Robots as Art and Automation

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Despite the fact that this exhibition announces itself as 'the 500-year quest to make machines human', the problem with robots is that they are demonstrably *not* human. But, then again, neither are we. Few of us could claim to live without technological prosthetics, even if it is only that we rely on our mobile phones to provide essential support for our working and social lives and our much discussed ageing populations rely on a panoply of medical devices for their extended lifespans. In other words, the boundary between humans and machines has been breaking down for some time. Surveying the past five hundred years of robotic, prosthetic and cybernetic devices confirms the fact that our own inventions have been steadily eroding the dominance of the 'human' as a distinct idea.

Given that history, robots seem to be attempts to reproduce and externalise – in mechanical form – something elusive but perceived as essential to human and other forms of life. Although the majority of the exhibits here in some sense replace or extend human capacities, the most interesting, to my mind, are those surviving from earlier centuries which blur the lines between art and science. The mechanical spider attributed to Tobias Reichel (1604), for instance, offers a study of the mechanics of the insect body, explored through beautifully realised miniature engineering.

Strictly speaking, these are automatons rather than robots but the distinction is less clear than it appears. Henri Maillardet's exquisite draughtsman-writer automaton (1830) was pre-programmed to produce seven different pieces of drawing or writing. In basic terms, it is little different from Inkha, King's College University of London's famous robot receptionist which greeted, directed and sometimes insulted visitors to the Strand campus between 2003 and 2015. Both are pre-programmed (although Inkha is capable of many more than seven responses) and both are automated analogues of a specific human function.

The difference is that Inkha is a post-cybernetic machine, capable of responding to stimuli from her environment and adjusting her output accordingly. She is thus closer to the robot ideal given form by countless science fiction movies and TV series, represented here by exhibits in the 'Dream' gallery which features the T-800 Endoskeleton from *Terminator 2: Judgement Day* (1992) as well as a replica of Maria, the female android from Fritz Lang's masterpiece *Metropolis* (1927), who, seen 'in the flesh' is, dare I say it, somewhat clunky in appearance, suggesting that even female robots must be subjected to airbrushing to meet the demands of celluloid femininity.

Slave Labour

The other galleries here are 'Marvel', 'Obey', 'Build' and 'Imagine' which roughly correlate to historical periods, beginning in the late sixteenth century. Although the exhibition is curated in such a way that overlaps are signified, the final gallery, 'Imagine', directs visitors in a straight line through the first sixteen years of the twenty-first century and includes Inkha as well as high-profile celebrities of the contemporary robot scene like Pepper (SoftBank 2014) which 'reads' emotions and interacts accordingly and Kodomoroid (2014, Fig 2), a Japanese communication android that uncannily resembles a small and somewhat frail East Asian woman. Kodomoroid is a newsreading robot, a sort of sophisticated RSS feed and is actually designed to look like a child, although with her white robe and preternaturally pale features, secured behind toughened Perspex, she resembles nothing so much as an inmate of a futuristic correctional facility. This impression isn't helped by the fact that her cell is part of a sequence of similar Perspex boxes containing robots that are similarly and with few exceptions, well, *white*.

When I mentioned this to a friend who is a graphic designer she immediately referred me to the cultural significance that Apple products have conferred on anything white and electronic[1]. It is also, of course, the safest colour if you don't want to think too hard about what other colours might signify when you are designing what is, essentially, a slave. Interactive and 'social' they may be but, for instance, YuMi IRB 14000 (Switzerland, 2015), an industrial robot designed to 'work across a table from a person', Neo Evolution V5 (Japan, 2015)

which has been adapted as a concierge and Honda's Azimo (Japan, 2000) and the REEM family (Switzerland, 2006 – 10) which are adaptable to any number of 'service' functions are all designed to perform what amounts to unskilled or semi-skilled labour.

Interestingly, the original press release for the launch of Kodomoroid announces her as 'a work of art of sorts which asks profound questions about humanity's future' (Miraikan, 2014). The idea here is that her obvious physical vulnerability is in contrast to her superior 'mental' capacities as she sifts and sequences newsfeed data from across the world; data which catalogues wars, deprivation and the effects of global warming. She is an android then, explicitly designed to point out the futility of designing for a future which may never exist or in which robots may be more fitted to survive than their creators.

