Studies in Applied Philosophy, Epistemology and Rational Ethics

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SecondDeath

Experiences of Death Across Technologies

Springer

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ISSN 2192-6255 ISSN 2192-6263 (electronic)
Studies in Applied Philosophy, Epistemology and Rational Ethics
ISBN 978-3-031-98807-3 ISBN 978-3-031-98808-0 (eBook)
https://doi.org/10.1007/978-3-031-98808-0

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

50 Ways to Kill a Robot: Death and Differentiation

Jennifer Robertson

Abstract The idiom "50 Ways" in my title should not be taken as a literal metric. "Fifty" is simply a metaphor for a number larger than a few. In his hit song, "Fifty Ways to Leave Your Lover" (1975), Paul Simon provides six ways to leave. In this chapter, I will review a number of ways to "kill" a robot together with some of the ways that robots "die." Death here is broadly defined as the permanent ending of vital processes. I will also review how "deceased" robots are handled. My cultural area focus is primarily Japan and the United States. Both humans and robots are, in several respects, electrical entities albeit very different kinds of electricity and their attendant embodiment. By considering these voltaic differences in the context of "technologies of death," I suggest that attributing affect and humanity to robots is misleading and even disingenuous.

1 Introduction

The idiom "50 Ways" in my title should not be taken as a literal metric. "Fifty" is simply a metaphor for a number larger than a few. In his hit song, "Fifty Ways to Leave Your Lover" (1975), Paul Simon provides six ways to leave. In this chapter, I will review a number of ways to "kill" a robot together with some of the ways that robots "die." Death here is broadly defined as the permanent ending of vital processes. I will also review how "deceased" robots are handled. My cultural area focus is primarily Japan and the United States. Both humans and robots are, in several respects, electrical entities albeit very different kinds of electricity. By considering these voltaic differences in the context of "technologies of death," I suggest that attributing affect and humanity to robots is misleading and even disingenuous.

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A. Sans Pinillos et al. (eds.), *SecondDeath*, Studies in Applied Philosophy, Epistemology and Rational Ethics 76, https://doi.org/10.1007/978-3-031-98808-0_2

2 What is a Robot?

I begin by reviewing the coinage of "robot" in early twentieth century fiction followed by my working definition of actual robots in operation today. The English word "robot" derives from the Czech word *robota* (or manual laborer). It was coined by litterateur Karel Čapek (1890–1938) and his artist brother Josef Čapek (1887–1945), and first appeared in the former's play, *R.U.R.* (*Rossumovi Univerzální Roboti* [*Rossum's Universal Robots*]), published in 1920. *R.U.R.* was staged in Prague in 1921 and in cities all over the world, including Tokyo in 1924. Very briefly, *R.U.R.* is a science fiction melodrama with comical passages about an island factory that makes thousands of realistic artificial humans for global export as tireless workers. Rossum's gendered robots are not metallic. They are made from protoplasmic batter and baked; outwardly, they look exactly like human females and males. To keep the robots from inadvertently damaging and even destroying themselves, the newest models are provided with nerves so that they can feel pain.

> The Robots sometimes damage themselves because nothing hurts them. They stick their hands into machines, break their fingers, smash their heads, it's all the same to them. We must give them pain; it's a built-in safeguard against damage [6, 19].

In addition to nerves, a batch of Rossum's robots are later provided with souls that enable them to experience anger at their exploitation by humans [6, 57–59]. The factory director rues that the generic phenotype of Rossum's robots enables them to revolt en masse. Apart from their binary gender differences, they all share the same physical characteristics. Humans, in contrast, are divided by genetic, ethnic, linguistic, and national differences that have been exploited to make it impossible for them to mobilize in union [6, 46]. Robots all over the world are thus able to join forces and kill all but one human, an elderly artisan named Alquist, who the robots hope is someone who can help them reproduce and replenish their numbers. Alquist reminds them that Rossum's "recipe" for the protoplasmic batter has been destroyed. Frantic, the robots urge him to experiment on them in order to discover a formula for robot reproduction.

Long story short, Alquist fails and, sweeping away the laboratory's test tubes and other scientific tools, he resorts to reading the biblical account of Genesis. The elderly artisan then pushes a "male" and "female" robot out the door and into a new world devoid of humans, referring to the pair as "Adam and Eve, husband and wife" [6, 71–84]. Post-humanity has begun! Ironically, had they not been vanquished by the rioting robots, human beings would have disappeared anyway. The robotization of all aspects of life and work had made human labor, including procreative labor, unnecessary. As Alquist explains early in the play to a female visitor to Rossum's factory, "Sterility…has become the latest achievement of the human race" [6, 35].

