is self-reflection and "self-control."[9] Flusser describes self-control in a more object-oriented manner in "The Non-Thing 2," in which the "organ of choice, of decision" is the fingertip which seemingly uncouples freedom of choosing to take a photo from the mechanics of the camera and the button.[10] Instead, the fingertip is part of the camera's programmed limitations and possibilities, leading to both waste (the fingertip transforms nature to culture to waste) and totalitarianism (there is no way to escape the pre-programmed software, and the programmers are, also, limited to the program).[11] Flusser's media theories of fingertips, informed by semiotics and phenomenology, helps us to invest the act of pressing the shutter button with philosophy and limits. But I want to go further: the process of photo taking is part of the process of identity reconsolidation via the body. To trace this idea, I explore touching the shutter button on a microscopic level.

Privileging philosophical thinking over feeling, seeing over touching, is not a new problem. And, as Jones and Flusser highlight, it is not easy to move from the philosophical ideas of touch and being touched to the phenomenon of physical touch. For example, the material and conceptual nature of the shutter button complicates

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[8] Ibid., 89-90.

[9] Vilém Flusser, "The Gesture of Photography," in *Gestures*, Translated by Nancy Ann Roth (Minneapolis, MN: University of Minnesota Press), 84.

[10] Vilém Flusser, "Non-Thing 2," in *The Shape of Things: A Philosophy of Design* (London: Reaktion Books), 90, 92–93.

[11] Ibid., 90, 93.

McLuhan's notion of Narcissus's reflection as an "extension of himself by mirror numbed his perceptions until he became the servomechanism of his own extended or repeated image."[12] In any attempt at equilibrium, or what current philosophers–Martha C. Nussbaum among them–refer to as eudaimonia, the central nervous system (body) seeks to reject or self-amputate the "irritating pressures," of self image.[13] Self-recognition brings numbness or shock, according to McLuhan. The modern photographic image, I argue, does something slightly different; it does not cause Narcissus-like numbness. Photograph taking–meaning that you press a shutter button and receive haptic feedback so that your intention is met with a result–this is precisely how collecting images can be seen as part of the process, the never-ending process of reinforcing identity. By identity, I rely on literary critic Andreea Deciu Ritivoi's view that it is a narrative construct made comprehensible through an enmeshed and emplotted relation with environments, other people, and socioeconomics, and that identity forms the locus for change and stability.[14] And McLuhan suggests such a reciprocal process: "The development of writing and the visual organization of life made possible the discovery of individualism, introspection and so on."[15] I take the concept of "visual organization" to include larger automatic and electric systems that include smaller subsets like the camera and photography ecosystem.

The shutter is what McLuhan might call a "servomechanism" or an "expediter of information," a type of machine that both uses and produces force and, essential to this argument, provides feedback.[16] The shutter button provides feedback in terms of sound, vibration, and, most of all, a felt understanding that the photo has been taken.

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[12] Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge, MA: The MIT Press, 1994), 41.

[13] Martha C. Nussbaum, *Upheavals of Thought: The Intelligence of Emotions* (Cambridge: Cambridge University Press, 2001), 31-33; McLuhan, *Understanding Media*, 43.

[14] Ritivoi's phenomenological and narrative emphases in her definition of identity are compatible with my views of the embodied, systemic, and narrative nature of identity. See, Andreea Deciu Ritivoi, *Yesterday's Self: Nostalgia and the Immigrant Identity* (Lanham, MD: Rowman & Littlefield, 2002), 46, 62-3, 68.

[15] McLuhan, *Understanding Media*, 45. Puskar corrects the idea that McLuhan's amputation is an adequate way to conceive of the loss of a foot when using a wheel. While prosthetic theory involving the shutter button, camera, and mobile phone is outside the scope of this essay, I agree with Jason Puskar, that McLuhan's easy equation of gaining one media and losing another needs continuous interrogation; "Decades of media studies have insisted that there is something politically valuable in this consciousness [thinking about what prosthetics do to us and for us], in that it helps debunk the alleged naturalness of the human," Puskar, *The Switch*, 130. For more on prosthetic theory, see especially Marquard Smith and Joanne Morra, eds., *The Prosthetic Impulse: From a Posthuman Present to a Biocultural Future* (MIT Press, 2006).

[16] McLuhan, *Understanding Media*, 351.

Kittler's views on the body and the body's role in discursive and medial systems do reference McLuhan's ideas, but they are slightly less comforting. David E. Wellbury says that for Kittler:

> The body is the site upon which the various technologies of our culture inscribe themselves, the connecting link to which and from which our medial means of processing, storage, and transmission run. Indeed, in its nervous system, the body itself is a medial apparatus and an elaborate technology. But it is also radically historical in the sense that it is shaped and reshaped by the networks to which it is conjoined.[17]

The phonograph, film (camera), and typewriter connect reproducibility on par with literature's systematicity; hands and fingertips (and sound waves from voices and other instruments) strike surfaces and are themselves receivers of shocks. For Kittler, the fingertip is but one surface of many in the production of sounds, images, and literature. This whole mise-en-scene (scene, body, vision system, hand-fingertip system, shutter button, and camera) forms one media system in Kittler's rubric. These ideas help me to pull the body closer to the technical aspects of the plastic and metal surfaces of the shutter button so that the image ecosystem I want to highlight in the following pages can be seen as an embroidered, reciprocally-related, system, where plastic, metal, mechanoreceptors, and ideas all make and are made by the other.[18]

In *The Miracle of Analogy*, Kaja Silverman focuses on the shutter to draw our attention to the idea of liquidity and stop time.[19] The shutter is the basis of photography: "the mechanical opening and closing of the shutter" gives photography a Bergsonian "substratum of instantaneity."[20] To fix and take a photograph is a process of turning the natural, liquid world into another, larger process in which feedback arrives through an uneven series of innovations. As I attempt to reveal in these pages, the fluidity of pressing the shutter complicates the idea of easily understood haptic feedback. Although cameras and mobile phone cameras have long been used by the visually disabled (including, but not limited to, visually diverse, partial vision, low vision, and blind, among other designations[21]) to re-see via expansion, focus, and

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[17] David E. Wellbury, "Forward," *Discourse Networks: 1800/1900* (Stanford: Stanford University Press, 1990), xiv.

[18] Wellbury, "Forward," xxx-xxxi.

[19] Kaja Silverman, *The Miracle of Analogy: or The History of Photography, Part 1* (Stanford: Stanford University Press, 2015), 68-69.

[20] Silverman refers to Henri Bergson's *Creative Evolution* to highlight instantaneity and fixity; Silverman, *The Miracle of Analogy*, 67-69, 174.

[21] See, National Center on Disability and Journalism. "Disability Language Style Guide" n.d. https://ncdj.org/style-guide/#:~:text=AP%20style:%20Included%20in%20its,those%20who%20have%20some%20sight.; and,

location,[22] too often, camera and mobile phone haptics rely on a hyper-normalized estimate of touch, on machines prototyped in labs run by non-disabled young men.[23]

The shutter and shutter button were developed unevenly over nearly two hundred years, and so a brief genealogy is necessary to reveal where we are today. Early shutters had no button; they were often one single mechanism. The simplest means to stop light from entering the wooden box was, until the 1880s, a lens cap or small metal plate controlled by the hand. Splitting the shutter system into different mechanisms– the light stopping mechanism and the shutter button mechanism–arrived incrementally, as a series of developments came together: spring loaded shutter

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"Low Vision and Legal Blindness Terms and Descriptions." The American Foundation for the Blind. https://www.afb.org/blindness-and-low-vision/eye-conditions/low-vision-and-legal-blindness-terms-and-descriptions#VisualAcuity_and_LowVision. According to the CDC, "In 2017, over 7 million Americans had vision loss or blindness based on best corrected visual acuity in their better-seeing eye (using autorefraction)," and "20% of all people older than 85 years experience permanent vision loss," Vision and Eye Health Surveillance System. "VEHSS Modeled Estimates for Vision Loss and Blindness," May 15, 2024. https://www.cdc.gov/vision-health-data/prevalence-estimates/vision-loss-prevalence.html#:~:text=Approximately%206%20million%20Americans%20have%20vision%20loss%20and%201%20million%20have%20blindness.