Three Laws

Of course we've come a long way from the days, around the mid twentieth century, when science fiction writer Isaac Asimov found it necessary to invent 'three laws' of robotics. First stated in 'Runaraound', a short story published in the March 1942 issue of *Astounding Science Fiction*, they decreed that:

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 it by human beings except where such orders would conflict with the First Law.
3) A robot must protect its own existence so long as such protection does not conflict with the First or Second Laws (Asimov 1983, pp269-70).

Asimov's Laws were meant to assuage fears that the new servant class would, in coming to full consciousness of their conditions, effectively stage a revolution and end the dominance of the human race forever. Currently, however, there are indications that they are achieving this without any significant effort.

As machines get smarter and take over more functions of human intelligence, organisations like *Humanity+* are taking refuge in a kind of accelerationism which embraces human 'enhancement' through a merger with advanced technologies. In this scenario, it is implied, climate change and its deprivations are of interest only to those sentimentalists who insist on remaining within the flesh as the more enlightened hurtle towards 'the singularity'.

This is the idea that, broadly speaking, humans are in the process of designing our own successor species. Exponential increases in machine intelligence will, according to techno-utopians like Ray Kurzweil and Masoyoshi Son, eventually lead to a situation where robots will design their own offspring, a process that will be too complex for mere mortal minds to encompass. Supported by wealthy corporations like Google, Space X and SoftBank, as well as considerable contributions from the US Government and the European Union (Fuller 2011, pp115-18), Kurzweil, Son and other luminaries of the robotics and artificial intelligence industries like Hans Moravec and Eric Drexler are working towards a brave new world in which minds disconnect from bodies, merge with machines and live forever, ostensibly, in a future version of the cloud. (Rejcek 2017, Thorpe 2016)

The 'singularity' describes the point at which 'we' (and my quotes here indicate a hesitation over just how inclusive this process might be) will no longer recognise ourselves as human or even understand what the concept entails. Why this should be desirable is left as understood. The thinking seems to be that our flesh bodies are a burden to be dispensed with; that our 'intelligence' (and, again, I'm hesitating to endorse a concept that is far from transparent) is trapped by our corporeality and our escape from both mortality and the planet is indicated by the current trajectory of technological development. The *Humanity+* programme involves both space migration and techniques like cryonic preservation as necessary steps in preserving self-selecting (and presumably superior) specimens of the current incarnation of humanity who will work towards the point where full integration becomes possible.

This kind of transcendence through assimilation seems to have been anticipated (as were many other aspects of contemporary life) by Marshall McLuhan when, in 1951, he identified a form of totemism in American life through which the threat to the human (and I would add here, specifically the human male) posed by technology was managed by recourse to embracing ideas which proposed that humans were not so very different from the machines that they feared[3]. Contemporary critical posthumanists would argue that, in any

case, the opposition between human and machine makes no sense if we take into account that the evolution of nature and culture are coterminous and interdependent (Braidotti 2013, Shaw 2017). However, McLuhan was writing at a historical moment which saw a significant turning point in the development of machine intelligence when the theory of cybernetics seemed to suggest that adaptive learning in machines was not only possible but inevitable (Holland and Husbands 2017).

This was the point at which, according to N Katherine Hayles (1999) we became posthuman; when expert systems seemed to point the way towards the development of general machine intelligence and it was recognised that humans, as much as machines, were cybernetic systems. This sets the terms for the interchangeability and interfaceability of organic and machine life. Walter Grey's cybernetic 'tortoises' (1951), one of which has been reconstructed for this exhibition, could move of their own volition, 'sense' their environment, avoid obstacles and even detect when it was time to return to their 'hutch' to re-charge their batteries.

The pulp science fiction of the period reacted with alarm and Asimov's three laws were borrowed by a number of writers to tame the robots that they could only imagine as avenging monsters (Shaw 2000, p68). But this of course was pre-miniaturisation and post-WWII. Technology for the world of the mid twentieth century was massive, imposing and often deadly. Perhaps reflecting, like the white droids of the twenty-first century, the dominant machine aesthetic of the time, early to mid-twentieth century robots were tin men. At the same time, and possibly in an unconscious attempt to tame the monster, some were strangely cute, despite their size.