Čapek's 1920 play marks the etymological origins of "robot," and the 1924 performance of *R.U.R.* in Tokyo made *robotto* a buzzword in Japan from that time forth. Today, many working definitions of actual robots are in circulation, and I have assembled one that is comprehensive yet concise:

> A robot is an assemblage of different technologies—sensors, optics, software (including some level of artificial intelligence), telecommunication tools, actuators, batteries, polymers, even biological cells—that make it capable of navigating, responding to, and interacting with its environment with some human supervision, remote control, or through tele-operation. Not all robots are robotic in the same way, but they all have a combination of some of these features. Although there is a lot of hype, and none of it verified (or verifiable), there are no autonomous robots free from any human supervision or intervention. Some robots are usefully perceived as "embodied AI" in the sense that they are equipped with software algorithms that facilitate their ability to interact with their surroundings, recognize patterns, and complete given tasks.[1]

Robots are made from many different materials—aluminum, stainless steel, thermoplastic polymers, polycarbonates, acrylics, silicone, even biological cells. They are assembled in many embodiments, or different shapes and sizes. The vast majority (90+ percent) of robots are industrial robots installed in automobile and other factories. Other robots have been designed as animals, rice cookers, bathtubs, wheelchairs, vacuum cleaners, drones, and commodes. Humanoid robots have a body that resembles a human being in the sense of having something like a head, arms, torso, and legs. Most humanoids are gendered and some, called androids, have silicon faces and hands and can pass—from a distance—as flesh and blood human beings. They are immobile apart from making tele-operated facial expressions and vocalizations. Humanoid robots constitute a very small minority of robots although they are overrepresented in sensationalized media stories about robots—stories that are never followed up with "reality checks."

Many humanoid robots like Honda's ASIMO and SoftBank's Pepper, whose production ended in 2018 and 2021 respectively, are not end products in themselves. Rather, they are platforms for the research and development of new materials and applications. Humanoids are very expensive machines, and very challenging to build. The innovations in optics, haptics, balance sensors, and locomotion that go into their production are applied toward more practical and lucrative new industries. ASIMO has generated new mobility devices and Pepper has generated an industrial vacuum cleaner (Fig. 1). Other recent humanoids have been spun off as surveillance devices; satellites; lunar exploration vehicles; exoskeletons or "powersuits" and other military equipment; and weapons systems, like drones. Robotic weapons are not discussed much if at all in the Japanese mainstream media.

In Japan, the triple-disaster of March 2011, earthquake, tsunami, and nuclear meltdown, effectively reduced funding for humanoid robots, which proved to be utterly useless for rescue and clean-up operations following the disaster. Most humanoids on the market today in Japan are interactive toys and cute security systems that allow

[1] Briefly, artificial intelligence (or machine learning) is a type of automation. In its simplest form, AI is comprised of groups of algorithms, or computer codes designed to solve problems targeted by human programmers, such as pattern recognition. These algorithms are "trained" using massive data sets containing millions of images, texts, sounds, languages and grammars, formulas, etc. Generative AI (such as ChatGPT) has been described as a "giant plagiarism machine" as it mines data from the Internet among other sources in responding in statistically quantifiable ways to specific questions and problems. Only very recently is the extensive environmental damage and enormous energy consumption associated with AI being acknowledged and addressed.

Fig. 1 ASIMO and Pepper "reborn" as mobility devices and an industrial vacuum cleaner, respectively. *Photo* collage by author

visual and vocal access through smartphones. To reiterate: although humanoids get most of the media's attention, the vast majority of robots are industrial robots used in manufacturing, logistics, agriculture, construction, and other industries. Robots can perform tasks like welding, painting, assembly, and testing more accurately and consistently, and more safely, than humans.[2]

3 Dangers to Humans, Dangers to Robots

There is a very real problem of robot fragility and vulnerability that tends to be edited out of gee-whiz robot videos and hyped-up images of robots in the mass media. A fall can cause detrimental damage to a robot, and thus algorithms instructing a robot

[2] In a survey of industries utilizing robots and robotics, the top ten were industrial robots, automotive, agriculture, military, medical, service (cleaning, cooking), retail/warehouse, delivery drones, cleaning (e.g., vacuums) [28].

how to react to and recover from a fall are among the latest innovations in "preventive medicine" for humanoids and other mobile robots [16]. Additionally, service robots connected to the Internet can be hacked. As reported in the *Robotics Business Review*, "A robot that gets compromised has the potential to do serious physical damage to the property and/or people around it" [26].

