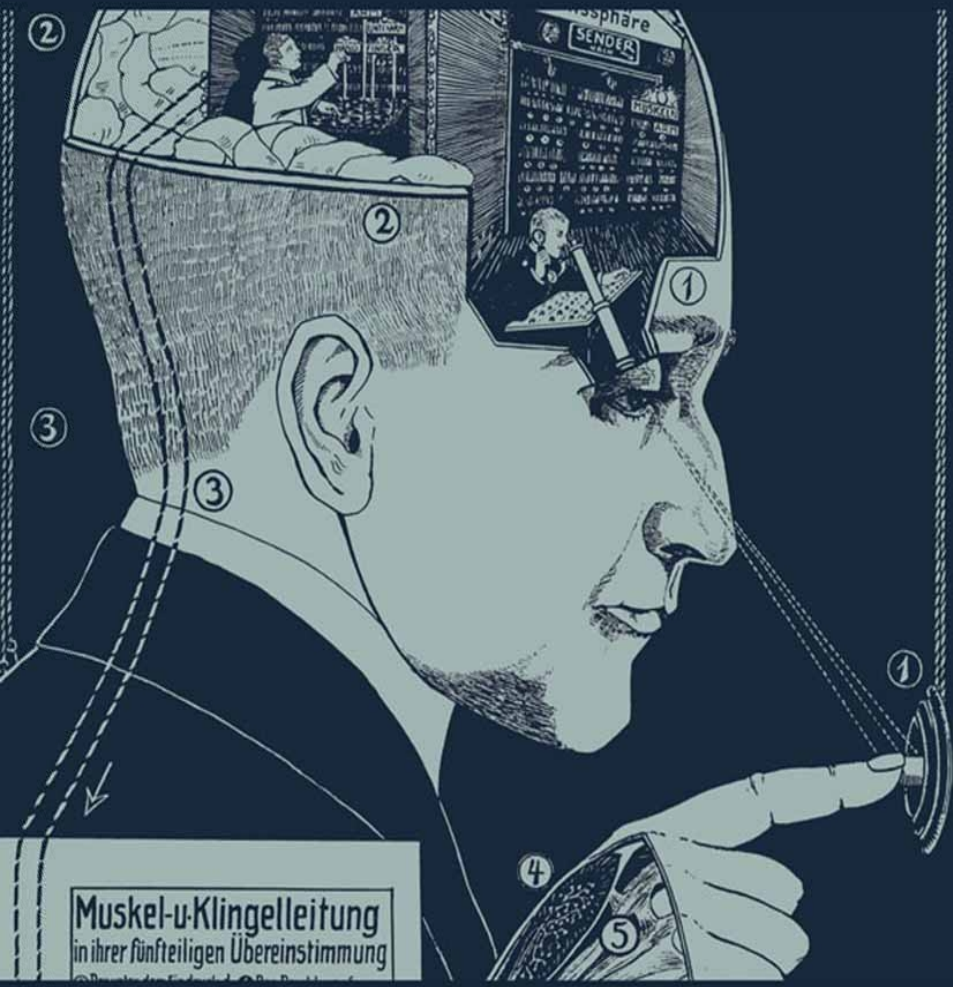
Minds, Bodies, Machines, 1770–1930

Edited by Deirdre Coleman and Hilary Fraser



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Edited by

Deirdre Coleman
Robert Wallace Chair of English, University of Melbourne, Australia

and

Hilary Fraser
Geoffrey Tillotson Professor in Nineteenth-Century Studies and Executive Dean of the School of Arts, Birkbeck, University of London

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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, and we are grateful to all who contributed to an immensely exciting intellectual event. The editors would especially also like to thank our postgraduate students for their administrative and editorial support throughout the project, in particular, Katherine Inglis, Fiona Brideoake, Amelia Scurry and Sashi Nair. Funding for the book's illustrations was provided by the School of Culture and Communication and the Faculty of Arts, University of Melbourne.

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Deirdre Coleman
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Notes on Contributors

Marie Banfield is a PhD student at Birkbeck, University of London, at present completing a thesis on the novels and poems of George Meredith in their contemporary intellectual and scientific context. Her article 'Meredith, Mazzini and the Risorgimento: The Italian Novels', was published in *Rivista di Studi Vittoriani*, XI, 21 (January 2006). Her essay 'Meredith's Altruist: Evolution, Society and Politics in *Beauchamp's Career*' forms a chapter in *Beauchamp's Career. George Meredith: testo e contesto*, a cura di Anna Enrichetta Soccio (Roma: Aracne, 2008). Her article 'Darwinism, Doxology and Energy Physics: The New Sciences and the Poetry and Poetics of Gerard Manley Hopkins' appeared in *Victorian Poetry,* 45, summer 2007.