W H Richards' George (UK 1930) was a showman rather than a worker and had the dubious pleasure of shaking hands with Hermann Göring and Joachim von Ribbentrop (Richards Lever & Richards 2017), Cygan (Italy 1957) was 2.5 metres tall and appeared, according to the catalogue, on a magazine cover with Brigitte Bardot (Russell, 2017, p84) and another George built in the UK by Tony Sale in 1949 out of scrap aluminium was six-foot tall and, the catalogue tells us, (p144) heralded as a pre-cursor robot domestic servant (but presumably only for the large homes of the well-heeled upper middle classes).

Industrial Relations

Appropriately then, the Georges and Cygan inhabit the 'Dream' gallery, alongside movie posters and toys that all, in some sense, play to desires for technology to be powerful, entertaining and, above all, controllable. Hollywood, in particular, has specialised in offering us marauding and rampaging robots and artificial intelligences which, in compliance with the industry's demands for a happy ending, must be ultimately tamed and the humans seen to triumph.

Famously, Ridley Scott had to wait ten years after the studio approved release of *Blade Runner* (1982) to release his director's cut (1992) with its more ambiguous ending and, although it is the robot Maria that is remembered and celebrated, in Lang's *Metropolis* she is a disruptive temptress who leads the workers to destroy their underground city. The resolution sees her vanquished and the original Maria, a strange cross between Mother Teresa and a shop steward, is restored to realise her version of industrial relations in which peace and understanding triumph over violence and revolution.

There is a clever contrast here between 'Dream' and 'Obey' which features the industrial machinery of the nineteenth and early twentieth century, reminding us that the robots that we take for granted are those that have had the most cultural impact. Although we may dream of robots in humanoid form, it is those that have replaced us, or at least some of our functions, in the relations of production that have brought the greatest changes in social life. Appropriately, it is made clear that it was the workers who had to obey the machines, rather than the reverse. This is emphasised by the proximity of the robot Maria as a centrepiece of the exhibition. Lang's film is equally famous for its representation of industrial machinery as a gape-jawed Moloch to which the workers are enslaved. In her essay for the catalogue, Judy Wajcman also evokes Charlie Chaplin's *Modern Times* (1936) which gave us the unforgettable image of the Little Tramp rendered unable to distinguish between his work on the production line and the artefacts of cultural life. In one memorable scene, he tries to 'tighten' the buttons on a woman's skirt with the spanners that have become fused to his hands.

Featured in the 'Obey' gallery is the single shuttle loom, introduced into the UK textile industry in the late nineteenth century and a significant driver of both industrial and social change. It reminds us that industrial workers in concert with their machines were, strictly speaking, the first cyborgs and that cloth weaving provided the impetus for the development of computer programming (Nahum 2017, p64). Some more recent industrial robots like 'Baxter' which has flexible arms and six 'facial' expressions (it looks sad when its power is low) are more 'human' in appearance but the holy grail of robotics, a robot that is capable of human analogue bipedal locomotion is still largely elusive.

The 'Build' gallery features, for instance, the Honda P2 (Japan 1996) which could even walk up stairs but had to stop for recharging every fifteen minutes. Eccerobot (Europe 2009) is a more convincing anthropomimetic design, if somewhat cyclopean in appearance and lacking a lower body. But it seems that attempting to imitate the structure of the human body brings with it similar problems of wear and tear. Eccerobot not only dislocated its shoulder but developed stiff joints and a twisted spine. Rob's Open Source Android (ROSA, France 2010-16) looks more promising but only seems to be able to manage to signal in semaphore. The ASIMO family of robots remain the most startlingly lifelike. This exhibition features an early (2000) version and informs us that the 2011 version can run, jump, hop, kick a ball and use sign language. The 2017 version (also not shown here) manages an uncanny approximation of dad dancing (BestTimesNow, 2017). But while its duckwalking locomotive ability is certainly impressive, it is the manual dexterity of ASIMO that should give us pause.

Opposable Thumbs

One of Gary Larson's *Far Side* cartoons depicts two cows sitting comfortably in a well-appointed living room. Between them is a table on which is a loudly ringing telephone. "Well, there it goes again", says one cow to the other, "and here we sit without opposable thumbs". Watching ASIMO, I'm reminded that robots need opposable thumbs even less than cows do. The idea of a robot answering a telephone, for instance, or manipulating a computer keyboard is just as logically inconsistent as expecting a cow to do so because a robot can *be* a telephone and *is* a computer. While there is little doubt that ASIMO is aimed squarely at the market inaugurated by Tony Sale's George, the fact remains that an obedient servant with human-level dexterity may be persuaded to operate technology somewhat more deadly than a telephone. It may then be the case that we will need Asimov's three laws after all.