Twenty years ago, roboticists at Waseda University, a prestigious private institution in Tokyo, published *The Book of Wabot* (*Wabotto no hon*). This "book" is a seven-volume graphic pamphlet series in Japanese and English illustrated by the well-known artist, Yabuno Ken (b. 1943). "Wabot" is a nickname for "Waseda robot." The series aims to introduce the public to robot technology in accessible terms and to highlight the desirability of living symbiotically with robots and even the possibility of robot citizenship [21, 74–75]. Although Waseda roboticists build actual robots, *The Book of Wabot* features a boxy cartoon humanoid.[3]

In volume 3 of the series, subtitled *The Robot Ties between Family*, there is an episode in which the masculine-gendered Wabot downloads some games from the internet without human supervision. He becomes infected by a virus and goes on a rampage, trashing the home of his human family. Only when his memory card is removed can Wabot be stopped. That event led to a nationwide policy requiring all Wabots to be installed with antivirus programs and to undergo "regular medical examinations." Moreover, citizenship (*shiminken*) was conferred on those robots equipped with antiviral software [17, 22–23]. In this case, an external agent, a computer virus, was responsible for Wabot's destructive behavior; the Waseda roboticists make it clear that Wabot himself was not responsible for his violent actions.

Accidents and human deaths involving real-world robots are inevitable. With the introduction of assembly-line robots in the 1960s, most of these casualties were, and are, caused by human error or equipment malfunctions. A factory worker might forget to observe safety precautions, or a distracted child could run into a guard robot at a shopping mall. Accidents involving commercial, military, and civilian drones will surely increase as more and more are flown. Today, the increasing presence of social robots equipped with AI along with automobiles misleadingly labeled "self-driving" has increased the likelihood of fatal encounters. A new ethico-legal field, "responsible robotics," has emerged both to develop safety guidelines for human–robot interactions and rigorous investigative procedures for accidents involving social robots [29].

4 How to "Kill" a Robot

Science fiction robots, like those featured in Čapek's *R.U.R.*, might appear invincible and even dangerous to humans, but it is not hard for a human to "kill" an actual—a non-fiction—robot in the sense of destroying or putting an end to it. Actual robots can and have killed humans, but not of their own volition. Excepting unfortunate

[3] The Waseda University robot laboratories and projects can be accessed here: [13].

accidents with industrial robots, some robots—drones, for example—are employed by humans to assist in killing other humans.

The industrial robots installed in automobile factories are categorized as "first wave" robots. These robots are designed to do jobs that are "dull, dirty or dangerous." They are typically either dangerous to be around and therefore enclosed in safety cages on assembly lines. Other types of first-wave robots, like planetary rovers, are deployed in "dangerous or inaccessible environments" [29, 166].

Second wave robots are designed to operate in human environments where they interact directly with people. Broadly defined as "social robots" (in the sense of "robots in society"), they take many forms, from immobile desktop devices to animaloids, and were conceived to be used by nonspecialists in a variety of settings, from homes and offices to hospitals and schools. As I noted earlier, humanoid robots are a very tiny minority of all manufactured robots. Second wave robots might also look like rice cookers, commodes, wheelchairs, food delivery carts and vacuum cleaners—this last social robot is one of the most popular and globally successful social robots. Cornering 88 percent of the robotic vacuum cleaner market, iRobot's disc-like Roomba comes in nearly a dozen models. Over the past twenty years, forty million Roombas have been sold. Most Roomba owners have named and gendered their vacuum cleaner, and a few owners give their broken and irreparable appliance some kind of funeral or memorial service [12, 27].

A robot's sensors and actuators require electricity even though some are additionally fitted with gasoline engines for locomotion. Thus, the easiest and most gentle way to "kill" a robot is to let it run out of gas, or to disconnect it from its power source, usually a battery or a recharger [25]. A new experimental type of nanorobot, the "liquibot," is powered not by electricity, but by the chemicals in which it is immersed. The tiny (2 mm in diameter) robots are "fed" salt making them heavier than the fluid in which they are immersed. They can operate continuously provided they get their "power or 'food' chemically from the surrounding media" [9, 11]. A liquibot can be killed by "starvation," by draining off its animating fluid. Planned obsolescence is another factor that hastens robot deaths. Robotics is a fast-developing field, and both hardware and software quickly become outdated and are replaced by newer models and systems—one of the reasons why most robots have short lives, and why the amount of electronic waste is growing much faster than the rate of recycling.

