What is an Intelligence?

AI and the Struggle for Embodiment

Charissa N. Terranova

This essay argues for a materialist perspective on Artificial Intelligence [AI]. It explores the specific characteristics of "intelligence" within AI, understood as a mechanical reproduction of human and nonhuman intelligences. It is one more contribution to the chatter about AI permeating the proverbial airwaves. While it is difficult to track data on the number of scholarly publications about AI, there is an abundance of statistics on the amount of AI-generated journalism.[1] The profusion of reporting on and by AI suggests that there is universal agreement on the definition of "an intelligence." Far from it. Techno-determinists concoct apocalyptic futures based on the black box of "intelligence," in which superintelligences take over the world.[2] A black box is an organic or artificial system in which the inputs and outputs are known, but fundamental internal workings are unknown.[3] The core functions of things like the gene, human brain, mental health, intelligence, mind, and consciousness are unidentified in their entirety: they are black boxes upon which entire disciplines and treatments have been built.

Beyond Human Intelligence

In 1955, scientists began explicitly modeling the notion of "intelligence" within AI after humans, assuming *Homo sapiens* is the only species capable of having intelligence.[4] The construction of intelligence has been a gatekeeping tool for humans for thousands of years, providing a wishful abstract boundary separating who gets rights and who does not. Humans have, for example, used exceptionalist notions of language and rationalism to commit genocidal violence upon our own species and others. Artist James Bridle writes that "we have taken our superiority in one particular aspect—intelligence, as measured by ourselves, obviously – and used it to draw a line between ourselves and all other beings, to justify our dominance over them."[5]

While the black box of intelligence goes largely unquestioned by scientists, artists revel in it. In artist Katherine Behar's two-minute video "Artificial Ignorance" (2018), a computerized female voice advises the advancement of "ARTIFICIAL IGNORANCE" alongside AI in order to realistically foreground the "partiality and limitation" of AI, showing how it "both performs[s] ignorance and produce[s] it" through "algorithmic bias, category errors, and stupidity riddle network effects (like the 'dumbing down' of humans who are hooked to AI's addictive/assistive devices)."[6] (Figures 1-6) Behar's "Artificial Ignorance" might function like labels on cigarettes and alcohol, warning humans that scientific evidence shows that the use of AI leads to addiction and the death of democracy through rampant misinformation.

This year, Apple interns Parshin Shojaee and Iman Mirzadeh led a group of researchers who revealed that AI reasoning was not 100 percent reliable and was in certain instances fully illusory. The group compared analytical processes in Large Reasoning Models (LRMs) with Large Language Models (LLMs), revealing that both types of AI completely collapsed when faced with high-complexity tasks.[7] When AI fails inthis way, it produces scads of incorrect information, known in a fanciful way as "hallucinations," rather than simply as inaccuracies or lies.

Artist Ken Rinaldo is sanguine about such hallucinations since they reveal AI to be as flawed as humans are. Rinaldo is a pluralist of perceptual experience. He blends robotics and organic material (microbes and soil) to make whimsical and other-worldly installations exploring the interplay of human and machinic *umwelten* (German for "unique perceptual apparatuses").[8] Estonian-born biologist Jakob von Uexküll coined the term "*umwelt*" 125 years ago to name the enigmatic otherness of animal perception.[9] Rinaldo explores how human and nonhuman *umwelten*—both mammalian and mechanical—overlap, thus providing enrichment and elucidation of all sorts of adjacent human scaffolds, including ethics, morals, epistemology, and ontology. In short, AI hallucinations are propitious for understanding human-machine kinship relations, as such system-failures show how AI is "intriguingly closer to emulating biological systems than we might have anticipated." [10] Rinaldo sees recent medical advances made

1 Journalist Bradley Emi reports that there are 60,000 AI-generated news articles published every day. A research group at Newguard.com found 1,271 AI-generated news and information websites spanning 16 languages in an ongoing tracking project. Automation expert Husain Jatoi accounts AI-written contents now dominate 60% of news articles. See Emi Bradley, "60,000 AI-Generated News Articles Are Published Every Day," https://www.newscatcherapi.com/blog/60-000-ai-generated-news-articles-are-published-every-day; McKenzie Sadeghi, et. al., "Tracking AI-enabled Misinformation: 1,271 'Unreliable AI-Generated News' Websites (and Counting), Plus the Top False Narratives Generated by Artificial Intelligence Tools,"https://www.newsguardtech.com/special-reports/ai-tracking-center/; and Jatoi, Hussain, "AI-Written Contents Now Dominate 60% of News Articles – What It Means for Media in 2025," https://pearllemon.com/ai-written-content-dominates-news-articles/, Accessed 06/13/2025.