[22] Photographers with different vision have many uses for photos and photography, not just the ones listed here. The range of these possible uses is outside the scope of this essay, but two examples provide potentials. Samantha Hurley, a journalism student and photographer at the University of Georgia, is legally blind due to albinism. She uses telephoto lenses to see things farther than twenty feet away. Hurley got her first cellphone when she was 11, and she says, "Whenever something was too far away or too small for me to make out, I would simply take a photo of it and then enlarge the picture in the palm of my hand until it was legible." In 2023, Hurley' was selected (anonymously) to cover the Paralympic Games, see, Samantha Hurley, "What a Blind Photographer Saw at the Paralympics." *New York Times*, September 13, 2024. https://www.nytimes.com/2024/09/13/opinion/paralympics-blind-photographer.html?searchResultPosition=4. Similarly, *New Yorker*'s ideas editor, Joshua Rothman, is legally blind. "Even with glasses," he says, "I live in a bit of blur. I've travelled to many places without quite seeing them, and known many people without quite knowing their faces. So, by taking photographs, I've found out what the world looks like. I imagine that even people with keen eyesight might experience something similar." See, Joshua Rothman, "What Can You Learn from Photographing Your Life?" *New Yorker*, October 22, 2024. https://www.newyorker.com/culture/open-questions/what-can-you-learn-from-photographing-your-life.

[23] According to Sapna Cheryan, Allison Master, and Andrew Meltzoff, in "There Are Too Few Women in Computer Science and Engineering," "Only 20 percent of computer science and 22 percent of engineering undergraduate degrees in the U.S. go to women," *Scientific American*, July 27, 2022, https://www.scientificamerican.com/article/there-are-too-few-women-in-computer-science-and-engineering/. And as of 2016, the median age of Apple engineers was 31, *Statista*, Statista Research Department, May 31, 2016, https://www.statista.com/statistics/653789/average-age-of-tech-company-employees/.

mechanisms, dry film techniques, and Eastman's roll film.[24] Norman Goldberg's *Camera Technology: The Dark Side of the Lens* provides detailed information on the technical development of the shutter itself. He notes, especially, that four twentieth-century developments enabled the interface to get smaller and faster: from human propelled and human governed to mechanically propelled and mechanically governed to mechanically propelled and electronically governed to, finally, electronically propelled and electronically governed.[25] Mark Paterson says that in particular, a "coordinated burst of technological leaps and photochemical innovations" enabled the camera, especially parts of the shutter mechanism, to get fast enough so that scientific photographs could capture fast moving subjects (like Muybridge's horses).[26] It was both shutter speed and the film development process that brought photography to daily life. From a piece of metal or cloth to a flap, to two flaps, to a leaf and iris mechanism and to current rolling and electronic shutters that can achieve shutter speeds of 1/32,000 second, each interface acted as a small machine: a mechanism to be manipulated by the hand, finger, and fingertip in order to control light.[27]

When a photo is taken, how it is taken, where it is taken, who takes it, and who views it are acknowledged facets of the materiality of mediation that, ironically, pushes on ideas of immateriality. Photography's surge toward digitization introduces a layer of mathematical abstraction to the process of image production, but that does not mean that because the chemical emulsions and darkroom processes recede from common practice that the oscillating ones and zeros inside the sensor chips dematerialize the process to the point where Poststructural evanescence wins the day. Not at all. In presenting ideas that tether plastic interfaces to intentionality and desire, it helps to recall Bill Brown's notion of materiality:

> One of the ironies of the digital regime (in the visual register) has been the extent to which photography and film are now reputed to have had intimate contact with the material world: at least photography has

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[24] Gustavson notes that beginning in 1839, an international surge in developments aided the continuous evolution of the camera; Todd Gustavson, *Camera: A History of Photography from Daguerreotype to Digital* (New York: Sterling Publishing Company, 2009), 32, 116-123, 88-91.

[25] Norman Goldberg, *Camera Technology: The Dark Side of the Lens* (San Diego, CA: Academic Press, 1992), 62-63; for a technical discussion of shutters, from mechanical to fully electronic, see especially 60-86.

[26] Mark Paterson, *How We Became Sensorimotor: Movement, Measurement, Sensation* (Minneapolis, MN: University of Minnesota Press, 2021), 163, 155-202.

[27] Flagship mirrorless cameras from Canon, Nikon, and Sony are able to achieve speeds over 1/32,000 second via electronic shutters. Richard Butler and Carey Rose, "Sony a9 III in-depth review," *Digital Photography Review*. https://www.dpreview.com/reviews/sony-a9-iii-in-depth-review.

> an indexical relation to its subject; at least analogical media don't translate the world into numbers and quality into quantity."[28]

No matter the amount of dematerialization, these media systems "still require physical support," and I would add to Brown's assertion that photography requires physical support, metaphysical support, biomechanical support, and educational support.[29]

Although the shutter button has changed in shape, size, material, and process from the older wooden box models of cameras created and used by Daguerre, they are still necessary for feedback.

Figure 1—1839 example of a Susse Frére Daguerreotype camera; note the metal pivoted shutter plate that allows light into the lens. (Photo by Luidmila & Nelson, Susse Frére Daguerreotype camera 1839, August 5, 2010, Wikimedia Commons).

[28] Bill Brown, "Materiality," *Critical Terms of Literary Study*. Edited by W.J.T. Mitchell and Mark B.N. Hansen (Chicago: Chicago University Press, 2010), 53.
[29] Ibid., 53.

Figure 2—1930 Leica III black. (Photo by Kameraprojekt Graz 2015, 1930 Leica III black, August 2, 2015, Wikimedia Commons).

Figure 3—Eastman Kodak Brownie Holiday Flash camera (ca. 1953-1962); note the mechanical shutter button positioned for right hand use. (Photo by Jarek Tuszyński, Eastman Kodak Brownie Holiday Flash camera, April 11, 2015, Wikimedia Commons).

Figure 4—1983 Canon A-1 SLR Film Camera. (Photo by Sean Scanlan, 1983 Canon A-1 SLR Film Camera, June 11, 2024, Personal Collection).

The shift from the Leica III's mechanical/mechanical shutter to the Canon A-1's mechanical/electronic shutter provides an entry point to the electric button/switch as an invention. Rachel Plotnick writes that the shutter button as we know it developed over decades and was aided and thwarted by the dueling characteristics of the consumer camera: to make it feature rich and easier to use ("You press the button, we do the rest" states an 1890 advertisement from Kodak).[30] As Plotnick says, "Although push buttons and their counterparts like dials, keys, and levers may seem trivial in the grand scheme of technological interactions, in fact they offer a fascinating vantage point from which to understand human-machine relationships."[31] The button, from a media studies frame, goes beyond the dialectical nature of user and use and can reveal the systemic process by which the image is placed within a larger ecology that includes materials, bodies, and desires.

In a parallel argument, Jason Puskar notes that, like the button, the switch is much more complex than it seems and reconfigures the overlapping medial ingredients of humans: technology, labor, bodies, actions, and thoughts. Particularly relevant is Puskar's notion that the switch intimately mediates the human as an assemblage "primarily as that crucial part that helps conceal the fact of assembly."[32] By taking seriously "seemingly trivial devices such as …shutter buttons on cameras…we

[30] See Rachel Plotnick, "At the Interface: The Case of the Electric Push Button, 1880–1923, *Technology and Culture* 53, no. 4 (2012): 828, 8. https://www.jstor.org/stable/41682743.

[31] Ibid., 816-817.

[32] See Jason Puskar, *The Switch: An Off and On History of the Digital Humans* (Minneapolis: University of Minnesota Press, 2023), 9.

may feel our way toward a new set of questions about the human and its agencies."[33] The implications of assembly and agency are important: the shutter button as switch is a vital processing fulcrum. It is more than a physical tool or a theory of a tool. Because it is an interface among the body, mundane images, and art images, it is a focalizing point for a mysterious drive to see and record. The shutter button helps inform one's memory; therefore, it is one of our continuously evolving technologies that both limits and expands how people see, remember, and think.

With these ideas of what the shutter button is and how it mediates us, I turn to some actual buttons. The figures below show four current models of mirrorless cameras manufactured by four different camera companies; the similar layouts (with many slight variations) enable photographers to find the shutter button on any of them with relative ease. Of course, the notion of "with relative ease" relies upon several ability issues (right-handed versus left-handed, visual ability, touch ability, and others) to which I will return shortly.[34]

Figure 5—2024 Canon EOS R7 Mirrorless Camera (Photo by Sean Scanlan, 2024 Canon EOS R7 Mirrorless Camera, June 7, 2024, Personal Collection).

[33] Ibid., 11-12.

[34] Though outside the scope of this essay, ergonomics and neuroergonomics (layout and finding), especially as they relate to haptics and disability, are vital to this discussion. See, Tadeusz Marek, Waldemar Karwowski, and Valerie Rice, eds. *Advances in Understanding Human Performance: Neuroergonomics, Human Factors Design, and Special Populations*. Milton: Taylor & Francis Group, 2010. ProQuest Ebook Central.