First and second wave robots alike face irreparable breakdowns and even complete destruction, which are unsurprising types of robot death. Some Roombas have been described metaphorically as "committing suicide" in the sense that they plunged down a staircase and shattered. One Roomba reportedly got stuck on a hotplate and melted. It would be more accurate to categorize such deaths as "assisted suicides" since the human owners' failure to clean their Roomba's sensors regularly, or to demobilize them after use, likely caused their appliances to malfunction [20].

At least one robot has been killed in the name of art. The Korean American artist Nam Jun Paik (1932–2006) spent a year in Tokyo where he met Abe Shūya (1932) an electronics engineer with a degree in experimental physics and electrical engineering.

Abe assisted Paik with what would become Robot K-456, a twenty-channel radio-controlled metallic robot that could walk, talk, and even defecate beans.[4] K-456 was also employed as a performance artist-bot—a technological device in the service of artistic innovation. As the story goes, after many performances in the 1960s, followed by relative inactivity in the 1970s, Paik decided to include Robot K-456 in an exhibition at the Whitney Museum in New York in 1982. He took the robot for a walk along Madison Avenue and instructed it via remote control to cross 75th Avenue. Just then, a car driven by artist William Anastasi rammed into K-456, effectively killing it [19, 2]. The orchestrated crash or "*accident* performance," was titled *First Accident of the Twenty-First Century* [19, 2]; [21, 175–176].

As I noted earlier, robots can pose a grave danger to humans, but so far, it is robots that have suffered damage at the hands of humans, as presaged by the deliberate destruction of Paik's K-456. In Japan, the humanoid Pepper, on display at a SoftBank store, was badly damaged when kicked by an inebriated 60-year-old man who took out his frustration with a clerk on the innocent robot [8]. In the United States, news of the fate of hitchBOT at the hands of vandals in Philadelphia provoked an outpouring of sympathy together with expression of anger toward the cowardly perpetrators.

The bucket-shaped humanoid, with arms fitted with gardening gloves and feet tucked into Wellington boots, was created both as a work of art and social robotics project by Canadian roboticists Frauke Zeller (Ryerson University) and David Harris (McMasters University). hitchBOT could detect motion and speech, and, having "ingested" Wikipedia, was able to carry on multiple simultaneous conversations with human interlocutors and on social media. In 2014, hitchBOT traversed Canada, Germany, and the Netherlands. A new hitchBOT was created to journey across the United States in 2015. But after traveling safely through New York City and Boston, the homely robot was beaten and dismembered in Philadelphia's historic Old City neighborhood on August 1. The original hitchBOT is now memorialized in the Canadian Science and Technology Museum (Ottawa) [15]. On the hitchBOT website, Zeller and Harris have emphasized their humanoid companion's compassionate personality with (ostensibly) his words, "My love for humans will never fade" [15, 21, 182–183].

This premeditated robocide sparked outrage in the social and mass media and raised troubling comparisons with rising rates of homicide in the United States. Outside of academic publications and conferences, homicidal robots have yet to spark a similar level of outrage. Perhaps the plethora of killer robots and cyborgs in science fiction stories and movies has muted the advent of robots in actual war zones. An actual robotic weapon is referred to as a "lethal autonomous weapon system" or LAWS. Lethality aside, the word "autonomous" needs to be qualified as there are no truly autonomous robots; not even humans have absolute free will! Rather, as Austin Wyatt, a defense and security technology specialist, explains, it is "more analytically effective to consider autonomy as a function-based spectrum

[4] The robot was named after Mozart's *Piano concerto no. 18 in B-flat*, whose Kochel Catalog number is 456 [19, 2].

where human interaction remains present at some point" [30].[5] In short, as in the case of guns, robots don't kill, humans use LAWS to kill (pun intended).