2 Bridle, James, *Ways of Being Animals, Plants, Machines: The Search for a Planetary Intelligence* (New York: Picador, 2022) 274-75.

3 "black box," at Oxford English Dictionary, https://www.oed.com/dictionary/black-box_n?tab=meaning_and_use#20344696 5, Accessed 06/14/2025; See also Bridle, 157

4 McCarthy, J., et. al., "A Proposal for the Dartmouth Summer research Project on Artificial Intelligence," (August 31, 1955) http://jmc.stanford.edu/articles/dartmouth/dartmouth.pdf, Accessed 06/14/2025.

5 Bridle, 270-71.

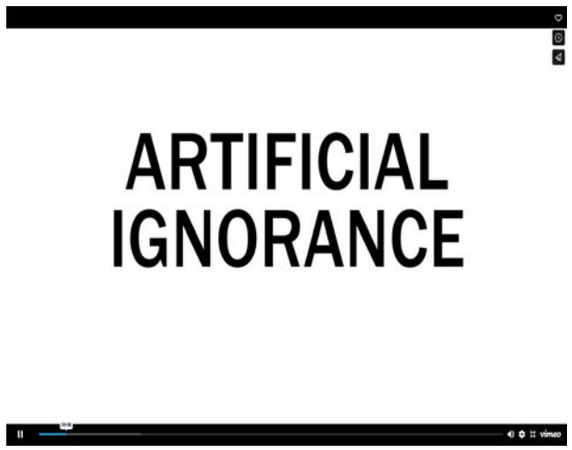
6 See Katherine Behar's video "Artificial Ignorance" (2018) https://katherinebehar.com/art/artificial-ignorance-video/index.html, Accessed 06/14/2025.

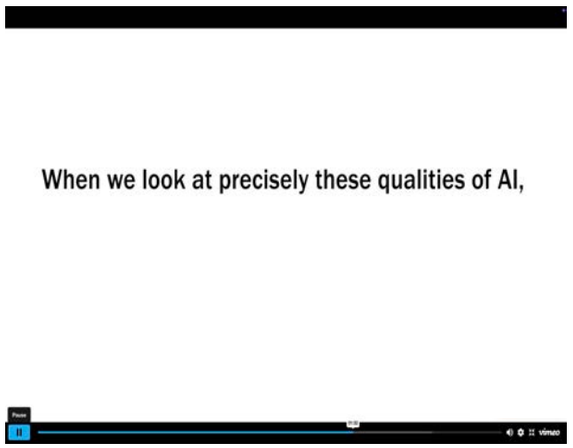
7 Shojaee, Parshin, et. al, "The Illusion of Thinking: Understanding the Strengths and Limitations of Reasoning via the Lens of Problem Complexity," *Apple Machine Learning Research* (June 2025), https://machinelearning.apple.com/research/illusion-of-thinking, Accessed 06/14/2025.

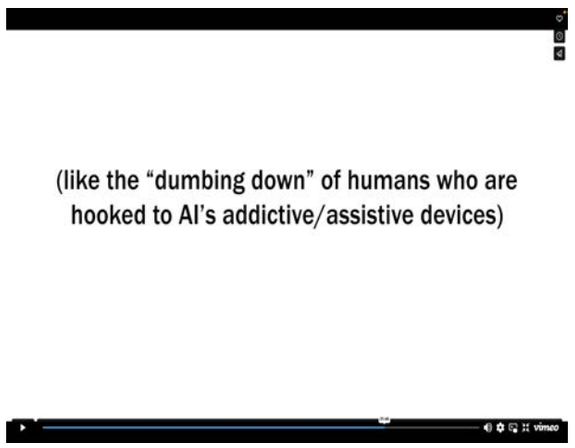
8 Terranova, Charissa, "Semblance of Mindful Intent: Agency and Feedback in the Artwork of *Ian Ingram*," in *Ian Ingram*, exhibition catalogue for exhibition at the Donald R. and Jan F. Beall Center for Art + Technology, University of California, Irvine (Irvine, CA: UCI Press, 2023) 64.

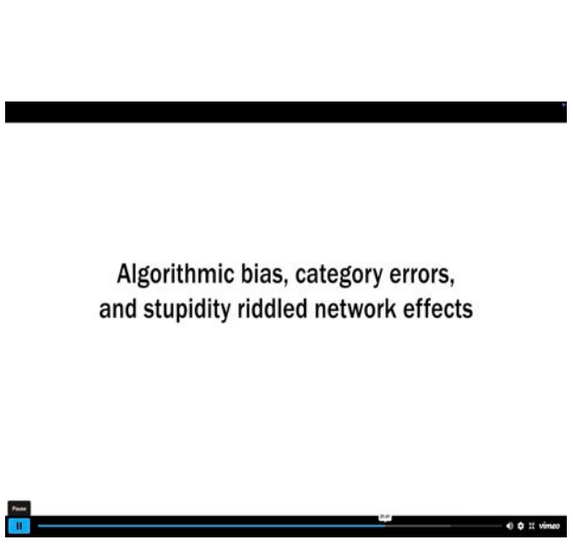
9 See Jakob von Uexküll, "The New Concept of Umwelt: A Link between Science and the Humanities," Semiotica, Vol. 134, No. 1 / 4 (2001) 111-23.

