Becoming With and Within:
An Appendicology of Life, Technics and the Human

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Summary

This thesis invites a re-examination of our understanding of the human and its relationship with the external world. To this end, it develops the paradigm of *appendicology* as a way of going beyond traditional conceptions of the human, nature and technology. Appendicology is a study of *appendages* and *appendixes* – bodily organs and parts that seem to be merely attached to the body proper and that appear peripheral, external or non-essential to the human form despite being internal or integral to it. At once internal and external, natural and alien to the body, the appendage and the appendix defy any absolute boundary between the inside and the outside, revealing the integral exteriority and natural foreignness of the human. This thesis engages with the contradictions and ambiguities posed by these organs of corporeal otherness to argue that the relationship between the human, technics and the natural world is one of *becoming* in which the human and the nonhuman, the natural and the artificial, the singular and the multiple are always necessarily implicated with and within one another.

By engaging with a range of material sourced from literary, scientific, and theoretical works, including texts by Jacques Derrida, Bernard Stiegler, Karl Marx, Frederick Engels, Charles Darwin, André Leroi-Gourhan, Lynn Margulis, Samuel Butler, Italo Calvino and Daniel H. Wilson, this thesis argues that the relationship between the human and technology, and that between the human and the natural world, must be considered alongside the multitudes of other relationships of becoming that constitute life. The central claim of this project is that an appendicology opens up ways of thinking that do not essentialize or privilege the human, or, for that matter, technology, nature or life, but that instead allow us to see each one in the other and to recognise how each is always already constituted through these others.

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Introduction
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Appendicology

In the 1872 novel *Erewhon: Over the Range* by Samuel Butler we find a rather whimsical description of a feature of Victorian tobacco pipes that can no longer be found in modern-day smoking implements: a 'little protuberance at the bottom of the bowl' that appears to have little if any purpose. This seemingly innocuous part is described in the text as a 'rudimentary' structure, a vestigial remnant of a far more robust part 'whose purpose must have been to keep the heat of the pipe from marking the table upon which it rested'.[1] As time passed and the use and design of tobacco pipes changed, the text explains, this protuberance became less and less pronounced, until it was 'reduced' to the tiny projection described in the text. '[I]n the course of time', Butler goes on to suggest, this part will 'become modified still further, and […] assume the form of an ornamental leaf or scroll, or even a butterfly, while, in some cases, it will become extinct'. This reference in *Erewhon* to what is now, presumably, an 'extinct' pipe part is intended to draw attention to the supposed existence of 'rudimentary organs' in common technological objects and implements. According to Butler, these parts are comparable to the various vestigial organs and structures found in the body, such as the appendix, and they point to a certain technological evolution that parallels what is commonly thought of as the natural evolution of life and the living.[2]

In his description of this supposed technological evolution, Butler uses the rhetoric and arguments put forward by Charles Darwin in *The Origin of Species* (1859) in order to argue that there is no fundamental distinction between the evolution of living beings and the development of new technological objects. The text urges us to think of contemporary machines as being comparable to the early ancestors of modern man. It is in these 'prototype[s]', Butler suggests, that one can find the germs of a 'future mechanical life' that will be just as complex as any of the living species found in the natural world today, including *Homo sapiens*.[3] All existing technological objects should thus be viewed as constituting

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[1] Samuel Butler, *Erewhon: Over the Range* (London: Forgotten Books, 2008), p. 166. Samuel Butler follows Charles Darwin here in his use of the term *rudimentary* to refer to vestigial organs and structures. For a more detailed analysis of the use of this particular term, see the section 'Reading the Rudiment' in Chapter Three.
[2] Butler, *Erewhon*, p. 166.
[3] Butler, *Erewhon*, p. 155.

different 'genera, subgenera, species, varieties, [and] subvarieties' according to their descent from a 'common ancestor'. Echoing Darwin's own conceptualisation of rudimentary organs in *The Origin of Species* and *The Descent of Man* (1871), the text goes on to argue that these evolutionary lines of descent reveal themselves in rudimentary and vestigial machine parts, such as the pipe part described above. These rudiments, the text suggests, are what 'mark' this evolutionary movement of technological descent.[4]

Butler's contention that there could exist some kind of machinic evolution that would rival that of the natural world is intriguing and is echoed in many contemporary conceptualisations of technology, particularly in science fiction and some transhumanist debates.[5] But any such notion of technological evolution hinges on one particular issue that Butler himself addresses in the text. This text acknowledges that there does appear to be one fundamental difference between the natural evolution of living species and the creation of new kinds of technological entities: whereas natural beings appear to reproduce on their own, there is an 'apparent absence of anything like a reproductive system in the mechanical kingdom'. But what at first appears to be a fundamental distinction – a distinction that threatens to invalidate any theory of technological evolution – is, this text argues, nothing more than an illusion. 'This absence', the text continues, 'is only apparent'.[6] If one looks hard enough, one can already identify the 'germs' of a reproductive system in existing machines. Butler goes on to explain that although these so-called reproductive systems may not resemble those observed in the natural world, they remain comparable to them nevertheless. We do not yet recognise this form of production as *re*production, the text explains, because we insist on perceiving

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[4] Butler, *Erewhon*, p. 165. For further discussion of the notion of technological evolution, see Belinda Barnet, 'Do Technical Artefacts Evolve?', in *Technicity*, ed. by Arthur Bradley and Louis Armand (Prague: Litteraria Pragensia, 2006), pp. 167-199.