It is, in fact, the deadly potential of robots that is elided in this exhibition. While it makes the point that industrial technologies effectively enslaved their human operators, it neglects the fact that smart bombs, drones and new co-ordinated and scalable autonomous weapons systems currently under development are furthering the 500-year quest to make machines human by making them capable of self-directed and single minded deadly violence (Russell, 2016).

Also missing are the android love dolls currently being created by companies like Abyss Creations (2017). which are set to drive the technology forward in the same way that demand for pornography drove the development of streaming video and digital payment systems. Abyss's current model, Harmony, cannot walk (it would use too much power) but she can hold a conversation, learn enough about her owner to respond autonomously to his desires and Abyss are working on an upgrade which will enable her to simulate an orgasm. It goes without saying that she is the perfect, compliant and uncomplaining companion that many men desire.

Jenny Kleeman, writing for *The Guardian* website, suggests that Harmony is a successor to Pygmalion's Galatea, the beautiful statue that he begged the goddess Venus to bring to life. The problem, of course, is that the living, breathing Galatea was, indeed, a real woman and thus imbued with agency and a mind of her own. In the myth, Pygmalion becomes disenchanted when she attempts to impose her will, displaying, to his mind, all the female 'faults' that he had fashioned the statue to avoid. Harmony, by virtue of *not* being human seems to be the ideal solution. With just enough autonomy to be surprising but not enough to refuse sex (or, indeed, run away) she is the perfect foil for insecure heterosexual masculinity and is thus set to both make her creators a fortune and set the standard for domestic service robots as well as sex toys.

Versions of Galatea and Harmony abound in literature and even the ancient and medieval worlds had their sexbots. Sanskrit texts from as early as the eleventh century refer to 'fountain houses' where female automata sprayed scented water from their nipples (Truitt 2017, 38) and a mid-twelfth century document recounts the

opulent automata that could be found in the city of Troy. Interestingly, one of these, a young woman whose dancing and acrobatics were so arresting that nobody could leave during her performance (ibid, p42) seems to have been the template for the robot Maria in *Metropolis* whose erotic dance was cut from the original version of the film and was not restored until 2002.

One of the very few *male* robot sex toys was imagined by Joanna Russ in her 1975 novel *The Female Man*. Davy is not only built like Adonis. He serves drinks, cooks and is a compliant sex slave. Currently, another sex doll company, called simply Android Love Dolls, is cautiously marketing a couple of wannabe Davys called Robert and Adam. Robert, the deluxe version, 'can perform over 100 sexual acts autonomously', has a 'realistic penis' and is 'like being with a real boy'. Disappointingly, he is only 5' 4", qualifying the use of 'boy' rather than 'man' and possibly (although inconclusively) not aimed at the female market. Personally, I incline more towards Shadow Robot Company's 'Dexterous Hand' (2013) which, according to the exhibition catalogue, can move its fingers and thumb both delicately and precisely.

The point here, of course, is that robot sex slaves, whatever their gender, must necessarily be fashioned after the human body and yet surpass it in responsiveness, malleability and dexterity. Robots may not *need* hands but if they are to replace us in any of our functions then they must necessarily enter a world in which touch and the ability to grasp and manipulate objects with delicacy and precision has structured the insertion of technology into social life as much as it has shaped our cultures.

As David Levy points out in *Love and Sex with Robots,* social robots must be able to sense the world as humans do (2009, p122) and touch and dexterity are an important part of the human sensorium. Furthermore, as the machines featured in the Obey gallery here remind us, industrial machinery was designed explicitly for efficient manipulation by persons with opposable thumbs and all the industrial robots on display here simulate the movement and capacity of human hands and arms. I am reminded of Antonio Gramsci's comment to the effect that the industrial worker on the Fordist production line could easily be replaced by a 'trained gorilla' (1971, p310). Cows, it hardly needs stressing, need not apply.