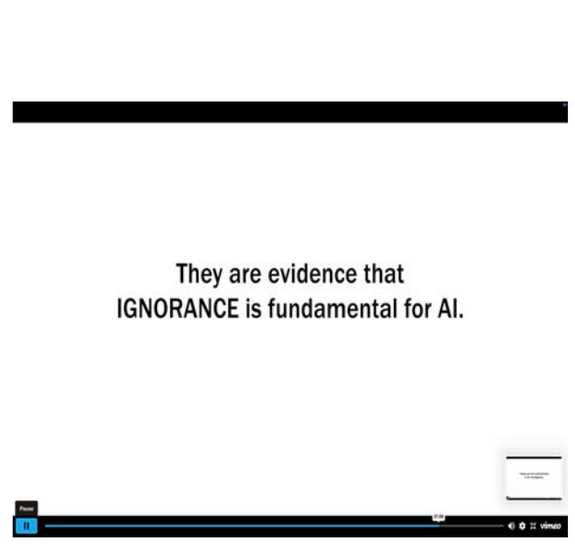
10 Rinaldo, Ken, "On Hallucinations and the Emerging Symbiotic Relationships between Humans, Machines, and Algorithms as Synthetic Evolution Begins to Drive Natural Selection," unpublished essay (September 2024).

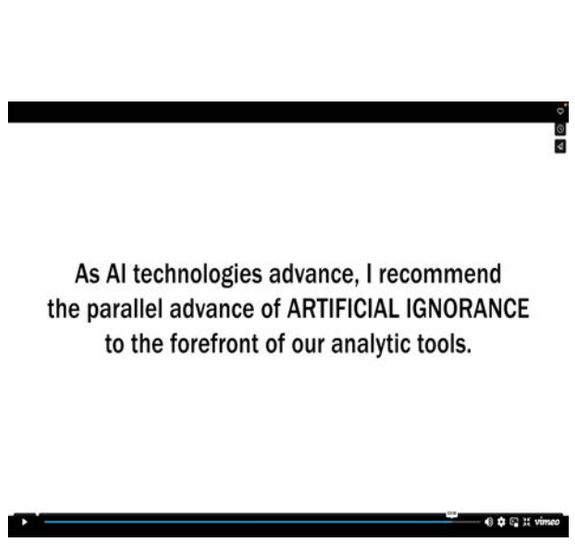












Figures 1-1 to 1-8. Katherine Behar, *Artificial Ignorance*, 2018.
Giving voice to "Artificial Ignorance," this video asks, *What does AI stand for?*
Video. 2 minutes, 7 seconds. Images reproduced with permission from artist.

through AI, such as the Cybil cancer diagnosis and cogent translation of informational noise between neurons and prosthetics, as clarion reasons for optimism, and more evidence of an elective machine-human affinity. Taking a cue from N. Katherine Hayles's latest book, *Bacteria to AI: Human Futures with Our Nonhuman Symbionts*, Rinaldo writes,

> *We might see human-AI relationships as entering a form of 'technosymbiosis.' Humans rely on AI to extend their cognitive abilities (such as through decision-making tools, language models, or medical diagnostics), while AI systems are refined and shaped by human input and interaction.*[11]

Technological tools are not alien, but organic corporeal extensions. Humans and technology co-evolve, calling for an updating of Darwin's evolutionary theory.

Yet, the invocation of art and AI often suggests something quicker and more basic than this— 2-D CGI fantasies of three-headed dragons wearing diapers, or demonic politicians with devilish horns turning to brown sludge that function, at best, as screen savers. By contrast, Rinaldo deploys a variety of AI in his work in original ways, using it as one tool of many in large, immersive installations. His work "Symbiogenesis" (2025-ongoing) materializes microbiologist Lynn Margulis's theory of endosymbiogenesis in techno-anatomical embodiment. Displacing Darwinism and natural selection as predominant narratives of life, endosymbiogenesis accounts for the telling role of bacteria-to-bacteria communication and symbiosis evidenced by non-nuclear DNA in organelles such as mitochondria in mammalian cells and chloroplasts in plant cells from which life evolved billions of years ago. In short, plants and animals emerged, millennia upon millennia in the past, through one bacterium enveloping another. Interdependence and cooperation are central to the deep time of biology, as much as competition and fitness are. In addition to video projection and telescopic visuals, "Symbiogenesis" also includes several mid-scale powder pink blown-glass mitochondria containing small speakers hanging from the ceiling (Figures 2-3). Emanating from them is an AI-created mélange of Margulis and Carl Sagan's voices reading a poetic text about the connections between cells and stars. (Margulis and Sagan were married from 1957to 1964.) The fact that intelligence is a black box makes for a sizeable crack in the humanist edifice, an invitation to investigate nonhuman intelligences in order to know them and our own species better.