Daniel Brown is a Professor in the English Department at the University of Western Australia. He has written books and journal articles on nineteenth-century science, philosophy and poetry; Victorian non-fiction; Gerard Manley Hopkins, Thomas De Quincey; film; and George Egerton. He recently finished writing a study of poetry by Victorian scientists, entitled *Science and Nonsense: Reading Victorian Scientists through Their Poetry*.

Deirdre Coleman's research interests include eighteenth and nineteenth-century literature, science and cultural history; abolitionism, travel writing, colonialism, natural history and racial ideology. Her articles have been published in *ELH*, *Eighteenth-Century Life* and *Eighteenth-Century Studies*, and her most recent books are *Romantic Colonization and British Anti-Slavery* (Cambridge University Press, 2005), and the *Australia* volume of *Women Writing Home, 1700–1920*: *Female Correspondence across the British Empire*, 6 vols (Pickering and Chatto, 2006). She is the Robert Wallace Chair of English at the University of Melbourne.

Steven Connor is Professor of Modern Literature and Theory at Birkbeck, London and Academic Director of the London Consortium Graduate Programme. He is the author of books on Dickens, Beckett, Joyce and other writers, as well as works of literary and cultural theory such as *Postmodernist Culture* (1989) and *Theory and Cultural Value* (1992). More recent books include *Dumbstruck: A Cultural History of Ventriloquism* (2000), *The Book of Skin* (2003), *Fly* (2006) and *The Matter of Air* (2010).

His website, www.stevenconnor.com, gives access to many unpublished essays, broadcasts and lectures.

Paul Crosthwaite is a Lecturer in English Literature and a member of the Centre for Critical and Cultural Theory at Cardiff University. His publications include *Trauma, Postmodernism and the Aftermath of World War II* (Palgrave Macmillan 2009), articles in *Angelaki, Cultural Politics* and *Textual Practice* and, as editor, *Criticism, Crisis and Contemporary Narrative: Textual Horizons in an Age of Global Risk* (Routledge, 2011). He is currently writing *Reading the Markets: Finance, Feeling and Representation in Contemporary Literature and Culture* and developing a new project, provisionally entitled *'An End and A Beginning': The Great Crash of 1929 and the Poetics of History.*

Hilary Fraser holds the Geoffrey Tillotson Chair of Nineteenth-Century Studies at Birkbeck, University of London, where she is also Dean of Arts. She has written monographs on aesthetics and religion in Victorian writing, the Victorians and Renaissance Italy, nineteenth-century non-fiction prose, and gender and the Victorian periodical. She currently works on women writing about art in the nineteenth century.

Katherine Inglis received her PhD in 2009 from Birkbeck, University of London. Her primary research interests are nineteenth-century fiction, the intersections between literature and science, and the history of book destruction. Her thesis, 'The Incoherent Self and Materiality in Hogg, Brontë and Dickens', explores how incoherence in fiction is supplemented by the eloquence of the material culture of science. Her publications include '"My ingenious answer to that most exquisite question": Perception and Testimony in Winter Evening Tales', *Studies in Hogg and his World*, 17 (2006); 'Becoming Automatous: Automata in *The Old Curiosity Shop* and *Our Mutual Friend*', *19: Interdisciplinary Studies in the Long Nineteenth Century*, 6 (2008), at: www.19.bbk.ac.uk; and 'Ophthalmoscopy in Villette', *Journal of Victorian Culture,* 15.3 (2010), 348–69.

Iain McCalman was born in Nyasaland, Africa and now lives in Sydney, where he is a Research Professor at the University of Sydney. He has held numerous visiting research fellowships in Britain and the United States, most recently at Duke University, North Carolina. In 2007 he was made an Officer of the Order of Australia for services to history and humanities. His most recent book, *Darwin's Armada*, has been published in Australia, the USA and the UK and was made into a three-part documentary, *Darwin's Brave New World* (2009).

James Mussell is Lecturer in English at the University of Birmingham. He is the author of *Science, Time and Space in the Late Nineteenth-Century Periodical Press* (Ashgate, 2007) and one of the editors of the *Nineteenth-Century Serials Edition* (2008: www.ncse.ac.uk). He has published widely on nineteenth-century science, print and culture. He also works in the digital humanities and is the editor of the 'Digital Forum' of the *Journal of Victorian Culture*.

Peter Otto is Professor of English Literary Studies at the University of Melbourne, where he teaches and researches in the literatures and cultures of modernity, from Romanticism to the new media of today. His recent publications include *Blake's Critique of Transcendence* (Oxford University Press, 2000); *Gothic Fiction, a Microfilm Collection of Gothic Novels Published between 1764 and 1830* (Adam Matthews, 2002–3); *Gothic Fiction: A Guide* (Adam Matthews, 2004) and *Entertaining the Supernatural: Mesmerism, Spiritualism, Secular Magic and Psychic Science* (Adam Matthews, 2007–8). His new monograph, *Multiplying Worlds: Romanticism, Modernity and the Emergence of Virtual Reality* (Oxford University Press, 2011), uncovers a key stage in the development of modern discourses of virtual reality.