[5] In transhumanist debates, the creation of artificial intelligence is often described using the rhetoric of evolution. As I show in more detail later on in this Introduction, thinkers such as Vernor Vinge and Hans Moravec portray the possible creation of artificial intelligence and artificial life as an evolutionary event comparable to the natural evolution of living species, with Moravec going so far as to describe the intelligent technologies of the future as descendants of the human species (see Vernor Vinge, 'The Coming Technological Singularity', *Vision-21: Interdisciplinary Science and Engineering in the Era of Cyberspace*, NASA Conference Publication 10129 (Westlake, OH: NASA Lewis Research Center, 1993), p. 12 <http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19940022855.pdf> [accessed 23 July, 2015], Hans Moravec, *Mind Children: The Future of Robot and Human Intelligence* (Cambridge, MA: Harvard University Press, 1988), and Hans Moravec, *Robot: Mere Machine to Transcendent Mind* (Oxford: Oxford University Press, 1999)). The possibility of machinic evolution is also explored in Daniel H. Wilson's science fiction novel *Robogenesis*, a text that will be looked at in more detail in Chapter Two. Here it is the human-created artificial intelligence known as Ryujin that initially designs and creates new species and varieties of what appear to be 'natural machines'. These creatures, described as being at once '[n]ot natural and not unnatural', are designed to blend into natural ecosystems as any natural species would and they appear to be able to reproduce and evolve symbiotically through specialised birthing machines (Daniel H. Wilson, *Robogenesis* (London: Simon & Schuster, 2014), pp. 248, 275, 336)).

[6] Butler, *Erewhon*, p. 154.

every machine as an individual entity. In truth, Butler contends, technological objects work together like some collective organism, reproducing and evolving through and with one another in what could be described as a symbiotic relationship. In the same way, Butler suggests, that a flower is fertilised with the aid of an external agent (a bee), technological objects reproduce through symbiotic relationships with the human beings that originally create them and the other machines that subsequently produce or reproduce them. 'The bare fact', Butler argues, 'that no vapour-engine was ever made entirely by another, or two others, of its own kind, is not sufficient to warrant us saying that vapour-engines have no reproductive system'.[7] The very existence of vestigial structures in machines, the text suggests, is proof of this machinic reproduction and of the possibility of technological evolution.

What Butler describes in these passages as a mere illusion – the assumption that machines are unable to reproduce and evolve as natural organisms do – recalls the classic distinction between *phusis* and *techne* given by Aristotle in the *Physics*. Here Aristotle famously distinguishes between 'natural objects' that contain within them 'a source of change and of stability' and other objects that 'have no intrinsic impulse for change' and do not 'intrinsically' contain 'the source of [their] own production'.[8] Whereas natural entities and living beings have the capacity to move and reproduce themselves, the technological object is presented in Aristotle's text as being dependent on some external cause and an external act of creation.[9] Read in relation to the notion of evolution being discussed here, one might suggest that this classic distinction between *phusis* and *techne* is in fact a distinction between a nature that appears to evolve on its own, reproducing itself into something new, and a technology that has no inherent capacity for such change, reproduction and evolution. It is this very understanding of evolution as being bound to *phusis* – as belonging to so-called nature, or as being natural in itself – that is questioned in Butler's text.

Butler's description of machinic evolution and of the technological rudiment opens up a number of questions about the ways that modern-day machines and possible future

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[7] Butler, *Erewhon*, pp. 162-163. For more on the notion of symbiosis and its relation to evolution see the discussion of Lynn Margulis's theory of symbiogenesis in the section 'Originary Biotechnicity' in Chapter Three.

[8] Aristotle, *Physics*, trans. by Robin Waterfield, ed. by David Bostock (Oxford: Oxford University Press, 1996), pp. 33-34.

[9] As Arthur Bradley suggests, this 'is the theory of technology that has dominated philosophy for more than 2000 years: the technical artefact is a *prosthesis* (*pro-thesis*, literally, that-which-is-placed-in-front-of) to nature, thought and the human, with no formative or reproductive power of its own, that can be utilised for good or ill depending upon who or what happens to wield it' (Arthur Bradley, *Originary Technicity: The Theory of Technology from Marx to Derrida* (Basingstoke: Palgrave Macmillan, 2011), p. 5).

technologies may challenge our conceptions of what constitutes a living, evolving being.[10] What I would like to draw attention to here is not merely the way in which these passages question our understanding of what technology is and what it can be, but the way that they also effectively challenge our conception of evolution itself. Butler's text does not simply invite us to think of technology as evolving like some kind of *natural* entity; it also invites us to question the supposed *naturalness* of evolution. If evolution is not limited to the so-called natural world, if it is not some exclusive property of *phusis*, then this implies that what we previously thought of as being technological is somehow always already natural, and what is natural might always already be technological. The suggestion that there might be a living germ of self-making in every technological object does not merely naturalise technology, it also, in a sense, denaturalises nature, leading us to suspect that the so-called natural evolution of all living beings, including of course that of the human species, may perhaps not be quite as natural as we might think. If the evolutionary concepts of the vestige and the germ can be thought of in relation to technology, then perhaps this is because there is something prosthetic about the germinal and the vestigial in the first place; it is perhaps because the evolution of all living beings including the human is always already prosthetic.

It is precisely such a questioning of the naturalness of evolution and more broadly of nature itself that this thesis engages with in its analysis of the relationship between life, technics and the human. The title to this thesis presents this project as an *appendicology*, as a study of *appendages* and *appendixes* – corporeal organs that appear peripheral, external or non-essential to the body despite being internal or integral to it. I have already introduced the notion of the appendix – a vestigial organ that Darwin refers to (much like Samuel Butler does in his own description of the so-called rudimentary pipe part) as a 'useless' structure that lost its function through the course of evolution and that now remains as a remnant or a trace of the past.[11] Despite being located deep within the body of an organism, the appendix does not appear to form an active part of its functioning and instead seems to refer back to another time and another place, to the other bodies, organisms and species that it once functioned within. As Darwin notes in *The Origin of Species*, such vestigial or 'rudimentary' organs are 'retained by

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[10] The notions of artificial intelligence and artificial life are particularly relevant here. The question of AI is discussed in my analysis of the Turing Test and my reading of Daniel H. Wilson's science fiction novels in Chapter Two (see the sections 'Turing's Machinic Mimic' and 'Cartesian AIs'). For more on the development of artificial life, particularly digital organisms and self-replicating computer programmes, see Richard E. Lenski and others, 'Genome Complexity, Robustness and Genetic Interactions in Digital Organisms', *Nature*, 400 (1999), 661-664, and Christoph Adami, 'Digital Genetics: Unravelling the Genetic Basis of Evolution', *Nature Reviews Genetics*, 7 (2006), 109-118.