Like Rinaldo, interspecies artist Ian Ingram is a perceptual pluralist interested in nonhuman *umwelten*. Having made art about lizards, squirrels, crows, dogs, and rats, he weaves ethology, software, robotics, and AI to decode how animals within a given species communicate with each other and, when channels cross, one species communicates with another, nonhuman-to-human and nonhuman-to-nonhuman. In 2018, Ingram worked at the Kilipsjärvi Biological Research station in Finland with fellow artist-ethologists Antii Tenetz and Theun Karelse as part of the Ars Bioarctica artist residency and the Random Forests project. Artist Shah Selbe joined the group remotely working from LA. Together they used an AI image classifier, Inception Version 3, that is part of Google's TensorFlow machine learning framework, which was developed to digitally metabolize images people post and tag online. Inception recognizes a host of banal things, like a plastic bag or guillotine, animals, such as the nudibranch, the eft, the mongoose, and the rhinoceros beetle, and hundreds of dog breeds, *but it does not recognize trees*. Ingram, Karelse, Tenetz, and Selbe set out to teach Inception about the things it could not see located in the

11 Rinaldo, unpaginated; see also N. Katherine Hayles, *Bacteria to AI: Human Futures with Our Nonhuman Symbionts* (Chicago: University of Chicago Press, 2025).

Figure 2. Ken Rinaldo, *Symbiogenesis*, 2025-ongoing. Mixed media. Rendering of installation forthcoming at SP/N Gallery, UT Dallas, February-April 2026. Image reproduced with permission from artist.

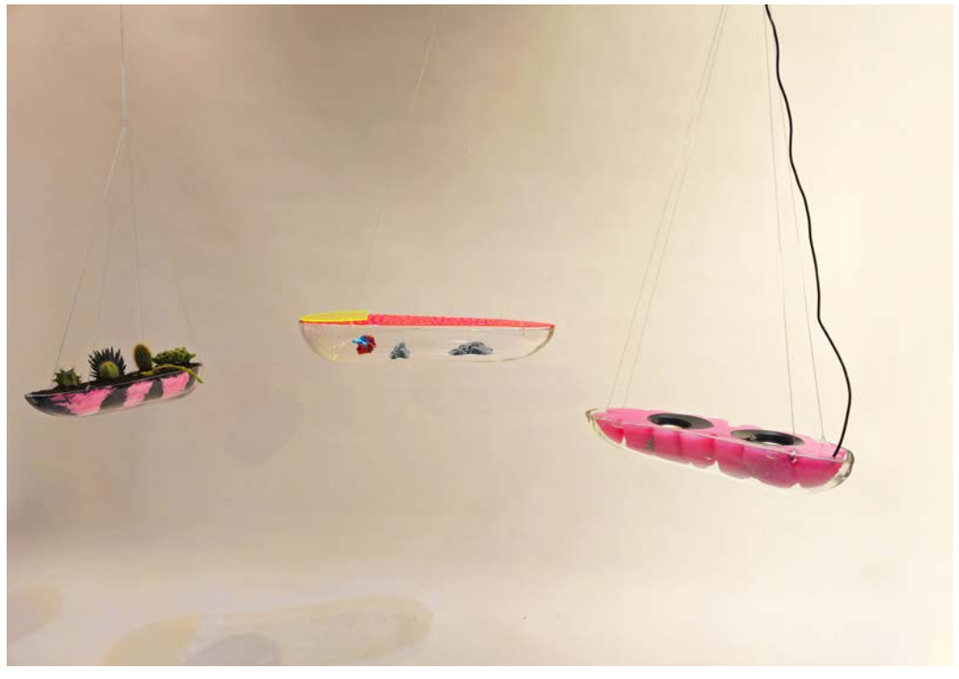


Figure 3. Ken Rinaldo, *Symbiogenesis*, 2025-ongoing. Mixed media. Detail of blown-glass mitochondria, July 2026. Image reproduced with permission from artist.

