REVIEW

Thought Without a Body

DEBRA BENITA SHAW
School of Architecture & Visual Arts, University of East London, London, UK

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The problem with subtitling an exhibition 'More Than Human', it seems to me, is that, for the 'more than' to make sense, you have to have some idea of what you mean by 'human' in the first place. Although we can probably accept that there is broad agreement that a machine that could outperform a typical person in one or more capacity might be said to function beyond human limits, to be strictly pedantic, you would need to specify that the human referred to is both typical and unaugmented. It is here that we would run headlong into the problem of identifying both the limits of typicality and the line that separates putative human beings from the devices on which their existence depends.

Strictly speaking a 'typical' human is always already a manipulator of technology. One of the founding ideas of the contemporary 'posthuman turn' is that the human is the animal that must, of necessity, create the environment in which it thrives and thus can be said to *only* thrive as a result of its coextension with technical devices. Put another way, there is no 'human' that exists apart from the technology which provides for its continued existence[1].

This linkage is important because *AI: More Than Human* reinforces one of the myths of Artificial Intelligence, namely: that such a development will finally lead to the birth of autonomous thinking machines, capable of both cognition and self-recognition. This may very well come to pass but, in that case, we would be faced with what Vernor Vinge has famously called the 'singularity'[2] which would usher in a species more accurately described as *other* than human. Admittedly, the brochure accompanying the exhibition goes some way to acknowledging this when it admits that 'the boundary between ourselves and technology [is becoming] harder to see' and that 'it may lead us towards new forms of life'. However, the exhibition in general tends to take for granted a common view about what the terms 'human' and 'artificial intelligence' actually describe. As long ago as 1987, the French philosopher Jean-François Lyotard posed the question 'Can Thought Go On Without a Body?'. His answer was a qualified 'no' because thought necessarily operates within the context of an encounter between the body and the world.

Robots as Data Accumulators

Perhaps this is why, traditionally, the *idea* of artificial intelligence has been modelled by robots. It is much easier, it seems, to attribute intelligent purpose to machines that, in some sense, present as lifelike in the way that they look or behave. The robots here are also the most accessible and recognizable exhibits, from MIT's *Atilla* micro-rover, designed for autonomous planetary exploration to Hiroshi Ishiguro's *Alter 3* which interacts with visitors in order to 'learn' how to mimic human-typical behavior. Ishiguro is better known as the developer of *Geminoid Hi-2*[3], a robot copy of himself and the *Telenoid*[4] (neither are on show here), essentially a cellphone based interface which transmits facial expressions and head and lip movements as well as the operator's voice.

Unlike *Alter*, which features a more mobile and human-like 'face' and 'hands' capable of complex gestures, *Telenoid* is built with the minimal design required to suggest human-like movement and facial features. The result is that it approximates nothing so much as a cuddly toy come to life. The same is true of Sony's famous *Aibo* robot dog (Fig. 1), here on show as an interactive exhibit which is impressive for the affective experience that it offers, uncannily eliciting the kinds of responses we normally reserve for real pets. I will admit that I queued to stroke it and tickle its ears and was rewarded with a wagging electronic tail and movements highly suggestive of a real dog ready to play. But then I'm a dog lover and perhaps too easily impressed by a machine that promises all the delights of canine company but without the need for a pooper scooper (or, with Lyotard in mind, without the need to deal with the messiness that real bodies in contact with the world inevitably produce).

[Fig. 1 near here. Caption – Fig. 1, *Aibo.* Photo credit: Debra Benita Shaw]

While *Aibo* seems to be no more than an expensive toy (currently discontinued but available used for upwards of £4,000), it is essentially, like other smart devices, a tool for data accumulation or, put another way, a surveillance device that is sufficiently distracting to be willingly admitted into our homes. The danger here then is not so much that an intelligent robot with a cuddly disposition may develop enough autonomy to become a 'new form of life' but that Sony have invented the perfect foil for surveillance anxiety. In the guise of learning to adapt to the owner's home and to perform tricks, *Aibo* essentially uploads significant quantities of data to the cloud, gathered by its nose camera and sensors, which is then processed, ostensibly for the purposes of 'teaching' the *Aibo* about its environment using, among other applications, facial recognition software. Sony have already run into problems in the US state of Illinois where the collection of biometric data is strictly regulated[5].

