Minds, Bodies, Machines: Essays in the
Cultural and Intellectual History of Technologies
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In 1989 Rodney Brooks, Director of the Artificial Intelligence (AI) Laboratory at MIT, predicted that America would soon be able to conduct inter-planetary exploration and colonisation with millions of tiny robots. Asserting that 'biology and evolution were good models to follow', Brooks designed his 'gnat robots' as insects, each with sensor-whiskers, six legs, and a sophisticated microchip. In terms of risk management and optimisation of resources, the superiority of 'swarms' of mass-produced, cheap and autonomous robots over a single large and expensive ground-controlled robot was obvious. In conclusion Brooks argued that, just as exploration of the Earth had 'proceeded by many small spontaneous sorties into the unknown', so 'with imagination and verve we can invade the whole solar system'.[1] Futuristic as this may sound, there is nothing new in the MIT Lab's imaginative blurring of the boundaries between the organic (the insect) and the mechanical (the robot). In the seventeenth century, inspired by the new science of magnification, observers noted the startlingly close resemblance between insects and 'Engines'. Insect interiors were, Richard Leigh declared, 'Like living Watches, each of these conceals / A thousand Springs of Life, and moving Wheels'.[2] For another observer, the 'pretty Engines' of 'Insectile Automata' housed 'all the perfections of the largest Animals', including the human machine.[3]

This fascination with the unstable boundaries between human or insect life and machines developed further in the eighteenth century with the invention of the first biomechanical automata. But it is in the nineteenth century, our focus here, that the relationship between the human and the machine under post-industrial capitalism becomes a pervasive theme. From Blake on the mills of the mind by which we are enslaved, to Carlyle's and Arnold's denunciation of the machinery of modern life, from Dickens's sooty fictional locomotive Mr Pancks, who 'snorted and sniffed and puffed and blew, like a little labouring steam-engine', and 'shot out […] cinders of principles, as if it were done by mechanical revolvency',[4] to the alienated historical body of the late-nineteenth-century factory worker under Taylorization, whose movements and gestures were timed, regulated and rationalised to maximize efficiency; we find a cultural preoccupation with the mechanisation of the

nineteenth-century human body that uncannily resonates with modern dreams and anxieties around technologies of the human.

This issue of *19* brings together a selection of essays from an interdisciplinary conference on 'Minds, Bodies, Machines' convened last year by Birkbeck's Centre for Nineteenth-Century Studies, University of London, in partnership with the English programme, University of Melbourne and software developers Constraint Technologies International (CTI). The aim of the conference was to explore the relationship between minds, bodies and machines in the long nineteenth century, with a view to understanding the history of our technology-driven, post-human visions. These visions were well represented by one of our keynote speakers, Kevin Warwick, Professor of Cybernetics at the University of Reading and controversial author of *I, Cyborg* (2002). In this autobiography, Warwick details his dissatisfaction with being human. Not only are we limited in physical strength, he argues, but our sensorium is restricted to five senses. Most grievous of all is the fallibility of our speech as a mode of communication. Warwick argues:

> Human speech is serial, error-prone and an incredibly slow way of communicating with others. Our coding procedures, called languages, severely restrict our intellect, as all our thoughts and ideas have to be transformed into signals that do not always accurately represent the original concept.[5]

Our creation of massively intelligent machines leaves us little option, Warwick believes, but to assimilate elements of technology into ourselves so that we become cyborgs – cybernetic organisms which are part-human, part-machine. For Warwick, the cyborg project has two faces, one respectable – medical research into physical disability – the other more difficult to sell, namely 'the upgrading of humans and the realization of the superhuman being' (*IC* 178). For the most part Warwick is untroubled by the ethics of the superhuman project, believing that before too long we will have no choice but to upgrade ourselves. Furthermore, there is the lure of being a pioneer, of standing (as his Victorian hero Alexander Bell once did) 'on the threshold of the most incredible scientific project imaginable, one that is sure to change, incalculably, humankind and the future' (*IC* 4). With an implant array fired onto his median nerve, Warwick thrills to the sensation of transmitting brain signals