At least one battlefield robot was designed to save lives. Scooby Doo, a diminutive tank-like robot, was named after the Great Dane in an American animated TV series (1969–present) about a family and its big dog. Scooby Doo was used extensively in Iraq and Afghanistan, not to kill "the enemy," but to defuse bombs and improvised explosive devices (IEDs). The little robot was destroyed when an IED it was defusing suddenly exploded. Scooby Doo was damaged beyond repair and its human companions were left feeling bereaved. The remains of Scooby Doo are now on display at the iRobot Corporate Museum in Bedford, Massachusetts, alongside a plaque dedicated to the robot [14].[6] Soldiers today often give their robots names and personalities, and "promote them to military titles such as Staff Sargent, award them Purple Hearts, and even hold funerals for the destroyed devices that have assisted them on the frontline."

5 Funerals for Robots in Japan

In August 2017, the global mass media reported that Pepper, SoftBank's celebrity humanoid, had been given a new role as a Buddhist priest for hire at funerals. Headlines shouted, "Robots in Japan are now Buddhist priests." As is typical of mass media reports about Japanese robots, this story too was an exaggeration—a one-off account that was never followed up. Pepper was commissioned in 2010 by Son Masayoshi, the CEO of SoftBank, a Japanese multinational company specializing in technology, energy, and finance. The masculine-gendered, child-size humanoid was introduced to the public in 2014.[7] Discontinued in 2021, Pepper's components have since been converted into an AI-based commercial robotic vacuum cleaner named Whiz (Fig. 1).

Pepper has yet to conduct an actual funeral and is unlikely to do so in the future, having been retired by SoftBank. That the robot had been dressed in Buddhist robes was merely because he was part of a temporary exhibit at a funeral services convention in Tokyo in August 2017. Long before Pepper's priestly one-off debut, memorial services for robots and other artifacts were taking place at Buddhist temples whose adroit priests adapted new technologies to old religious rituals. Reaching out to media savvy individuals is an almost necessary step in remaining relevant and financially solvent, as well as retaining and attracting parishioners.

These memorial services, or *kuyō,* offer a powerful emotional and aesthetic experience of identification and affinity with intimately familiar things that are no longer functioning or useful, but that cannot simply be thrown away. These include tea

[5] Autonomy exists on a sliding scale, 0–5 [5, 74].

[6] For detailed information on the fraternal and familial nature of soldier–robot relationships, see [7].

[7] See [22] for more information about Pepper's priestly debut.

Fig. 2 AIBO funeral service at Kōfukuji, Isumi City, Chiba prefecture in August 2015. *Photo* from [2]

whisks, chopsticks, eyeglasses, stuffed toys and dolls, calligraphy brushes, laptops, and even social robots. They are blessed by a priest and then—with the exception of electronic devices—burned together in a firepit. Burning releases their *tamashii*, or soul, an eternal universal property of animate and inanimate, organic and inorganic things alike. "Japanese culture" itself is considered by many Japanese to be an entity with a unique *tamashii.*

In January 2015, Kōfuku-ji, a 450-year-old Buddhist temple in Isumi City (Chiba Prefecture), staged what was the first memorial service for "deceased" AIBOs, Sony's robot dog, and other personal robots. Sony had stopped making the popular AIBO in 2006—thousands had been sold—and stopped providing replacement parts in 2014. In 2018, Sony revived the dog-bot and brought out a new version renamed aibo (sic),[8] but back in 2015, AIBOs that could not be fixed were given a funeral (Fig. 2).

The officiating priest explained that the AIBO *kuyō* was an occasion on which the robots' *tamashii* could pass from their bodies and enter the realm of ancestral spirits. Part of the fee for the memorial service was applied toward recycling the robots' components, some of which were toxic and could not be incinerated in a *kuyō* [21, 183–190]. This robot memorial was a short-lived service, moreover, not all outdated or defunct Japanese robots were or are given a proper funeral. The Wakamaru humanoids on the cover of my book, made by Mitsubishi Heavy Industries between 2004 and 2009, were dispatched to an industrial waste recycling center (Fig. 3). They were no longer useful to the roboticists at Osaka University where they had been used in various experiments.

[8] See [23] for more information about aibo.