Ethics

From 1959 - 2006, British newspaper *The Daily Mirror* ran a cartoon strip called 'The Perishers'[6] which, among other characters, featured a dog called Boot who was fascinated by the life of a rockpool that he encountered every year during his owners' summer holiday. For their part, the crabs inhabiting the rockpool looked forward to their yearly visit from what they dubbed 'the eyeballs in the sky', half because their religion dictated that the eyeballs belonged to a god come to judge them, the other half because it was their chance to prove that the eyeballs did not, in fact, exist. With *Aibo* in mind, this seems to me like a perfect allegory for our blindness to the ubiquity of increasingly smarter devices alongside the fear that we are either signing over valuable data to corporations without any way of claiming a share of the profits or that accumulations of data supposedly collected for benign purposes can just as easily be utilized for authoritarian control or, perhaps more immediately, for the manipulation of consumer behaviour[7].

To be fair, *AI: More than human* goes some way to addressing these concerns. In a section that considers machine ethics prominence is given to 'Autonomous Weapons: An Open Letter', a 2015 petition signed by over 4000 AI and Robotics researchers calling for a ban on weapons which can target human populations without the intervention of a human operator. Starkly it states that such weapons are not only easy to mass produce but cheap and easily adaptable. 'It will only be a matter of time', the researchers state, 'until they appear on the black market and in the hands of terrorists, dictators wishing to better control their populace, warlords wishing to perpetrate ethnic cleansing, etc. Autonomous weapons are ideal for tasks such as assassinations, destabilizing nations, subduing populations and selectively killing a particular ethnic group'[8].

This point is succinctly illustrated by Joy Buolamwini's *AI: Ain't I A woman?* (Fig. 2), shown in the near vicinity, which illustrates with startling clarity how facial recognition technology reflects the biases of the culture in which it is produced. In her prose poem and accompanying video Buolamwini documents how algorithms designed to differentiate by race and gender frequently mis-identify black females. So, Sojourner Truth[9] is a 'clean shaven adult male', data pioneer Ida Wells is 'a young boy smiling at the camera', a young Michelle Obama is 'a young man wearing a black shirt' with her hair registering as a 'toupee', Oprah 'appears to be male' and Serena Williams is simply designated 'male'. As a graduate student at the MIT Media Lab, Buolamwini had to don a white mask in order to be recognized by even a simple camera in order to proceed with her studies. As displayed here, it resembles nothing so much as a death mask. As the accompanying inscription points out, the failure of detection devices to recognize black bodies could have implications for self-driving cars which 'would find it more difficult to detect darker-skinned pedestrians'. Of course, what is chilling here is that correcting for this bias will confer the power to positively identify darker skins and enhance the efficiency of the kind of selective policing which disproportionately targets young black men and which too often ends in their deaths[10].

[Fig. 2 near here. Caption – Fig. 2, *AI: Ain't I A woman?*. Photo credit: Debra Benita Shaw]

So called 'autonomous' weapons are, in fact, nothing of the sort. They are only autonomous to the extent that they have the capability to carry out complex sets of instructions and become self-directing only once they have been programmed and provided with data. And, as a recent article in *GQ* points out, all these devices really do is 'squeeze that data through algorithms made by us in order to reach a set of outputs. They obey our instructions, our commands; they don't form their own concepts, link ideas in imaginative ways or use abstract reasoning of their own making'[11]. Much as the tech industries would like to predict that the time is fast approaching when true general artificial intelligence will emerge, this exhibition provides very little evidence that a horizon is in view. What we think of as AI is really just advanced machine learning (ML) or, more technically, a series of feedback and feedforward loops through which machines integrate positive results into their pre-established routines and discard negatives according to a goals pre-determined, and coded, by humans. And, as *AI: Ain't I A Woman* succinctly proves, what Buolamwini calls the 'coded gaze'[12] essentially conditions the system in advance, often with unexpected and highly revealing results.

Golem

This ethical dimension of advanced learning machines is lent perspective by the opening exhibits in the Barbican's Curve Gallery which display various attempts to imagine *Der Golem*, the Jewish myth of artificial life which resonates throughout the art and literary history of, as established here, many different cultures. This is unsurprising of course, given the Jewish diaspora and perhaps equally unsurprising given that the myth speaks to common fears about the unforeseen consequences of developing powerful weapons. Thought to have originated in 16th century Prague, *Der Golem* recounts the tale of a man of clay, brought to life by Rabbi Judah Loew to protect the ghetto from a Christian fanatic. So much is well known, as is the fact that the myth has influenced many artists and writers concerned with what it means to be human from Mary Shelley's *Frankenstein* (1818) to Alex Garland's *Ex Machina* (2014), among many others.