via a computer onto a robot hand: 'I felt extremely powerful. Although the robot hand was roughly the same size as my own, we could have made one much bigger and stronger, in which case I would have been like the six-million-dollar man from the science-fiction series' (*IC* 233). If Warwick's cyborg is super-masculine, it is also heteronormative: the exciting aim of achieving nervous system to nervous system communication with his wife Irena via a 'his-and-hers implant experiment' helps to save their marriage (*IC* 137). Like the experiment with the robot arm, success in the first stage of this 'pure' form of communication opens out into even grander vistas; a form of telegraphic code between nervous systems might begin by sending movement signals, but theoretically there is no limit to what might be achieved. As Warwick speculated: 'what about emotional signals associated with being happy, depressed, shocked or even sexually aroused?' (*IC* 138) In so far as Warwick's project involves 'jacking into' his wife's nervous system by means of direct neural links, his cyborg differs markedly from the ironic and revolutionary cyborg of Donna Haraway's feminist-socialist 'Manifesto for Cyborgs' (1985), an essay which opened a space for new forms of identity – 'we are all chimeras, theorized and fabricated hybrids of machines and organism'.[6] What both share, however, is a daring flirtation with 'transgressed boundaries, potent fusions, and dangerous possibilities' (*MC* 154).

For Warwick the successful marriage of two nervous systems is celebrated as a highly sexualised and triumphant transgression of boundaries. In 'Dreaming of Cyborgs, Sex, and Catastrophe', Peter Otto responds to this moment and to Warwick's keynote talk 'Upgrading Humans via Implants – Why Not?' by reflecting on the drives and fantasies that underpin this longed-for oneness of 'pure' connection, this fusion of body-machine-body. Informing and shaping Warwick's science are, Otto argues, 'images, concepts and dreams drawn from literature, mythology and popular culture'. The stark alternative which haunts Warwick's utopian vision of merging with the machine is an android apocalypse in which humans, degraded to a sub-species, are dominated by super-intelligent machines, a nightmare which can only be averted by the comic-book superheroes of Warwick's formative years, Hal Jordan and the Green Lantern Corps. In Otto's view a more productive, less apocalyptic way of imagining human/machine interaction is

provided by Andy Clark's *Natural-Born Cyborgs* (2003) which argues that it is a mistake to see human minds standing apart from technology. Instead of conflict between minds and machines, the focus should be on complex ecologies that include biological and non-biological components.

Jonathan Sawday, in 'Upgrading Humans – Re-grading People', also rejects Warwick's dramatic futuristic scenario of machines and humans battling for supremacy, arguing instead that we have always been fused with our devices, implements, and prostheses. As a literary critic and cultural historian, Sawday locates Warwick's post-human aspirations within a wider cultural tradition. Hovering uneasily between scientific reality and 'the more ambiguous arenas of myth, fiction, film, and even computer games', Sawday argues that Warwick's hopes and ambitions exemplify 'much earlier dreams of human perfection and perfectibility'. His work also has continuities with Charles Darwin's theory of evolution, and with Sigmund Freud's idea of man as a 'prosthetic God', made magnificent by his 'auxiliary organs' but also greatly troubled by them.

Just as literature, film and other media have shaped Warwick's thinking about science, so too do they influence popular understandings of science, and these understandings play an important role in what is now called 'the policy arena', an influential, semi-autonomous zone of activity according to Jay Clayton. Where science policy is concerned, interdisciplinary committees of researchers and scholars participate vigorously in the debates, but cultural critics are conspicuous by their absence. Given that critique in this arena has the chance of having real consequence, Clayton asks how we, as specialists deeply versed in literature, popular culture and the arts, might make our voices heard? Through a reading of Wilkie Collins's novel *The Legacy of Cain* (1888), Clayton models a kind of critical practice that could be of interest to the policy community in so far as it performs a historical and comparative analysis of the changing place of scientific concepts in society. The current 'hot topic' of epigenetics, the study of the non-genetic sources of human inheritance, is what makes a Victorian novel like *The Legacy of Cain* so interesting today. The idea that environmental conditions affecting the parent can be passed onto the child, a view captured in Collins's novel, appears to us today to have a liberating effect; as a science epigenetics undermines biological determinism, it

frees us up from an automaton-like playing out of hereditary impulses. But Clayton shows how this 'progressive' strand of Collins's thinking about character and inheritance in late-nineteenth-century England co-exists with a quite contradictory set of conventional cultural presuppositions about women's innate character. In its thematic incoherence, Collins's late-nineteenth-century novel teaches us to think in more complex ways about how we conceptualise the heritability of behaviour today.