[11] Charles Darwin, *The Origin of Species and The Descent of Man* (New York: The Modern Library, 1945), p. 408.

the power of inheritance' and 'relate to a former state of things'.[12] In this sense these structures serve as traces or marks of otherness within the body; traces of an otherness that is at once internal and external, natural and alien to the bodies that host them. It is this very mark of internal exteriority and inherent otherness that, I argue in this thesis, at once unites and distinguishes all forms of life and the living from one another in an evolutionary repetition and re-articulation of biological difference and sameness that implicates every body, every organism and every species in another. In their very referral to and deferral from other states and other bodies, the appendix and other vestigial organs do not merely point to an exteriority, an otherness and a difference that is internal and inherent to every so-called natural body and organism; they also point to a movement of evolution that itself always already constitutes and is constituted by this play of interiority and exteriority, this difference and sameness that appears to denaturalise nature from within.

The appendage tells a related but somewhat different story.[13] In its definition of this term, the *OED* describes the *appendage* as 'a *subsidiary external adjunct*, *addition*, or *accompaniment*, which *does not form an essential part* of that to which it is added, but is usually *natural* or *appropriate* to it'.[14] Whereas, in its supposed lack of function, the vestigial appendix appears alien and external to the bodies that host it despite being buried deep within them, the *appendage* is described here as being natural, integral and proper to the body, while

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[12] Darwin, *The Origin of Species*, p. 347. The appendix was first depicted in anatomical drawings by Leonardo da Vinci in 1492 and was mentioned in a study by the physician Berengario da Carpi in 1521, while the first recorded surgical removal of the appendix occurred in 1735 (G. Rainey Williams, 'A History of Appendicitis', *Annals of Surgery*, 197:5 (1983), 495-506 (pp. 495, 499)). Although for many centuries this organ was believed to be useless, recent studies have suggested that the appendix may indeed serve as 'a "safe house" for commensal bacteria' in the gut (R. Bollinger and others, 'Biofilms in the Large Bowel Suggest an Apparent Function of the Human Vermiform Appendix', *Journal of Theoretical Biology*, 249:4 (2007), 826-831 (p. 826)). This vestigial organ is believed to be a reservoir of 'symbiotic gut bacteria' that work in conjunction with the body to maintain a healthy digestive system (H.F. Smith and others, 'Comparative Anatomy and Phylogenetic Distribution of the Mammalian Cecal Appendix', *Journal of Evolutionary Biology*, 22:10 (2009), 1984-1999 (p. 1985)). These recent studies may appear to invalidate Darwin's description of the appendix as a remnant of the past. But, as I suggest in Chapter Three, regardless of whether an organ is strictly rudimentary or not, whether it is purely vestigial or not, it may still be said to serve as a reminder of the past, having evolved and descended, like every other organ within the body, out of homologous organs in other species.

[13] The two terms are clearly related to one another and are both derived from the Latin *appendere*, meaning 'to hang on'. Both terms were originally used to refer to entities that appeared to be 'attached' onto something else 'as if by being hung on'. In fact, as it is used in biology, the term *appendix* refers to the *shape* of this vestigial organ that appears to be attached to the large intestine or the *cecum* like some external appendage. As the *OED* informs us, the term *appendix* originally appeared as a variant of *appendage* and it was only later that it came to specifically denote an extra addition at the end of a document or a book, and, in biology, this appendage-like vestigial structure. ('Appendix, n.', 'Appendage, n.', in *OED Online* (Oxford University Press, June 2015) <http://www.oed.com/view/Entry/9612>, <http://www.oed.com/view/Entry/9592> [accessed 4 August, 2015]). It has been suggested that the use of the term *appendix* may have led to the assumption that this organ is useless, that 'the choice of the noun "appendix" from the beginning of the organ's nomenclature, gave it little chance of ever being considered important' (Tahir Iqbal and others, 'A Meta-Analysis of History and Functions of Vermiform Appendix', *Pakistan Journal of Surgery*, 27:4 (2011), 316-320 (p. 316)).

[14] 'Appendage, n.', in *OED Online*; my italics.

simultaneously also appearing external and foreign to it. This play of interiority and exteriority, naturalness and foreignness can be thought of in relation to human limbs – appendages that extend out of the torso and appear external to the body proper.[15] But as sensory and communicative organs, organs of locomotion and organs of labour, human arms, legs, hands and feet do not merely *appear* to be external to the body; in their very use and function these human appendages feel, move, work and play at the interface between a perceived internal self and an outside world, allowing the human being to interact with and manipulate its external environments and to extend and exteriorise itself into the objects that it creates and uses. In this sense, these appendages negotiate the relationship between the human and technology, with the human hand in particular serving as an organ of creation, an organ of *techne*, the organ that built fires, crafted tools and developed writing. From the first hand-held tools of our ancestors to the digital media of our age, the hand is implicated in all human technologies. Equally, technology is also implicated in the hand. Our first *digital* devices – as the term itself suggests – were and continue to be our fingers, our first tools of *manipulation* our hands. This organ that creates and uses technology is also in itself a technical and mechanical part of the body, an organ that serves as a natural tool that is always already there. It is for this reason that the French paleoanthropologist André Leroi-Gourhan is able to argue that human tools and implements are natural extensions or exteriorisations of the body's limbs, with the hammer, for example, serving as an improved fist.[16] At once natural and mechanical, the creator of tools and a tool in itself, an organ that is integral to the body but external to its internal functioning, the hand epitomises the interior exteriority of the appendage by pointing to a technicity that is not merely internal *or* external to the human and to nature, but that is at once internal *and* external to both.