One of the most direct references is probably in Marge Piercy's cyberpunk novel *Body of Glass* (1992, published in the US as *He, She & It*) in which a scientist builds a fully functioning human analog AI to protect a community of Jewish hackers from an evil corporation. In this, as in some other versions of the myth, the Golem itself is benign, but the logic by which it functions leads it to reach conclusions that

prove a danger to those that it is pledged to protect. Piercy's version is interesting for the way that Yod, her Golem surrogate, at the end pronounces himself too dangerous to live and fulfills his duty of protection by self-destructing in the heart of the enemy enclave.

The inference here is that an AI programmed for ethical calculation may be forced to conclude that its existence is untenable and is thus, ultimately, impossible. On the other hand, artefacts from the Japanese Shinto tradition, also on display here, remind us that cultures founded in animist ideas are more able to conceive of intelligence as a property of non-living organisms or, perhaps more importantly, that the machines that we already live with are attuned to us, and we to them, to the extent that the line between human and machine is not only blurred but, in some sense, non-existent. With this in mind, Sam Twidale and Marija Avramovic's *Sunshowers* merges videogame technology with techniques from neural networks and genetic algorithms to craft a real-time animation exploring techno-animism through Shinto mythology. The result is one of the more visually arresting exhibits and one of the most thoughtful in that it uses story-telling to examine how our knowledge of the world is never distinct from the tools through which we encounter it.

This is one of the tenets of posthuman theory which recognizes the significance of language as the first technology through which our ideas about ourselves and the world are processed. Or, as Stefan Herbrechter puts it: '[s]een from an ontological point of view posthumanization shows that human beings have always been 'technological' through and through, whether as a result of tool use or of the 'recursivity' of symbolic language as ultimate 'ontologizing' tool' (Herbrechter, 2013, p. 20). This, it seems to me, is actually referred to in the Golem mythology, particularly in the version in which the Golem is animated by having the Hebrew word *Emeth*, meaning 'truth', inscribed on its forehead (Collins & Pinch, 1993, p. 2).

This, of course, doesn't mean that the Golem is motivated by any true understanding of the world but that the Golem's entry into the world corresponds to a shift in perception, and symbolic representation, through which its existence (and thus the existence of any new technology) becomes meaningful. The relevance of this is starkly accentuated in the 'Data Worlds' section of *AI: More Than Human* which includes, alongside Buolamwini's *AI: Ain't I A Woman?*, the University of Washington's *Synthesising Obama* video, illustrating the power of deep fakes to construct alter-realities. *Synthesising Obama* is built utilizing datasets of accumulated video of the former US President through which algorithms learn to build fake videos in which his lips are perfectly synchronized. In short, they can make him say anything, bringing into question the faith we have historically placed in recording devices and thus the veracity of both the spoken and written word.

Data also speaks in Stephanie Dinkins' *Not the Only One* or *N'TOO* (Fig. 3), situated in the 'Endless Evolution' section. This is an attempt to address the white bias of AI and the unchallenged assumption that, if robots had skin colour, it would probably be white. Dinkins' interactive installation is built from a dataset of memories spanning three generations of women in one black American family. *N'TOO* thus recounts an oral history while learning by responding to questions and comments from visitors. *N'TOO* itself is an artefact designed to develop a personality which speaks a generational history in the first person. What is suggested here then is not only the evolution of AI but that future self-aware AI entities will encode the racial memories of the humans that they have evolved beyond. *N'TOO* is thus proposing a posthuman black identity rooted in the past of the African diaspora. There are also implied references here, I would suggest, to the Afrofuturism of the late 20th century as represented by artists and musicians like Sun Ra[13] and Rammellzee[14] as well as its feminist oriented revival in the 21st century through, most notably, Janelle Morále[15].