I

Humanoid robotics is a new science in which living creatures and machines continually redefine each other. The dynamics of this redefinition are captured in the language of computer scientists and engineers. 'Robo sapiens' gives a robotic spin to *Homo sapiens*; 'animatronic' yokes 'anima' (the soul) to 'electronic'; 'biomechanics' fuses nature and mechanical engineering; and 'Cog' is the name of Rodney Brooks's humanoid robot, a name which links 'cog' of a wheel to human cognition, and is evocative of the clockwork mechanics of the Enlightenment. All these neologisms distinguish living organisms from machines at the same time that they breach that boundary. As coinages, they capture the ways in which all aspects of our lives – physical, intellectual, and spiritual – are now mediated by technology. In this issue of *19*, five essays chart the continuities and discontinuities in the imagining of the human/machine interface in the nineteenth and twenty-first centuries. Patricia Pulham, in 'The Eroticism of Artificial Flesh in Villiers de L'Isle Adam's *L'Eve Future*', plots this 1886 novel's female android Hadaly (which means 'the ideal') as a descendant of the classical myth of Pygmalion and a forerunner of today's 'Real Dolls' – highly realistic, human-sized silicone 'love dolls'. Liminal, neither dead nor alive, Hadaly and her many sisters in literature, film and popular culture elicit contradictory responses in their beholders: either the fantasy of animation, or the love of sculptural stasis, a form of necrophilia. They also demonstrate how anxieties about technology are frequently displaced onto the figure of the woman, as evidenced in Frankenstein's brutal destruction of the female mate for his monster. Conforming to a masculine ideal – still, silent and perfectly

malleable in form – female dolls are preferable to unsatisfactory real-life mistresses because they are objects on which their creators can project their own desires and desired responses.

For the Pre-Raphaelite painter Edward Burne-Jones, the fickle mistress in his life was 'damnable paint', especially when it came to depicting his favourite subject, the heroic, super-normal individual. Plagued by the instability of his medium, the damaged, abraded surfaces of Burne-Jones's paintings stood, Caroline Arscott argues, as correlates of the anxiety he felt about his own disintegrating body. In tracing this anxiety in her article 'Mutability and Deformity', Arscott shows how scientific developments in the nineteenth century led to a radical re-imagining of the body and its possible boundaries, with the artist moving from a fantasy of the hero as cybernetic body – a machine-man whose physiology was imagined in mechanistic terms – to a fantasy centred on the bacterial. From an intricate infolding, such as we see in the platelets of Burne-Jones's knights' armour and more generally in the mechanical marvels of the Great Exhibition (1851), the emphasis shifts during the nineteenth century to the spread and mutation of organic being through and beyond the self. Furthermore, in Count Dunin's 'Expanding Mechanical Figure', displayed in the Great Exhibition (Arscott, **fig. 3**) we see a parallel shift from the amazing and intricate automaton of the eighteenth century, which could duplicate the actions of a single figure, to the depersonalised logic of factory production, where a single automaton performs one action perfectly and in so doing occupies the place of a thousand men.

In 'The Face of Physiology' Paul White traces the mechanisation of physiology as a discipline in the nineteenth century, a trend which threatened to sever the link between the mind (or moral character) and body, a link central to the popular science of physiognomy, or the art of reading character through external features and form. Under pressure from the developing science of physiology, the face, which had once been a medium of sympathy and a window to the soul, now became a device of self-registration, proving that the play of mind and emotion was no more than a stage-set concealing a mechanism. White shows how Charles Darwin's *On the Expression of Emotions in Man and Animals* (1872) identifies emotional expressions as vestiges of physiological modifications that had once

given competitive advantage. Darwin's approach to expression is instrumentalist, focussing solely on those aspects which can be measured and manipulated, whilst remaining reticent on the relationship between emotions and inner character. Darwin's position is presented as falling between Charles Bell, who believed emotions expressed the highest and noblest part of human nature, and the French galvanist, Guillaume Duchenne, who interpreted emotion as a form of mechanism. For Darwin, expressions were indeed reflex actions, but they were neither purely mechanical nor completely controllable by volition. Nevertheless, his instrumental approach to facial expression might be said to look forward to the behaviourists who, in their emphasis on externals rather than on internal mechanisms or subjective experiences, have been so influential on mid-twentieth-century cyberneticists.