Appendicology, as it is conceived in this thesis, concerns itself with these two kinds of organs and body parts that occupy the same space of otherness and liminality. The appendages that constitute the very extremities and limits of the body and, in the case of the human, serve to negotiate its relationship with technics, find their counterpart in the appendix that lies buried deep within the body but seems to belong elsewhere. This appendicology interrogates the

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[15] An extreme manifestation of this sense of exteriority can be observed in the disorder known as 'xenomelia' or 'foreign limb syndrome', described as 'the continuous experience of being "overcomplete" in possessing four limbs and the resulting request for surgical removal of the unwanted "foreign" extremity' (Leonie Maria Hilti and others, 'The Desire for Healthy Limb Amputation: Structural Brain Correlates and Clinical Features of Xenomelia', *Brain: A Journal of Neurology*, 136 (2013), 318-329 (p. 319)). Despite forming part of the body proper, these limbs are experienced as foreign and extraneous parts that need to be excised from the body in order for it to feel somehow natural and whole.

[16] André Leroi-Gourhan, *Gesture and Speech*, trans. by Anna Bostock Berger (Cambridge, MA: MIT Press, 1993), p. 246.

contradictions and ambiguities posed by these organs of corporeal otherness by first looking at how the corporeal motif of the appendage draws attention to the evolutionary or, better still, co-evolutionary process of becoming shared by the human and technics, and then using the motif of the appendix to consider how this process of becoming can be thought of in the context of the multitudes of other evolutionary relationships that constitute the so-called natural world. These organs gesture towards an exteriority and an otherness that is internal and inherent to the natural body and nature itself, an exteriority and otherness that always already constitutes it from within. It is this tension of interiority and exteriority, this inherent prosthetic otherness of nature, that, I argue, simultaneously relates and distinguishes all different forms of life and the living from one another, including, of course, the human species. In its recognition of this shared internal otherness, an otherness that always already repeats, reproduces and re-articulates itself as and in difference, this appendicology fragments and fractures any singular boundary or opposition between nature and technics, the human and technics, and, indeed, between the human and the rest of the so-called natural world. In so doing, it shows how the human, technics and nature are always already implicated in one another and how they always already evolve with and within one another.

Appendages

In *Gesture and Speech* (1964), André Leroi-Gourhan speaks of the tool as an extension of the human hand; as an implement that is secreted or 'exuded' by the human body, growing out of it as if it were part of its natural form.[17] Following on from this, he suggests that 'it is logical that the standards of natural organs should be applied to such artificial organs';[18] that technological objects and implements, therefore, be thought of as natural parts of the human body akin to their organic correlatives. Leroi-Gourhan's description of the technological implement as an organ, or as I describe it in this thesis, as an *appendage* of the body, may at first glance appear to be a simple metaphor that draws a rhetorical link between the artificial, inert tool and the natural, animate limbs of our own bodies. But describing the technological object as an organ or an appendage is not merely a rhetorical device or a turn of phrase: appendicology points to a lived relationship between the human and technology that cannot be

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[17] Leroi-Gourhan, *Gesture and Speech*, pp. 91, 106. A similar if less explicit notion of exteriorisation is suggested by Lewis Mumford in *Technics and Civilization*, where technology is described as 'enlarging the mechanical or sensory capacities of the human body'. Automatic machines, Mumford argues, merely constitute the 'last step in a process that began with the use of one part or another of the human body as a tool' (Lewis Mumford, *Technics and Civilization* (London: Routledge and Kegan Paul, 1934), pp. 9-10).

[18] Leroi-Gourhan, *Gesture and Speech*, p. 91.

reduced to mere metaphor. As will become evident in the course of this thesis, thinking technology as an appendage allows us to see how the relationship between the human and technics is determined by a play or a movement of supplementarity that always already implicates the one within the other.

In her latest book *Alone Together*, the sociologist and psychologist Sherry Turkle claims that we have become 'tethered to our devices', that our mobile phones, for example, have become an intimate part of our selves and our bodies.[19] Describing the relationship teenagers seem to share with their phones, she notes that '[t]he technology has become like a phantom limb, it is so much a part of them'.[20] For these teenagers, Turkle suggests, the phone is like a disembodied arm or leg that feels like an actual part of the body despite being separate from it. A similar feeling has been described by N. Katherine Hayles, who claims in one of her recent books that when her internet connection fails or her computer breaks down she feels 'as if [her] hands have been amputated'.[21] The feeling of loss brought about by malfunctioning devices is experienced as *an actual corporeal loss*, as the loss of an essential part of one's own body. For the philosopher Bernard Stiegler, the misplacing of a memory aid or of a technological device such as a mobile phone highlights a more fundamental human lack.[22] Identifying the feeling of loss that Hayles speaks of as a central aspect of the totality of our contemporary existence, Stiegler claims that 'what Socrates describes in the *Phaedrus* – that the exteriorisation of memory is a loss of both memory and knowledge – is what, today, we experience on a daily basis, in *all* aspects of our existence and more and more often in our feeling of impotence, if not disability'.[23] The exteriorisation of ourselves, our thoughts, our memories, our contacts and our social connections into our technological devices and our virtual networks necessarily leaves us feeling impotent and crippled. Whether these objects are lost or close at hand, the very fact of their existence reveals a lack within ourselves, a lack comparable to that of a missing limb or appendage. In exteriorising ourselves into our technological objects, we transform these devices into the inorganic organs and appendages of our bodies, organs and appendages that we are unable to function without.