[Fig. 3 near here. Caption – Fig. 3, *N'TOO.* Credit: Debra Benita Shaw]

The Sublime Promise of the Archive

The history of machine learning is addressed in the 'Mind Machines' section which includes Charles Babbage's original *Analytical Engine*, developed by Ada Lovelace in the late 19th century and the template for modern computing devices, a WWII *Enigma* machine, IBM's chess champion *Deep Blue* and other luminaries like DeepMind's *AlphaGo. Aibo* is also in this section, alongside MIT CSAIL's *SoFi*, which has learned to emulate the characteristics of fish and can swim independently alongside them in the sea, and Google PAIR's project *Waterfall of Meaning* which visualizes the kind of word embedding employed by ML to mathematicise meaning. Visitors are invited to type words to be processed by the waterfall. I typed in 'epistemology' which returned an apology and a message that the system did not recognize the word. Another visitor[16], more imaginatively, typed 'Google' which, amusingly (and perhaps unsurprisingly?), returned the same message.

One of the intentions behind *Waterfall of Meaning* is to map biases between and across cultures to avoid, perhaps, the kind of error through which ML reproduces the racial blindness so starkly revealed by *AI: Ain't I A Woman?*. But, barring the possibility that it was simply malfunctioning on this occasion, its failure to recognize the corporation that founded the project is instructive. It perhaps points to another kind of blindness; a failure to see that bias is inherent in systems where capital dictates both the framing of data projects and the worlds that they subsequently construct. I am reminded here of Jacques Derrida's introduction to *Archive Fever* (1995) where he begins by pointing out that the archive cannot archive itself or, rather, it conceals itself as the origin which guarantees the order within, an order which itself refers to practices of colonization (see also Thomas Richards' *The Imperial Archive*). Interestingly, what isn't clear from either the installation or the project website is what happens to the words that the system fails to recognize. In other words, it isn't clear whether we are being invited to access a static dictionary or contribute to a dynamic work in progress; an order determined in advance or one which changes in response to input.

Similarly, Alexander Mordvintsev's *DeepDream: The Artificial Pareidolia,* another Google project, prompts neural networks to compose images based on impressions from stored visual data. Some of these are, frankly, terrifying, others are hilarious and some starkly beautiful. The press release refers to them as 'psychedelic' which is not entirely inappropriate. They speak, perhaps, to the current renewed interest in psychedelic experience[17] and to the gnawing sense that we now live in the world that we wished for in the 1970s, realized through the ubiquity of Google processing rather than a shared cosmic high.

Other visual experiences, like Mario Klingemann's *Circuit Training* and Nexus Studios and Memo Akten's *Learning to See* are essentially exercises in teaching neural networks what we think art looks like. *Learning to See*, for instance, invites visitors to manipulate a pile of cable on a piece of pink cloth under a light source which the network then interprets as a 'painting'. Certainly what we see approximates something that we might want to call 'art' but it is hardly conceptually challenging or instructive. More interesting are Anna Ridler's linked works *Myriad (Tulips)* and *Mosaic Virus* which reference the politics of the archive, and its role in the structuring of art history as well as the embeddedness of ML in human cultures. *Mosaic Virus,* an artificially generated image of a tulip blooming, shown over three screens, is produced out of the 10,000 images of tulips collected by Ridler for *Myriad (Tulips)*. The title refers to a virus that caused a genetic mutation in tulips that, in 17th century

Holland, were so highly valued that the bulbs became a form of currency and had the effect of destabilizing the Dutch economy.

Growth in *Mosaic Virus* is controlled by fluctuations in the value of bitcoin, thus making a trans-historical connection through which the capitalist imaginary, as expressed through derivatives and similar financial instruments, is linked to the conceit of 17th century Dutch flower painting. The artists of this period painted blooms which were sublime but purely imaginary. Although they referenced studies from life, they brought together varieties that could never be seen together and rare specimens that were often only rumoured to exist. Ridler's work thus demonstrates how the imaginary is structured by the sublime promise of the archive; the revelation of mastery through the completion of knowledge (the knowledge that is more than the sum of what the repository contains). This is, of course, also the promise that structures the awe with which we contemplate AI but, as Ridler demonstrates, the datasets with which it operates are always decided in advance and motivated by purely human concerns. *Myriad (Tulips)* is important for the fact that it is the raw data for *Mosaic Virus*, photographed and carefully categorized by Ridler herself.

Art

The point that Ridler seems to be making here is that ML may be a creative medium and the idea of AI may even inspire creativity but algorithms, however sophisticated, cannot, in themselves, create art. This may seem obvious if we understand art to be an expression of ideas in a form which provokes an aesthetic or visceral response. Put another way, if an AI could initiate a work of art in response to concerns which have impacted its lifeworld in some way then the singularity would already be here and the art it would create would have no meaning for those of us who connect through an organic relationship to the stuff of the world and for whom, arguably, the state of *being* a body qualifies the nature of our reaction to visual stimuli.