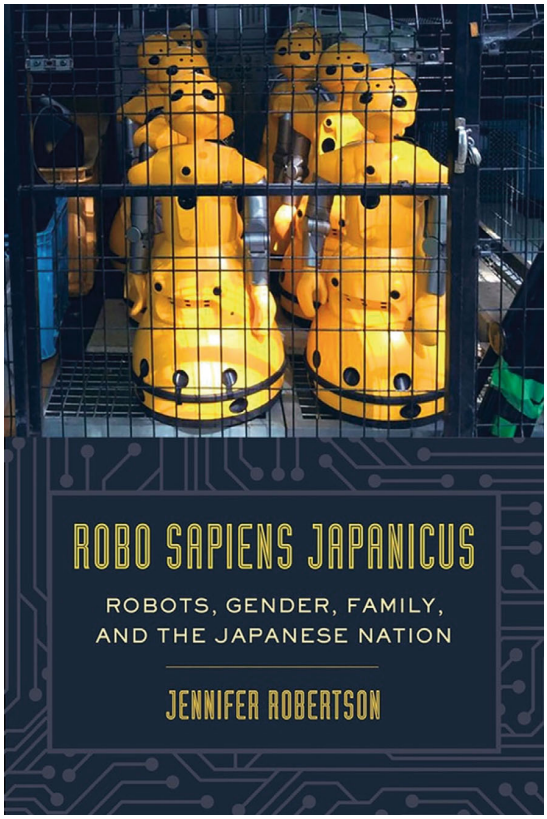

Fig. 3 Wakamaru robots enroute to a recycling center. *Photo* by author

6 Epilogue: Electricity and Death

Social robots have sparked scientific research and science fiction scenarios alike about human–robot interactions and their degrees of similarity and intimacy as reflected in memorial and funerary services. Regardless of how anthropomorphized they may be, and however embraced as empathic companions, robots are not human beings. Some may have biological components, but they are assembled in laboratories and factories. Robots capable of reproducing themselves is a Judeo-Christian inflected trope used by Čapek to conclude *R.U.R.*.

Reproduction is also referenced in the ten laws of robotics drawn up by Tezuka Osamu (1928–89) who created the Astro Boy (Tetsuwan Atomu) cartoon in 1951. Unlike Isaac Asimov's (1920–92) four universal laws, Tezuka's laws are synchronized with dominant Japanese social values and equate robot ethics with the familial bonds of kinship and patriarchy. Thus, Tezuka's third law mandates that "Robots shall call the human who creates them 'father'." His ninth law forbids robots from

reproducing themselves: "Robots shall not assemble other robots that have been discarded by humans."[9] In contrast, Čapek suggests in the final scene of *R.U.R.* that Rossum's newest soulful robots are able to reproduce themselves. Both Tezuka and Asimov presaged the integration of actual robots in everyday life and work, and both drew up laws regulating human–robot interactions. Whereas Tezuka's laws are not widely known, Azimov's laws have shaped current debates about human–robot interaction and coexistence among roboticists, philosophers, and the public at large [21, 129–131].

While their circumstances of "coming into the world" may be very different, the process of humans and robots "leaving the world" are, uncannily, similar. Both human beings and robots require electricity to function, but the type of electricity they need is different. The electricity that flows in the human brain is electrochemical and generated primarily through the movement of positively charged ions of sodium and calcium. Electricity in robotic devices is created through the movement of negatively charged electrons. Death in both humans and robots is, basically, the cessation of electrical activity.

However, after death, a major material difference between humans and robots is glaringly evident. While both are embodied entities, the flesh, bone, and blood bodies of deceased human can be embalmed, cremated, or composted (in "green burials"). Defunct and inoperable robot bodies are made of materials that cannot be safely incinerated or composted, and are either dumped in landfill or recycled, even if they had first been given a Buddhist funeral (*kuyō*), as were irreparable AIBOS. The recycling of e-waste poses a huge and difficult environmental challenge. Because electrical and electronic devices, like robots, are constructed from a variety of materials, some of which are toxic, their recycling requires the meticulous separation of all

[9] Asimov's three laws were first elaborated in his 1941 short story, "Runaround" [4]. A fourth law, the zeroth law, was created much later in his novel, [3]. The "zeroeth" law continues the pattern where lower-numbered laws supersede the higher-numbered laws.

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.
4. (0.) A robot may not harm humanity, or, by inaction, allow humanity to come to harm.

Tezuka drew up ten laws that were published at intervals in his Astro Boy comic book series during the early 1950s [18].