Laura Salisbury is RCUK Fellow in Science, Technology and Culture and a lecturer at Birkbeck, University of London. She has published widely on Beckett, including a study of his 'aphasic' modernism, and on relations between literature and philosophy. With Andrew Shail she is co-editor of *Neurology and Modernity: A Cultural History of Nervous Systems, 1800–1950* (Palgrave Macmillan, 2010).

Introduction

Deirdre Coleman and Hilary Fraser

Which of us has not stood, captivated, before one of the 'human statues' that are now such a feature of tourist sites the world over? In October 2006, so many such figures lined the famous boulevard Las Ramblas in Barcelona's red light district that the City Council resolved to submit them to an 'artistic test', as a way of reducing their number. These bizarre street artists, mutely and inscrutably defying the spectator to detect a flicker of life in their expressionless faces or their still, poised bodies, are magical figures of suspended animation. Occasionally the clink of a tourist's coin may, especially thrillingly, cause a marble boy or a golden angel to break into clockwork motion, to come alive. Children stand transfixed by the wonder of a human, metamorphosed into a statue, transforming itself into a machine. Las Ramblas has long been a site for such entertainments. It was home for nearly four decades to the spectacular Roca Museum, established around 1900, whose collection included a mechanical wizard, displays of both beautiful and horrific waxworks, and a section devoted to human freaks, alongside embryological and anatomical models that could be opened up for examination, and were accurate enough to be used as both formal medical and popular teaching tools. As the Wellcome Collection's recent exhibition in London of waxwork models amply attests,[1] earlier audiences were as excited and intrigued as modern-day tourists and museum visitors by the spectacle of models that are life-like and bodies that are machine-like.

Interest in the human–machine interface developed in the eighteenth century with the invention of the first biomechanical automata, the most famous of which were Vaucanson's defecating duck and the flute-player. Anatomy and dissection played an important role in the building of these life-like automata, with anatomists producing flayed

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specimens or écorchés for study, versions of artificial life fashioned from preserved human cadavers.[2] Later in the century, another version of artificial life attracted attention in the shape of embalmed cadavers whose life-likeness suggested the triumph of science and technology over death. In 1775 the anatomist John Sheldon displayed his God-like surgical and technical skills by transforming his young dead mistress into the most gazed-upon object in his extensive anatomical cabinet. A French visitor to London in 1784 has left us a description of Sheldon's 'entirely naked' and mummified mistress, whose glass-topped case occupied a 'distinguished place' in the anatomist's bedroom:

> She had fine brown hair, and lay extended as on a bed. The glass was lifted up, and Sheldon made me admire the flexibility of the arms, a kind of elasticity in the bosom, and even in the cheeks, and the perfect preservation of the other parts of the body. Even the skin partly retained its colour, though exposed to the air . . . Wishing afterwards to imitate the natural tint of the skin of the face, a coloured injection was introduced through the carotid artery.[3]

Palpating the embalmed body, Sheldon brings dead matter to life, troubling the cognitive boundaries normally separating life from death, the living from the merely lifelike, nature from art. In what seems another form of suspended animation, the dead mistress's flesh is firm and resilient; like living tissue it defies putrefaction. For Sheldon as Pygmalion, the body of this young woman represents the striving for eternal life through human artistry; like an eighteenth-century sex-doll, she also engenders an erotic fantasy of desire and animation.[4]

With a shortage of bodies for the growing number of medical students, embalmment was one way of meeting the demand for dissection. Although Sheldon's mistress was not preserved for this purpose, his wife later complained that some of their unsupervised visitors dealt 'roughly' with the corpse, cutting the threads 'to inspect the Inside'.[5] Here, with her inner mechanics exposed, the mistress's cadaver resembles an anatomical wax sculpture, or 'Venus' (see Figure 1). The year 1775 witnessed another bizarre case of embalming, performed by the celebrated anatomist William Hunter on the body of Mrs Van Butchel. From the day she died and for almost two months, Martin Van Butchell described in detail the cleansing and surgical processes of embalmment to which his wife was subjected. He was an enthusiastic assistant, and when the mummification was complete, he bore his wife's body home in triumph.[6] The case became something of a cause celêbre, with crowds