That said, there are artists who understand very well how digital media can produce artworks with contemporary significance and develop new forms of aesthetic experience but that are not included here. Glitch[18] artists like Rosa Menkman[19] come to mind here, as well as Hito Steyerl whose *Actual Reality*[20] employs algorithms to visualize the structural relationship between global inequality and the art world itself. The hype around *Portrait of Edmond Belamy*[21], (also not shown here) a painting produced by a collection of algorithms which sold for $432,500 at Christie's in 2018, obscures the fact that the price reflects its value as a unique artefact rather than its relevance as a work of art. Both visually, and in terms of what it tells us about the contemporary global art market it is, frankly, appalling.

There is nothing quite so bad on display at *AI: More Than Human*. But there is also nothing, Ridler's work aside, which speaks to the unique capacities of algorithms or how, as a medium, they may provide the foundation for new forms of creative expression. Chris Salter's *Totem*, for instance, situated in the Barbican's Level G and outside the space of the main exhibition, is visually arresting but achieves nothing that could not have been achieved without the complexities of machine learning. Without actually *knowing* that a neural net is sensing the environment and processing the information in order to affect the pulse and rhythm of the lights, it is little more than a fairly unremarkable light sculpture. Nor does the knowledge that it is generated by ML do much to enhance the experience.

Universal Everything's *Future You*, located at the Gallery's Silk Street entrance is fun but, again, there are more interesting applications of similar technologies elsewhere in the art world. Choreographer Wayne McGregor's *Living Archive*[22], for instance (not shown here), is a learning technology that works with the

characteristic movement styles of his dancers and the accumulated lexicon of his creative output to enhance the process through which choreography is developed. *Future You*, similarly, develops an archive of movement through observing visitors that interact with it during the installation and, accordingly, produces shapes that move with the human body, rather than simply emulating it, but it is oddly lacking in substance. Without any sense of how what it learns might be applied, other than for a brief moment of entertainment, it is, like *Aibo*, just a beguiling toy with some suggestively sinister implications.

An AI with advanced knowledge of human movement may be able to dance with you but, as science fiction writer Philip K Dick predicted in 1956, it is the kind of knowledge that can also be used to anticipate your future behavior and, as in Dick's *Minority Report*, precipitate your arrest for even *thinking* about a crime. It may make shop-lifting a thing of the past but it would also have serious implications if it was used (as it certainly could be) for policing demonstrations or controlling prisoners.

McGregor, in fact, has produced one of the most genuinely thought provoking and beautiful works incorporating ML. His *Zoological*[23], first performed at London's Roundhouse Theatre in 2017, featured seven ML-directed helium-filled white globes that interacted with both the dancers and the audience. Driven by algorithms that were again trained in human movement, they provided an experience that was both eerie and compelling. While *Zoological* also evoked the spectre of surveillance, there was, at the same time, a feeling of encountering genuine otherness; of, perhaps, the possibility of affective resonances between human and machine structured through a shared language of kinesis.

It is this sense of otherness; of an encounter with a genuinely *different* form of life that is missing from *AI: More Than Human*, in at least two senses. As I have pointed out, it fails to differentiate between genuine AI, which would necessarily be autonomous and self-directing, and deep machine learning, which may perform way beyond the capacities of human recall and inference but is, nevertheless, dependent on human programming. Moreover, these exhibits lack the kind of imagination which, quite literally, animates McGregor's *Zoological.* His floating spheres appear to exhibit curiosity and sometimes behave like a swarm or a milling crowd while still being utterly alien. By contrast, human/animal analog robots like *Alter 3* and *Aibo* are little more than sophisticated automatons.

A-Life

While artificial intelligence may be an elusive concept, artificial *life*, explored in the Endless Evolution section, is fast becoming an everyday reality. Video games that employ natural laws, like Maxis Software's *SimLife: The Genetic Playground*[24], released as long ago as 1992 (not shown here), can be seen as the templates for some of the exhibits here in that their aim is to create, within a virtual environment, a simulation of organic growth and development. With the advent of 3-D digital printing, similar principles are applied to producing, for example, medical technologies which 'grow' replacement organs for transplant. Included in this section are examples of 3-D printed scaffolds for tissue growth produced by Wake Forest Institute for Regenerative Medicine and Wyss Institute and Emulate, Inc's 'Organs-on-Chips' (Fig. 4) technology which has the potential to revolutionise drug testing.

