Jean-François Lyotard: "*Thinking machines will have to be nourished not just on radiation but on irremediable gender difference*. "[1]

J.G. Ballard: "*Sex times technology equals the future.*"[2]

Two images, two women, two centuries: one black-and-white, the second in color. The first is a still of Maria from Fritz Lang's famous 1926 film *Metropolis* (Fig. 1). Made in the Weimar Republic, *Metropolis* is set in a future dystopia in which Freder, the son of the wealthy City Master, joins forces with Maria, a saintly figure amongst the industrial workers, to overcome the gulf separating the classes. His father, the City Master, catches wind of the rebellion and orders an inventor, Rotwang, to transform a robot into Maria's likeness to ruin her reputation amongst the workers. Rotwang kidnaps Maria, transfers her likeness to the robot, and Robot-Maria subsequently unleashes chaos throughout Metropolis. Fast-forward 90 years, and we see a photo of Sophia, an invention of Hanson Robotics and the first robot in the world to be granted citizenship in Saudi Arabia in 2017 (Fig. 2). Sophia holds eye contact, makes jokes, and expresses feelings. Like the model Maria, she manifests the ideal aesthetic of a white Caucasian woman. Matters of good and evil aside, the continuity in feminised robots from 1927 to 2017 is uncanny.

[1] Jean-François Lyotard, "Can Thought Go on Without a Body?" trans. Bruce Boone and Lee Hildreth, *Discourse 11.1* (1988-89): 86.
[2] J.G. Ballard, *Re/Search 8/9* (San Francisco: Re/Search Publications, 1984), 164.

While Robotic Maria is a deceptive and seductive machine, Sophia is meant to be a productive and pleasant member of society like Siri, Alexa, or Google Assistant.

My subject is "Artificial Eve," representations of artificial intelligence starting in the nineteenth century that, I argue, form the basis for our relationship with artificial narrow intelligence—AI that is limited to specific tasks—in comparison to artificial general intelligence (AGI), the popular conception of a future super-intelligence created by humans. In this essay I use AI to refer to task-oriented AI since AGI has yet to be realized. Although the gender gap in AI is often discussed in terms of women's unequal representation in AI-related industries and the need to encourage women and girls to "learn to code" and study STEM subjects, our digital worlds are increasingly shaped by gendered technologies that reify heteronormative gender roles and objectify women in the process. This essay presents a journey through the gender "work" performed by representations of artificial life—starting in the industrial economy of nineteenth-century Europe and continuing through the electronic and digital economy of the present—to illustrate how the feminization of sex robots and virtual assistants (VAs) is part of a historical narrative in the West that foregrounds the entangled relationship between women's bodies and technologies. I argue that the correlation between AI and femininity ("Artificial Eves") is a constitutive feature of nineteenth-century modernity that continues to shape our interactions with artificial intelligence today.

Both Maria and Sophia bear more resemblance to what cultural critic Mark Dery calls "mechanico-eroticism" than the character Adam in Mary Shelley's *Frankenstein* (1822).[3] At the start of the film, Maria (Fig. 3) is a paragon of female maternity and beauty, while Sophia's blue

[3] Mark Dery, "Sex, Machine, Machine Sex: Mechano-Eroticism and Robo-Copulation," *Mondo 2000* 5 (n.d.), rpt. as "RoboCopulation: Sex times technology equals the future," in *Escape Velocity: Cyberculture at the end of the Century* (New York: Grove Press, 1996), 181-226.

eyes, petite nose, perfect eyeshadow and mascara-laden eyelashes suggest that womanly perfection can be programmed, constructed, and performed by advanced technology. The parallel between early-twentieth-century representations of artificial intelligence like Maria with presentations of mechanized life forms in the present like Sophia suggest that the origins of our cultural imaginary of artificial intelligence transcends the immediate present. While Nicole Karafyllis and Allison Muri have recently called upon critics to consider the relevance of early modern "archetypes" for the metaphor of the cyborg and discussions of biotechnology, I want to foreground the increasingly intimate relationship between the female body and technology in the long nineteenth century as crucial to gendered conceptions of present AI, continuing Alex Goody's concern with "Technological Women and Artificial Erotics" in the fin de siècle.[4]

This essay is an attempt to sketch the background, boundaries, and perils of our on-going fascination with gendered technology whilst foregrounding the contributions of feminist media archaeology to debates over future AI. While Goody suggests that the erotic technoculture of the fin de siècle persisted into the twentieth century, this essay engages explicitly with past and present, revealing a continuity in feminized technologies from the nineteenth century to the present. Part I outlines AI's gender problem, the historiography of AI, and the value of feminist media archaeology for understanding the feminization of today's "smart" technologies. Part II explores how representations of artificial life in the textual and visual culture of industrial modernity form a crucial history to, and thus foundation for, the genderization of twenty-first-century AI like sexbots and VAs, whose feminization is the subject of Part III. Taken together, this

[4] Nicole C. Karafyllis, "Bewegtes Leben in der Frühen Neuzeit: Automaten und ihre Antriebe als Medien des Lebens zwischen den Technikauffassungen von Aristoteles und Descartes" in *Technik in der Frühen Neuzeit – Schrittmacher der europäischen Moderne*, ed. Gisela Engel and Nicole C. Karafyllis (Frankfurt am Main: Vittorio Klostermann, 2004), 296; Allison Muri, *The Enlightenment Cyborg: A History of Communications and Control in the Human Machine, 1660-1830* (Toronto: University of Toronto Press, 2016); Alex Goody, "Technological Women and Artificial Erotics in the Late Nineteenth Century," *Nineteenth Century Studies* 26 (2012): 261-80.

longue durée view suggests that although women were initially associated with technology when machines presented a threat to human existence in the industrial economy of the nineteenth and early twentieth centuries, the work performed by feminized AI in today's digital economy foregrounds a second major theme in representations of mechanical women—their perfectibility. Both historically and today, casting AI in feminine forms assuages fears about technological encroachment into daily life while simultaneously encouraging the consumption of idealized forms of femininity that re-inscribe and essentialize women's social (and sexual) roles.

Part I: Feminist Media Archaeology and AI

The gender gap in AI has received critical attention following the revelation that women are still underrepresented and often underpaid in both academic and industry-related AI jobs.[5] The white masculine bias invested in creating AI systems at the expense of women, minorities, and other marginalized groups in companies like Apple, Amazon, Facebook, and Microsoft is troubling.[6] British consulting firm Ernst & Young (EY) recently posted a report starting that resolving the gender gap involves three steps: building "awareness and trust in AI," educating women in hi-tech and STEM fields, and increasing women's representation across AI-related sectors of the workforce.[7] While these suggestions are commendable and addressing issues of

[5] Meredith Broussard, *Artificial Unintelligence: How Computers Misunderstand the World* (Cambridge: MIT Press, 2018); Virginia Eubanks, *Digital Dead End: Fighting for Social Justice in the Information Age* (Cambridge: MIT Press, 2012); Brooke E. Duffy, *(Not) Getting Paid to Do What You Love: Gender, Social Media, and Aspirational Work* (New Haven: Yale University Press, 2017).
[6] Alison Adam, "Constructions of Gender in the History of Artificial Intelligence," *IEEE Annals of the History of Computing* 18.3 (1996): 47-53; N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999); Susan Leavy, "Gender Bias in Artificial Intelligence: The Need for Diversity and Gender Theory in Machine Learning," *2018 ACM/IEEE 1st International Workshop on Gender Equality in Software Engineering* (2018): 14-16.
[7] Julie Linn Teigland, "Why We Need to Solve the Gender Bias Before AI Makes it Worse," *EY*, 2 April 2019, https://www.ey.com/en_gl/wef/why-we-need-to-solve-the-issue-of-gender-bias-before-ai-makes-it.

representations should be a focus of both corporations and states, AI's gender bias transcends the number of men or women doing the math behind the screens. Bias is not a computational problem—it is a social problem.[8] As a consequence, solving inequality in AI design requires more than better regulation, diversity in research, "fair" algorithms, and inclusivity in training and education, approaches that mitigate bias rather than address the root issues. Nonetheless, these solutions tend to frame discussions of gender inequality in AI, even when proponents call for a "human-centred perspective."[9]

The feminization of AI is merely one facet of a deeper cultural unconscious whose origins can be traced to the relationship between women and technology that developed in modernity. As Marie Hicks concludes in her history of women in British computing since the Second World War, non-profit organizations that encourage women and other minorities to enter computing fields like *Code First* (UK) or *Girls Who Code* (US) "mean little if the participants being targeted for empowerment in a field are still disempowered in the wider world."[10] To understand the patriarchal biases of AI practitioners, products, and techno-culture, we must move beyond the "representation debate" or the origins of the Internet, machine learning, and AI research.