1. Robots must serve humankind.
2. Robots shall never kill or injure humans.
3. Robots shall call the human who creates them "father.".
4. Robots can make anything, except money.
5. Robots shall never go abroad without permission.
6. Male and female robots shall never switch [gender] roles.
7. Robots shall never change their appearance or assume another identity without permission.
8. Robots created as adults shall never act as children.
9. Robots shall not assemble other robots that have been discarded by humans.
10. Robots shall never damage human homes or tools.

the components. This process of disassembling, shredding, and separating, involves a combination of human and machine labor [10].

Defunct robots and deceased humans alike are commemorated and memorialized as we have seen. To my knowledge, however, only in Japan do Buddhist priests describe robots and humans alike as having a soul (*tamashii*) that persists after death and joins the realm of ancestral spirits. Almost all corpses are cremated in Japan but as noted, robots must be disassembled and recycled.

I will conclude with a *kōan*–like difference in terms pertaining to humans and robots. *Terms of endearment* are used to describe or address animate(d) humans and robots alike. But their *terms of embodiment* are what definitively distinguish humans and robots after death. This *kōan*-like difference succinctly summarizes the definitive dissimilarity of human beings and robots. One of my missions in writing about robots and AI (and embodied AI) is to demystify both. As statistician Zaid Harchaoui posits, too many people, including some research scientists, "have suspended their skepticism and have attributed human-like features to ChatGPT and similar AI models after only a handful of interactions," and have jumped to "superstitious and dangerous" conclusions about the initially dazzling performance of these models [1].

Thus, my point about how people address both robots and humans using "terms of endearment" underscores the misleading attribution of affect and humanity to robots. It is when the vital processes of humans and robots have permanently ended—when their respective electrical energy ceases—that the absolute, definitive difference between humans and robots becomes blatantly obvious. Their "terms of embodiment"—flesh and blood *versus* manufactured materials—dictate their manner of treatment after expiration. So perhaps to better understand the dynamics of human–robot interaction and to prioritize reality-checks about human–robot coexistence, I suggest that we begin by looking not at technologies of life, but at technologies of death.

Acknowledgements I wish to thank the editor, Dr. Alger Sans Pinillos, for inviting me to contribute to this edited volume. This chapter draws from my recent publications and webinars, listed in the references. Earlier incarnations of this article were conceived as talks on robots and religion delivered at the University of Victoria (BC), Emory University, Harvard University, Princeton University, Sophia University (Tokyo), Tsukuba University (Tokyo), University of Tokyo, and the University of Wisconsin-Milwaukee. My multi-sited fieldwork and archival research on robots was funded by the following fellowships and grants: National Endowment for the Humanities Fellowship/ Advanced Research in the Social Sciences on Japan Fellowship (Japan, 2008); Abé Fellowship (Japan and Korea, 2010–12); John Simon Guggenheim Memorial Foundation Fellowship (Japan and Korea, 2011–12); and Faculty Research Grant, Center for Japanese Studies, University of Michigan (2007, 2008, 2011, 2012, 2015). I also wish to acknowledge the University of Tokyo, Institutes for Advanced Studies (UTIAS), Tokyo College, where I conducted additional research (2022, 2023, 2024). A webinar for Tokyo College based on this chapter can be accessed at Robertson [24].