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[19] Sherry Turkle, *Alone Together: Why We Expect More from Technology and Less from Each Other* (New York: Basic Books, 2011), p. 14.
[20] Turkle, *Alone Together*, p. 17.
[21] N. Katherine Hayles, *How We Think: Digital Media and Contemporary Technologies* (Chicago: The University of Chicago Press, 2012), p. 2.
[22] Bernard Stiegler, 'Anamnēsis and Hypomnēsis: The Memories of Desire', trans. by François-Xavier Gleyzon, in *Technicity*, ed. by Arthur Bradley and Louis Armand (Prague: Litteraria Pragensia, 2006), pp. 15-41 (pp. 15-17).
[23] Stiegler, 'Anamnēsis and Hypomnēsis', pp. 18-19.

Turkle's and Hayles's descriptions of phantom limbs and amputated hands, as well as Stiegler's more general analysis of the inherent lack or impotence revealed by technology, all rely on the same image used by Leroi-Gourhan: that of technology as an organ or an appendage of our body. The technological object *is* precisely such an appendage because we experience it as such. Stiegler claims that the experience of losing a memory aid or a technological device proves that 'a part of our self […] is outside of us'.[24] This implies two distinct but interrelated things: firstly, that technology – that which we think of as being external and separate to us – is somehow a natural or integral 'part of our self', and secondly that 'our self' – what we think of as being natural and inherent to us – is in some way also already external and prosthetic. What appears to be external to us is revealed to have an internal connection with ourselves, while what we think of as our own internal nature appears to be external and thus somehow unnatural. Both these strands of argument are interrelated: if that which is external to us is also internal, then our interiority is necessarily also determined by an exteriority. This may seem like a redundant or perhaps even a tautological point to make, but what it reflects is a logic or, better yet, a movement of supplementarity that shows how interiority and exteriority are implied and implicated in one another without being either opposed to or conflated with the other.

Explaining the paradoxical structure of this supplementarity, Derrida shows in *Of Grammatology* how 'the concept of the supplement […] harbors within itself two significations whose cohabitation is as strange as its necessity'. For a supplement to be a supplement, that which it adds itself to must already be whole and complete in and of itself. The supplement is something extra – it 'adds itself, it is a surplus, a plenitude enriching another plenitude, the *fullest measure* of presence'.[25] But, at the same time, the very fact of supplementation implies the *need* for an addition; it points to a lack that somehow needs to be filled to create a new whole. As Derrida explains,

> […] the supplement supplements. It adds only to replace. It intervenes or insinuates itself *in-the-place-of*; if it fills, it is as if one fills a void. […] As substitute, it is not simply added to the positivity of a presence, it produces no relief, its place is assigned in the structure by the mark of an emptiness.[26]

According to the pattern of thought that Derrida introduces here, the supplement reveals an inherent lack, a whole that is and yet is not complete, one, in fact, that only comes into existence

[24] Stiegler, 'Anamnēsis and Hypomnēsis', p. 15.
[25] Jacques Derrida, *Of Grammatology*, trans. by Gayatri Chakravorty Spivak (Baltimore: The Johns Hopkins University Press, 1997), p. 144.
[26] Derrida, *Of Grammatology*, p. 145.

through this supplementation. Derrida goes on to explain that throughout the history of metaphysics the supplement has been designated as '*simple exteriority*, pure addition or pure absence'. According to this logic, '[*w*]*hat is added is nothing because it is added to a full presence to which it is exterior*'.[27] Thus, for example, 'art, *technè*, image, representation, convention, etc.' are perceived as being mere supplements to nature – external, artificial and alien additions that lie 'outside of the positivity to which […they are] super-added'.[28] Technology and artifice seem to merely supplement nature, serving as external additions to that which forms an already self-sufficient, unified and integral whole. But according to the structure of supplementarity described by Derrida, the very fact of this addition challenges 'the original purity of nature'[29] by revealing 'the originarity of the lack that makes necessary the addition of the supplement'.[30] What the supplement reveals is that nature is not and never has been self-sufficient, unified or whole. The natural interiority of the whole that is supplemented with an exterior or prosthetic addition is never purely natural or integral, but always has implied within it that exteriority or prostheticity that comes to supplant it. As Derrida explains, '[t]he outside bears with the inside a relationship that is, as usual, anything but simple exteriority. The meaning of the outside was always present within the inside, imprisoned outside the outside and vice versa'.[31]

This is the general structure or play of supplementarity which, as Derrida elaborates, 'would have it that the outside be inside, […] that what adds itself to something takes the place of a default in the thing, that the default, as the outside of the inside, should be already within the inside, etc.'.[32] It is this supplementary play between inside and outside that informs Hayles's experience of the loss of the technological object as a corporeal loss and that underpins Stiegler's notion of an inherent lack revealed by technology. Read through the motif of the appendage, technology is not merely an external and artificial prosthetic device that comes to be added onto an internal and self-sufficient human nature; it is rather that which is *simultaneously* internal and external to this so-called nature, or that which, more precisely, is internal *by virtue* of being external to it and external *by virtue* of being internal to it. It is for this reason that the loss of a technological object can be experienced as a form of corporeal deprivation or physical impotence. As an appendage – as 'a part of our self […] [that lies]

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[27] Derrida, *Of Grammatology*, p. 167.
[28] Derrida, *Of Grammatology*, pp. 144, 145.
[29] Derrida, *Of Grammatology*, p. 203.
[30] Derrida, *Of Grammatology*, p. 214.
[31] Derrida, *Of Grammatology*, p. 35.
[32] Derrida, *Of Grammatology*, p. 215.

outside of us'[33] – the technological object is a natural aspect of ourselves and our bodies that we are dependent on. Consequently, our human selves and our bodies are not as natural or integral as we might think. '[H]uman nature', as Stiegler puts it in broad terms, 'consists only in its technicity, in its denaturalization'.[34] That which we think of as human nature is always already in and of itself marked by the exteriority and artificiality of that which supplements it.