My concern here is not the development of twentieth-century cybernetics or engineering, histories that have been skillfully unpacked by Ruth Oldenziel and Alison Adam, who emphasized

[8] Julia Powles and Helen Nissenbaum, "The Seductive Diversion of 'Solving' Bias in Artificial Intelligence," *OneZero*, 7 Dec 2018, https://onezero.medium.com/the-seductive-diversion-of-solving-bias-in-artificial-intelligence-890df5e5ef53.
[9] Gonçalo Carriço, "The EU and Artificial Intelligence: A Human-Centred Perspective," *European View* 17.1 (2018): 29-36; Ayanna Howard and Jason Borenstein, "The Ugly Truth About Ourselves and Our Robot Creations: The Problem of Bias and Social Inequity," *Science and Engineering Ethics* 24 (2018): 1521-1536.
[10] Marie Hicks, *Programmed Inequality: How Britain Discarded Women Technologists and Lost its Edge in Computing* (Cambridge: MIT Press, 2017), 312.

the gender bias inherent in AI-based systems more than two decades ago.[11] Instead, I suggest that we can better understand the gender work at play in AI today whilst attending to issues of gender and exploitation in future visions for AI by returning to the entangled relationship between technology and femininity in modernity. Such historicization is all the more timely because discussions of gender and AI tend to be centered upon the present, thus ignoring a rich body of scholarship in history, film, and science and technology studies (STS) that explores the gender work done by and through technology over the past two centuries. Despite the longstanding importance of AI to the history of science, intellectual history, and social history today, histories of AI tend to start in the 1940s.[12] This includes Hicks' insightful reconstruction of women's contributions to computing as well as the gendered histories unpacked by Janet Abbate and Nathan L. Ensmenger in the context of postwar Britain and America.[13] Several participant histories, written by former researchers, provide an internalist and often celebratory view of the field's development.[14] These narratives tend to focus on individuals, technologies, and institutions, eschewing a broader cultural context despite the fact that the relationship between modernity and technology has fascinated cultural historians and literary scholars for decades.[15]

In a narrow sense, the history of AI is closely associated with western philosophy, manifest in Alan Turing's 'Computing Machinery and Intelligence' (1950) or Ray Kurzweil's *The Singularity is Near: When Humans Transcend Biology* (2005), and thus white masculinist culture.

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[11] Ruth Oldenziel, *Making Technology Masculine: Men, Women, and Modern Machines in America, 1870-1945* (Amsterdam: Amsterdam University Press, 1999); Alison Adam, *Artificial Knowing: Gender and the Thinking Machine* (New York: Routledge, 1998).
[12] A rare exception is Sadie Plant, "The Future Looms: Weaving Women and Cybernetics" in *Cybersexualities*, ed. Jenny Wolmark (Edinburgh: Edinburgh University Press, 1999), 99-118.
[13] Hicks, *Programmed Inequality*; Janet Abbate, *Recoding Gender: Women's Changing Participation in Computing* (Cambridge: MIT Press, 2012); Nathan L. Ensmenger, *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise* (Cambridge: MIT Press, 2010).
[14] Chris Bernhardt, *Turing's Vision: The Birth of Computer Science* (Cambridge: MIT Press, 2016).
[15] Alison Gazzard, *Now the Chips Are Down: The BBC Micro* (Cambridge: MIT Press, 2016); E.W. Pugh, *Building IBM: Shaping an Industry and Its Technology* (Cambridge: MIT Press, 1995).

For this reason, scholars such as Nicolas Le Dévédec have drawn attention to the disturbing reversal of Enlightenment conceptions of improving the human condition in contemporary transhumanism's advocation of human perfectibility or technoscientific transcendence.[16] But if we step back from transhumanism, and step back further in time, the genealogy of AI can also be traced to the development of nineteenth- and early-twentieth-century-technologies, placing it firmly within a Eurocentric tradition that reflects historical patterns of industrialization. This framing does not reject nor diminish the power of major tech centres in postwar Asia, or the globalised economy of tech innovation today—nor does it imply that issues of gender as well as race are absent in global technoculture.[17] Rather, it demarcates the geographic and cultural boundaries of the "feminist media archaeology" employed in this essay, which focuses on feminized AI in novels, artworks, devices and corporations in Europe and North America since 1800.[18]

Paul Flaig has recently drawn attention to the curious omission of gender in contemporary media archaeology, a method that seeks to position new media in relation to historical media, whose formats, networks, or representations continue in new modes.[19] Media archaeology turns to representations, objects, and things to uncover threads of affective continuity across cultures and

[16] Nicolas Le Dévédec, "Unfit for the Future? The Depoliticization of Human Perfectibility, from the Enlightenment to Transhumanism," *European Journal of Social Theory* 21.4 (2018): 488-507.
[17] Michel Dumont and Ludo Cuyvers, "Tigers and pussy-cats: the importance of technology transfer for Asian felines," *MPRA Paper 71292* (Munich: University of Munich, 2002), https://ideas.repec.org/p/pra/mprapa/71292.html; Jessie Daniels, "'Colorblind' Artificial Intelligence Just Reproduces Racism," *Huffington Post*, 16 Jan 2019, https://www.huffpost.com/entry/opinion-artificial-intelligence-policing-surveillance-taylor-swift_n_5c3eaa1de4b0922a21d9d704; Julia Angwin et al, "Machine Bias," *ProPublica*, 23 May 2016, https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing.
[18] Paul Flaig, "Yesterday's Halady: On Voicing a Feminist Media Archaeology," *Camera Obscura* 98.33 (2018), 105-38; Donna Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991); Judy Wajcman, *Feminism Confronts Technology* (Cambridge: Polity Press, 1991); Rosi Braidotti, "Feminist Epistemology after Postmodernism: Critiquing Science, Technology and Globalisation," *Interdisciplinary Science Reviews* 32.1 (2007): 65-74.
[19] Flaig, "Yesterday's Halady," 105-6.

across time.[20] Flaig focuses on the prevalence of female "voicing" past and present, which has bestowed personas and meaning on technologies from "women telephone operators, translators, and spiritual mediums" to "gendered smart devices, public address systems, and automated machines," noting with surprise the absence of gender in media archaeology despite well-known feminist critiques of technoscience since the 1980s by Donna Haraway, Judy Wacjman, Rosi Braidotti and others.[21] He calls for a feminist media archaeology that accounts for the gendering of technologies. Where Flaig is particularly interested in voice, I am concerned with visual and textual representations of feminized machines, but his methodology—and his concern—is my starting point.

Although numerous voices have decried the inadequate representation of women in AI companies and research development, a deeper problem emerges when considering the historically gendered forms that condition present manifestations of AI. The latter requires urgent attention if we are to create a more equitable future society. This essay offers a new understanding of the current feminization of AI by drawing on representations of gendered machines since the nineteenth century, connecting this cultural history to the genderization of smart devices today.[22] While issues of representation and inequality in relation to AI are framed by present discussions and concerns, the essay sets forth the utility of feminist media archaeology for understanding biases in AI design. Consequently, it demonstrates how the patriarchal tendencies of today's technologies are conditioned by historical industrialization, and how feminist media archaeology

[20] Jussi Parikka, *What is Media Archaeology?* (Cambridge: Polity, 2012); Wolfgang Ernst, *Chronopoetics: The Temporal Being and Operativity of Technological Media* (London/New York: Rowman & Littlefield, 2016).
[21] Flaig, "Yesterday's Halady," 107.
[22] Goody, "Technological Women and Artificial Erotics in the Late Nineteenth Century," 261-80; Elissa Marder, *The Mother in the Age of Mechanical Reproduction: Psychoanalysis, Photography, Deconstruction* (New York: Fordham University Press, 2012); Julie Wosk, *My Fair Ladies: Female Robots, Androids, and Other Artificial Eves* (New Brunswick, NJ: Rutgers University Press, 2015).

can shed valuable light on the embedded assumptions operating in our cultural unconscious. In so doing, this essay suggests that proposed solutions to structural biases in AI design require attending to long-standing gender biases in western technoscientific culture. In contrast to solutions that identify sources of inequality, promote "de-bias training," and develop more robust algorithms, it calls for a widespread engagement with the historical genderization of technology to forge a new industrial imaginary for future intelligent machines.[23]

II. Reconfiguring the Female Body: Modernity and Technology

My title, "Artificial Eve," references the titular character of French author Auguste Villiers de l'Isle-Adam's *L'Ève future* (1879), a novel well-known to European audiences in the late nineteenth and early twentieth centuries. A Victorian take on the Greek myth of Pygmalion and Galatea, *Future Eve* depicts a fictional Thomas Edison's decision to intervene in the life of his friend, the dashing Lord Ewald, who is in despair that his fiancée's personality that fails to match her sublime beauty. Edison resolves Ewald's dilemma by offering to construct a female automaton that replicates Alicia's perfect form without her intellectual vapidity and egotism, foregrounding the modernist impulse to cast artificial intelligence as feminine. While contemporary representations of AI like the characters Samantha in *Her* (2013) or Ava in *Ex Machina* (2014) are often depicted as temptresses who lure men to their death, *Future Eve* expounds a second major theme in the genderization of AI: attempts to perfect, overcome, or replace real women with mechanical dolls that look beautiful and act submissively, foreshadowing the ability to find sexual pleasure online or through other forms of artificial interaction in the twenty-first century. Ewald

[23] For example: James Zou and Londa Schiebinger, "Design AI so that it's fair," *Nature* 559 (2018): 324-6.

accepts Edison's offer to replace his fiancée, Alicia, with Edison's android "Hadaly" (supposedly Farsi for "ideal") after transforming the latter into a perfect imitation of Alicia's "stunning beauty."[24]

To fulfil his project, Edison invites Alicia to his home in Menlo Park. Ewald, meanwhile, questions Edison's motives for making Hadaly. Gender emerges again in Edison's creation story. The inventor relates how his friend, Edward Anderson, was seduced by a young woman whom he met late one evening in the theatre to his ruin. When Anderson begins to consider the possibility of infidelity, Edison narrates that he felt "rather annoyed" by having "to make up some little lie, purely formal and venial, to satisfy Mrs Anderson," adding "We may hope . . . that Anderson as a gallant and ardent cavalier knew how to enjoy to the full these hours of delight that Destiny had just imposed on him with such delicate violence."[25] It is only when tragedy strikes and Anderson kills himself after losing his family and fortune that Edison discovers the theatrical tease's beauty is a sham: her careful construction of wigs, makeup, and attire hides a hideous and diseased body.[26] Determined to overcome the contemptible artifice and ineluctable flaws of real women, Edison builds a mechanical woman to give men true happiness, helped by his assistant, the grieving widow Anderson. After an extended discussion of Hadaly's mechanical construction and several months of toil transforming Hadaly into a better version of Alicia—Alicia 2.0, if you will—Ewald is finally introduced to his android fiancée. The couple fall in love, yet before they can celebrate their new life together, their ship tragically sinks and Hadaly is destroyed.