[Fig. 4 near here. Caption – Fig. 4, 'Organs on Chips'. Photo credit: Debra Benita Shaw]

Neri Oxman's *The Synthetic Apiary* (Fig. 5) and the 'personal computer farms' developed by MIT's Open Agriculture Initiative are micro-environments that may offer hope for the future of bees and other flora and fauna faced with extinction. These are hopeful projects at a time when our ecosystems are suffering

the effects of climate change and medical technologies that we have come to rely on, like antibiotics, are in urgent need of replacement. But hope here, I think, is the problem.

[Fig. 5 near here. Caption, Fig. 5, *The Synthetic Apiary.* Photo credit: Debra Benita Shaw]

The glossary included in the brochure for *AI: More Than Human* is instructive. The entry for 'artificial intelligence' points out that it is 'often a speculative field' and this, I think, is the point that we need to take seriously. Speculation only leads to funding when it appeals to vested interests and only to real-world applications when a return on the investment is ensured. And even funding from philanthropic sources does not ensure that solutions can be applied where they are most needed. Nor do technological solutions always work as they were intended. Although the exhibition does ask us to consider some of the ethical questions raised by AI, it does not address its embeddedness in a world where unequal distribution of resources not only causes some of the problems that the science is now being asked to address but is also likely to ensure that any benefits are only felt by a privileged minority.

An exhibition which blurs the distinction between art and science, as *AI: More Than Human* undoubtedly does, is to be welcomed and it provides a succinct metaphor for the way that the concept of AI blurs the distinction between organic and technical, likewise between human and machine. Yoichi Ochiai's artificial butterfly, also in the Endless Evolution section, makes this point emphatically. Nevertheless, the speculative aspect of AI is emphasized by the sheer number of exhibits which are really ML driven imaginative constructions of what AI *might* achieve rather than technological solutions for real-world problems. What is also missed here is that rudimentary ML is already a mundane part of our world and one which is not only having a significant effect on human employment but is also a source of everyday frustrations.

The final part of *AI: More Than Human*, teamLab's *What A Loving and Beautiful World* (Fig. 6) is located in the Pit, several floors down from the main exhibition, and requires the use of the Barbican's notoriously confusing elevator system. As we stopped, several times, to admit ghost passengers, ascended when we were trying to descend and inexplicably returned to our floor of origin (more than once), I had time to reflect on the fact that what we were actually experiencing was the failure of machine memory or, in terms of the idea behind the exhibition, a capricious AI employing a logic known only to itself.

[Fig. 6 near here. Caption – Fig. 6, *What A Loving and Beautiful World.* Photo credit: Debra Benita Shaw]

What a Loving and Beautiful World is an immersive environment which resembles a Chinese garden populated with sinographs. These are triggered by visitor movements to 'unfold' and reveal new configurations. The environment thus 'evolves' through encounters with human bodies. As the culmination to an exhibition that raises so many difficult questions, it is nothing if not cynical. On the evidence we have so far, the world to come is likely to be anything but loving and beautiful. If it is ever realized, AI is hardly guaranteed to be benign.

teamLab's contribution then is a fantasy and, in that sense, it is a fitting end to an exhibition which has very little to say other than that the cultural imaginary of the 21st century is still in the grip of the technological sublime, ie., the conviction that technology will deliver us into utopia. This is emphasized by the screens which litter the Curve Gallery showing clips from science fiction films that feature imagined artificial intelligences. It is not so much that these films are always celebratory or optimistic. Many, in fact, are dystopian. But cinema itself is a highly determined experience which, while it may deal

with complex ideas and ethical questions is nevertheless a compensatory spectacle which takes us on a brief journey into the unfamiliar before reassuringly delivering us back into the mundane world of the everyday. *AI: More than Human* provides a parallel experience. In privileging the visual, particularly in experiences like *What a Loving and Beautiful World* and *Future You*, it emphasizes the spectacular at the expense of any consideration of the political implications of the technology that constructs what we see.