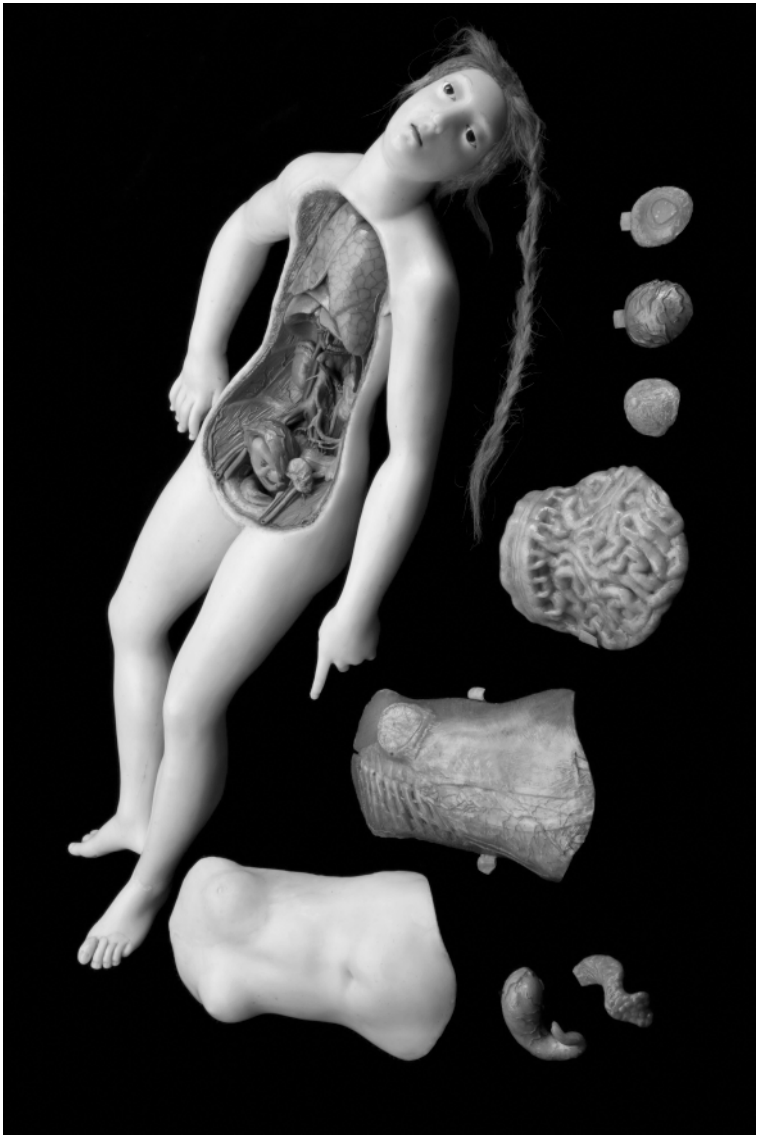

Figure 1: Wax 'Anatomical Venus'

of visitors hoping for a glimpse of Mrs Van Butchel's corpse, touted as sporting a much more spirited appearance in death than when alive.[7] One newspaper Epitaph praised Hunter for his supreme technical and artistic skills which had not just arrested time but reversed it, restoring Mrs Van Butchell to the charms she possessed before illness preyed upon them:

> . . . Hunter's skill in spite of Nature's laws,
> Her beauties rescued from Corruptions jaws;
> Bade the pale roses of her cheeks revive
> And her shrunk features seem again to live.

With his re-vivified wife at home, the devoted widower could now 'Caress, touch, talk to, even sleep/Close by her side'. More salaciously, the Epitaph suggests that Mrs Van Butchell is now as 'Firm, plump and juicy as before'; indeed, she is even 'fairer' and 'sweeter', and certainly more 'tractable'. With a touch of misogyny, Van Butchell is congratulated on laying claim to a woman 'whose temper's every day the same!'. At the end of life, art begins: the aesthetic process of embalmment makes death the ultimate beauty, with the 'true-to-life' corpse exceeding the living but dying Mrs Van Butchell. A taxidermic masterpiece, she is now the ultimate cabinet of curiosity.

Human statues which come to life like clockwork, and embalmed corpses more alive than the living: such liminal figures should not be relegated to the sideshows of history. Instead, they have a central place not only in the history of anatomy and medicine, but in our very conceptualisation of what it is to be human. This is why we feel such a frisson when we gaze upon or think about these categorically ambiguous forms, for their indeterminacy reminds us of the relations of propinquity between us and things. As Merleau-Ponty memorably formulates it,

> The visible world and the world of my motor projects are both total parts of the same Being … Visible and mobile, my body is a thing among things; it is one of them. It is caught in the fabric of the world, and its cohesion is that of a thing.[8]

The human body, with its motor skills and its moving parts, shares a special kinship with the machine, and indeed there has long been a fascination with the unstable boundaries between them. The technological imagination has, since the Renaissance, widely permeated literary, visual, political and philosophical culture. Early modern writers and

visual artists engaged with new technologies ranging from engines to microscopic lenses, from the camera obscura and calculating machines to automata. In the eighteenth century attempts to understand life by reproducing it mechanically resulted in life-like automata. But it is in the nineteenth century 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' 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',[9] to the alienated historical body of the late-nineteenth-century factory 'hand' under Taylorization, whose movements and gestures were timed, regulated and rationalized to maximize efficiency, we find a cultural preoccupation with the mechanization of the nineteenth-century human body that uncannily resonates with modern dreams and anxieties surrounding technologies of the human.