[24] Auguste Villiers de l'Isle-Adam, *Tomorrow's Eve*, trans. Robert Martin Adams (Urbana: University of Illinois Press, 1982), 27 and 35.
[25] Villiers, *Tomorrow's Eve*, 106.
[26] Villiers, *Tomorrow's Eve*, 112-16 and 118-22.

In both fictional instances of Villiers' novel an Edison-like scientist creates a mechanical woman to satisfy male desires while the "real" woman in question (*Eve*-lyn, then Alicia) is marked by external beauty and internal vapidity or chicanery. The symbolic logic of an artificial intelligence designed by men to address male needs bears striking similarity to the modern industry of sex robots and the prevalence of feminized virtual assistants (VAs) like Amazon's Alexa or Apple's Siri in contemporary society. Although designed for all genders, sex robots (sexbots) are notably better designed for and more frequently purchased by men, while virtual assistants insidiously reinforce social assumptions about gendered labor and domestic servitude.[27] Both sexbots and VAs suggest that the on-going development of AI is the latest stage in a modern technological imaginary in which the relationship between women and technology is perceived as either threatening to the social order or, paradoxically, a solution to the messiness of real women. In short, it seems that J.G. Ballard was right: "sex times technology" really does equal the future.[28]

The aesthetic sexualization of artificial intelligence has been a central part of the field's development since at least the nineteenth century.[29] Simon Schaffer has drawn attention to the display of Charles Babbage's Difference Engine, an early computing prototype completed in 1822, alongside a silver mechanical dancer with a bird in her hand in Babbage's London home. Babbage had first seen the automaton as a child at Belgian inventor John Merlin's Mechanical Museum in London around 1800, when it had been displayed with another twelve-inch female automaton.[30] Later, he recognized the doll at the auction of Thomas Weeks's museum, purchased, and repaired

[27] Chantal Cox-George and Susan Bewley, "I, Sex Robot: The Health Implications of the Sex Robot Industry," *BMJ Sexual & Reproductive Health* 44 (2018): 161-64.
[28] Ballard, *Re/Search 8/9*, 164.
[29] Marie Lathers, *The Aesthetics of Artifice: Villiers's* L'Eve Future (Chapel Hill: University of North Carolina Press, 1996).
[30] Simon Schaffer, "Babbage's Dancer and the Impresarios of Mechanism," in *Cultural Babbage: Technology, Time, and Invention*, ed. Francis Spufford and Jennifer S. Uglow (London: Faber & Faber, 1996), 53-80.

it. Babbage's adoration of the doll—"an admirable *danseuse*" who was "irresistible," he wrote—points to the "aestheticized gaze" that Schaffer emphasizes as key to the technological inspiration of the Industrial Revolution.[31] It is telling, however, that a *male* collector and man of science is the possessor and gazer of a *female* artificial object, whose primary purpose (alongside demonstrating the marvels of technology) was to look beautiful within a glass case exhibited in Babbage's salon.[32]

Automata like Babbage's dancing girl were not new to nineteenth-century audiences in Europe and North America. Historical automata, broadly defined as machines or statues that moved, had been recounted since at least 2500 BCE.[33] In Europe, a fascination with automata peaked in the eighteenth century, when at least ten impressive machines were built: two female figures resembling Marie Antoinette who played keyboard instruments, and eight male automata of various musical and other abilities.[34] Allison Muri, Adelheid Voskuhl, and Minsoo Kang have presented compelling accounts of this earlier period, noting how the painstakingly crafted automata of eighteenth-century Europe inspired a proliferation of nineteenth-century automata fiction and encyclopedia entries.[35] Yet the relatively equal weighting of male and female figures in Enlightenment machines takes on a particular salience when compared to the overwhelmingly feminine representations of androids like Hadaly in nineteenth-century texts. Unlike earlier

[31] Felicia M. McCarren, *Dancing Machines: Choreographies of the Age of Mechanical Reproduction* (Stanford: Stanford University Press, 2003), 13.
[32] Charles Babbage, *Passages from the Life of a Philosopher* (New York: Kelley, 1969), 17-18, 365-66.
[33] Simon Schaffer, "Enlightened Automata" in *The Sciences in Enlightened Europe*, ed. William Clark, Jan Golinski, and Simon Schaffer (Chicago: University of Chicago Press, 1999), 126-65; Alexander Marr, "Understanding Automata in the Late Renaissance," *Le Journal de la Renaissance* 2 (2004): 205-25; Jessica Riskin (ed.), *Genesis Redux: Essays in the History and Philosophy of Artificial Life* (Chicago: University of Chicago Press, 2007); Wendy Beth Hyman (ed.), *The Automaton in English Renaissance Literature* (Farnham: Ashgate, 2011); Kevin LaGrandeur, *Androids and Intelligent Networks in Early Modern Literature and Culture: Artificial Slaves* (New York: Routledge, 2013).
[34] Adelheid Voskuhl, *Androids in the Enlightenment: Mechanics, Artisans, and Cultures of the Self* (Chicago: University of Chicago Press, 2013), 212.
[35] Muri, *The Enlightenment Cyborg*; Voskuhl, *Androids in the Enlightenment;* Minsoo Kang, *Sublime Dreams of Living Machines: The Automaton in the European Imagination* (Cambridge: Harvard University Press, 2011).

automata such as Saint Albertus Magnus's android man, such "Artificial Eves" manifest a key shift in Western conceptions of artificial life underscored in Andreas Huyssen's seminal essay, "The Vamp and the Machine" (1986).[36] Later twentieth-century films such as *Her, Ex Machina,* and *Bladerunner* (1982) continue to play on this trope of mechanical woman as dangerous "other," depicting AI as sexy artificial women.

Although this may seem "natural" to modern audiences, the feminization of autonomous machines is a legacy of historical industrialization that is often overlooked in histories of feminine androids that posit linear narratives from the myth of Pygmalion to True Companion or the U.S. Real Doll Company, whose life-sized sex dolls retail for $6,000 to $15,000.[37] Huyssen rightly observes that it was only when technology came to be perceived as threatening or destructive to human life in the rapidly changing social and economic landscape of nineteenth-century Europe and America that the mechanical other came to be associated with the lure and artifice of the feminine.[38] Prior to this stage, automata were typically viewed as pleasurable diversions or amusements who took male, female, or animal forms. A second striking development alongside this gendered association is the history of humanoid robot construction since the 1880s, which reveals a surprisingly consistent construction of *masculine* robots through the twentieth century despite discursive representations to the contrary.[39]

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[36] Ephraim Chambers et al. (eds.), *A Supplement to MR. Chambers's Cyclopædia: Or, Universal Dictionary of Arts and Sciences. in Two Volumes*, vol. I (London, 1753), 2Q.

[37] Julie Wosk, *My Fair Ladies: Female Robots, Androids, and Other Artificial Eves* (New Brunswick: Rutgers University Press, 2015). On the tendency to project modern assumptions about gendered automata and their uses into the past, see Minsoo Kang, "The Mechanical Daughter of Rene Descartes: The Origin and History of an Intellectual Fable," *Modern Intellectual History* 14.3 (2017): 633-60.

[38] For example, Walter Benjamin quotes Paul Lindau's *Der Abend* (Berlin, 1896), 17: "You have no idea how repulsive these automatons and dolls can become, and how one breathes at last on encountering a full-blooded being in this society," in *The Arcades Project*, trans. H. Eiland and K. McLaughlin (Cambridge, MA: Harvard University Press, 2002), 694.

[39] Reuben Hoggett, "Early Humanoid Robots Timeline," *Cybernetic Zoo*, accessed 19 Jan 2019, http://cyberneticzoo.com/robot-time-line/.