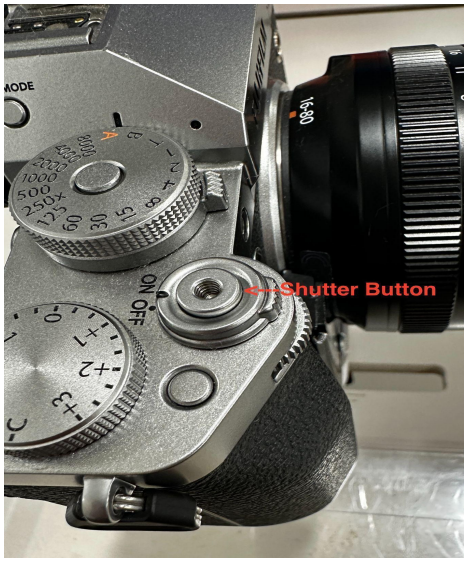

Figure 6—2024 2024 Fuji X-T5 Mirrorless Camera (Photo by Sean Scanlan, 2024 Fuji X-T5 Mirrorless Camera, June 7, 2024, Personal Collection).

Figure 7—2024 Nikon Zfc Mirrorless Camera (Photo by Sean Scanlan, 2024 Nikon Zfc Mirrorless Camera, June 7, 2024, Personal Collection).

Figure 8—2024 Panasonic LUMIX G9II Mirrorless Camera (Photo by Sean Scanlan, 2024 Panasonic LUMIX G9II Mirrorless Camera, June 7, 2024, Personal Collection).

From about the 1930s on, the shutter button on 35mm SLR-style film cameras (and moving forward into digital single lens reflex cameras (DSLR) and digital mirrorless cameras) have remained remarkably similar in position (activated by the right-hand index finger fingertip) and in size. The cameras in Figures 4-8 have shutter button diameters that range between, approximately, 8–12 mm, stack height range from 1-6 mm; and total travel distance range between 1-4 mm).[35]

Mechanoreceptors

Now that we've identified theoretical sense processing and some imaging media components, we are ready to review the medial interface that activates the shutter button: the hand, index finger, and, especially, the fingertip. Let's begin a narrative

[35] SLR stands for Single Lens Reflex and DSLR stands for Digital Single Lens Reflex. Nasim Mansurov writes that, "While a DSLR camera uses a mirror mechanism to either reflect light into an optical viewfinder, or pass it through directly to the camera sensor, a mirrorless camera completely lacks such mirror mechanism (hence the name), which means that the light passing through the lens always ends up on the imaging sensor. Since light is no longer reflected on an optical viewfinder (OVF), mirrorless cameras typically rely on electronic viewfinders (EVF) and LCDs that basically project what the imaging sensor sees. Because of the lack of a mirror mechanism and an optical viewfinder, mirrorless cameras can be made simpler, lighter and less bulky when compared to DSLR cameras." See Nasim Mansurov, "What is a Mirrorless Camera," *Photography Life*, February 11, 2018. https://photographylife.com/what-is-a-mirrorless-camera.

focused on pressing the shutter button, its mechanics and its processes. And further, let's keep in mind this question along the way: how does the shutter button provide adequate feedback between intention and image capture, so that the photographer wants to continue taking photos? It is important to remember that the shape, size, and structure of the button has much to do with the shape and size of hands and fingers as well as spatial sensing sensitivity. To trace the narrative and answer my question, I rely on two texts in particular: Lynette A. Jones' (mechanical engineer) and Susan J. Lederman's (neuroscientist and psychologist) *Human Hand Function* and neuroscientist David J. Linden's *Touch: The Science of Hand, Heart, and Mind*.[36] "The hand is a miraculous instrument that serves us extremely well in a multitude of ways," begin Jones and Lederman, not simply to take photos, but to identify and extract information about the world including "surface texture, compliance, weight, shape, size, orientation, and thermal properties," while not forgetting vibration and movement, two facets of sense that will guide much of our narrative.[37]

The fact that the "fingertips, along with the tip of the tongue," are "the most spatially acute parts of the body," encourage a reflection on Kittler's idea that "we knew nothing about our senses until media provided models and metaphors."[38] The shutter button is a small component of a larger technological (biological/material) system–an image recording device that allows multimedia sensing. The shutter button is both a direct and indirect interface, an interface that could be thought of as part of a chain of media events condensed into the following micronarrative: desire to press the shutter button, electrochemical signal to somatosensory cortex, reliance on motor skills to find the button, threshold-level stimulation in which the right index fingertip feels the button (itself a complex switch consisting of mechanical, thermal, and electrocutaneous stimulation), the fingertip senses via the four mechanoreceptor sensors (Meissner's corpuscle, Merkel disk receptor, Pacinian corpuscle, and Ruffini ending; we will return to these four momentarily), then electrochemical signals go back to the spinal column, and, in ways not well understood, they travel back to the somatosensory cortex—to conscious thought.[39]

I need to make two points before proceeding. First, as much progress as has been made in the area of hand anatomy, cognitive science, biology, biochemistry, and psychophysics, we still do not know exactly how this chain of events between fingertip

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[36] Lynette A. Jones and Susan J. Lederman, *Human Hand Function* (Oxford: Oxford University Press, 2006); David J. Linden, *Touch: The Science of the Hand, Heart, and Mind* (London: Penguin Books, 2016).

[37] Jones and Lederman, *Human Hand Function*, 3.

[38] Jones and Lederman, *Human Hand Function*, 4; Kittler, *Optical Media*, 34.

[39] Jones and Lederman, *Human Hand Function*, 41-44.

and consciousness works. Yes, we have made progress since Ernst Heinrich Weber and Gustav Theodor Fechner's work on sensory stimulus and response, but mysteries remain.[40] Second, this short essay can make only a small contribution in understanding the fine-grained path described above. Future work in this area, my own included, should continue to account for differences in touch sensitivities across gender, race, and ability.[41] What I hope to achieve here is a slightly better understanding of the complexity not only of the button itself but also of the pressing of the button and its connected paths through media and desire.

For years I've predicted to those who will listen to me that the shutter button's staying power, resurgence even, is due to medial connections among body, material, and physics (and psychophysics). Technological advance often means that media interfaces shrink and regrow unevenly: think of the increased size of SUVs–along with the popularity of tiny cars (in Europe); think of shrinking mobile phones.[42] Lev Manovich notes that the term human-computer interface "describes the ways in which the user interacts with a computer," an interaction that changed from a work-driven basis to our daily reliance upon an all-encompassing "universal media machine."[43] The shutter button (and other manipulations available on cameras and mobile phone cameras) is what he would call a "human cultural interface."[44] Both the hand and the

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[40] Weber and Fechner are not only important to the rise of the concept of proprioception, they, along with Hermann von Helmholtz and Wilhelm Wundt argued for quantitative measurement of hand perception, giving rise to psychophysics. Weber's law is still relevant today. Jones and Lederman, *Human Hand Function*, 4-5; See also, Friedrich Kittler, *Discourse Networks: 1800/1900* (Stanford: Stanford University Press, 1990), 207, 222.

[41] For a discussion on gender, disability, blindness and prosthetic theory in terms of the switch (and, especially, the keyboard), see Puskar, especially chapter 5 "Counting on the Body" and Chapter 8, "Human Types," 62-78, 122-136. For discussions of gender and race and media, see Sarah Sharma and Rianka Singh, eds., *Re-Understanding Media: Feminist Extensions of Marshall McLuhan* (Duke University Press, 2022), 23-35, 179-191. See also, peripheral neuropathy: damage to the peripheral nervous system which may affect the hand's ability to send signals to the brain, and vice versa. "Peripheral neuropathy affects millions of people in the U.S." "Peripheral Neuropathy" (National Institute of Neurological Disorders and Stroke, n.d.) https://www.ninds.nih.gov/health-information/disorders/peripheral-neuropathy.

[42] Nathan Bomey, "Why SUVs are getting bigger and bigger," *USA Today*, December 27, 2019. https://www.usatoday.com/story/money/cars/2019/12/27/suvs-gm-ford-toyota-chevrolet/4408728002/; Talib Visram, "Tiny cars are all the rage in European cities, could they ever work in America?, *Fast Company*, February 22, 2023. https://www.fastcompany.com/90852521/tiny-cars-european-cities-could-they-work-in-america; Wikipedia, "History of Mobile Phones," Last Updated June 11, 2024. https://en.wikipedia.org/w/index.php?title=History_of_mobile_phones&action=history.