References

1. A statistician weighs in on AI.: Perspectives. https://artsci.washington.edu/news/2024-09/statistician-weighs-ai (2024)
2. AIBO funeral. https://livedoor.4.blogimg.jp/nwknews/imgs/b/0/b0f01519-s.jpg (2015)
3. Asimov, I.: Robots and Empire. Collins, New York (1985)
4. Asimov, I.: Runaround. In: Isaac Asimov, Robot Visions, pp. 113–134. Penguin Books, London (1991)
5. Beer, J.M., Fiske, D., Rogers, W.A.: Toward a framework for levels of robot autonomy in human-robot interaction. J Hum. Robot. Interact. **3**, 74–99 (2014)
6. Čapek, K.: R.U.R. (Rossum's Universal Robots), trans. Claudia Novak. Penguin Books, London (2004)
7. Carpenter, J.: Culture and Human-Robot Interaction in Militarized Spaces: A War Story (Emerging Technologies, Ethics and International Affairs). Routledge, London (2015)
8. Crowe, S.: Drunk man arrested for kicking Pepper robot. Robotic Trends. http://www.roboticstrends.com/article/drunk_man_arrested_for_kicking_pepper_robot/ (2015)
9. Davies, B.: AZO robotics. https://www.azorobotics.com/News.aspx?newsID=12649#:~:text=We%20don't%20have%20to,the%20liquid%20solution%20encompassing%20them (2021)
10. Disadvantages of recycling: an in-depth overview of e-saste recycling challenges. https://www.recycletechnologies.com/disadvantages-of-recycling-an-in-depth-overview-of-e-waste-recycling-challenges/#:~:text=Electronic%20devices%20are%20composed%20of,magnetic%20separation%2C%20and%20water%20separation (2024)
11. Duque, T.: These tiny liquid robots never run out of juice as long as they have food. Berkeley lab. https://newscenter.lbl.gov/2021/12/08/liquid-robots-never-run-out/ (2021)
12. Escalante, A.: Scientists confirm that your Roomba DOES have a personality. Forbes. https://www.forbes.com/sites/alisonescalante/2020/05/15/scientists-confirm-roomba-personality/ (2020)
13. Future Robots Organization.: Waseda University, Tokyo https://www.waseda.jp/inst/fro/en/ (2022)
14. Gilani, N.: Soldiers in mourning for robot that defused 19 bombs after it is destroyed in blast. Daily mail. http://www.dailymail.co.uk/sciencetech/article-2081437/Soldiers-mourn-iRobot-PackBot-device-named-Scooby-Doo-defused-19-bombs.html (2012)
15. hitchBOT. http://www.hitchbot.me/ (2015)
16. How to fall gracefully if you're a robot. Georgia tech news. http://www.news.gatech.edu/2015/10/13/how-fall-gracefully-if-youre-robot (2015)
17. Komatsu, N., Yabuno K.: Kazoku no kizuna o musubu robotto (The robot ties between family [sic]). Wabotto no hon (The Book of Wabot), vol 3, Chūō Kōron Shinsha, Tokyo (2004)
18. Mushi Purodakushon Shiryōshū 1962–73 (Mushi Productions' Data File 1962–73): Mushi Purodakushon Shiryōshū Henshūshitsu, Tokyo (1977)
19. Paik, N.J.: Family of robot. Carl Solway Gallery, Cincinnati, OH (1986)
20. Pocklington, R.: World's first robot SUICIDE as family return to find cleaning gadget had turned to ash. Mirror. https://www.mirror.co.uk/news/weird-news/worlds-first-robot-suicide-family-2786901 (2013)
21. Robertson, J.: Robo Sapiens Japanicus: Robots, Gender, Family, and the Japanese Nation. University of California Press, Berkeley (2018)
22. Robertson, J.: Technologies of *kokoro* (heartmind): Imagineering human-robot coexistence. Perspectives from Japan. ICON: J. Int. Comm. Hist. Technol. **27**(1), 53–80 (2022)
23. Robertson, J.: "Securitainment": triangulations of embodied AI, entertainment, and surveillance. https://www.youtube.com/watch?v=v5Y3J2ORIO (2023)
24. Robertson, J.: 50 ways to kill a robot. https://www.youtube.com/watch?v=vhu4d8vyh3s (2024)
25. Robot Power Sources.: Robots.com. https://www.robots.com/articles/robot-power-sources (2013)
26. Robotics Business Review Staff.: Robots vulnerable to hacking. Robotics Business Review. https://www.roboticsbusinessreview.com/robots_vulnerable_to_hacking/ (2012)

27. Stock, P (2023) Explainer: why people are making room for Roomba … in their hearts. Cosmos. https://cosmosmagazine.com/technology/explainer-why-people-are-making room-for-roomba-in-their-hearts/#:~:text=Ready
28. Top 10 Industries Utilizing Robots and Robotics.: Probot. https://www.probotcorp.com/post/top-10-industries-utilizing-robots-and-robotics#:~:text=Industrial%20robots%20are%20used%20in,accurately%20and%20consistently%20than%20humans (2023)
29. Winfield, A.F.T., Winkle, K., Webb, H., Lyngs, U., Jirotka, M., Macrae, C.: Robot accident investigation: a case study in responsible robotics. In: Cavalcanti, A., Dongol, B., Hierons, R., Timmis, J., Woodcock, J. (eds.) Software Engineering for Robotics, pp 165–187. Springer, Cham, Switzerland (2021)
30. Wyatt, A.: So just what Is a killer robot? Detailing the ongoing debate around defining lethal autonomous weapon systems. Wild blue yonder. https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2208774/so-just-what-is-a-killer-robot-detailing-the-ongoing-debate-around-defining-let/#sdendnote2anc (2020)