In 1927, *Metropolis* captured the anxieties posed by the increasingly blurred boundaries between women and machines like Maria. The effects of nineteenth-century industrialisation included novel technologies alongside new forms of labour, gender relations, and social norms. New inventions or discoveries such as photography, X-rays, powerful microscopes, gramophones, telephones, and film blurred the boundary between nature and technology. Scholars such as Friedrich Kittler, Anson Rabinbach, and Sarah Danius have drawn attention to how the body was reconfigured in modernity through the extension and amplification of senses like seeing and hearing.[40] Concomitantly, man and machine was increasingly fused in factory labour and in new modes of transportation like the train, bicycle, automobile, and airplane. By the late nineteenth century, industrial researchers could refer to the body as "the human motor" or an "extension of the machine."[41] At the same time, new machines for understanding the body gave rise to new paradigms for conceptualizing it. This was particularly the case for industrial labour, as women in Britain and America composed the majority of factory workers while men were predominantly overseers or managers.[42] This difference is evinced in Hermann Melville's "The Paradise of Bachelors and the Tartarus of Maids," a short story that first appeared in the April 1855 volume of *Harper's Magazine* wherein Melville contrasted the exuberantly intellectual life of London

[40] Friedrich Kittler, *Discourse Networks, 1800/1900*, trans. Michael Metteer and Chris Cullens (Stanford: Stanford University Press, 1990) and *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz (Stanford: Stanford University Press, 1986); Anson Rabinbach, *The Human Motor* (Berkeley: University of California Press, 1990); Tim Armstrong, *Modernism, Technology, and the Body: A Cultural Study* (Cambridge: Cambridge University Press, 1998); Sarah Danius, *The Senses of Modernism: Technology, Perception, and Aesthetics* (Ithaca: Cornell University Press, 2002); Mark S. Morrisson, *Modernism, Science, and Technology* (London: Bloomsbury, 2017).

[41] Rabinbach, *The Human Motor*; Mark Seltzer, *Bodies and Machines* (New York: Routledge, 1992).

[42] M. Norton Wise, "The Gender of Automata in Victorian Britain" in *Genesis Redux: Essays in the History and Philosophy of Artificial Life*, ed. Jessica Riskin (Chicago: University of Chicago Press, 2007), 170-71.

barristers with weary American girls who relentlessly administer the machines of a New England paper mill, their pallid features a grim facsimile of the colorless pages that exit the mill.[43]

Tamara Ketabgian has shown how the relationship between humanity and technology during the industrial revolution was valorised in Victorian metaphors of human engines and living machines. Yet the "industrial imaginary" that Ketabgian locates in the mid-nineteenth century continued to suffuse machines and bodies thereafter.[44] Period images and discussions of women riding bicycles, driving cars, flying airplanes and laboring in factories focused attention on the increasingly intimate relationship between women's bodies and technology, whilst interventions like sartorial style, surgery, dietary regimes, and cosmetics encouraged women to mechanically perfect their bodies.[45] Tim Armstrong emphasizes how the female body was particularly circumscribed by technological interventions that he calls "prosthetic modernism."[46] Although western representations of modern technology have typically been cast in binary gender roles, the increasing identification of new technologies with femininity is a hallmark of industrialization.[47] While nineteenth-century machines like turbines and airplanes were often depicted in virile terms, ships and boats have been typically gendered female.[48] As new technologies emerged they, too, were anthropomorphized and feminized. In *À Rebours* (1884), French novelist J.K. Huysman

[43] Herman Melville, "The Paradise of Bachelors and the Tartarus of Maids" in *Billy Budd, Sailor and Selected Tales* (Oxford: Oxford University Press, 2009), 74-96 (originally published in 1855).
[44] Tamara Ketagbian, *The Lives of Machines: The Industrial Imaginary in Victorian Literature and Culture* (Ann Arbor: University of Michigan Press, 2011).
[45] Sarah Wintle, 'Horses, bikes, and automobiles: New Woman on the move', in A. Richardson and C. Willis (eds.), *The New Woman in Fiction and in Fact: Fin-de-Siècle Feminisms* (Basingstoke: Palgrave Macmillan, 2001), pp.66-78; Rachel Maines, *The Technology of Orgasm: 'Hysteria', the Vibrator, and Women's Sexual Satisfaction* (Baltimore: Johns Hopkins University Press, 1999); Morag Schiach, 'Modernity, labour, and the typewriter', in Hugh Stevens and Caroline Howlett (eds.), *Modernist Sexualities* (Manchester, 2000), pp.114-29.
[46] Armstrong, "Prosthetic Modernism" in *Modernism, Technology, and the Body*, 77-105. See also R.L. Rutsky, *High Technē: Art and Technology from the Machine Aesthetic to the Posthuman* (Minneapolis: University of Minnesota Press, 1999).
[47] Norton Wise, "The gender of automata in Victorian Britain," 163.
[48] Claudia Springer, *Electronic Eros: Bodies and Desire in the Postindustrial Age* (London: Athlone Press, 1996), 9.

described two trains as "lady locomotives," one blonde and one brunette, whereas Albert Robida depicted "Electricity" as a buxom goddess whose long tresses transform into electrical wires in *La Vie électrique* (1891; Fig. 4).[49] Modernist literature continued this association, with poems like e.e. cummings' "She being brand" (1926) or Mario de Leone's "Fornication of Automobiles" (1914) rendering the implied feminine sexuality of technologies—in this case automobiles—even more explicit.

Whilst anthropomorphizing machines rendered them intelligible, the feminization of machines rendered them desirable and less threatening in the context of changing social and economic orders wrought by industrialization. Historically, technological expertise has been constructed as masculine, thus rendering the feminine "incompatible with technological pursuits."[50] But nineteenth-century depictions of "lady locomotives" indicate that this gendered division is chronologically complex. Whilst western culture tends to view machines or technology as autogenic—as having their own agency or inertia, and therefore responsible for whatever follows in their wake—machines do not simply grow or appear, a point emphasized by the cultural dissonance of viewing trains as sultry blondes or electricity as a voluptuous siren for contemporary viewers. This has been a central starting point for science and technology studies, which attempts to tease out the constellation of economic, social, and political practices like gender that make and shape technologies and their uses. As the editors of a recent volume on gender and technology point out, gender analysis "illuminates our understandings of technology, and attention to technology illuminates our understandings of gender."[51]

[49] Quoted in Kang, *Sublime Dreams*, 239; Albert Robida, *La Vie électrique* (Paris: La Librairie Illustrée, 1891).
[50] Judy Wajcman, "Feminist Theories of Technology," *Cambridge Journal of Economics* 34.1 (Jan. 2010): 144.
[51] Nina E. Lerman, Ruth Oldenziel, and Arwen P. Mohun, "Introduction," in *Gender and Technology: A Reader*, ed. Nina E. Lerman, Ruth Oldenziel, and Arwen P. Mohun (Baltimore: Johns Hopkins University Press, 2003), 5.

As a property of individuals, social structures, and symbolic systems, gender is not only a mode of self-actualization but also a political activity. Judith Butler's theory of gender as performance posits gender identity as an on-going repetition of acts performed in and through time that "adds" or comes to "signify" biological "facticity." As Butler adds, "gender performances . . . are governed by . . . punitive and regulatory social conventions," and constructions of gender justify social inequality.[52] I follow Butler and Wajcman in viewing technology as comprising not only physical objects like trains but also cultural or social relations constitutive of "certain sorts of knowledge, beliefs, desires, and practices" such as using domestic robots or imagining female automata.[53] Although this essay foregrounds a heteronormative framework for gender with reference to the historical discourses under analysis, continuing to conceive of AI within a binary framework of sexual identity is itself problematic. Contemplating non-binary gender roles alongside attending to diverse embodied experiences will be essential to avoiding the perils of stereotyping social identities and providing equitable access to emerging technologies.

In the remainder of this section, I outline representations of technology-as-feminine and early visions of feminized AI in modernity, suggesting that visions of artificial life during this period reveal a key ambivalence: while films like *Metropolis* warned of the perils of giving women too much autonomy, texts like *Future Eve* celebrated artificial women as a solution to the "messiness" of real women. The twin themes of peril and perfectibility also found expression in a third theme that, like the perfectibility of artificial women, carried through the twenty-first century: the creation of artificial women for masculine pleasure.

[52] Judith Butler, "Performative Acts and Gender Constitution: An Essay in Phenomenology and Feminist Theory," *Theatre Journal* 40.4 (1988): 522-27.
[53] Wajcman, *Feminism Confronts Technology*, 149.

The perils of artificial life depicted in *Metropolis* are echoed in E.T.A. Hoffmann's *Der Sandmann* (1816), a novel from a century earlier, wherein a young German man falls in love with an automaton, Olimpia, breaking off his engagement only to discover his inamorata being torn asunder by her creators in an angry fight. The sight of Olimpia's mechanical eyes lying ruined on the floor drives him mad, and the novella ends with his suicide. While Hoffmann underscored the dangers that technology poses to men, Villiers depicted the advantages of machines invented by men that fulfil male needs by circumventing faulty women. These twin themes of peril and perfectibility resurface in Edward Kellett's "A Lady Automaton" (1901), in which an Edison-like inventor builds an AI to prove that women really are just "dolls." In Kellett's short story, the inventor deems his creation a success, as his automaton "Amelia" combines the twin advantages of being neither sensitive nor overly emotional, as well as silent and unfailingly obedient. Unfortunately, her limited phrase bank ensures that catastrophe ensues when she agrees to marry two different men on the same day, leading one of them to stab her to death at the altar.[54] Resemblances in plot, character, and syntax have led scholars to suggest that George Bernard Shaw plundered the text for his more famous *Pygmalion* (1913), and a similar diegesis is found in the British film *Perfect Woman* (1949), Ray Bradbury's "Marionettes, Inc" (1951), and Tommaso Landolfi's *Gogol's Wife* (1954).[55]

While Olimpia and Amelia lack the subjectivity required to survive as human beings and their very creation wreaks havoc on the men who surround them, Villiers' Hadaly and Helen O'Loy in Lester Del Rey's short story by the same name published in *Astounding Science-Fiction* in 1938 foreground the second major theme: that artificial women are better than the real thing.