Cultural historians have begun to explore the discursive fields that have developed around key new technologies over the past three centuries and more, and how they have intersected with and shaped new forms of knowledge, self-representation and being in the world. Jonathan Sawday, for example, followed up his fine study of the early modern culture of dissection, *The Body Emblazoned* (1995), in which he argues that anatomy, by literally opening up the human body to scrutiny, produced the idea of human interiority, with a magisterial book on the imaginative history of the machine: *Engines of the Imagination: Renaissance Culture and the Rise of the Machine* (2007). Jonathan Crary, in his influential book *Techniques of the Observer* (1990), is concerned with 'vision and its historical construction' in the nineteenth century.[10] He argues that, alongside developments in physiological optics and optical technology, 'a new kind of observer took shape in Europe'[11] in the early decades of the nineteenth century, displacing the disembodied visual experience of the seventeenth and eighteenth centuries, defined by the incorporeal relations of the camera obscura, with an emphatically corporeal visual subject. Just as the camera obscura, he contends, was 'part of a larger organisation of representation, cognition and subjectivity in the seventeenth and eighteenth centuries',[12] so various new optical devices invented in the nineteenth century, such as the stereoscope, the kaleidoscope, the phenakistiscope and the diorama, were expressions of a new model of vision, whereby the observer comes to embody the optical effects of the machine, such that 'both were now contiguous instruments on the same plane of operation'.[13] New technologies of writing,

information and communication – such as telegraphs, telephones and typewriters – have also yielded rich seams of speculation about the relays between the natural and the technological. For cultural theorist and literary critic Mark Seltzer, looking at the shift from handwriting to typewriting in late-nineteenth century American machine culture, what is notable is not the replacement of bodies by machines but the radical and intimate coupling of bodies and machines.[14] Nietzsche expressed this coupling succinctly. The first philosopher to use a typewriter, he typed in one of his letters: 'Our writing tools are also working on our thoughts'.[15] Finally, for Mary Ann Doane in her book *The Emergence of Cinematic Time* (2002), it is the new technology of film that is of interest. Alongside the pocket watch, which Georg Simmel in 1903 linked to a new preoccupation with temporal precision that was crucial to 'the technique of metropolitan life', and the standardization of time demanded by rail travel and telegraphy, Doane argues that the cinema was a major factor in the reconceptualization of time in modernity.[16]

The essays collected here continue this critical trajectory, offering detailed analyses of particularly compelling constellations of minds, bodies and machines in the nineteenth-century cultural imaginary. The first two chapters explore, respectively, ideas about 'imagination-machines' and 'influencing-machines' that emerged at the beginning of the century, the moment when the machine began to invade – and for some seems to reflect, define or even determine – human consciousness. In Chapter 1 of this book, Peter Otto's focus is on Gothic fiction, and his interest, like Crary's, is in the cultural meanings of the camera obscura in the late eighteenth and early nineteenth centuries. He takes his start from Coleridge's contempt for the Gothic genre whose fantastic effects are 'supplied *ab extra* by a sort of mental *camera obscura* manufactured at the printing office', leading to a confusion between *ab extra* projections of reality and *ab intra* delusions of imagination in the mind of the reader. Through his readings of a Gothic novel that exemplifies Coleridge's despised imagination-machines, Ann Radcliffe's *The Mysteries of Udulpho* (1794), Otto traces how the real-unreal worlds and affective power of the genre were shaped by the paradigm of camera obscura, and were moreover an inevitable product of the machinic consumer culture that was to define the long nineteenth century, not least its publishing industry.

John Perceval, one of the figures Steven Connor discusses in Chapter 2 on early nineteenth-century elaborations of the 'influencing machines' postulated by sufferers from schizophrenia, similarly invoked the printing office when he drew an analogy between a printing press and an

imagined mechanical breathing regulator that enables an orderly production of thoughts. The mechanization of print media was an underlying trope for many of the nineteenth-century writers discussed in this volume, including Connor's exponents of a machinery of the mind. In his article 'On the Origin of the "Influencing Machine" in Schizophrenia', the pioneer psychoanalyst and neurologist Viktor Tausch (1879–1919) was the first to name the controlling engines imagined by some paranoid schizophrenics as responsible for their psychoses. Connor begins his own exploration of the phenomenon with the first documented case, that of James Tilly Matthews, who obligingly made a drawing of the machine – the Air-Loom – to which his mind was subject, complete with a key to all its components (see Figure 3 in Chapter 2). This machine becomes an allegory of the process of thought, rendering the operations of mind in strangely material terms. The pneumatic components of these ingenious engines of thought are of particular interest, their fluid mechanics a delicious parody of the ethereal vital fluids associated with mesmerism, animal magnetism and electricity. Connor thus joins Iain McCalman (Chapter 6) in exploring the curious overlap between scientific and esoteric thought, incorporating a discussion of the way in which air machines assist in the corporealisation of thought. Connor concludes by tracing the delusional pneumatic visions of other nineteenth-century sufferers from this psychiatric disorder, arguing that '[t]he passion of the machine arises not in the fear of alienation by, but in the voluptuous delight of identification with it'.