This thinking of supplementarity and the prostheticity that it reveals in human nature has been elaborated on by Bernard Stiegler and David Wills. In his writings, Stiegler often borrows Leroi-Gourhan's description of the technological object as an organ or appendage of the body. In 'Technics of Decision', for example, he argues that 'this living being that we call man […] is a being that, to survive, requires *non-living organs*. […] eye-glasses, houses, clothes, sharpened flints, etc. […]'.[35] Stiegler argues that the human exteriorises its internal self into these technological organs or appendages, creating what Samuel Butler describes in *Erewhon* as a 'full complement of limbs' outside of the body proper.[36] Stiegler goes on to argue that this exteriorisation is not something that is prosthetically added onto the human, but is rather an originary and inherent aspect of humankind. Using the logic of the supplement, Stiegler develops the concept of exteriorisation to argue that there can be no human interiority that precedes it. It is rather the very process of exteriorisation itself – the making of the technological object into an appendage of the body – that constitutes the human in the first place, or, to phrase this differently, it is the exteriorisation of the human in(to) technics that allows for the creation of the very interiority that we define as human. As Stiegler notes, there is 'no interiority *preceding* exteriority. On the contrary: exteriorisation *constitutes* the interior as what it is'.[37] Consequently, then, the very claim that the human exteriorises itself, or makes the technological object an appendage of itself, needs to be re-thought. There is no *a priori* human being that exteriorises itself, or that creates and manipulates technology as if it were a part of itself. It is rather through this very process of exteriorisation and the experience of the technological object as a corporeal appendage that the human comes into being.

This implies that the human is always already technological and prosthetic. This insight lies at the heart of David Wills's *Prosthesis* and *Dorsality*. In *Prosthesis* – a book that is in

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[33] Stiegler, 'Anamnēsis and Hypomnēsis', p. 15.
[34] Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus*, trans. by Richard Beardsworth and George Collins (Stanford: Stanford University Press, 1998), p. 148.
[35] Bernard Stiegler, 'Technics of Decision: An Interview', trans. by Sean Gaston, *Angelaki*, 8:2 (2003), 151-168 (p. 158); my italics.
[36] Butler, *Erewhon*, p. 174. A more detailed analysis of Butler's conceptualisation of the technological appendage can be found in the first three sections of Chapter One.
[37] Stiegler, 'Anamnēsis and Hypomnēsis', p. 19.

itself explicitly concerned with the loss of limbs and the supplementation of prosthetic appendages – Wills suggests that it is our experience of the body that introduces us to technicity. According to Wills, it is the body and its 'articulations [that] serve as the model for the mechanical; […] the mechanical is more readily identifiable in the body than elsewhere in the physical world'.[38] The body, as Wills explains further, is inherently prosthetic. In this sense, 'the prosthetic body […is] the paradigm for the body itself'.[39] This is further elaborated on in *Dorsality* with specific reference to corporeal appendages. Following Leroi-Gourhan's suggestion in *Gesture and Speech* that 'human evolution did not begin with the brain but with the feet',[40] Wills argues that the coming into being of the human involves a turning (in)to technology that is implied by the limb:

> […] the turn is first of all an inflection, a bending, *the movement of a limb* that, as the Latin teaches us is the sense of *articulation*. Within that logic, there is technology as soon as there are limbs, as soon as there is bending of those limbs, as soon as there is any articulation at all. As soon as there is articulation, the human has rounded the technological bend, the technological turn has occurred, and there is no more simple human. Which, for all intents and purposes, means that there never was any simple human. […] The human is, from the point of view of this turn, understood to become technological as soon as it becomes human, to be always already turning that way.[41]

The process of exteriorisation identified by Stiegler in the creation of the first tools and technological implements is here shown by Wills to extend to and include the very evolution of our bodies and our limbs. These bodies and limbs are, according to Wills, in themselves already technological and prosthetic. As he explains further, '[f]rom and in its beginning, back where it began, the human is therefore receiving a definition from a technologization of the body, in a becoming-prosthesis […]'.[42] Technology, for both Wills and Stiegler, is indeed 'a matter of exteriorization', but one 'that calls into question the integrity of any interiority'.[43]

Wills's and Stiegler's discussions of the exteriorisation of the always already prosthetic human reveal why the metaphor of the technological appendage is not merely a metaphor. What the notion of the technological appendage reveals is that the distinction between the body and the technological object is not as absolute as it may seem. The technological objects that we exteriorise ourselves in can be thought of as natural parts of ourselves, while our own natural bodies are already technical, with perhaps our hands and our feet being the most overtly

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[38] David Wills, *Prosthesis* (Stanford: Stanford University Press, 1995), pp. 27-28.
[39] Wills, *Prosthesis*, p. 137.
[40] Leroi-Gourhan, *Gesture and Speech*, p. 229.
[41] David Wills, *Dorsality: Thinking Back through Technology and Politics* (Minneapolis: University of Minnesota Press, 2008), pp. 3-4.
[42] Wills, *Dorsality*, p. 9.
[43] Wills, *Dorsality*, p. 10.

technical parts of all. Referring to the technological object as an appendage of the body thus implies a certain continuity between natural and artificial organs and points to the inherent *prostheticity* of the body and the *naturalness* of our prostheses. If the notion of the appendage functions as a metaphor, then it is a metaphor that describes a relationship of supplementarity in which tenor and vehicle are intimately implicated in one another and, indeed, in which the tenor is already partly the vehicle and the vehicle already partly the tenor. Using the notion of the appendage to understand the relationship between the human and technology is not merely a rhetorical gesture, or, perhaps, it is a rhetorical gesture that in its very rhetoric echoes the relationship of supplementarity that it attempts to describe.