Finnish environs, including "mountain birches," as well as "lichens, moss and the other members of plantae and fungi surrounding the research center." [12] In the process, they became acutely aware of the biases of online human categorization that kept causing Inception to stumble. Blind spots of human-intelligence traps abound. Inception could see a snowmobile, but not trees in its path. The industry vernacular for this type of underperformance caused by bad data is "Garbage In – Garbage Out," which Ingram intelligently deconstructs:

> *Garbage—refuse, unwanted material, discarded byproducts of industry, commerce, and just plain, quotidian modern living—of course plays a center-stage role in the problem of sustainability. The concept of garbage also is a perfect example of the shortcomings of a human bias. We have in the past miscategorized vital elements of ecosystems as garbage, notably clearing fallen trees in forests in the name of husbandry, only later understanding that those rotting trunks play an important role in the cycles of that place.* [13]

In essence, human-made Inception sees the world through human-made eyes, internalizing the inescapable obstacles of anthropocentrism, materializing another aspect of human-machine twinship. Ingram, Karelse, Tenetz, and Selbe unschooled and reschooled Inception through a parliament of AIs of their own design. They were set with the task of eviscerating problems created by humans embodied as consumers of everyday artificial objects such as flip-flops and Big Macs but not sycamores and oaks. The task of properly embodying AI in political economy, natural worlds, or art seems overwhelming because of its rapid, protean transformation, coupled with the great complexity of each of these systems and almost no accountability from the companies creating it.

12 Ingram, Ian, "Making New Minds That Love Trees," *Medium.com* (Dec. 11, 2018) unpaginated.

13 Ingram, unpaginated.

The Legerdemain of Digital Disembodiment

Digital AIs such as LLMs and Generative AI [GenAI] arrived in the 2010s as though disembodied magicians. [14] In keeping with the current zeitgeist of rampant corruption, bald-faced lying, and fear-mongering, LLMs and GenAI output 'new' data through split-second sweeps of the internet, in which they pilfer and grok gigabytes of informations—dead and living artists' photos, paintings, films, and writing—to spit out something that satisfies a given input, which is often a prompt consisting of a few keywords. Humans interact regularly with these machine intelligences, which in turn communicate their capacities through seemingly dematerialized mediation, that is, via assembled digital systems and devices, such as computer screens and smart phones. They produce a wide array of stuff ostensibly *ex nihilo* and without delay, as though they were invincible poltergeists.

The bewilderment that comes with such fast, easy communication elicits adjacent emotions of awe and terror—fascination with AI's ability to out-perform humans and fear of redundancy. The sublimity of AI gives exponential power to Silicon Valley AI start-ups and corporate platforms such as Google, Amazon, Facebook, and X. Heeding the admonitions of Guy Debord and Jean Baudrillard, humans are commodities. These corporations commodify human attention spans, trading them like cotton, steel, and toilet paper. [15] All forms of once-industrialized agency are compressed, and there is little overhead cost for profiteers. Concentration functions as both worker and commodity,

14 Anonymous (likely AI), "Large Language Models," https://aws.amazon.com/what-is/large-language-model/, Accessed 06/13/2025 and Adam Zewe, "Explained: Generative AI," https://news.mit.edu/2023/explained-generative-ai-1109, Accessed 06/13/2025.

15 See Jean Baudrillard, *The Consumer Society* (London: Sage Publications, 1998) and Guy Debord, *Society of the Spectacle* (New York: Red & Black, 2000).