Connor observes that Perceval, in analysing his own paranoid condition, defines madness as 'the incapacity to distinguish literal from figurative expressions, and the consequent tendency to take metaphors literally'. As our next cluster of essays, by Katherine Inglis, Paul Crosthwaite and Marie Banfield, makes clear, though, the machine madness Perceval identifies among the psychologically ill could be said to be symptomatic of a broader cultural phenomenon in which the categories of human and machine were unsettled, and in which there was a propensity to take mechanical metaphors literally. In Chapter 3, on James Hogg's *The Three Perils of Woman* (1823), Inglis focuses on the figure of the 'ghastly automaton' of the mother, and the conjunction of maternity, madness and mechanization in a novel in which the maternal body is represented as a defective machine. She notes that the meanings of 'automaton' are unstable and contradictory, both within and beyond the text: an automaton is 'at once a true self-mover and a mimic of autonomous motion, a mechanical simile that moves *as if* endowed with life'. And yet she observes of Hogg's heroine Gatty, who

gives birth in an asylum during a three-year period of unconsciousness, that the metaphorical association of woman with machine goes beyond that of simile; as Inglis argues, Gatty 'becomes an automaton indeed, not *like* an automaton'. We are reminded equally of Connor's machine-mad literalists and of Otto's Gothic 'imagination-machines', with their confusion of reality and delusion. Furthermore, Inglis locates Hogg's Gothic mechanization of childbirth within eighteenth and early nineteenth-century medical culture, recalling the anatomical models gathered for the recent Wellcome exhibition, so many of which were pregnant females, with a special focus on the foetus *in utero* and the potential complications of childbirth. In the context of the emergence of obstetrics and the suppression of female-dominated midwifery, Inglis argues that the representation of the maternal body as a machine in eighteenth-century midwifery literature and medical illustration, and the use of androids/automata in medical instruction, reduced childbirth to mechanical principles and the mother to an engine of reproduction.

Like Inglis, Paul Crosthwaite (Chapter 4) is intrigued by the slippages between metaphor and simile in the relationship between human and machine, but his own interest is in the cultural history of computer-generated writing, and in particular late-eighteenth and early nineteenth-century mechanical writing figures. He modifies Jessica Riskin's distinction between an eighteenth-century ethos of simulation and a nineteenth-century culture of analogy by arguing that throughout both periods the makers of writing automata gave their machines a human form and human movements in order to create the illusion that they were autonomously rather than mechanically generating the words they produced – that they were not just *like* authors, they *were* authors. The very word 'author', from the Latin 'auctor', creator, denotes an originary function, and therefore, as in the case of mechanical childbirth, the concept of a clockwork author seems especially paradoxical, the more so when it coincides with the emergence of a Romantic discourse of authorship. Of course, as Crosthwaite notes, '[t]he author of Romantic theory is a notoriously contradictory being'; and the ambiguous agency of these writing automata could be said to resonate with Wordsworth's celebration in 'Tintern Abbey' of 'all the mighty world/ Of eye and ear, both what they half-create,/ And what perceive' – and also, we might add, with Coleridge's Aeolian harp, as well as with the relational confusion of *ab intra* and *ab extra* projection he identifies as the product of 'imagination-machines' in Gothic writing. Such parallels notwithstanding, in the age of digital as in the age of mechanical reproduction there is, Crosthwaite argues, something ineluctably

human about the writing and the reading of poetry that eludes the automaton-author and equally the cybernetic poet: an intention to *mean* that 'can arise only from embodied existence in the referential realm of material objects and relations'.

This takes us back to metaphor, and forward to Marie Banfield's discussion (Chapter 5) of 'Metaphors and Analogies of Mind and Body in Nineteenth-Century Science and Fiction' which, as if to confirm Riskin's thesis, begins with William James's remark that science is 'nothing but the finding of an analogy'. Banfield's focus is on the work of the psychologists Alexander Bain, George Henry Lewes, James Sully and James himself, and on the novelists who most engaged with contemporary psychology, George Eliot, Henry James and George Meredith. Nineteenth-century writers, she argues, were drawn to metaphor because of its capacity to juxtapose different discourses and domains, but also because it enables ambivalence in the face of human paradox and contradiction. However, Lewes warned of the dangers of 'taking a metaphor for a fact, and arguing as if the mind were a *mirror*'. That way, as we know from Connor's essay, madness lies. The mind does not passively offer a 'faithful reflection of the world', only 'a faithful report of its own states'. Echoing Wordsworth, Lewes sees the mind as 'the partial creator of its own forms'. For William James, similarly, '[t]he knower' is not a mere reflective mirror, but is 'an actor, and co-efficient of the truth on one side, whilst on the other he registers the truth which he helps to create'.