As this brief analysis suggests and as I substantiate in the course of this thesis, an appendicology provides a way of thinking the relationship between the human and technology in terms of a supplementarity that always already implicates the human in technics and technics in the human. In this sense, the motif of the appendage draws attention to the critical paradigm of *originary technicity* and the way that it is used in contemporary theory to question traditional conceptions of the human and technology.[44] But the appendicology that I develop in this thesis also raises questions about our understanding of this paradigm. By drawing attention to the so-called originary technicity of the body, appendicology invites us to consider whether this inherent technicity is particular to the human or whether it extends to other bodies and other beings. Discussing the technicity of the human limb and the originary prostheticity of the human, David Wills suggests that this is just *one* example, albeit a highly privileged one, of a technicity that extends to the most rudimentary of cellular activities and that is therefore shared by other forms of life. Wills argues that,

> [a]lthough it is the limb that will determine the prospect of a relation to a tool, to what we call artifice in general, and so inaugurate and underwrite a conception of a human or an animate that becomes technologized by entering into a prosthetic articulation with whatever it fashions outside its own body, one might as well argue that the animate first articulates and so becomes technological in the self-division of a cell, in the self-generation of an amoeba.[45]

Wills identifies the originary 'articulation' of the animate in cellular division as a form of technicity[46] and suggests that any thinking of originary technicity must not be limited to the

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[44] For a detailed analysis of the development and use of this critical paradigm, see Bradley's *Originary Technicity*.
[45] Wills, *Dorsality*, pp. 3-4.
[46] As Wills indicates, the term *articulation* is used here in its Latin sense of a division into multiple parts (see 'Articulation, n.', *OED Online* (Oxford University Press, August 2015) <http://www.oed.com/view/Entry/11190> [accessed 10 September, 2015]). For further discussion of this term, see Derrida, *Of Grammatology*, pp. 65-66, and the section 'A Question of Origin' in Chapter Three.

human relationship with technology. This suggestion is pursued and elaborated on in this thesis, where the motifs of the appendage and the appendix are used not solely to understand the originary technicity of the human but to also consider how life is itself constituted by the same supplementarity that underlies the relationship between the human and technology.

The idea of what I will for now refer to as *nonhuman technicity* – of a technicity that exceeds and extends beyond the human to all other forms of life – is gestured towards by several contemporary theorists writing about the relationship between the human and technics. In *Technics and Time, 1*, for example, Bernard Stiegler claims that 'the zootechnological relation of the human to matter is *a particular case* of the relation of the living to its milieu, the former passing through organized inert matter – the technical object'.[47] The human relationship with technics, Stiegler suggests here, is just one case, one example, and one articulation of a broader supplementarity that extends to all of life and the living. But such a thinking of nonhuman technicity requires careful examination. In his discussions of the originary technicity of life and of the human, Stiegler often returns to André Leroi-Gourhan's analysis of the process of hominization, showing how anthropogenesis, or the creation of the human, is inseparable from a certain technogenesis or technological creation. Leroi-Gourhan's analysis of this process in *Gesture and Speech* explores the ambiguity and the supplementarity of the relationship between the human and technics, but it also reveals a supplementary tension at work in the way that this so-called human technicity is thought of in relation to nonhuman life. On the one hand Leroi-Gourhan must clearly distinguish between the human and the animal if he is to show that it is technology that creates the human; on the other hand, he must also acknowledge the evolutionary relationship that links the human to its prehuman ancestors and human technology to nonhuman forms of technicity if he is to argue that technology is as natural to the human as the very limbs of the body.[48] Thus, while Leroi-Gourhan argues that it is the relationship with the technological implement that '*radically separates* the human

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[47] Stiegler, *Technics and Time, 1*, p. 49; my italics.

[48] This contradictory and supplementary logic is also at work in the writings of Charles Darwin, particularly in *The Descent of Man* where Darwin seeks to *distinguish* the human from the animal while continuing to argue for a community of evolutionary descent that *unites* the human with other animal species. This apparent contradiction arises out of an attempt to account for what I refer to in Chapter Three as the supplementary movement of 'evolutionary becoming' that constitutes life – a supplementarity by means of which life differs and defers from itself, coming into being through this very process of differentiation. Perceived through these structures of supplementarity and differentiation, the human is necessarily both distinct from and similar to the animal, with human life constituting both a continuation and a break with animal life. The human is necessarily both separate and inseparable from the animal because it is inscribed in the same supplementary movement of becoming and of differentiation that underlies all of forms of life. As Jessica Mordsley notes in her discussion of the question of human origin in paleoanthropological studies, '[i]t is impossible to pin down a precise moment of origin of the human, since every organism necessarily contains the trace of its parents, right back to the first life on earth' (Jessica Mordsley, 'Tracing Origins in Paleoanthropology', *Oxford Literary Review*, 29 (2007), 77-101 (p. 96)).

lineage from that of the anthropoids', he also claims that human 'tools sprang, literally, from the nails and teeth of primates *without the smallest perceptible interruption*'.[49] The human and human technicity are, according to Leroi-Gourhan, *at once radically separate from* and *intimately implicated in* nonhuman life and nonhuman technicity.