The lesson we can take from this exhibition is, I think, that we seem to have come a long way but can be seen to have travelled not very far at all. The intricacy and artistry of early modern automata makes the twenty-first century robots on display here seem clunky and unimaginative, despite their more sophisticated ability to interact. ASIMO possibly comes closest to emulating human behaviour but there is nothing here that plunges us into the uncanny valley. This seems to suggest that we are still a long way from producing robots that will be considered persons but the emergence of Synthetic Biology which is moving towards engineering wetware which can, potentially, house the software of Artificial Intelligence suggests that it is a scenario for which we may need to prepare (Synbicite 2017).

Nevertheless, as Judy Wacjman points out, in the headlong rush to produce servants that will save us time, we have not stopped to ask what we are saving time *for* (p.115). Nor, I would add, have we fully questioned the politics of producing human analogues who are effectively slaves. I was pondering this when I came across an industrial robot called AMICO which seemed to be on strike. A notice informed me that it was 'resting'. 'But', the curators had added confidently, 'we'll have it working again soon'.

Robots defining the human

According to Ben Russell in his introduction to the exhibition catalogue, 'robots have played the vital role of mirrors for us humans, allowing us to look at ourselves and argue about what we are and what we might be' (2017, p12). But I think it is more accurate to say that they embody an ideal; a representation of what we desire, or desire others, to be. Robots, on the evidence here, are functional abstractions which support the illusion of mimesis but are fundamentally simulacra; in Jean Baudrillard's terms, copies without an original (Baudrillard 1983). Far from 'making machines human' it seems we have been engaged, over the past 500 years, in attempting to model successive ideologically determined iterations of what we think humans *should* be.

The centrality of the Obey gallery to this exhibition is again significant here. It makes the link between the subsumption of labour by capital as expressed in industrial machinery and control of the reproduction of living

beings which is its corollary. In this sense, mechanical production can be seen to effectively *define* what it means to be human. As Charles Thorpe points out, when Philip K Dick wrote *Do Androids Dream of Electric Sheep?* (1968), the book on which Scott's *Blade Runner* was based, he was well aware that the trajectory of industrial capitalism and 'the transformation of living organisms into productive machines' was towards 'the animation of the non-living' so that the two would finally become indistinct (2016, p55). *Blade Runner*'s 'skin jobs' are marketed as 'more human than human'. What they *are* is efficient machines, rendered complaint by curtailed lifespans which also ensures that they remain replaceable commodities.

It is worth remembering that the 500 years of history represented here is also a history in which people deemed less than human have been denied basic rights, European curiosity about other races has produced questionable 'scientific' practices designed to establish a hierarchy of natural kinds and evolutionary theory has been enrolled to prove the 'truth' of Social Darwinism and justify the practices of eugenics. As Tony Bennett (1995) has demonstrated, the conventions of museum display have played no small part in establishing these discourses and fixing something called 'humanity' within a determined matrix, providing a taxonomic 'truth' which would allow the human to emerge as distinct. This exhibition reminds us that robots have played their own part in enabling us to determine the parameters of that distinction. But it also suggests that the time may be fast approaching when telling the difference will no longer be possible or, for some, even desirable.

Notes

[1] Thanks to Angela King for this observation.

[2] He had in mind theories like Behaviourism which understood human psychology purely in terms of stimulus/response such that psychological states could be determined solely with reference to the actions of the body. Aberrant behaviour could thus be corrected by eg., brain surgery in the same way that the operations of a machine could be corrected by tinkering with the mechanism. Interestingly, a form of neo-behaviourism is implied in contemporary social engineering techniques. See Will Davies' *The Happiness Industry* (2016).