The mind and the emotions are, in Bain's psychology, profoundly related to the physiological body, and both mind and body are described in terms of metaphors drawn from contemporary science and technology. His model of consciousness, for example, is informed by energy physics and thermodynamics. Banfield demonstrates how the representation of character and consciousness in the fiction of Eliot, Meredith and Henry James is inflected by such metaphors in ways that suggest new understandings of the interdependence of the psychological and the corporeal, and a new conceptualization of consciousness as a dynamic force or current that is part of the objective world of things. The eponymous protagonist of Meredith's *Diana of the Crossways* (1885), for instance, herself a writer, has a mind like 'a steam-wheel', a metaphor which, as Banfield notes, 'signifies both a process of relentless, mechanical activity and the work and productivity of the brain'. Like an automaton, she is at once genuinely self-powered and mechanically driven. Furthermore, '[m]etaphors', the reader is told, 'were her refuge'. 'The banished of Eden had to put on metaphors … Especially are they needed by the pedestalled woman in her conflict with the natural'.

If pedestalled women needed metaphors in their conflict with the natural, then so did those excluded by their class from the cultural and scientific mainstream, such as the self-educated plebeian radical Alfred Wallace, the co-discoverer with Darwin of natural selection, and the subject of Iain McCalman's essay (Chapter 6). Our next section is devoted to some notable clashes between mid-nineteenth-century scientists that throw into focus some of the key tensions in their thinking about the relations between minds and bodies, and between human and inorganic behaviours. Continuing our theme of emergent theories about the mind and consciousness in the new field of psychology, McCalman explores the vexed question of Wallace's conversion to spiritualism, and his theory of the spiritual evolution of mind. In a decisive break with Darwin, some ten years after the publication of *On the Origin of Species* (1859), Wallace published a devastating paper entitled 'On the limits of natural selection as applied to man' (1870), in which he postulates a higher 'Intelligence' in order to account for man's mental descent from animals and the growth of human consciousness. Seeking out the 'common social context' that makes it possible to reconcile Wallace's adoption of a spiritualist interpretation of mental evolution with his belief not only in natural selection but also in the secular ideologies of Owenism and phrenology, McCalman finds it in his socio-political background. As a plebeian autodidact and radical, Wallace was introduced to phreno-magnetism, a new pseudo-scientific phenomenon which 'offered him a science of human behaviour that linked the bodies, minds and environments of man in law-like relationships, yet also allowed room for elements of irrationalism, or at least of sentience and emotion'. Understanding this context, McCalman argues, enables us to see Wallace's spiritualist turn not as the volte face of a confirmed materialist but, aptly enough, as an adaptation of his earlier thought.

Wallace has traditionally been represented as a divided man: at once the explorer-naturalist who was 'a man of science' and a social philosopher who was 'a man of nonsense'. If McCalman overturns the view that he was a man of nonsense, Daniel Brown (Chapter 7) contests the very idea that science and nonsense are polarized categories by making a case for the principle of Nonsense, as it was espoused by James Clerk Maxwell in his poetic ripostes to fellow physicist John Tyndall's reductionism in his mechanistic construal of atomism:

> Yield, then, ye rules of rigid reason!
> Dissolve, thou too, too solid sense!
> Melt into nonsense for a season,

Then in some nobler form condense.
Soon, all too soon, the chilly morning,
This flow of soul will crystallize,
Then those who Nonsense now are scorning,
May learn, too late, where wisdom lies.

Tyndall was one of the leaders of a group of London-based scientists known as the 'Metropolitans', who in the 1860s and 1870s espoused a radical form of scientific materialism that was inaugurated by his 1868 Norwich lecture to the British Association for the Advancement of Science. In this lecture, he argues that atomic forces constitute a natural mechanism that overturns the argument from design by demonstrating nature's independence of a creator: for, like William Paley's watch, natural phenomena 'also have their inner mechanism, and their store of force to set that mechanism going'. Maxwell, a member of a rival group of 'North British' physicists, took issue in his own addresses to the British Association with what he perceived to be Tyndall's reductive materialism, but he also addressed their differences in a more playful way in a series of ribald verses he penned in the early 1870s for the Red Lion Club. By contrast with Tyndall's mechanistic determinism, Maxwell and his colleagues developed a statistical theory which, Brown explains, 'recognises that molecules have different properties from the bodies they compose and that their mechanistic behaviours can interact in unforeseen ways'. Brown's focus in this essay is on these comic poems in which, he argues, Maxwell parodies Tyndall's scientific materialism, invoking Lucretius' poem on atomism, *On the Nature of Things*, in particular the doctrine of free will that is so integral to his physics, in order to propose an alternative cosmology.