[43] Lev Manovich, *The Language of New Media* (Cambridge, MA: The MIT Press, 2001) 69.

[44] Ibid., 70.

shutter button, as they interface, transfer an astounding array of cultural and electrochemical information to each other.

Our highly nuanced perception of touch reveals a combination of tactile sensation and the social imprints of culture, age, gender, ethnicity, personal experience, and a myriad of other identity markers–all of these sensations congeal into awareness. And all of these dynamic processes are condensed into the action of pressing the shutter button on a camera; for our purposes, I trace the process of pressing the shutter on a Sony A7Cii mirrorless camera, a camera similar in features to those in Figures 5-8. A longer, future exploration might consider a range of mobile phone-cameras and a range of point-and-shoot, DSLR, and mirrorless cameras. For now, this anecdotal comparison suitably suffices to reveal the complexity of shutter button psychophysics. Figure 9 shows the similarity between the Sony's physical shutter button and the iPhone 14 Pro's digital screen image of a shutter button. I will return to the iPhone's lack of a physical shutter button at the end of this essay with a discussion of blindness and access.

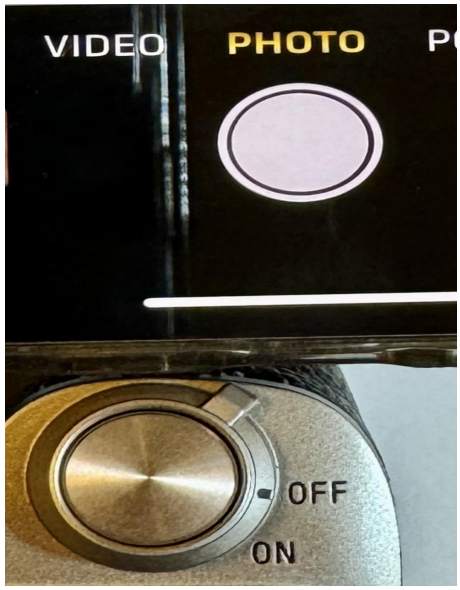

Figure 9—2023 iPhone 14 Pro (top) and 2024 Sony A7cii. Note the similarity of shape and size of both shutter buttons, though one is physical, and one is a digital image of a shutter button (Sony: 12 mm; iPhone: 12 mm (the outside white circle)). The iPhone does not have a raised physical profile, but, crucially, it does provide haptic feedback (which can be turned off). In addition, photos can be taken with the rectangular physical volume buttons located on the upper left side of the camera. Each volume/shutter button is 11.26 mm by 2.69 mm and is approximately 0.3 mm tall. These buttons are spring loaded and provide both auditory and haptic feedback. The Sony's haptic feedback is in the spring vibration that pushes back or resists the fingertips force; further, the Sony's shutter button allows haptic feedback for its automatic focus feature, activated by pressing the button halfway. The halfway step is subtle but noticeable, and the electronic shutter (there is no mechanical shutter)

provides a subtle vibration that can be felt by both hands holding the camera. This vibration can be turned off by selecting "Silent Shutter" in the camera's menu system; the shutter activation can also be heard, a feature that also can be turned off.[45] (Photo by Sean Scanlan, Shutter Button Size Comparison: iPhone 14 Pro and Sony A7cii, June 7, 2024, Personal Collection).

Photographers interact with the shutter button in similar yet different ways. The shutter button achieves its goal of being usefully medial via its situatedness; it should be in a place on the camera that takes into account the index finger's range of motion, the average fingertip size, as well as the distance the button is from the other parts of the camera (or phone). The index finger needs to be able to reach other switches (on/off and modes), buttons (that adjust menu, display options, timer, review, delete, among others) and dials (that adjust shutter speed, aperture, ISO, exposure compensation, among others) to operate the device. The shutter button should be easy to find and manipulate, but it should be separate from the other controls so that when the photographer wants to take the photo, the button is within an intuitive, memorizable range of motion.

Our skin is surprising in many ways, not merely in the fact that it is surprisingly big and heavy (it is the largest human organ, weighing, on average, 14 pounds), but primarily in the fact that it is our interface between our internal and external worlds."[46] Linden continues that:

> In addition to allowing touch information in, it has to keep a lot of dangerous things out. Skin serves as a barrier to repel noxious stressors like parasites, microbes, mechanical and chemical insults, ultraviolet radiation, etc. To aid this task, it has its own specialized branch of the immune system and secretes its own hormones.[47]

The skin is a system with a larger system, and these systems interact with many other systems, among them, a physical/digital device that aids in recording and storing images. Mediating continuously, both communicating and receiving communication, rebuilding and disintegrating, the skin is our own media technology.

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[45] Jeff Keller and Dan Bracaglia, "Sony a7C II review," *Digital Photography Review,* November 14, 2023, https://www.dpreview.com/reviews/sony-a7c-ii-review#:~:text=Finally%20good%20enough%20for%20manual,still%20no%20full%20mechanical%20shutter.

[46] Linden, *Touch*, 34.

[47] Ibid., 34.

Stepping back into Kittler's thoughts on McLuhan's sense theories, we note the problematic[48] centrality of bodies, especially female bodies, in earlier media studies in order to highlight the shutter button's interconnections.

> According to McLuhan, media are the intersection points (Schnittstellen) or interfaces between technologies, on the one hand, and bodies, on the other. McLuhan went so far as to write that under audiovisual conditions our eyes, ears, hands, etc. no longer belong to the bodies they are associated with at all, let alone to the subjects that figure in philosophical theory as the masters of the aforementioned bodies, but rather to the television companies they are connected to.[49]

This passage provides a linkage among devices, bodies, corporations, and economics. The skin, then, is physical and optical, biological and technological. It may be going too far to say that the skin is a storage and economic device, but just barely. What is safe to say is that the skin seems to be part of Apple's ideas about what constitutes device interaction, even if they are late to understand the need for better interoperability.[50] Throughout *Human Hand Function*, Jones and Lederman encourage companies to engage in haptic research more thoroughly: "We note that it is of critical ergonomic importance that these hardware and software systems be built with the capabilities and limitations of the tactile/haptic and motor systems of the human user carefully considered."[51] Optical media encodes visibility, and the hand, in turn, extracts and provides information about the world. The human hand not only displays precise dexterity when grasping, reaching, and manipulating, but it also can communicate via gestures and aid in essential communication for the vision and hearing impaired. The human hand is also a tool for music, drawing, painting, sculpture, and dance.[52] Connected to these uses and beyond their immediate daily

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[48] In the introduction to *Optical Media*, John Durham Peters notes that besides Kittler's stance against cultural studies, his treatment of women "has always been problematic" (7-8). See John Durham Peters, "Introduction: Friedrich Kittler's Light Shows," *Optical Media* (Cambridge, UK: Polity Press, 2013), 1-17. See, Sharma and Singh's *Re-understanding Media: Feminist Extensions of Marshall McLuhan*, especially noting that my essay acknowledges that more work needs to be done to explore the gendered and unequal politics and socioeconomics surrounding the shutter button. See also Rachel Plotnick's *Power Button* and Jason Puskar's *The Switch* for insights into the gendered, sexual, and humanizing aspects of pushing buttons and switches.

[49] Kittler, *Optical Media*, 29.

[50] "Apple announces new accessibility features, including Eye Tracking, Music Haptics, and Vocal Shortcuts," Apple Newsroom, May 15, 2024. https://www.apple.com/newsroom/2024/05/apple-announces-new-accessibility-features-including-eye-tracking/.

[51] Jones and Lederman, *Human Hand Function*, 7.

[52] Ibid., 3.

usefulness, the hand is also part of how identity is formed; the hand is how we know aspects of the world and how the world, reciprocally, knows us.

Our sense of touch as an interface to art and representation has fascinated us at least since the paleolithic era, but it has only recently been analyzed, quantified, and described. Weber and Fechner improved our understanding of hand function by introducing quantitative techniques to study physiological sensory thresholds. The Weber-Fechner Law "documented a mathematical relation between the size of the change in stimulus magnitude and the just noticeable difference in perceived intensity."[53] Their work inaugurated psychophysical methods still in use today. The idea of proprioception, so common is critical work in a range of scientific and humanities work, requires explanation. Information from special sensors that are embedded throughout the body provide signals to the brain; and, according to Linden, "these signals enable you to form a mental image of where your body is in space. This ability, called proprioception, makes it possible for you to sense, for example, the position and movement of your arm, even when your eyes are closed and you are not touching anything."[54] Proprioception is vitally linked to haptic processing as the sensors in the body and just below the surface of the skin are part of a system that perceives the body in space and also what to do when using a tool such as a shutter button; these concepts are reciprocally related.