Bibliography

Abyss Creations. (2017). *RealDoll*. [online]. Available at: https://www.realdoll.com/. [accessed 12 June, 2017]
Android Love Dolls (2017). [online]. Available at: http://www.androidlovedolls.com/. [accessed June 12, 2017]
Asimov, Isaac. (1983). *The Complete Robot*. London: Panther.
Baudrillard, Jean. (1983). *Simulations*. New York: Semiotext(e).
Bennett, Tony (1995). *The Birth of the Museum: History, Theory, Politics*. London & New York: Routledge.
BestTimesNow. (2017). *Honda's Asimo 2017 demo at Barber Motorsports Park*. [video]. Available at: https://www.youtube.com/watch?v=fQ3EHtEl_NY. [accessed 12 June, 2017]
Blade Runner. (1982/92). [film] California, USA: Ridley Scott.
Braidotti, Rosi, (2013). *The Posthuman*. Cambridge, UK & Malden, MA: Polity Press.
Davies, Will. (2016). *The Happiness Industry*. London & New York: Verso.
Dick, Philip K. (1968/1999). *Do Androids Dream of Electric Sheep?* London: Orion.
Fuller, Steve. (2011). *Humanity 2.0: What it Means to be Human Past, Present and Future.* Houndmills, Basingstoke, UK & New York: Palgrave.
Gramsci, Antonio. (1971). *Selections from Prison Notebooks*. London: Lawrence & Wishart.
Hayles, N Katherine. (1999). *How We Became Posthuman*. Chicago & London: University of Chicago Press.
Holland, Owen & Phil Husbands. (2017). Pioneers of Cybernetics: Grey Walter's robot tortoises and the Ratio Club. In: B. Russell, ed., *Robots: The 500-year quest to make machines human*. London: Scala Arts & Heritage. Pp86-99.
Humanity+ [online] Available at: humanityplus.org. [accessed 11 June, 2017]
Isaac Asimov's "Three Laws of Robotics", (1942/2001). *List of Lists.* [online]. Available at: http://www.auburn.edu/~vestmon/robotics.html [accessed 11 June, 2017]
Kleeman, Jenny. (2017). The race to build the world's first sex robot. *The Guardian* [online]. Available at: https://www.theguardian.com/technology/2017/apr/27/race-to-build-world-first-sex-robot. [accessed 12 June, 2017]
Levy, David. (2007). *Love and Sex with Robots*. Harper Collins e-books. [Kindle edition]
McLuhan, Marshall. (1951/1967). *The Mechanical Bride.* London: Routledge.
Metropolis. (1927/2002). [film]. Berlin, Germany: Fritz Lang.

Miraikan, (2014). *Meet the World's Most Advanced Android Robots!*

Modern Times. (1936). [film]. California, USA: Charlie Chaplin.

Nahum, Andrew. (2017). Automata, androids and life. In: B. Russell, ed., *Robots: The 500-year quest to make machines human*. London: Scala Arts & Heritage. Pp50-67

Rejcek, Peter, (2017). Can Futurists Predict the Year of the Singularity?. *SingularityHub* [online]. Available at https://singularityhub.com/2017/03/31/can-futurists-predict-the-year-of-the-singularity/. [accessed 11 June, 2017].

Richards Lever, Andrina & Deborah Richards. (2017). Robots in the family: Captain W H Richards and his mechanical men. In: B. Russell, ed., *Robots: The 500-year quest to make machines human*. London: Scala Arts & Heritage. Pp70-83.

Russ, Joanna. (1975/85). *The Female Man*. London: The Women's Press.

Russell, Ben. ed., *Robots: The 500-year quest to make machines human*. London: Scala Arts & Heritage.

Russell, Stuart. (2016). Robots in War: The Next Weapons of Mass Destruction. *World Economic Forum*. [online]. Available at: https://www.weforum.org/agenda/2016/01/robots-in-war-the-next-weapons-of-mass-destruction/. [accessed 09/06/2017].

Shaw, Debra Benita. (2000). *Women, Science & Fiction: The Frankenstein Inheritance.* Houndmills, Basingstoke, UK & New York: Palgrave.

Shaw, Debra Benita. (2017). *Posthuman Urbanism: Mapping Bodies in Contemporary City Space*. London & New York: Rowman & Littlefield International.

Synbicite. (2017). What is Synthetic Biology? [online]. Available at: http://www.synbicite.com/synthetic-biology/what-synthetic-biology/. [Accessed 27 June, 2017].

Terminator 2: Judgement Day. (1991). [film] California, USA: James Cameron

Thorpe, Charles. (2016). *Necroculture*. New York: Palgrave Macmillan.

Truitt, E R (2017). In whose image? Ancient and medieval automata. In: B. Russell, ed., *Robots: The 500-year quest to make machines human*. London: Scala Arts & Heritage. Pp32-47.

Wajcman, Judy. (2017). Humanoid robots and the promise of an easier life. In: B. Russell, ed., *Robots: The 500-year quest to make machines human*. London: Scala Arts & Heritage. Pp102-117.

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