Maxwell's verses from the early 1870s play upon the anthropomorphic character of his physical theory; indeed, as Brown argues, they are premised upon the implication of a radical analogy between human and inorganic bodies and behaviours. Moving from molecules to microbes, in our next essay, on 'Influenza, Informatics, and the Body in the Late Nineteenth Century', James Mussell (Chapter 8) considers the extension of biological language to electronic communication systems. Beginning with a contemporary analogy between computer viruses and pandemics, and reflecting upon the spread of both information and infection, Mussell takes us back to the influenza pandemics of the late nineteenth century which, he argues, were simultaneously biological and cultural phenomena, 'able to infect both the human and the social body simultaneously and move between both'. Like Maxwell's

molecules, the microbe was the subject of both comic lyrics and anthropomorphic fantasy. Florence Fenwick Miller, for example, writing in the *Illustrated London News*, reflects upon the 'somewhat appalling idea that each human system forms a world, in which a whole myriad of microscopic animalculae are born, live by their own exertion, perhaps form kingdoms or republics, hoard wealth, prey on each other, rear offspring, and depart from life', and imagines how 'the enterprising microbe has travelled with speed, perhaps by train or by telegraph, to other parts of the kingdom'.

Focusing on how viruses move through both human and social bodies, Mussell captures in the 'awful poetry' of microbiological migration a host of anxieties swirling around the porousness of things, the permeability of bodies, and the materiality of language. In so far as these anxieties are fundamentally identified with modernity, Mussell's essay joins with the final essay in our collection, Laura Salisbury's 'Linguistic Trepanation: Brain Damage, Penetrative Seeing, and a Revolution of the Word' (Chapter 9), to investigate the way in which the latest technologies offered a new ontology of the human mind, body and perceptual system. For some early twentieth-century writers, bodily penetration, whether by a soldier's bullet, a surgeon's knife, or the radiant waves of an x-ray, come to signify modernity. For Guillaume Apollinaire, for example, Salisbury argues that his head wound and surgically trepanned skull become 'a site of interpenetration carved out by the force of war that brings minds, bodies and machines into a commerce with one another that initiates linguistic innovation'. This exciting and unsettling sense of the porosity of the body, and of the unstable boundaries between cognition, language, the physicality of the human brain and technology, recalls an earlier historical moment when the French physician and neuroanatomist Paul Broca, and after him the German anatomist and neuropathologist Carl Vernicke, as part of their research into aphasia, developed materialist models of language production based on morphological studies of the structure of the brain and the localization of its functions. Salisbury traces how their work intersected with what she describes as a 'general discursive environment' in the latter half of the nineteenth century, in which bodies were imagined as fleshly machines, and how '[t]he linguistically trepanned revolutionary of the word paradoxically uses a technological imaginary to speak and write beyond the structures and shapes of the nineteenth-century machine'.

For these later writers, working around the turn of the twentieth century, like the figures with whom this volume begins at the turn of the nineteenth century, corporeality and technology are conceived of

as existing in profound metaphorical relationship. But the nature of the human–machine interface has changed. Instead of automata and steam engines, the analogies for a technology of the human invoke the electrical impulses of the telegraph, the phonograph, cinema and the x-ray rather than the galvanized corpse; the microbe and the molecule rather than the insect; the nervous system rather than the brain-machine. Today, another hundred years on, the metaphorical distance between human and machine could be said to have collapsed altogether, as can be seen, for instance, in the case of Kevin Warwick, Professor of Cybernetics at the University of Reading and controversial author of *I, Cyborg* (2002). Warwick believes that, given our creation of highly intelligent machines, we must keep pace by assimilating elements of this technology into ourselves so that we become cybernetic organisms, part-human, part-machine. An important part of the cyborg project involves, for Warwick, 'the realization of the superhuman being'.[17] 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. Achieving nervous system to nervous system communication forms an even more ambitious stage in the upgrading of the human. With his wife Irena, Warwick investigates a 'pure' form of communication via a 'his-and-hers implant experiment', a connection which goes beyond movement to the 'emotional signals associated with being happy, depressed, shocked or even sexually aroused'.[18] In so far as Warwick's project involves 'jacking into' his wife's nervous system by means of direct neural links, his cyborg project gives a new spin to 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'.[19] Although Warwick's cyborg project has none of the irony of Haraway's, both theorist and practitioner share a daring flirtation with 'transgressed boundaries, potent fusions, and dangerous possibilities'.[20]

With her 12 pairs of legs, Aimee Mullins, fashion model and Paralympian, puts all the irony back into Haraway's cyborg.[21] A double amputee since the age of one, Mullins uses her celebrity and great physical beauty to be the figurehead of the prosthetic industry, drawing in animatronic designers, aerospace engineers, glass blowers, wood-workers and all kinds of other artisans to design and build legs which fuse art with cutting-edge technology, playfully confounding the boundaries of animal and human, human and machine (see Figure 2). Turning the loss of both lower limbs into a triumph, Mullins offers the prosthetist