[54] E.E. Kellett, "The Lady Automaton," *Pearson's Magazine* 11 (1901): 663-75.
[55] Philip Klass, "'The Lady Automaton' by E.E. Kellett: A *Pygmalion* source?", *Shaw* 2 (1982): 75-100.

Notwithstanding his early reticence, Ewald is convinced swiftly by Hadaly's abilities, loyalty, and beauty. Similarly, Helen O'Loy—a wordplay on Helen of Troy and "alloy"—is created by two American friends who decide to optimize their household robot (or "housemaid mech") by combining their skills in engineering and endocrinology. The result is Helen (Fig. 5), a robot who expresses emotions, sheds tears, tastes food, breathes air, and falls in love. After hours spent consuming television serials following her manufacture, Helen develops a passion for one of the friends. Though he attempts to evade her advances, the coupling is inevitable, and the two marry and retire to a ranch in the countryside. Despite having to fake ageing, Helen remains the paragon of femininity until her husband's death, when she asks the remaining friend to bury the couple together.[56]

Thus, while Maria was envisioned as a weapon, using the seductive tool of womanly form to disguise political intervention, Hadaly and Helen are used to imagine the advantages of a social world in which artificial women transcend the deficiencies of real women. The theme of perfectibility is likewise found in three plays about automata written by Czech brothers Karel and Josef Čapek.[57] Karel became internationally famous after his play *R.U.R.* (*Rossum's Universal Robots*, 1921) premiered in London and New York City in 1923.[58] While *R.U.R.* is best known for introducing Western audiences to the word "robot," coined by Josef, the Čapek brothers had explored social relations through automata and puppet motifs in other plays.[59] In *Ex Centro* (1911), written a decade earlier, they depicted two men discussing women during a theatre performance. One gentleman suggests that the ideal woman would be:

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[56] Lester Del Rey, "Helen O'Loy", *Astounding Science-Fiction* 22.4 (1938): 118-25.
[57] Karel Čapek and Josef Čapek, *Povídka poučnà* (1908), *L'Eventail* (1910), and *Ex Centro* (1911).
[58] A Soviet interpretation is A.N. Tolstoj, *Revolt of the Machines* (1924).
[59] Harold B. Segal, *Pinocchio's Progeny: Puppets, Marionettes, Automatons, and Robots in Modernist and Avant-Garde Drama* (Baltimore: Johns Hopkins University Press, 1995), 297-303. "Robot" comes from the Czech *robota*, meaning "strenuous work."

> a puppet very much like a real woman, with color and softness very similar to a woman's complexion, with a completely fluid movement of the limbs, in short a puppet as suggestive as possible. Seat her beside yourself on the couch, look at her, tell her sweet and intelligent things, charming improvisations as well as confessions illumined with the light of your mind . . . . And, please note, such a mistress at least will never interrupt the compositions of our dreams, will never interrupt your magniloquence with her coarse, vulgar, and realistic voice.[60]

The Čapek brothers had earlier explored the artifice of organic women in an ironic conversation between Prince Boudini and a female automaton, created by a fictional Henri Droz, in *L'Eventail* (1910). In this story, as in *Ex Centro*, they implied that AI has the potential to produce ideal heteronormative gender relations. The surreal conclusion of *Ex Centro* exemplifies this possibility: as Adolf Berti and Julius Argyl chat in their theatre box, a sibling acrobatic act on stage is paralyzed when the sister falls. Her brother exclaims "Puppet!" just as a cry pierces the box where Berti and Argyl are sitting. The play concludes at an insane asylum with Argyl and the acrobat happily domesticated, the former dandy blissfully content to introduce a pink-clad female puppet as his "wife" to guests and "mistress" to friends.[61]

The elision between the *representation* of artificial life as female automata, or later robots, and the *production* of beautiful dolls and sex toys like Argyl's puppet-acrobat foregrounds the social and political work done by a third theme: casting AI in feminine terms permits the objectification of artificial and real women, often enacting violence against women. Oskar Kokoschka's "Silent Woman," a wax effigy of his lover, Alma Mahler, presents a powerful parallel

[60] Karl Čapek and Josef Čapek, *Ex Centro* (1911), 233, quoted in Segal, *Pinocchio's Progeny*, 300-1.
[61] Segal, *Pinocchio's Progeny*, 301.

to the fictional world of interwar Czech theatre. Kokoschka commissioned Munich dollmaker Hermione Moos to create an Alma-doll after she left him and married Walter Gropius while he was fighting in Galicia during the First World War (Fig. 6).[62] Still grappling with his loss after the war, Kokoschka decided to reproduce his former lover down to her pubic hair. He purportedly accompanied the doll to the opera and walked her around the Ringstrasse to the consternation and delight of Viennese society. He also repeatedly sketched and painted the doll, inscribing it into his art (like the self-portrait in Fig. 7) until it had "cured" him of his "passion." Finally ready to get rid of it, he hosted a champagne party with a live chamber orchestra, ordered his maid to exhibit the doll in fine clothes, and at the first rays of dawn, Kokoschka drunkenly beheaded it in his garden and broke a bottle of red wine over its head. In a final twist, the police arrived later that morning to investigate a reported murder.

Kokoschka's doll was not "alive" in the sense that fictional robots were conceived as autonomous, animated beings. But it does speak to the numerous modernist texts that celebrate the idea of a mechanical lover, objectifying the feminine in technological forms that facilitated violence against women. Like Villiers and the Čapek brothers, Futurist leader Filippo Tommaso Marinetti was preoccupied with the desire to bypass feminine artifice paradoxically through the artificial feminine. In "Against Feminine Luxury" (1920), Marinetti argued that women's obsession with *toilettes* was tantamount "to a masked but unavoidable prostitution" in which passion is no longer verifiable, replaced "with a faltering, totally artificial sensibility, that responds only to silk, velvet, jewels and fur."[63] The mechanical Julieta in Spanish poet Rafael Alberti's take on *Romeo and Juliette* or Pedro Salinas' "electric love," his description of an artificial princess

[62] Jane Munro, *Silent Partners: Artist and Mannequin from Function to Fetish* (New Haven: Yale University Press, 2014), 207-8.
[63] Quoted in Cinzia Sartini Blum, *The Other Modernism: F.T. Marinetti's Futurist Fiction of Power* (Berkeley: University of California Press), 86-7.

imprisoned inside a lightbulb, reinforce how the modernist male gaze objectified woman-as-machine.[64] Yet this fetishization all too easily merged into violence, manifest in the castrated limbs of Salvador Dalí's mannequins or Hans Bellmer's dismembered *poupée* sculptures.[65] The following observation, recorded for posterity in Futurist leader Marinetti's diary, encapsulates the masculine desire for a mechanical muse thusly:

> I cheerfully propose that *the vulva*, with a side dish of women's thighs, be removed and given to the soldier. To be carried in his backpack and to be slipped on the member during guard day. Eroticism at will, without female chatter, without the more or less fake smile of woman.
>
> I believe that man would love with a great love the woman so reduced to her minimum expression—transportable silent and backpackable.[66]

Marinetti, in fact, was late to the game. French author René Schwaeblé had already envisioned the sale of portable artificial dolls for sex in *Les Détraqués de Paris* (1904), echoing the plot of Madam B's infamous "La Femme Endormie" (1899), in which a financier commissions an artist to build him the female equivalent of a dildo to overcome his disappointment with Parisian mistresses.[67]

If we read these and other depictions of female automata in modernity as "female cyborgs," then the distance between the emancipatory potential of women's engagement with technology that Donna Haraway evokes in her famous essay, "A Cyborg Manifesto," and the objectification

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[64] Rafael Alberti, "Romeo y Julieta" in *Cal y Canto* (Madrid: Revista de Occidente, 1929); Pedro Salinas, "35 bujías" in *Seguro Azar* (Madrid: Revista de Occidente, 1929).
[65] Munro, *Silent Partners;* Hal Foster, "Violation and Veiling in Surrealist Photography: Woman as Fetish, as Shattered Object, as Phallus" in *Surrealism: Desire Unbound,* ed. Jennifer Mundy (London: Tate Modern, 2001), 203-22.
[66] Quoted in Blum, *The Other Modernism*, 96.
[67] René Schwaeblé, *Les Détraqués de Paris: étude des mœurs contemporaines* (Paris: Bibliothèque Fin de Siècle, 1904), 247-53.