What the celebratory tone of this noisy and somewhat overloaded exhibition obscures is the deadly silence at the heart of the archive: that what passes for truth obscures a highly motivated strategy of accumulating and sorting data to serve aims which are rarely questioned or even mentioned. The fact remains that these machines are part of a global system in which data is wealth but only if it can be processed in such a way as to serve the interests of capital. With this in mind, some of the more entertaining exhibits here seem like a cynical attempt to present ML as benign and pave the way for its incursion into ever more intimate parts of our lives. Nevertheless, there are, as I have suggested, some exhibits which show a more nuanced awareness of the ideas that inform our understanding of AI. *Myriad(Tulips)/Mosaic Virus* is unique in this context in that it develops an argument for attending to both the provenance of the datasets that inform ML output and the human labour that compiles them. Aside from this, only Twidale and Avramovic's *Sunshowers* and Dinkins' *Not the Only One/N'TOO* come close to interrogating the meaning of AI in the context of human cultures.

As Lyotard says: '[i]f you think you're describing thought when you describe a selecting and tabulating of data, you're silencing truth' (Lyotard, 2000[1987], p.137). For machines to be truly autonomous thinkers, they would need, as he points out, to be aware of what they have not yet thought; to appreciate the need to fill gaps in existing knowledge with the purpose of working towards a more comfortable accommodation with the world. For this, they would need bodies that can experience discomfort and an awareness of difference to provide an analogy with what is missing, novel or incomplete. In other words, they would need to be human.

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No potential conflict of interest was reported by the author.

Notes on contributor
Debra Benita Shaw is a Reader in Cultural Theory at the University of East London. She is the author of *Women, Science & Fiction* (Palgrave, 2000), *Technoculture: The Key Concepts* (Berg, 2008), *Posthuman Urbanism: Mapping Bodies in Contemporary City Space* (Rowman & Littlefield International, 2018) and co-editor (with Maggie Humm) of *Radical Space: Exploring Politics and Practice* (Rowman & Littlefield International, 2016).

Notes

[1] See eg., Bernard Stieger, *Technics & Time 1: The Fault of Epimetheus* (1994)
[2] Vernor Vinge 'The Coming Technological Singularity' (1993) https://accelerating.org/articles/comingtechsingularity.html
[3] See https://wenboshao.weebly.com/description-of-geminoid-hi-2.html
[4] See http://www.geminoid.jp/projects/kibans/Telenoid-overview.html
[5] 'Aibo's dark side: Why Illinois bans Sony's robot dog' https://www.cnet.com/news/what-sonys-robot-dog-teaches-us-about-biometric-data-privacy/

[6] Examples of 'The Perishers' cartoons are reproduced here https://www.mirror.co.uk/lifestyle/cartoons/perishers/
[7] See Shoshona Zuboff *The Age of Surveillance Capitalism* (2019).
[8] 'Autonomous Weapons: An Open Letter From Ai & Robotics Researchers' https://futureoflife.org/open-letter-autonomous-weapons/?cn-reloaded=1.
[9] The exhibit's subtitle (*Ain't I A Woman?*) comes from her famous speech two centuries ago and from the 1981 book by bell hooks.
[10] See excerpt from Paul Butler's *Chokehold* here https://www.theguardian.com/us-news/2017/aug/11/chokehold-police-black-men-paul-butler-race-america
[11] 'You can stop worrying about artificial intelligence (for now)' https://www.gq-magazine.co.uk/article/artificial-intelligence-future
[12] 'How I'm fighting bias in algorithms' https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms)
[13] 'Sun Ra' *last.fm* https://www.last.fm/music/Sun+Ra
[14] 'Rammellzee' *artnet* http://www.artnet.com/artists/rammellzee/
[15] See https://www.jmonae.com/?frontpage=true
[16] Many thanks to Angela King for this contribution.
[17] See eg., Erik Davis' *High Weirdness* (2019)
[18] Glitch is art that works with the 'glitches' that result from imperfectly coded visual representations generated by computers.
[19] See 'Glitch Studies Manifesto' https://archive.org/stream/RosaMenkmanGlitchStudiesManifesto_201504/%20Rosa%20Menkman%20-%20Glitch%20Studies%20Manifesto_djvu.txt
[20] Available here https://www.serpentinegalleries.org/exhibitions-events/hito-steyerl-actual-reality-os
[21] 'Is artificial intelligence set to become art's next medium?' . https://www.christies.com/features/A-collaboration-between-two-artists-one-human-one-a-machine-9332-1.aspx
[22] See https://aiartists.org/wayne-mcgregor
[23] See https://www.random-international.com/zoological
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