I want to pause here for a moment. There is something slightly ironic at work in this essay that is so focused on touch within the larger frame of photography studies, image studies, and the visual arts. There is a crucial need to discuss the visual and tactile together. Part of my response is to refer to the important work of media scholars Mark Paterson and David Parisi. Paterson says that the haptic senses have historically received less attention, although there has long been a historical thread of laboratory-based research."[55] Writing expansively on this topic, Parisi says that the sense of touch was gradually accepted into the scientific lab: Nineteenth century narratives of science "depict the sense of seeing and hearing as the primary objects of modern psychosensory science." The quantification of the senses in the late nineteenth, aided by heightened interest in measuring electricity, helped lead to increased study of touch. This narrative, relates Parisi, revealed that touch "proved equally capable [as seeing and hearing] of being made into an object of structured, positivist stimulation and observation."[56]

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[53] Ibid., 4.

[54] Linden, *Touch*, 78.

[55] Mark Paterson, "Social robots and the futures of affective touch." *The Senses and Society* 18, no. 2 (February 27, 2023): 110–25.https://doi.org/10.1080/17458927.2023.2179231.

[56] Parisi, *Archaeologies of Touch*, 16.

Back to our efforts to take a photograph. The four broad categories that guide touch sensing are: tactile sensing, active haptic sensing, prehension, and non-prehensile skilled movements. In tactile sensing, the fingertip is passive, and an object indents it, while in active haptic sensing, the hand moves voluntarily and haptically uses sensory input provided by the stimulation of receptors embedded in the skin, muscles, tendons, and joints. The third category, prehension, refers to the processes of the hand reaching to grasp, and non-prehension skilled movements, the fourth category, refers to a range of skilled activities such as keyboard manipulation (piano and typewriter keys) and pressing a shutter button.[57]

Tactile experience is less a step-by-step narrative than a (nearly simultaneous) multi-medial processing of many subsystems from the outermost edge of the skin to the deepest edge of the dermis; pressing of the button, as Puskar would say, creates a break in the flow of action. But the entire action that combines body and machine is a "sprawling process."[58] These peripheral receptor subsystems feed into and are fed by larger primary somatosensory pathways.

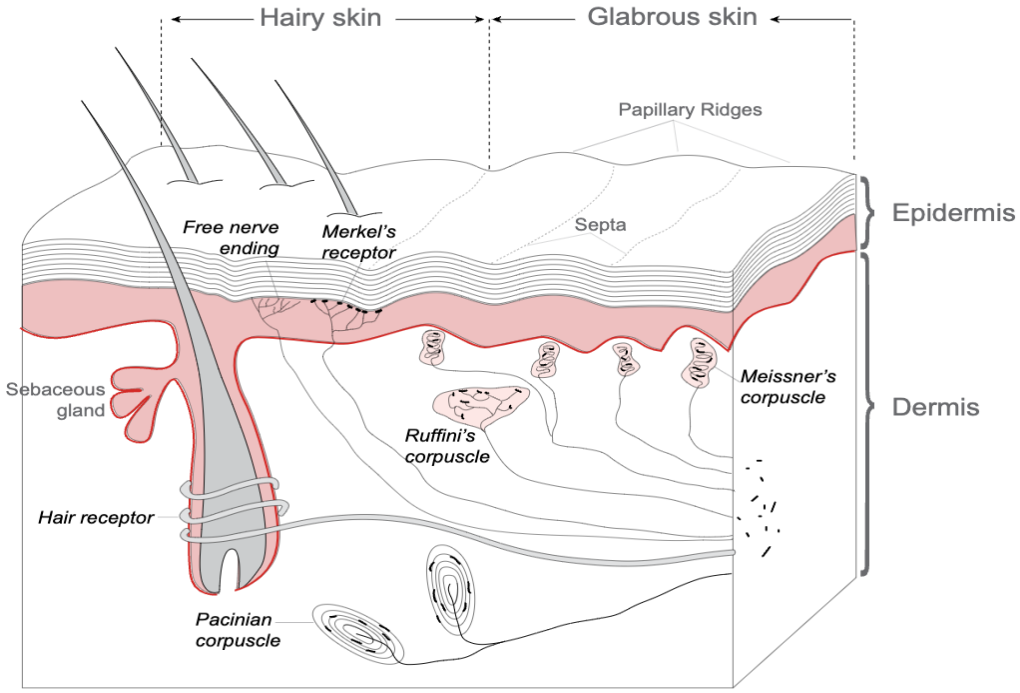

Figure 10—Skin Proprioception (Photo by Thomas Haslwanter, Skin Proprioception, March 19, 2011. https://commons.wikimedia.org/wiki/File:Skin_proprioception.svg).

[57] Ibid., 7-8.
[58] Puskar, *The Switch*, 8.

You pick up your camera and decide to photograph, say, a small blue ceramic vase on a table–the image and still life setup are less important than the pathway and process, but for the purposes of simplicity, let's go with it. The average digital camera (point-and-shoot or DSLR or mirrorless) are biased to dominant right-handed users, so you hold the camera in the right and, perhaps, support the lens with your left. Your right hand most likely uses the thumb and middle and ring finger to support the weight of the camera. Depending on the size of the camera, the pinky will curl under the body of the camera, helping to support its weight. The index finger has a lot of work to do as it helps adjust a range of photographic interfaces (buttons and dials besides the shutter button).

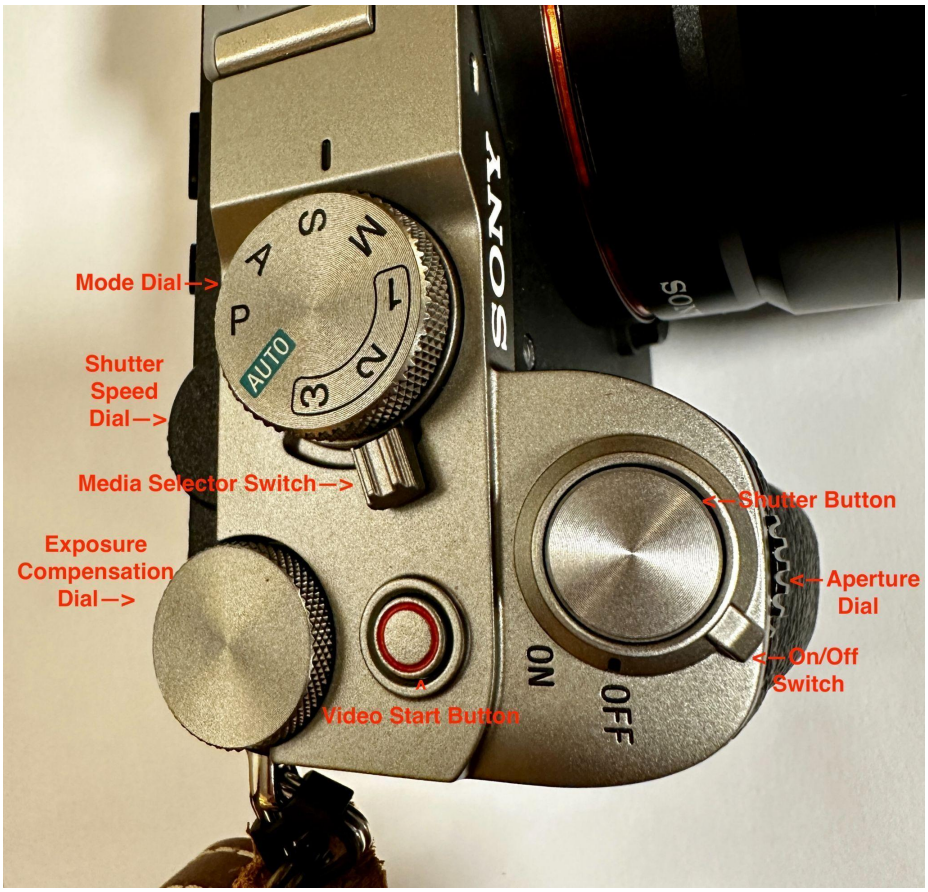

Figure 11—The placement of the dials, switches, and buttons allow for separation of controls; the sides of the two dials vary in texture; engraved into the top of the two dials and the shutter button are very fine concentric lines that resemble the fingertip's fingerprint; the only surface on the camera

that is completely smooth is the glass screen on the rear of the camera. (Photo by Sean Scanlan, Top Controls for Sony A7cii, June 17, 2024, Personal Collection).