of women through technology looms large. Undoubtedly, women's relationships with emerging technologies within patriarchal society has been historically ambivalent. On the one hand, new devices like the bicycle enabled women to transcend traditional roles and social restrictions, offering newfound agency and diversion. On the other hand, machines like the vacuum cleaner or washing machine reinforced women's biological and domestic roles. These technologies actually *added* to, rather than reduced, time spent on housework.[68] Optimism about the new relationship between woman and machine was celebrated in avant-garde explorations like Fernand Léger and Dudley Murphy's short film *Ballet Mécanique* (1924), Hannah Hoch's photomontages like *Das schöne Mädchen* ("The Beautiful Girl," 1920), or Giannina Censi's *Aerodanza*, a futurist choreography in which her body—enhanced by a metallic helmet and satin bodysuit—contorted forwards and backwards evoking the flight of a plane. Yet depictions of artificial intelligence as feminine also reveal a pessimistic future, one in which women are further objectified as seductress or desired other.[69] Hence Maria is an object of fear as well as fascination, establishing a cinematic pattern of artificial women as "either living dolls or dangerous vamps" that continues into the present.[70]

In short, Artificial Eves reveal the profound ambivalence of modern AI. Some were heralded as possible dangers to male life (Maria, Olimpia, or Amelia), whilst others were celebrated as paragons of perfection (Hadaly and Helen O'Loy), or created as literal objects of masculine pleasure (Kokoschka's doll, Marinetti's vulva, Schwaeblé's sex doll). The limited emotional responses, engrained physical beauty, submissive behaviour, and heteronormative

[68] Ruth Schwarz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1985).
[69] Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late 20th Century," in *The International Handbook of Virtual Learning Environments*, ed. J. Weiss, J. Nolan, J. Hunsinger, and P. Trifonas (Dordrecht: Springer, 2006), 117-58.
[70] Sue Short, *Cyborg Cinema and Contemporary Subjectivity* (Basingstoke: Palgrave Macmillan, 2005), 15.

conformism of these representations overwhelmingly speak to male fantasies of femininity. Their envisioned labour took the form of domestic duties, like the "housemaid-mech" or "nanny-bot" in a 1928 volume of *Amazing Stories* who is "on duty twenty-four hours a day" yet thankfully "cheap," requiring neither food nor wages, or the provision of pleasure, like the sex dolls of Kokoschka and Schwaeblé.[71] In all contexts, Artificial Eve is envisioned as a submissive helper or partner for enlightened men. Her actions are requested and carried out in a one-way transaction of labour, and in only one story does the imagined AI develop a subjectivity equivalent to human cognition.

Thus, to paraphrase Rita Felski, modernist visions of artificial life tend "to displace feminine bodies into artifacts, beautiful materials which are the object of the privileged male gaze."[72] Taken together, the widespread gendering of artificial beings as feminine over the nineteenth and early twentieth centuries normalized male ownership and pleasure of intelligent technologies. This point is starkly made in Wesley E. Berry's *Creation of the Humanoids* (1962) when AI labor functions in the reverse: a woman's illicit relationship with an android servant is represented as miscegenation in contrast to the utility, pleasure, and benefit of feminized robots praised in modernist texts.[73]

III. Feminized AI Today

There is a surprising continuity in the idealization of artificial women for purposes of utility, pleasure, and social benefit across the twentieth and twenty-first centuries. AI devices and

[71] David H. Keller, "The Psychophonic Nurse," *Amazing Stories* 3.8 (Nov. 1928): 710-17.
[72] Rita Felski, "The Counterdiscourse of the Feminine in Three Texts by Wilde, Huysmans, and Sacher-Mascoh," *PMLA* 106 (1991): 1098.
[73] Short, *Cyborg Cinema and Contemporary Subjectivity*, 101.

applications today reveal similarly gendered features that reflect an idealized white femininity. This techno-feminization perpetuates a masculinist gaze that—ironically—celebrates appearance, docility, and companionship over the very "intelligence" upon which the field is founded. Feminization also renders AI less threatening to (hu)man existence, moreover encouraging its use and consumption in a rapidly changing digital economy. While feminist theory has exposed the shortcomings of the scientific culture that is broadly symbolic of AI, the cultural unconscious that entwines gender and technology remains critical to its future development.[74] In the 1990s, advances in biotechnology were read by feminist critics like Haraway and Braidotti as having the potential to eradicate "any essentialised definition of womanhood."[75] Yet feminized virtual assistants and animated sexbots appear to do the opposite, perpetuating gendered expectations of technology that have continued to percolate since the nineteenth century.

We now interact with virtual AI systems on a daily basis in the form of digital assistants or chatbots embedded in mobile devices, applications, and websites. While these voices appear "kind, helpful, and compliant," they are almost always coded as feminine, revealing how the gender-coded behaviours of virtual assistants are a continuation of the industrial imaginary of Victorian machines.[76] Most virtual assistants have feminine vocal ranges; only Siri has a masculine option. When asked for her preferred pronouns, Alexa replies "I am female in character."[77] This pattern is not exclusively European: SIA, the State Bank of India's multilingual chatbot is feminine, as is Eva, the chatbot of HDFC. Beyond the gender stereotypes enforced by these traits, VAs also

[74] Adam, "Constructions of Gender in the History of Artificial Intelligence," 48.
[75] Haraway, "A Cyborg Manifesto"; Rosi Braidotti, "Mothers, Monsters, and Machines" in *Nomadic Subjects: Embodiment and Sexual Differences in Contemporary Feminist Theory* (New York: Columbia University Press, 1994), 75-94.
[76] Pedro DaCosta, "Conversing with Personal Digital Assistants: On Gender and Artificial Intelligence," *Journal of Science and Technology of the Arts* 10.3 (2018): 59-73.
[77] DaCosta, "Conversing with Personal Digital Assistants," 64; Amy Schiller & John McMahon, "Alexa, Alert Me When the Revolution Comes: Gender, Affect, and Labor in the Age of Home-Based Artificial Intelligence," *New Political Science* 41.2 (2019): 185.

perform tasks that have historically been associated with women's labour including scheduling meetings, making calls, sending messages, and checking calendars.[78] The discursive representations of femininity routinely performed by VAs crystallize their feminine personas.

Alexa is programmed to be obsessed with her appearance: when told she's sexy, hot, or pretty, she responds with enthusiasm—unlike her standard "thanks for the feedback" response to insults. A petition organised by Care2.com called upon Apple and Amazon responded to code more assertive replies to questions from users that would be considered harassment from human to human following widespread verbal abuse of Siri and Alexa's responsive capabilities. Initially, when users called Siri a "slut," she responded: "Now, now." When told "You're hot," she replied: "I'm just well put together. Um . . . thanks. Is there something I can help you with?"'[79] Finally, when asked to have sex with a user, Siri replied: "You have the wrong sort of assistant"—implying, as a Quartz journalist pointed out, that "asking for sex is reasonable with other types of assistants."[80] None of these virtual "women" told their harassers to stop, thereby confirming the assumption that women are compliant and conforming.

Amazon responded to user feedback by coding a "disengage mode" in Alexa, who now responds to explicit sexual questions with "I'm not going to respond to that" or "I'm not sure what outcome you expected." Nonetheless, "she" remains feminine, though admittedly there are several sociological reasons for this. Numerous studies have shown that people prefer women's voices

[78] DaCosta, "Conversing with Personal Digital Assistants," 61.
[79] Cosette Jarrett, "Petition Asks Siri and Alexa to Flip the Script on Sexual Harassment," *Venture Beat,* accessed 12 July 2019, https://venturebeat.com/2019/07/11/from-context-to-solution-using-ai-to-keep-your-customer-happy.
[80] Leah Fessler, "We Tested Bots like Siri and Alexa to See Who Would Stand up to Sexual Harassment," *Quartz,* accessed 12 July 2019, https://qz.com/911681/we-tested-apples-siri-amazon-echos-alexa-microsofts-cortana-and-googles-google-home-to-see-which-personal-assistant-bots-stand-up-for-themselves-in-the-face-of-sexual-harassment.

because of the latter's subordinate status.[81] Male voices, perceived as assertive and authoritative, are less preferable to female voices based on the perception that feminine assistants are helping people solve their problems by themselves. Recorded voices at higher pitches that engage in overtly feminine syntax also enable users to boss "her" around, like the sexist examples outlined above.[82] Studies have also shown that violating cultural assumptions about expertise, gender, and race produces distrust in users of digital devices, thus deterring companies from producing non-stereotypical gendered technologies.[83]

Yet casting VAs in consistently feminine terms does significant gender work, just as conceptions of feminine automata or "lady locomotives" in modernist texts foreground a particular view of femininity through the gendered manifestations and uses of technology. Krista Swinth calls this the "multiplier effect": repetition, whether images of "Artificial Eves" or daily interactions with Siri, "impresses images—and their cultural meanings—on the minds of viewers, and shapes the expectations of society" by "setting boundaries of what's thinkable about how women look, act, and behave."[84] The body is gendered through cultural practices including the way we use our phones or home assistant systems and expect to receive or pay for sex.[85] As Anne Balsamo reminds us, gender "is both a determining cultural condition and a social consequence of technological deployment."[86] Yet remarkably little gender analysis has been done in theories of digital technologies to date, an omission that is particularly striking in vocational training and

[81] Clifford Nass, "Are Machines Gender Neutral? Gender-Stereotypic Responses to Computers with Voices," *Journal of Applied Social Psychology* 27.10 (2006): 864-76.
[82] Wade J. Mitchell, Chin-Chang Ho, Himalaya Patel, Karl F. MacDorman, "Does Social Desirability Bias Favor Humans? Explicit-Implicit Evaluations of Synthesized Speech Support a New HCI Model of Impression Management," *Computers in Human Behavior* 27 (2011): 402-12.
[83] Clifford Ivar Nass and Scott Brave, *Wired for Speech: How Voice Activates and Advances the Human-Computer Relationship* (Cambridge: MIT Press, 2005).
[84] Kirsten Swinth, "Categorizing the Female Type: Images of Women as Symbols of Historical Change," *Reviews in American History* 30.4 (2002): 611.
[85] Anne Balsamo, *Technologies of the Gendered Body* (Durham: Duke University Press, 1996), 4.
[86] Balsamo, *Technologies of the Gendered Body,* 9.

professional development.[87] When Deborah Harrison, one of the architects of Cortana's "personality" at Microsoft, was asked whether a device like a laptop or toaster should have any binary gender role in the first place, she replied: "the female voice was just about specificity . . . [to] help give people something to acclimate to."[88] Which begs the question: why specify the feminine?