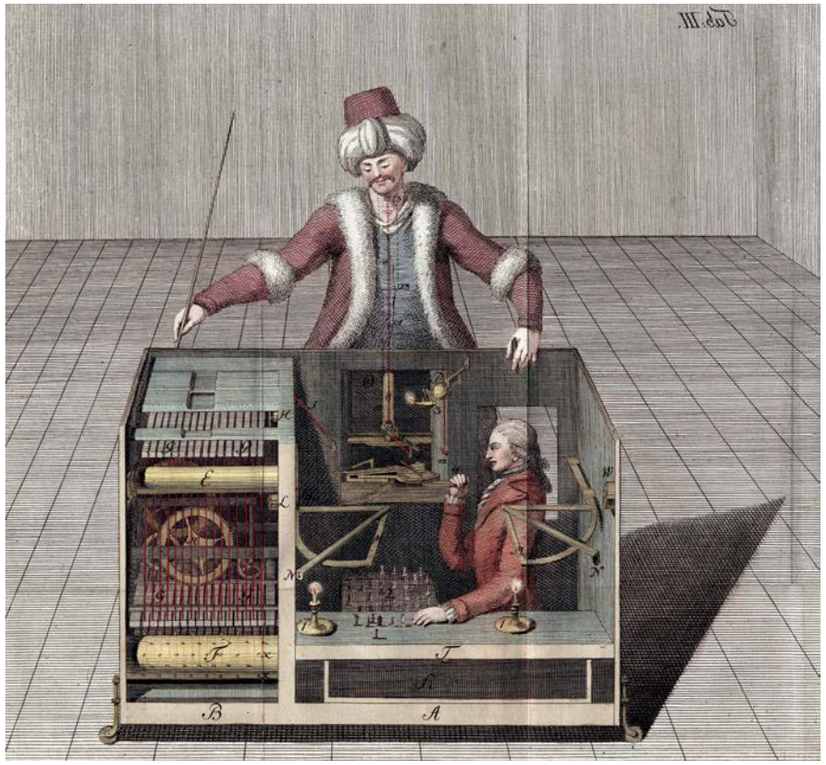


Figure 4. Imagined Mechanical Turk with Human from Joseph Freidrich zu Racknitz, On the Chessplayer of Mr. von Kempelen and its Replica, 1789. Courtesy Humboldt University of Berlin, University Library. Public domain

as digital platforms require far fewer people to build and maintain than a factory floor. Minds immersed online are fast money; attention-grabbing spectacles like mass shootings and buffoonish politicians full of mendacity are financial bonanzas for billionaires developing AI.

That so much material content appears to body forth so quickly from no bodies at all is perhaps one of screen-mediated AI's greatest tricks, replaying ad nauseum the age-old promises of fantasy mirror worlds falsely portending futures of consciousness without embodiment. It is reminiscent of Hilary Putnam's deracinated "brain in a vat" experiment that led to the *Matrix* film franchise and Ray Kurzweil's incorporeal "singularity," the delirious but dubious guarantee of infinite consciousness via uploading one's mind to the internet. [16] All the while, the sleight of hand at work in LLMs and GenAI is truly closer to the late eighteenth-century Mechanical Turk, a robotic chess champion that was in fact controlled by a human scrunched up inside of a box that supposedly housed the robot's pistons, cogs, and gears (Figure 4) . While there is no phalanx of tiny people pulling levers inside our phones, there are real workers around the world assembling them for global consumers.

16 See Hilary Putnam, "Brains in a Vat," in Sven Bernecker & Fred I. Dretske, *Knowledge: Readings in Contemporary Epistemology* (New York: Oxford University Press, 2000) 1-21 (2000) and Ray Kurzweil, The Singularity is Near: When Humans Transcend Biology (New York: Viking Press, 2005).

Figure 5. Amy Youngs, *Sounds from the Subterrarium*, 2024. Mixed media, including living springtails, soil, plant, custom glass, video microscope, and computer running p5js program. Installation view with the artist. Image reproduced with permission from artist.

Figure 6. Amy Youngs, *Sounds from the Subterrarium*, 2024. Mixed media, including living springtails, soil, plant, and custom glass. Detail of custom glass terrarium. Image reproduced with permission from artist.

Figure 7. Amy Youngs, *Sounds from the Subterrarium*, 2024. A living springtail seen through video microscope. Image reproduced with permission from artist.

Far from disembodied or immaterial, twenty-first-century AI is physically embodied in a variety of ways. It is a series of effects, "intelligences" if you will, channeled through devices made by laboring bodies with internal components of rare minerals extracted from China, Myanmar, South Africa, and other geographies powered by server farms using massive amounts of electricity emitting tons of carbon. [17] Artist Amy Youngs identifies a silver lining within this foreboding reality in "the way AI challenges human supremacy. AI shows us that intelligence—the language-oriented, fact-recalling, 'reasoning' type that we recognize— can exist outside of human brains." [18] The intelligences that emanate via digital AI are embodied cognitions: mechanical forms of mind or consciousness, performing via specific means that relativize human intelligence, toppling it from the superior point of anthropocentric hierarchies while setting in relief manifold forms of other intelligence, human and nonhuman alike.

Youngs' "*Sounds from the Subterrarium*" (2024) foregrounds an array of intelligences using a battery of technologies, including the wetware of miniscule creatures in dirt to set in relief the complexity of soil ecosystems. A computer-vision tracking algorithm follows populations of miniscule arthropods called springtails as they churn, filter, and fertilize soil in real time. Their varying speeds are translated optically and sonically in the space around the terrarium, so many strategies for directing human attention to these almost imperceptible living beings (Figure 5-7). Youngs queries, "What might we learn from observing and interacting with intelligences far more ancient than our own?" [19]