The index finger might (as in the case of the A7Cii) flick the switch to turn the camera on–this switch is part of the shutter button mechanism (see Figure 11). The index finger also controls a ridged front dial that controls the aperture and the tiny red video-record button. Your thumb has access to several controls: shutter speed (ridged dial), display options (button), menu options (button), ISO (ridged ring on the back panel), playback (button on the back panel), exposure compensation (large ridged dial), timer (ridged ring on back panel), focus target (ridged ring on back panel), functions (button on back panel), and the mode dial (a large PASM dial) must be turned using both index finger and thumb (the rear glass screen is touch-enabled; via touch, the photographer can alter many settings and activate the shutter). The important point is not the sheer number of options, but that your right hand can command such a vast array of options; the textured surfaces are crucial for unsighted operation, for once you practice with your camera, any camera, you can locate these operational surfaces by feel and memory.

The blue vase is in focus, and you easily find the shutter button and press halfway to make sure it is in focus–a slight resistance in the shutter button is sensed by the right fingertip. Checking the electronic viewfinder (EVF), you see that the vase is in focus and fully depress the shutter button. The shutter button stops once it reaches its floor, and the force of the interior spring pushes against your finger. Since there is no need to advance the film, once the shutter has returned to the top of the shutter button stack, it is ready for another photo; as with most cameras, continuous pressure on the shutter button will engage a burst mode which asks the camera to continue to take photos until your finger disengages the button or until the camera's processor reaches its limit. When the finger fully depresses the shutter button, there is, depending on the camera model and menu setup, an audible click and a slight vibration as the shutter opens and closes. In addition to the shutter vibration, your right finger feels the button's rebound–all these sensor signals–surface texture variations, vibrations, and sounds–are part of the camera's haptic feedback system letting you know that a photo has been taken. But really happened under the skin when you pressed the button?

This tactile task is accomplished with almost no thought–here I'm referring to pressing the shutter button, not composing the shot and not manipulating the aperture, speed, ISO, white balance, exposure compensation and other possible settings. When you press the button, however, the task is not just one task, even if it seems simple and can be done with little effort. Instead, your body relies on four

mechanoreceptors to sense what is going on and how to act: tactile sensors in the skin that convert mechanical energy "delivered into the skin into electrical signals."[59] These following four touch sensors, previously mentioned, are not the only sensors in the hand, but they are crucial for pressing the shutter button: Merkel disk receptors, Meissner's corpuscles, Pacinian corpuscles, and Ruffini endings (see Figure 10).[60]

Let's go through the steps of pressing the shutter very slowly so that we can see these mechanoreceptors at work. You are occupied with looking through the viewfinder or at the small screen (many cameras have an EVF located in the center of the camera, but some are located on the left corner of the camera–forcing the use of the right eye), so your index finger must find the shutter button. Your fingertip can find very very small surface irregularities–like buttons on a camera. An important feature of the index fingertip's skin is that it has dermatoglyphics, or fingerprints, and that it is hairless, or glabrous; most of the body is covered with hairy skin. Glabrous skin is "found on the palms of the hands (including the inner sides of the fingers), the soles of the feet, the lips, the nipples, and portions of the genitals."[61] These fingerprints are important in helping sense where the fingertip is and what it is doing. You move your finger from the front of the camera where it was busy turning the ridged dial to set the right aperture, then it moves about 7 mm up the front of the camera to the rounded lip of the shutter button. Using Linden's narrative of finding a quarter in your pants pocket in order to feed a parking meter, a similar set of sensory operations aids you in recognizing different parts of the camera to find and know that you are pressing the shutter button.[62] This process involves all four touch sensors; we will discuss them in order even though these operations overlap, and they occur fluidly and with incredible speed.

Merkel disk receptors are the most important of the four as they allow "you to detect the edges of objects, local curvature, and rough texture."[63] Located "between the epidermis and the dermis," Merkel cells are clustered in disks that operate via a signal that travels by a nerve fiber to the spinal cord and "ultimately, [to] the touch-sensing regions of the brain." As your fingertip's skin is deformed by the shutter button's raised lip (approximately 3 mm); an impression is left on the skin, one that is "encoded by brief changes in voltage lasting about one one-thousandth of a second, called spikes," and these voltage changes are sensitive to skin deformations as small as

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[59] Linden, *Touch*, 48.
[60] Ibid., 40-41. See also Jones and Lederman, *Human Hand Function*, 24-31.
[61] Linden, *Touch*, 35.
[62] Ibid., 39-49.
[63] Ibid., 40.

0.05 mm.[64] Your shutter button on this particular model of Sony camera is composed of three circular metal disks–think of them as three small coins: the first is molded onto the top of the camera and resembles a small dime with a side profile wall about 2.4 mm tall, the second disk is smaller and has a wall of about 0.6 mm, and finally, the button itself is a smooth, curved silver metal button 12 mm in diameter and raised from the smaller ring by about 0.3 mm (see figure 11).[65] Merkel disks help you distinguish the aperture dial from the shutter button; the dial has small vertical ridges about 0.5 mm apart, and each ridge is 2.9 mm tall. The shutter button sits just above the ridged aperture dial separated by the metal camera top that is 2.8 mm thick. These distances are small, but Merkel cells can detect indentations ten times as small as the distances represented in the dial and shutter button configuration.[66] At this point, please note, you have only felt the presence of different surfaces. We have not yet pressed the button.

Next, you are ready to begin pressing the button. But wait. Before you press it, how do you figure out the minimal force needed to press the shutter button? This is (at least) a two-step operation: first you half-press the shutter button to focus, and, second you completely press it to take the photo–doing all this without applying too much force which might cause the camera to shake thereby resulting in a blurred image. This is where Meissner's corpuscle comes into play. Meissner's cells are even denser and closer to the surface of the epidermis than Merkel cells, but they "fire spikes only at the very beginning and the very ending of prolonged skin indentation [...] This means that, unlike Merkel disks, Meissner's corpuscles don't respond well to steady force on the skin, but rather are strongly activated by faint low-frequency vibration that repeatedly indents and reforms the corpuscle." As with scrolling the wheel of a computer mouse or gripping a quarter or moving the index finger along the ridges of the aperture dial or shutter button, the Meissner's cells work in tandem with the ridges that form our individual fingerprints, and they are "exquisitely sensitive to tiny, rapid skin movements," in other words, "microslips." These microslips make precision control of small dials and buttons possible because each microslip "sends electrical signals to the neurons in the spinal cord that contract the relevant finger muscles to," increase or decrease the force needed "until the microslips stop."[67] Hence,

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[64] Ibid., 40, 42.

[65] For comparison, the diameter of the US dime is 17.91 mm and is 1.35 mm thick. "Coin Specifications," *United States Mint*, Last updated April 28, 2022. https://www.usmint.gov/learn/coin-and-medal-programs/coin-specifications.

[66] Ibid., 42.

[67] Ibid., 43-44.

you feel the top ridge of the shutter button as your fingertip gently touches the rounded surface of the button's several rings. But you don't mash down the button.

To recap: you've located the different surfaces: aperture dial, top of camera, bottom of shutter button "stack" of disks, and, finally, the actual 12 mm shutter button itself. Your fingertip senses it is touching the top of the shutter button.

Now you begin to press. Of course, you will use much of the tactile feedback subconsciously to alter the trajectory of your finger over these surfaces–all the while thinking about what you see in the viewfinder, when to press the button, how air movement, light, and environment affect the composition (along with, most probably, other memories of other photo-taking events). The next set of sensor cells in our narrative is the Pacinian corpuscle. These cells "are extremely sensitive to tiny vibrations and have almost no spatial localization: A single Pacinian corpuscle in the fingertip, by virtue of its layered wrapping and deep location, can be activated by vibration anywhere on the finger." I will address the idea of haptic feedback in more detail in a few moments, but for now it is important to consider the slight click of each stepped movement of the aperture dial and the stepped resistance while depressing the shutter button, and, of course, the very slight mechanical shutter vibration when the shutter opens and closes. While Meissner's corpuscle are sensitive to small vibrations, "Pacinian corpuscles are most sensitive to high-frequency vibration in the range of 200 to 300 hertz at which they can detect skin motion as small as 0.00001 mm (two hundred times smaller than the diameter of a tiny vellus hair)."[68] The reason that we can use fine instruments and tools, such as a camera shutter button, is because Pacinian corpuscles "provide a high fidelity neural image of transient and vibratory stimuli transmitted to the hand by an object in the hand." Each button, dial, and switch on the camera provides feedback to the hand and the user, and in this way, the shutter button, as Kittler and McLuhan intimated decades ago and as Puskar, Plotnick, Paterson, Parisi, and Linden now write, is like a quarter inserted into the parking meter or a violin bow pulled across a string: these tools "effectively become sensory extensions of the body."[69]

Ruffini endings are the fourth tactile sensor that completes the shutter button story. This cell involves "sensing horizontal skin stretching."[70] Neuroscientists do not completely understand the inner workings of Ruffini endings; it is thought they "may help detect motion of an object along the skin surface as that object stretches the skin locally," and may "provide information to the brain about the confirmation of the

[68] Ibid., 45.
[69] Ibid., 46.
[70] Ibid., 47.

hand and fingers through hand stretch signals" such as when the right hand's fingertip is stretched or curved around the body of a camera, moving from dial to button and back again, helping the photographer's hand and fingers maintain readiness to take an image.[71] Now you gently press down the shutter button's total travel distance of 1.00 mm with just enough force, just enough speed, just enough angle to feel it all happening. You've taken the photo of the blue vase.