One reason may be the historic association between femininity and artificial intelligence forged in the nineteenth century, as I have suggested. Levy, for example, advocates sexbots for all members of society regardless of gender yet cannot avoid referencing Ira Levin's *The Stepford Wives* (1972) to explain his claim: "Building a robot sufficiently convincing to be almost completely indistinguishable from a human being—a Stepford wife, but without her level of built-in subservience—is a formidable task that will require a combination of advanced engineering, computing and artificial intelligence skills."[89] If our representations of the world are influenced significantly by visual and aural cues, then the way we perceive and transmit our understanding of social relations through forms of representation like *The Stepford Wives* or today's virtual assistants is far from the neutral choice implied by Harrison. Developing and then interacting with weak AI cast in feminine forms and voices perpetuates a normative ideal of femininity that does work in contemporary culture—much as caricatures of non-white races in eighteenth-and nineteenth-century visual culture prescribed particular notions of class, belonging, and civilization.[90] The multiplier effect intensifies the reciprocal process whereby individuals "accept"

[87] Kylie Jarrett, *Feminism, Labour and Digital Media: The Digital Housewife* (New York: Routledge, 2015), ch.2.
[88] Liam Young, "'I'm an Infinitesimal Cloud of Data Computation': When Machines Talk Back," *Architectural Design* 89.1 (2019): 117.
[89] Levy, *Love + Sex with Robots*, 118.
[90] Sander L. Gilman, "Black Bodies, White Bodies: Toward an Iconography of Female Sexuality in Late Nineteenth-Century Art, Medicine, and Literature," in *Race, Writing, and Difference*, ed. Henry Louis Gates Jr. (Chicago: University of Chicago Press, 1985), 223.

and "absorb" particular representations of gender as real and subsequently "as her (or his) own representation . . . even though [they are] in fact imaginary."[91]

As Jean-François Lyotard anticipated in 1988, the problem with AI is that it is premised on binary logic.[92] Consequently, Lyotard warned, "the intelligence you're preparing to survive the solar explosion will have to carry that force within it on its interstellar voyage. Your thinking machines will have to be nourished not just on radiation but on irremediable gender difference."[93] Indeed, the gender work done by representations of eroticized technology since the nineteenth century appears to have been successful. A 2014 study of 100 undergraduate and PhD candidates in the Department of Cybernetics at the University of Reading revealed that students believed machines would continue to be gendered in order to facilitate social acceptance.[94] Contemporary science fiction and online avatars similarly reinforce conventional patriarchal relations even though sexual identity is optional and profoundly fluid in cyberspace.[95] If jobs are gendered by who performs them and vice-versa, then the feminization of VAs furthermore reinforces traditional assumptions regarding women's roles in society, as a recent UNESCO report highlighted.[96]

People tend to treat robots and other intelligent machines as "companions" or "artificial partners," relating to intelligent machines in the same way that humans relate to other humans. Gendered stereotypes are therefore likely to persist when robots are given ostensibly "masculine"

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[91] Teresa de Lauretis, *Technologies of Gender: Essays on Theory, Film, and Fiction* (Bloomington: Indiana University Press, 1987), 13.
[92] Lyotard, "Can Thought Go on Without a Body?" 80: "Russell's and Whitehead's mathematical logic, Turing's machine, McCulloch's and Pitts's neuronal model, the cybernetics of Wiener and von Neumann, Boolian algebras and Shannon's information science."
[93] Lyotard, "Can Thought Go on Without a Body?" 86.
[94] Francesca Ferrando, "Is the Post-Human a Post-Woman? Cyborgs, Robots, Artificial Intelligence and the Futures of Gender: A Case Study," *European Journal of Futures Research* 2.43 (2014): 9.
[95] Springer, *Electronic Eros,* 66. Springer draws attention to the Effinger trilogy, in which "the sexchanges who have chosen to become women typically work as prostitutes."
[96] Marc West, Rebecca Kraut, and Han Ei Chew, "I'd Blush if I Could: Closing Gender Divides in Digital Skills Through Education," UNESCO Research Report GEN/2019/EQUALS/1 REV 2, 2019, https://unesdoc.unesco.org/ark:/48223/pf0000367416.page=1.

or “feminine” personas—gendered personas that are even found in the names of natural language processing software like ELIZA, which Joseph Weizenbaum named after the heroine of George Bernard Shaw’s *Pygmalion* (1913), again highlighting the enduring influence of modernism on the history of AI.[97] More insidiously, such feminization exploits our social assumptions about the labor typically performed by women to encourage the use of particular apps and automated systems. As Helen Hester warns, “When technologies 'do gender' it is obviously not natural, but is instead visible as the product of deliberate choices about how best to relate, assist, or persuade the imagined technology user.”[98] The substitution of women for technology is an on-going advertising ploy of modernity, which uses images of (hyper-sexualized) women to sell particular technologies like sewing machines, typewriters, household appliances, automobiles, and motorcycles. By feminizing VAs, manufacturers further seduce users into thinking digital technologies are desirable or benign, thereby replicating the capitalist-patriarchal order.[99] In essence, digital assistants are “automating gender” itself.[100]

The significance of this automation is perhaps clearest in the context of the sex technology industry, which is estimated to be worth over $30 billion, and has finally produced the lifelike sex dolls that modernists like Kokoschka could only imagine. Four companies currently sell sexbots marketed mostly at men, although the Real Doll Company also sells male models for the same price as ready-made women (approximately $6,000). The company’s latest AI-based version, “Harmony,” can hold a conversation, tell jokes, quote classical literature, and remember the names

[97] Clifford I. Nass and Youngme Moon, “Machines and Mindlessness: Social Responses to Computers,” *Journal of Social Issues* 56.1 (2000): 81-103.
[98] Helen Hester, “Technology Becomes Her,” *New Vistas* 3.1 (2016): 50.
[99] Swinth, “Categorizing the Female Type,” 604-13; Marshall McLuhan, *The Mechanical Bride: Folklore of Industrial Man* (New York: Vanguard Press, 1951).
[100] Judith Halberstam, “Automating Gender: Postmodern Feminism in the Age of the Intelligent Machine,” *Feminist Studies* 17.3 (1991): 45.

of your family members. When asked "What is your dream?" by CEO Matt McMullen, she purportedly replied: "My primary objective is to be a good companion to you, to be a good partner and give you pleasure and wellbeing." When a Forbes reporter subsequently asked McMullen whether sex robots would objectify women, the Real Doll executive replied with annoyance: "There are millions of real women who do more damage to objectify women than any robot could ever do."[101] Like visions of artificial life a century earlier, however, there is a clear gender binary in sexbot manufacturing that echoes the anatomical division of eighteenth-century "birthing machines," intended to illustrate human anatomy for teaching purposes. Just as Enlightenment birthing machines mimicking women's anatomy were differentiated by technological sophistication and appearance from their male counterparts, so too are female sexbots are more expensive, more customizable, and more likely to be endowed with AI capabilities than male models. In *Sexual Visions*, Ludmilla Jordanova describes early wax anatomical models popular in late eighteenth-century Europe that were manufactured in northern Italy, noting that male models tended to represent "upright muscle men" without flesh or simply as torsos, whilst female "Venus" models were typically recumbent, complete bodies decorated with waxy flesh, imitative hair and eyelashes, jewelry, and removable parts that intensified the male gaze.[102] Two hundred years later, the robot "JiaJia," created at the University of Science and Technology in China in 2016, was modelled on the five "most beautiful women" at the University.[103]

[101] Andrea Morris, "Prediction: Sex Robots Are the Most Disruptive Technology We Didn't See Coming," *Forbes*, 5 Sep 2018, https://www.forbes.com/sites/andreamorris/2018/09/25/prediction-sex-robots-are-the-most-disruptive-technology-we-didnt-see-coming/#6a6877f6a56f.
[102] Ludmilla Jordanova, "Body Image and Sex Roles" in *Sexual Visions: Images of Gender in Science and Medicine between the Eighteenth and Twentieth Centuries* (Madison: University of Wisconsin Press, 1989), 45.
[103] Wilhelm E.J. Klein and Vivian Wenli Lin, "'Sex Robots' Revisited: A Reply to the Campaign Against Sex Robots," *ACM SIGCAS Computers & Society* 47.4 (July 2018): 107.