The physiological research that underpinned accounts of the human body and emotions as a reflex mechanism was facilitated by new technologies, such as photography, that promised to replace the scientific practitioner as observer with a precision machine. Darwin himself used photography as a distancing device in his work on the evolution of expression. Stephen Monteiro, in his article 'Veiling the Mechanical Eye' shifts the focus from the camera's role in science to its social mobility within the topography of Victorian London. Charting the different locations and settings of the portrait photographer Antoine Claudet's various London studios, Monteiro shows how the increasing prestige of photography was dependent upon veiling its scientific technology of optics and chemistry, presenting instead a spectacle of creativity and luxury. Hoping to obfuscate the commercial relationship between photographer and client, Claudet's final studio – his 'Temple of Photography' on Regent Street – used paintings, sculpture and architecture to shift the focus from the machinery of photography to the act of image-making itself, in the process mimicking the relationship between the portrait painter and his sitter. Crucial to Claudet's commercial success was the creation of a mythology that photographers were not mere mechanical 'operators' but creative artists who relied on an invisible machinery to bind their endeavours to the highest traditions of fine art.

Finally, in 'The Republic of Pemberley', Fiona Brideoake brings us into the realm of cyberspace, politeness and citizenship. Drawing upon the universalising

rhetoric of the Habermasian public sphere, Brideoake brings into productive alignment the democratising impulses of both eighteenth- and twentieth-century technologies of sociability. She does this by juxtaposing the contemporary cyber-community of 'The Republic of Pemberley', patronised by fans of Jane Austen, with the sociable paradigms symbolised by eighteenth-century Bluestocking salons. Both communities espouse a utopian discourse of egalitarianism and social inclusiveness; at the same time, however, these ideals are undercut by certain class and heteronormative restrictions on membership. In the case of the theoretically democratic spaces of the Bluestocking salons, we see how progressive possibilities were undermined by class prejudice and sexual propriety. Similarly, in the 'Republic of Pemberley', a democratising pop-cultural celebration of Jane Austen continually rubs up against normative containment, expressed in somewhat twee assertions of bourgeois social norms. All kinds of people are welcome in the 'Republic', except that you are required to be a very particular kind of Austen devotee. Even the performative identities afforded by the anonymity of cyberspace are ruled out in favour of 'real' identities, thus reinstating all the prevailing hierarchies of race, class and gender which the 'Republic' purportedly stands against.

The sketch of the female automaton with mechanical arms, powered along by steam (or is that an industrial smoke-stack on her head?) can be found in the family papers of the novelist Fanny Burney, a second generation Bluestocking. This satirical sketch of a fashionably dressed and coiffed young woman reminds us that technologically mediated sociability is not just a feature of our own age. As a Parisian hostess remarked to Horace Walpole, the men and women at her recent salon played their roles like 'spring-driven machines',[7] a direct allusion to Diderot's definition of an android as 'an automaton with a human figure, equipped through the means of a certain spring drive to act like and conduct functions which apparently resemble those of humans'.[8] Some of the more elaborate and ingenious androids built in the eighteenth century were so lifelike that they survived into the nineteenth century, troubling the supposed opposition between the terms 'life' and 'mechanism' and inspiring visions of intelligent machines. John Joseph Merlin, 'a very ingenious mechanic' and a friend of Fanny Burney, created two automata that made a huge impression on the young Charles Babbage, the inventor of the

calculating machine. At about eight years old, young Babbage was taken by his mother to Merlin's Mechanical Museum in London where the inventor took the boy upstairs to his backstage workshop. There Babbage saw what he would never forget: two female figures of silver, about twelve inches high. The first automaton was 'singularly graceful', a figure composed of brass and clockwork which could

> perform almost every motion and inclination of the human body, viz. the head, the breasts, the neck, the arms, the fingers, the legs &co. even to the motion of the eyelids, and the lifting up of the hands and fingers to the face.