Teaching students that there is a long, deep history of "AI" quells fears of an android takeover. Humans have made machines that work for the most powerful among them for a very long time. This is why they are called "robots," a term derived from the Czech word "robota," meaning forced labor, which Czech writer Karel Čapek coined in the science fiction play *R.U.R.* (1920).[20] In this sense, AI has been with us for at least two millennia. Ktesibios was a Greek barber and mechanic living in Alexandria during the third century BCE, who invented the water clock and water organ, both machines automated through feedback devices.[21] Ismail al-Jazari and Syrian Muhammad al-Sa'ati were twelfth-century Muslim inventors who also built automated water-clocks.[22] Since then, there have been many variations of partially and fully automated machines like these. They operate by "control" systems, which means they function through open feedback communication that makes them self-managing and self-making [*autopoietic*] like toilet flushing systems, thermostats, the greater environment and atmosphere of planet earth, and all parts of living bodies, from cells to skin. At the end of World War II, radar specialist Norbert Wiener developed the interdisciplinary science of cybernetics based on the feedback control used in the centrifugal governor of James Watt's steam engine of 1789, the nervous system of pilots flying planes in the heat of World War II dogfights, and self-correcting wartime anti-aircraft gunners.[23] Microbiologist Lynn Margulis and polymath James Lovelock then adopted cybernetics as the central regulatory process of their Gaia hypothesis.[24]

17 See Kate Crawford, *Atlas of AI: Power, Politics and the Planetary Costs of Artificial Intelligence* (New Haven: Yale University Press, 2021).

18 Youngs, Amy, email exchange, 06/10/2025.

19 Youngs, Amy, email exchange, 06/10/2025.

20 "robot," *Oxford English Language*, https://www.oed.com/dictionary/robot_n1?tab=meaning_and_use#152132177, Accessed 06/16/2025.

21 Mayr, Otto, *The Origins of Feedback Control* (Cambridge, MA: MIT Press, 1970) 11-15.

22 Mayr, 32-37.

23 See Norbert Wiener, *Cybernetics: Or, Control and Communication in the Animal and the Machine* (Paris: Hermann et Cie, 1948) and Steve Heims, *Constructing a Social Science for Postwar America: The Cybernetics Group* (1946-1953) (Cambridge, MA: MIT Press, 1993).

24 See Bruce Clarke, *Gaian Systems: Lynn Margulis, Neocybernetics, and the End of the Anthropocene* (Minneapolis: University of Minnesota Press, 2020).

With the advent of electronic feedback-driven mainframe computers at the close of World War II, the age of computational AI had begun. In 1955, engineer John McCarthy coined the term "Artificial Intelligence" as part of a proposal for a summer workshop at Dartmouth college attended by McCarthy, Marvin Minsky, Claude Shannon, and Nathaniel Rochester, among others. The driving force of the "artificial intelligence problem" circumscribing their activities was the presumption that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it." [25] Of course, by "intelligence," they meant simply human intelligence. Though normal for the time, it is preposterous today that there was so little critical awareness of the role gender and ethnicity played in the original crafting of AI as concept or thing. What might it have looked like if it had been invented by another more polyglot group, other than this one made up of all white, English-speaking, Eurocentric, male engineers? Would it have been called "Artificial Intelligence," or perhaps the other AI that is Behar's "Artificial Ignorance," or "KMUT" pronounced "mutt" with a silent "k," standing for the clunky "Knowledges Mimetic Utility Tool"?

No detailed information was provided in the proposal about the hulking machine that made AI. In 1957 McCarthy regularly used the 15-ton IBM 704, a mainframe computer powered through 100-200 tubes of vacuum-tube logic circuitry, to develop AI in the form of FOTRAN and LISP software languages.[26] By comparison, the first programmable general purpose digital computer ENIAC was another giant mainframe computer built during the war a decade earlier that weighed 30 tons, used 18,000 vacuum tubes, and needed its own air-conditioning system for cooling. So, from its incarnation, engineers designed AI with an accelerationist teleology so that it would manifest Moore's Law: rapid efficiency, ever-shrinking machines, and ever-expanding intelligence. New research nonetheless shows that AI is arduous, time consuming, and makes software developers less productive in the workplace.[27]

Their funding proposal listed several assorted tools, rubrics, goals, and a budget of $13,500. These included automatic computers, the ability to program them to use language and build neuron nets, to basically 'learn' through the play of abstractions, randomness and clarity, and self-improvement. It makes sense that an engineer developing a computational AI would design it with self-improvement, since automated intelligences should self-regulate and, beyond this, AI must have the capacity to teach itself – to improve its 'self' in mind, but not so much body, through absorbing new information. Perhaps the economy of communication led to a poor choice of words, in particular the loaded term "self," given its connections to Enlightenment philosophies of individualism and mind. It is likely though that McCarthy and the others based the notion of "self" on the Greek prefix "auto-" in words such as "autopoiesis," "automatic," and "automobile."