Pressing the shutter button and getting various forms of feedback such as shutter sounds (artificial sounds from a mobile device camera) shutter vibrations and microslips forms part of the many possible procedures for perceiving the self. "Ultimately," says Linden, "representing the tactile world in the brain is in service of achieving some particular outcome: making a decision, forming a memory, or initiating action."[72]

Ability and Desire: Future Haptic Shutter Buttons

What happens under our skin when we take a photo helps us to understand why and how the shutter button could disappear from mobile phones and then reappear. Some answers are provided in the introduction to a special issue on haptics in *New Media & Society*. David Parisi, Mark Paterson, and Jason Edward Archer write that the "digitization of buttons, knobs, and switches has only increased the trend of transforming extrusions into flat surfaces, a radical tendency that reduces the design aesthetics and affordances of their materially-protruding, mechanical equivalents."[73] In *Archaeologies of Touch*, Parisi unfolds this idea further. He asks, "does the touch screen belong here," on a camera interface? Who and in what ways are decisions about the materials used in "crafting the touchscreen's housing, the device's angles and contours, and the placement of the hard and soft keys around the touchscreen?"[74] Parisi makes clear that haptics on a mobile phone touch screen were, until about ten years ago, largely one way: when the fingertip meets the glass screen, there were no tangible effects back to the finger:

> it is a meeting of organic and inorganic electrical fields registered only by the machine. By replacing data-rich buttons, keys, scroll wheels, and knobs with a flat, homogeneous tactile space of glass, touch screens seemed to diminish rather than enhance the tacticity of

[71] Ibid., 48.
[72] Ibid., 69.
[73] David Parisi, Mark Paterson, and Jason Edward Archer, "Editor's Introduction: Haptic Media Studies," *New Media & Society* 19 no. 10 (2017): 1513-1522. DOI: 10.1177/1461444817717518.
[74] David Parisi, *Archaeologies of Touch* (Minneapolis, MN: University of Minnesota Press, 2018).284.

> human-computer interfaces, effectively shifting the burden of registering inputs from the dense clusters of nerve receptors in the pads of the fingers onto the eyes.[75]

It wasn't until the fall of 2015 that Apple introduced a simple haptic feedback to its iPhone 6s, "trying to write something akin to the materiality of buttons, keys, and knobs back into the flat glass screen's lifeless space," in such a way that small "vibrational cues" could mimic the feedback of a physical key or button.[76] Throughout my research, and even as the prevalence of camera touch screens grows, I have not found a digital camera *without* many physical buttons; in general, the more expensive and complex the camera, the more buttons it has.[77] And, at the same time, I've only seen much older mobile phones and the newer Sony Xperia mobile phone with a dedicated two-step shutter button.[78]

Two parallel developments seem to be increasing: the prevalence of flat screens that require touching and the increased use of haptics to help users navigate the experience of touching a flat undifferentiated glass surface. Parisi, Paterson, and Archer continue: "The effect of the worldwide profusion of touchscreens is to correspondingly undervalue, and underestimate, the complexity of our everyday haptic interactions with them."[79] Anybody who has dropped their slippery mobile phone or has spent time and money deciding which protective grip case (a prosthesis protecting a prosthesis) to get for their phone understands that phone manufacturers undervalue Merkel disk receptors.

In the same issue of *New Media & Society* on haptics that Parisi, Paterson, and Archer introduce, Gerard Goggin reflects on how disabilities media studies scholars can think more productively about the problems of touch technologies, especially for whom touch devices are built.[80] The history of touch interfaces such as typewriters, piano keys, and video game consoles have enabled scholars to note that design doesn't always follow logic or user experience. Jones and Lederman point out that the typing

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[75] Ibid., 286.

[76] Ibid., 287.

[77] The capable mirrorless Canon EOS R100 has 11 buttons, switches, and dials; the flagship Canon EOS 1DX iii has 32 buttons, switches, dials. The former is about $300; the latter is about $6,500, "Canon EOS R100 review," https://www.dpreview.com/reviews/canon-eos-r100-review;
" Canon EOS-1D X Mark III Overview," https://www.dpreview.com/products/canon/slrs/canon_eos1dxiii.

[78] Basil Kronfli, "Sony Xperia 1 V review: a powerful camera phone," *Digital Camera World*, May 29, 2023. https://www.digitalcameraworld.com/reviews/sony-xperia-1-v-review.

[79] Parisi, Paterson, and Archer, "Editor's Introduction: Haptic Media Studies," 1516.

[80] Gerard Goggin, "Disability and Haptic Mobile Media," *New Media & Society*, 19(10), (2017): 1563-1564, 1563-1580.

keyboard "has been characterized as one of the most maladaptive human-machine interfaces ever invented."[81] A similar thought could be cast against nearly buttonless mobile phones, especially, the first iPhone, which included no VoiceOver software and led to lawsuits.[82] While a fuller discussion of haptics and disability is warranted, I want to underscore two of Goggin's conclusions. First, although many companies, Apple included, were slow to understand the value of haptic vibration, they have since supported app experimentation, and they enable vibration customization through menu changes. Other companies such as Google and Samsung also provide haptic designs in their products, although they often consider health as the metric for providing feedback rather than focusing on capabilities and limitations. Second, haptic vibration has become so common within our universal media machine that "notification culture" and phantom vibrations emanating from a pocket have become a pathology. Yet, at the same time, Goggin continues, there is plenty of room for more future-oriented haptics that could help all users; examples of future haptics could include "haptic maps, wayfinding for virtual environments [and] haptic feedback for comprehending the internet, web, or [...] computer programs."[83] Fingertips are good at sensing vibration, but our four mechanoreceptors can do much more than sense a few types of vibrations, and companies and research organizations should think more carefully about the critical ergonomics of touch.

The disability of blindness is part of this discussion on haptic processing in important ways. According to the American Printing House for the Blind, "Total blindness is the complete lack of light perception and form perception and is recorded as 'NLP,' an abbreviation for 'no light perception.' Few people today are totally without sight. 85% of all individuals with eye disorders have some remaining sight; approximately 15% are totally blind."[84] These distinctions are important because vision issues can occur suddenly and create an urgent need to know what things look like and where one is. And as people age, vision often declines, meaning that many people need prosthetics such as glasses, contact lenses, or surgery to better navigate the world. Cameras and phones not only help people with low vision, they also help those with total blindness by reading or speaking out loud the content of photos, helping especially to identify (via voice apps) people, places, and, in the US, what

[81] Jones and Lederman, *Human Hand Function*, 123.
[82] Goggin, "Disability and Haptic Mobile Media," 1576-1577.
[83] Ibid., 1574-1576.
[84] APH ConnectCenter. "What is Legal Blindness?" ConnectCenter, https://aphconnectcenter.org/visionaware/eye-conditions/what-is-legal-blindness/#:~:text=Total%20blindness%20is%20the%20complete,for%20%E2%80%9Cno%20light%20perception.%E2%80%9D.

denominations of paper money is in their wallet. According to Judith Dixon, an author, academic, advocate for the blind, and photographer, people would ask her:

> 'Why would a blind person want to take pictures?' My answer was simple: 'For all the same reasons that sighted people do–to share our lives with friends and family and the world at large.' But I knew then (and I think it's even truer now) that another important reason we, as blind people, might want to take pictures is to learn about our world.[85]

In her book *Capturing and Sharing the World*, Dixon explains how to use VoiceOver to get a phone to speak the objects in a photo. By doing this, a blind person can take a photo of, say, a new apartment or a park or anything, and get information about it that otherwise would be hard to get. Hearing a verbal description of what is in a photo makes sense when you can't see, and Dixon provides essential information on the ways to utilize alternate shutter buttons to take photos, such as using voice commands, an Apple watch, volume buttons, and Bluetooth keyboards.[86] Dixon does not publicly denounce the design problems of mobile phones as much as I have here, but she does point out the need for a physical home button: "For years, all of our phones had Home buttons. We liked them very much and some people liked them so much, they continue to use older iPhone models that include a Home button."[87] Better button design, more raised physical buttons, more haptic feedback could help all photographers.