Babbage remembered that 'she used an eye-glass occasionally and bowed frequently as if recognizing her acquaintances', a mechanised display of polite sociability. But it was the second automaton which made the greatest impression. She was, Babbage recollected,

> an admirable danseuse, with a bird on the forefinger of her right hand, which wagged its tail, flapped its wings and opened its beak [. . .]. The lady attitudinized in a most fascinating manner. Her eyes were full of imagination, and irresistible.[9]

Over three decades later Babbage purchased the *danseuse*, restored her to mobility, and after inviting female friends to clothe her nakedness, enshrined her on a glass pedestal in his drawing room. Guests were then entertained by Babbage with a lecture on the figure's 'pure mechanism' and its status as a 'splendid bauble', all of which were explicitly contrasted with the product of masculine reason sitting in an adjacent room, the Difference Engine, No. 1. The gender hierarchy of low (feminine) mechanism as opposed to high (masculine) engine is ironic given that it was Babbage's friend, the brilliant mathematician Ada Lovelace, who developed the first software programme for the Difference Engine, an achievement due principally to the fact that she saw more clearly than Babbage the great potential of his machine.[10] Her understanding of her role *vis-à-vis* the Engine can be seen in her witty designation of herself in 1843 as 'the High Priestess of Babbage's Engine'. That she should figure herself as the religious guardian of secret knowledge was curiously prescient of a tendency today to regard software as a spiritual domain, in itself a return to the Platonic belief that mathematics is the soul of the world.[11] In 1998, in honour of Lovelace's achievements, the British Computer Society established the Lovelace Medal.

Kevin Warwick's cyborg ambitions occupy a moment in a much longer history of master narratives that have grown up around minds, bodies and machines since the Enlightenment. This issue of *19* explores just some of the entanglements of these narratives with literary, cultural and social concerns. The connections are complicated and fascinating, from the Victorians' gendered and hierarchical division of machinery into mechanisms and engines, to the new materialist physiology which denigrated emotion in favour of manly self-control, or the preference for dolls over flesh and blood women. All these discourses have important implications, for women, for animals, children and non-European races. And if we ever arrive at the post-human, will it entail the annihilation of human subjectivity or can we look forward to a more positive partnership between humans, nature and intelligent machines?

Endnotes:

[1] Rodney A. Brooks and Anita M. Flynn, 'Fast, Cheap and Out of Control: A Robot Invasion of the Solar System', *Journal of the British Interplanetary Society*, vol. 42 (1989), 478-485.

[2] Richard Leigh, *Poems, upon several occasions, and, to several persons. By the author of The Censure, of the Rota* (London, 1675).

[3] Henry Power, *Experimental Philosophy, in three books containing new experiments microscopical, mercurial, magnetical. . . .* (London: 1664).

[4] Charles Dickens, *Little Dorrit* (1857), ed. by John Holloway (London: Penguin, 1967), pp. 190, 202.

[5] Kevin Warwick, *I, Cyborg* (Urbana and Chicago: University of Illinois Press, 2002), p. 2. Further references to this edition are given after quotations in the text.

[6] Donna Haraway, 'A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century', in *Simians, Cyborgs and Women: The Reinvention of Nature* (New York: Routledge, 1991), pp. 149-181 (p. 150).

[7] Simon Schaffer, 'Enlightened Automata', in *The Sciences in Enlightened Europe* (Chicago: University of Chicago Press, 1999), p. 138.

[8] Diderot, *Encyclopédie* (1751), quoted by Adelheid Voskuhl, 'Motions and Passions: Music-Playing Women Automata and the Culture of Affect in late Eighteenth-Century Germany', in *Genesis Redux: Essays in the History and Philosophy of Artificial Life*, ed. by Jessica Riskin (Chicago: University of Chicago Press, 2007), p. 293.

[9] See Simon Schaffer, 'Babbage's Dancer', <http://www.hrc.wmin.ac.uk/theory-babbagesdancer-print.html>.

[10] For mechanism as opposed to engine, see M. Norton Wise, 'The Gender of Automata in Victorian Britain', in *Genesis Redux: Essays in the History and Philosophy of Artificial Life*, ed. by Jessica Riskin (Chicago: University of Chicago Press, 2007), pp. 163-95.

[11] See Jessica Riskin, 'Introduction: the Sistine Gap', in *Genesis Redux: Essays in the History and Philosophy of Artificial Life*, ed. by Jessica Riskin (Chicago: University of Chicago Press, 2007), p. 6.