Nonetheless, language is leaky, choices are facile, and outcomes are loaded. The "self" in "self-improving" is equally rooted in René Descartes' mind-body dualism wherein self and mind are the fount of both human ratiocination and soul everlasting in heaven or hell—not unlike Kurzweil's singularity, wherein one uploads their mind to the internet to achieve infinite selfhood. (Whether the internet is heaven or hell is another debate – and hells-bells, what narcissism!) It also echoes John Locke's sense of individual self, rooted in sense-based experience, perception, aesthesis, and, of course, property ownership limited to white men. Perhaps this is overreaching, and the idea of self was always more simply about Marvin Minsky's later idea of "society of mind" which progressively de-essentialized the mind and self, describing the brain in terms of a plurality of agents.[28]

Jumping to a more recent moment, when the AI pioneers have long since passed from the scene, thinkers in the new millennium have developed potent ideas about self, mind, cognition, and consciousness, extending beyond the cranium through bodies into gadgets and the world at large. These ideas plant AI and other technologies firmly in bodies interwoven across networks of other bodies. Building on the ideas of Gilbert Simondon and Gilles Deleuze, Bernard Stiegler explained the self as an exteriorization of the machines we use.[29] With the notion of extended mind, Andy Clark energized older monist ideas about embodied cognition, first argued in the eighteenth-century *Lebenskraft* debate.[30] Most recently N. Katherine Hayles argues that our relationships with machines and the internet make us cognitive assemblages that necessitate a rethinking of evolution in terms of technosymbiosis.[31]

Self-improvement continues to energize and shape AI in 2025 in the form of Recursive Self-Improvement (RSI), which AI researcher Daniel Kokotajlo foresees with doomsday extravagance creating an "AI explosion" by 2027.[32] Through RSI, Kokotajlo predicts that AI will exponentially improve, which means: "A.I. 'agents' soon figure out how to make their descendants smarter, and those descendants do the same for their descendants, creating a feedback loop."[33] Notably, this vision of rapid technological evolution through RSI is conceptualized around complete disembodiment, without grounding in the labor of human bodies, rare earth minerals inside of digital devices, server farms that power them, or supply chains that move them, much less history.

The notion that RSI's near-future creation of a human-destroying superintelligence is hyperbole, not to mention that we already live in a technofeudalism in which many of us are indentured serfs.[34] (The difficulty of ungluing oneself from social media is an apt discussion for another time.) But reality dictates that intelligence on its own, without embodiment, has little utility. *New Yorker* journalist Joshua Rothman writes, "In the real world, what matters is power—'the ability to modify one's environment'."[35] Intelligence is always specifically embodied in a precise environmental ecosystem—whether a rhinoceros, professor, or garbage compactor. The threat of deracinated RSI is one more AI God-trick; it is, once again, a legerdemain of disembodied AI.[36] Distinct from magic, there is the reënchantment of nature, biology, and life, by artists using AI to reveal the manifold embodiment of the more-than-human world. *A*

25 McCarthy, J., et. al., "A Proposal for the Dartmouth Summer research Project on Artificial Intelligence," (August 31, 1955) http://jmc.stanford.edu/articles/dartmouth/dartmouth.pdf, Accessed 06/18/2025.

26 McCarthy, John, "History of Lisp" (Feb. 12, 1979) Stanford AI Lab, http://jmc.stanford.edu/articles/lisp/lisp.pdf, accessed 06/18/2025.

27 Becker, J. et al., "Measuring the Impact of Early-2025 AI on Experienced Open-Source Developer Productivity," Computer Science (July 12, 2025) https://arxiv.org/abs/2507.09089, accessed 07/24/2025.

28 See Marvin Minsky, *The Society of Mind* (New York: Simon & Schuster Paperbacks, 1986).

29 See Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus* (Redwood City, CA: Stanford University Press, 1998).

30 See Andy Clark and Dave Chalmers, "The Extended Mind," *Analysis* (1998) Vol. 58, No. 1: 7-19; J. McCarthy, et. al., eds., *The Early History of Embodied Cognition 1740-1920: The Lebenskraft-Debate and Radical Reality in German Science, Music, and Literature* (Leiden: Brill, 2016).

31 Hayles, 2025, op. cit.

32 Rothman, Joshua, "Two Paths for A.I.," *The New Yorker* (May 28, 2025) https://www.newyorker.com/culture/open-questions/two-paths-for-ai, Accessed 06/18/2025.

33 Rothman, "Two Paths for A.I."

34 See Yanis Varoufakis, *Technofeudalism: What Killed Capitalism* (New York: Melville House, 2024).

35 Rothman, Joshua, "Two Paths for A.I."

36 Haraway, Donna, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* (Fall, 1988) Vol. 14, No. 3: 575-599.