It seems that some are taking notice of how haptic feedback helps photographers. In January 2023, Canon patented a new shutter button that provides vibration to the camera grip when autofocus locks on a target. John Aldred states that often circumstances call for a completely silent shutter to avoid distracting subjects but using a silent shutter might make it "difficult to determine whether or not the image has been reliably recorded."[88] A haptic grip and shutter button enables the user to "perceive the shooting operation while suppressing the camera shooting sound."[89]

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[85] Judith Dixon, *Capturing and Sharing the World: Taking Photos and Videos with an iPhone*. (Boston, MA: National Braille Press, 2020), 15. For 43 years, Dixon was Consumer Relations Officer at the National Library Service for the Blind and Print Disabled within the Library of Congress and has served as Chair of the Braille Authority of North America. She is an expert in Braille which means that she is an expert in haptic processing. "About - Judith Dixon," n.d. https://judydixon.net/about.html.

[86] Ibid., 6-7, 24- 26.

[87] Ibid., 25.

[88] John Aldred, "Canon Patents Haptic Shutter Button That Vibrates When You Lock Focus," DIY Photography. January 24, 2023. https://www.diyphotography.net/canon-patents-haptic-shutter-button-that-vibrates-when-you-lock-focus/.

[89] Ibid., np.

And in October of 2023, not to be outdone by Canon, Sony announced a similar patent that addresses a lack of feedback when operating a camera with silent shutter mode: as opportunities to use a reactionless release (electronic shutter) are increasing, the need for such a mechanism may be increasing. Kalum Carter reports that Sony's patent will provide the right-side camera grip with fingertip vibration, "enabling you to distinguish when a shot was captured. When shooting silently, this would be extremely useful, decreasing the need to check the viewfinder or monitor."[90] Both Canon's and Sony's haptic feedback will direct vibration feedback to the index finger, not to sensitive parts of the camera; it is essential to all cameras that such vibration not interfere with the image itself as blurring would defeat the purpose.

This discussion of shutter buttons and photography's medial evolution has much to do with desire, longing, and collecting. We press the shutter button over and over in order to capture, to understand, and to possess. In the face of historical ruptures, economic precarity, and political instability, we press the shutter button–no matter where it is–to shift these fraught narratives to our narrative. Susan Sontag notes that "A photograph is not just the result of an encounter between an event and a photographer; picture-taking is an event in itself, and one with more peremptory rights–to interfere with, to invade, or to ignore whatever is going on." Though she is talking more about the moral character of an event in which the photographer is taking part in a crime, a coup, a family reunion, a wedding, or a tour, the idea that the photographer is "creating a tiny element of another world" is apt.[91] Pressing the button is participation, and here I want to piece together the manipulation of the device that uses both intentional tactile sensing and unconscious mechanoreceptors: we photograph to "contact or lay claim to another reality," we compose it, we see it, we desire it, we take it. But Sontag's conclusions can take us only so far. Desire, she says, "has no history–at least, it is experienced in each instance as all foreground, immediacy."[92] Desire can titillate or it can reveal misery, but the desire to press the button is more than a moral, utilitarian, or pedagogical impulse. I believe it has much to do with constructing a sense of self; we do so by using the senses at hand, in our hands, at our fingertips.

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[90] Kalum Carter, "Will Sony's new proposal phase out mechanical shutters?" *Digital Camera World*, October 16, 2023, https://www.digitalcameraworld.com/news/will-sonys-new-proposal-phase-out-mechanical-shutters. See also, Jaron Schneider, "Sony Wants to Put Haptic Feedback Into Its Cameras' Shutter Buttons," PetaPixel. October 16, 2023. https://petapixel.com/2023/10/16/sony-wants-to-put-haptic-feedback-into-its-cameras-shutter-buttons/.

[91] Susan Sontag, *On Photography* (New York Picador, 1977) 11.

[92] Ibid., 16-17.

When Sontag says that "The final reason for the need to photograph everything lies in the very logic of consumption itself [...] As we make images and consume them, we need still more images; and still more," we should note the truth of her theories still retains power.[93] We are consuming machines and no doubt many of the media scholars I've quoted would agree.[94] But consumption is fractional to identity. Closer to my own theory of image desire, she says that possessing a camera is "akin to lust. And like all credible forms of lust, it cannot be satisfied," because we are in the never-ending process of identity consolidation and reconsolidation, we engage in activities that confirm who we are, that we exist, again and again. Images are real, she says, "more real than anyone could have supposed."[95] They are real, whether physical or digital, because they are extensions of us. They are appendages, just like the camera, just like the shutter button, just like the fingertip.

Coda

In early 2024, reports on popular photography, camera gear, and product reports have corroborated that Apple's forthcoming iPhone 16 (September 2024 release date) will feature a new button: a shutter button (to be called "capture button"). According to Hartley Charlton, the "Capture Button's main function will be to trigger image or video capture, but a light press will enable the user to adjust focus. This is effectively the same functionality found on most DSLRs and mirrorless cameras."[96]

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[93] Ibid., 179.

[94] Mark Paterson discusses the idea of "screen hunger" and other technology and media-related habits that connect to the desire to constantly take photos. Mark Paterson, *Consumption and Everyday Life* (London: Routledge, 2023) 2.

[95] Sontag, *On Photography*, 180. The street photographer Daido Moriyama wonders if it is possible to consolidate identity by taking more and more photos. "You take one, then one more, then one more, and so on. The more you take, the more you want to take. It's like you're continually stimulating yourself, increasing your desire" (73). "What I learned from these experiences," he says, "is that the passage of time has this ability to completely erase things from your memory. And what you're left with is simply what's in the photograph. Whatever it is that you thought you were capturing on the negative is the instant you pressed the shutter button–it doesn't take long to slip from your mind. Of course, in the instant you press the shutter button, a memory of the image flashes across your mind, together with the various things you're thinking about at that moment–aesthetic considerations, concepts, desires. But whatever's in the photograph stands completely independent of those thoughts" (52). See, Daido Moriyama and Takeshi Nakamoto, *Daido Moriyama: How I Take Photographs* (London: Laurence King Publishing, 2010) 73, 52.

[96] Hartley Charlton, iPhone 16's New 'Capture Button' Rumored to Emulate High-End Camera Functionality, *Mac Rumors*, February 6, 2024, https://www.macrumors.com/2024/02/06/capture-button-to-emulate-two-step-shutter/; "Phones with dedicated camera shutter button," Forum,

Neuroscientists, psychologists, and media studies scholars have, for decades at least, written about the extensions and cyborg appendages, but it seems that we are just beginning to understand how our electronic and digital tools affect our relation to the world and the world's relation to us. Linden concludes his study of the sense of touch by reflecting that:

> Our body schema–the brain's internal map of our body in space–can expand and morph to encompass inanimate objects that we touch and control [...] Similarly, the body schema of a ditch digger comes to include her shovel, and a violinist, her bow, each of which can come to function as a tactile sensory appendage.[97]

The camera (on its own or part of a mobile phone or pair of glasses) is a shovel, a bow, but some versions of cameras are all screen and fail to talk back to us, they fail in the way that a shovel and bow succeed. The camera features on the mobile phone will continue to change because we cannot escape the compulsion to capture, collect, and understand the world through images; sight interacts and interferes with touch, and vice versa. How sight and touch process each other is how we navigate the world and how the world navigates us. Our desire to take a photo is part of the process of receiving haptic feedback: we want to feel the camera take the photo; taking an image does something to us. Ultimately, the desire for images is part of our desire for haptic feedback. My earlier query now has an answer: from the narrative of the four mechanoreceptors, to the accumulation of buttons on the modern digital camera, to disability media studies, we need improved shutter buttons because we want the machine to talk back to us when we ask it a question. The shutter button shapes photography, photography shapes the button, and button, camera, and photography are us. By us, I mean to include all abilities, anybody who may want to photograph the world using physical shutter buttons, auditory buttons, or, soon enough, buttons "pressed" via thoughts.

Digital Photography Review, January 2021, https://www.dpreview.com/forums/thread/4546583?page=2.

[97] Linden, *Touch*, 205.

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