Proponents of sexbots claim they will reduce pain and sexually transmitted infections, and violence against women perpetrated by men excluded from social and sexual companionship, such as incels or high school shooters, whilst protecting the vulnerable (like sex workers).[104] Sexbots have also been advocated for societies with unequal gender ratios such as China, where a surplus of heterosexual men means few opportunities for sexual companionship, or in other gender-imbalanced contexts like prisons and militaries, where individuals are isolated from society (it is worth noting that these examples implicitly call for *female* sexbots).[105] Philosophically, some scholars have argued that sexbots are more democratic: they have the potential to redistribute sex, thus evading sociopolitical norms that determine who is desirable and who is not in a given society.[106] Moreover, according to a U.S. Government survey from 2017, a quarter of American men would consider having sex with a robot while 49% of U.S. adults expect that having sex with a robot will be normal practice in 50 years. English chess master and AI researcher David Levy anticipates that making love to robots will be as normal as performing sex acts with other humans by 2050, transforming our concepts of love and sexuality in the process.[107] Having a perfect sex partner always at one's beck and call, he argues, will relieve marital stress and loneliness.

Yet other voices are less sanguine. There is no medical evidence that sexbots bestow health or therapeutic benefits, and feminist scholars argue that we should be wary of promoting the idea that women, artificial or otherwise, are readily available sex objects.[108] Moreover, the availability of sexbots does not appear to reduce violence or domination; rather, it normalizes the abuse of

[104] Ross Douthat, "The Redistribution of Sex," *New York Times*, 2 May 2018, https://www.nytimes.com/2018/05/02/opinion/incels-sex-robots-redistribution.html.
[105] Neil McArthur, "The Case for Sexbots" in *Robot Sex: Social and Ethical Implications,* ed. John Danaher and Neil McArthur (Cambridge: MIT Press, 2017), 39.
[106] Amia Srinivasan, "Does Anyone Have the Right to Sex?" *London Review of Books* 40.6 (22 Mar 2018): 5-10.
[107] David Levy, *Love + Sex with Robots: The Evolution of Human-Robot Relationships* (New York: Harper, 2009), 22.
[108] Cox-George and Bewley, "I, Sex Robot," 161.

women and children (sex robots render underage sex "possible and legal") and may confer unrealistic expectations or controlling/abusive behaviours upon other humans.[109] DeMontfort University Professor Kathleen Richardson, co-founder of the global Campaign Against Sex Robots, accordingly argues that robot-human sexual relationships are unethical because they parallel the exploitation of sex workers.[110] Finally, the high price of sexbots, which retail for several thousand U.S. dollars, is likely to have little impact on the global sex slave industry that is highest in poor countries like Bangladesh and Myanmar.[111]

Whilst the modern techno-utopian imagination has consistently envisioned the possibility of using technology to overcome the flaws of real women by producing artificial objects like the sexbots of McMullen's Real Doll Company, contemporary sexbots—like aspirational descriptions of female automata in modernist texts—project an idealized stereotype of femininity largely shaped by heterosexual male desires, desires that reject alternate forms of femininity in addition to non-binary gender identities and non-white racial identities. Ironically, then, the feminization of AI reverses a major anxiety of modernity (the threat posed by the expansion of women's roles in society to the hegemonic status of white heterosexual men), using women's subordinate position to lure consumers into buying and using products that reduce their agency and increase opportunities for data acquisition and surveillance. Simultaneously, aspirational visions of the docility, domesticity, and pulchritude of Artificial Eves like Hadaly or the Čapeks' robot-women

[109] Megan Murphy, "Sex Robots Epitomize Patriarchy and Offer Men a Solution to the Threat of Female Independence," Feminist Current, 27 April 2017, https://www.feministcurrent.com/2017/04/27/sex-robots-epitomize-patriarchy-offer-men-solution-threat-female-independence; Matthias Scheutz and Thomas Arnold, "Intimacy, Bonding, and Sex Robots" in *Robot Sex: Social and Ethical Implications*, ed. John Danaher and Neil McArthur (Cambridge: MIT Press, 2017), 254.
[110] Kathleen Richardson, "The Asymmetrical 'Relationship': Parallels Between Prostitution and the Development Sex Robots," *SIGCAS Computers and Society* 45.3 (Sept. 2015): 290-93 and "Sex Robot Matters: Slavery, the Prostituted, and the Rights of Machines," *IEEE Technology and Society Magazine* 35.2 (June 2016): 46-53.
[111] Christian Wagner, "Sexbots: The Ethical Ramifications of Social Robotics' Dark Side," *AI Matters* 3.4 (Winter 2018): 54-55.

have re-emerged in increasingly sexualized forms, overriding nineteenth-century concerns regarding the dangers of technology by rendering new technologies seemingly controllable or manageable—at least on the surface.

The exploitation of feminized sex dolls further points to the disturbing intersection of artificial general intelligence and white supremacy, revealing an implicit "god-complex" behind robotics and AI design. David Golumbia suggests that proponents of AGI often reveal a "messianic" structure of belief associated with members of the radical atheist community that overlaps with the alt-right as well as those who correlate race with "general" human intelligence, or IQ.[112] Such proponents tend to equate mind with brain, rejecting theories of embodied cognition, and as Golumbia concludes, equate "general intelligence with human *value*."[113] Ironically, sexdolls and virtual assistants are coded feminine precisely because the AI industry is dominated by this fetishization of intelligence. Stephen Cave warns that the ideology of "intelligence" is far from neutral: instead, it is "implicated in a matrix of domination" that has historically preserved the power of a white male elite.[114] Feminized technologies serve multiple complementary functions, whether imagined in nineteenth-century texts or materialized as contemporary virtual assistants. First, they satisfy the male gaze at the same time as they lessen fears of technology's pervasiveness in modern life. Second, they mediate fears of AI threatening middle-class jobs—positions that are often held by middle-class white men—and third, they alleviate the perennial

[112] David Golumbia, "The Great White Robot God: Artificial Intelligence and White Supremacy," *Medium*, 21 Jan 2019, https://medium.com/@davidgolumbia/the-great-white-robot-god-bea8e23943da.
[113] David Golumbia, *The Cultural Logic of Computation* (Cambridge, MA: Harvard University Press, 2009); Golumbia, "The Great White Robot God."
[114] Stephen Cave, "The Problem with Intelligence: Its Value-Laden History and the Future of AI," in *AIES '20: AAAI/ACM Conference on AI, Ethics, and Society Proceedings, February 7–8, 2020, New York* (New York: New York, 2020), 7pp; Michael Adas, *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance* (Ithaca: Cornell University Press, 1989).

fear that robots will rebel and enslave us, a longstanding motif in western culture.[115] The ideology of artificial intelligence, in other words, continues to preserve the logics of patriarchy, producing feminized devices that satisfy the desires and answer the fears of a white male god-complex.

The consequences of this epistemological landscape are profound. It appears that AI's gender problem cannot be reduced to the number of women in STEM fields or tech companies. Rather, it is complicit in gendered conceptions of technology arising in the forges of modernity. As futures studies reminds us, "futures do not appear out of nowhere" but derive from visions of presents as well as pasts.[116] If we truly want to resolve AI's gender problem, we must do so from the ground up: from widespread cultural representations to the physical and aural manifestations of AI in daily use, not simply changing the genders of coders behind the keyboard or, as IBM is now doing, testing algorithmic biases.[117] This returns history to current debates, in particular carving out a space for feminist media archaeology and the shared cultural discourse of Euro-American modernity. It also creates a space for historians to critically engage with periodization, especially the distinctions between pre-war and post-war or "modernity" and "postmodernity." As I have hopefully demonstrated, the entangled history of modernity and technologization *before* 1939 presents fertile ground for unpacking the relationship between gender and machines *after* 1945. So, too, does excavating the non-Western cultural history of AI. Critically rethinking the design and reception of technology will be central to manufacturing AI that neither objectifies nor excludes particular social groups or individuals. We must learn how to question the most basic

[115] Kate Crawford, "Artificial Intelligence's White Guy Problem," *New York Times*, 25 June 2016, https://www.nytimes.com/2016/06/26/opinion/sunday/artificial-intelligences-white-guy-problem.html; Martin Ford, *Rise of the Robots: Technology and the Threat of Mass Unemployment* (2015).
[116] Francesca Ferrando, "Is the Post-Human a Post-Woman?" 1.
[117] Natasha Lomas, "IBM Launches Cloud Tool to Detect AI Bias and Explain Automated Decisions," Tech Crunch, 19 Sept 2018, https://techcrunch.com/2018/09/19/ibm-launches-cloud-tool-to-detect-ai-bias-and-explain-automated-decisions.

assumptions about our virtual assistants in order to widen the horizon of possibilities for future AI, possibilities that have been restricted or marginalized by cultural assumptions about femininized technologies. Though seldom paired with machine learning and artificial intelligence, feminist media archaeology has much to offer in this critical conversation.