This apparent contradiction reflects a pattern of supplementarity comparable to that discussed above. As I argue at length in the following chapters, it is not only the relationship between the human and technology that is structured according to a movement of supplementarity – a supplementarity that cannot be reduced to a mere opposition or a singular unity. The relationship between human and nonhuman life, between human and so-called nonhuman technicity, is also structured according to a supplementarity that does not allow for either a clear separation or a simple identification between the two. It is for this reason that the boundary between the human and the nonhuman and between human and nonhuman forms of technicity appears in Leroi-Gourhan's text to be at once both radically divisive and imperceptible, resolute and undecidable. The boundary between the animal and the human and between human and nonhuman forms of technicity that Leroi-Gourhan grapples with in his analysis is not so much a boundary but an aporia, not a divisive line but a supplementary proliferation of similarities and differences that simultaneously unite and separate.

Describing this aporia of supplementarity, Derrida argues in *The Animal That Therefore I Am* that the discussion over the relationship between the human and the animal should not focus on 'whether or not there is a limit that produces a discontinuity'; it should rather attempt to think this limit as 'abyssal', to acknowledge that 'the frontier no longer forms a single indivisible line but more than one internally divided line', lines that 'can no longer be traced, objectified, or counted as single and indivisible'. There is, Derrida suggests, no singular or absolute distinction between the human and the animal. This does not mean that there is *no* distinction between the two; it does not suggest that one should simply conflate the animal with the human and the human with the animal, annulling any difference and collapsing the one into the other. Instead, what Derrida suggests is that there are *multitudes* of limitless differences that can never be singular or absolute – differences that in their singularity differ and defer from the innumerable other differences that they supplement and are supplemented by. It is in this sense that I read the rest of this passage from *The Animal That Therefore I Am* which explains how

> [b]eyond the edge of the *so-called* human, beyond it but by no means on a single opposing side, […] there is already a heterogeneous multiplicity of the living, or more

[49] Leroi-Gourhan, *Gesture and Speech*, pp. 12, 240; my italics.

precisely (since to say "the living" is already to say too much or not enough), a multiplicity of organizations of relations between living and dead, relations of organization or lack of organization among realms that are more and more difficult to dissociate by means of the figures of the organic and inorganic, of life and/or death. These relations are at once intertwined and abyssal, and they can never be totally objectified. They do not leave room for any simple exteriority of one term with respect to another.[50]

Rather than a boundary or a division between the human and the nonhuman, or indeed, for the purpose of my argument, between what I am here referring to as human and nonhuman forms of technicity, we must think a proliferation or a multitude of differences that complicate the notion of any boundary, rendering the very distinction between the *human* and the *nonhuman* (and consequently the very use of these terms) problematic. This distinction is problematic not because there are *no* differences between the two, but because there are *multiple* differences. As Derrida argues elsewhere,

[i]f I am unsatisfied with the notion of a border between two homogeneous species, man on one side and the animal on the other, it is not in order to claim, stupidly, that there is no limit between "animals" and "man"; it is because I maintain that there is more than one limit, that there are many limits. There is not *one* opposition between man and non-man; there are, between different organizational structures of the living being, many fractures, heterogeneities, differential structures.[51]

Distinguishing between the *human* and the *nonhuman* reduces this proliferation of differences and similarities to an opposition, to one absolute, singular and unchanging difference. What Derrida calls for in these passages is for us to think the relationship between the so-called human and nonhuman precisely outside of the opposition implied by these terms. This does not mean that the two terms should be conflated with each other and that the differences between the human and other forms of life should be denied or ignored; instead it invites us to think of *all* life, whether human or not, as being constituted out of the multiplicity of organisation that Derrida speaks of. It is in this sense that Derrida argues that there can be no 'simple exteriority' and, I would add, no simple *interiority,* 'of one term with respect to another'.[52] So-called human and nonhuman life and technicity are neither simply distinct nor merely the same; they arise out of a complex of differences and similarities that implicate the one in the other without reducing them to the same.

[50] Jacques Derrida, *The Animal That Therefore I Am*, trans. by David Wills (New York: Fordham University Press, 2008), p. 31.
[51] Jacques Derrida and Elisabeth Roudinesco, *For What Tomorrow… A Dialogue*, trans. by Jeff Fort (Stanford: Stanford University Press, 2004), p. 66.
[52] Derrida, *The Animal That Therefore I Am*, p. 31.

It is this understanding of a proliferation of supplementary differences – differences that constitute themselves out of and in sameness and that are multiple in their very singularity – that informs my thinking of life and technicity. It is, I argue, this supplementarity – the supplementarity of the relationship between the organic and the inorganic, the natural and the technical, the singular and the multiple, the part and the whole – that structures every movement or process of becoming discussed in this thesis. The purpose of my discussions of so-called *nonhuman technicity* or *biotechnicity* in the following chapters is not to suggest that there is no difference between the human relationship with technics and the relationships of becoming that constitute the rest of the so-called natural world; the purpose is rather to consider how all these relationships are structured by a supplementarity that replicates itself but also inscribes itself anew in the becoming that constitutes life.

Appendixes

Thinking originary technicity beyond the human and, indeed, beyond the supposed boundary between so-called human and nonhuman nature is of particular importance today. Present-day advancements in technology and biotechnology mean that humankind does not only have the power to completely reshape and remodel the material world around it; it is also potentially able to fundamentally change the human body, the human mind and even the germ line of the species.[53] As prosthetic enhancements to the body and the brain become more common and modifications to the human germ line more probable, it becomes imperative that we consider technicity in specific relation to the body and in relation to the biological more generally. Appendicology, with its focus on bodily structures and on the relationship between corporeality and technicity, constitutes one possible way of approaching these issues. Thinking the human in the context of a more general supplementarity of organic and inorganic becoming, of an originary biotechnicity shared by all forms of life, does not simply push us to reconsider our understanding of the past and the present – our understanding of what the human *is* and how it evolved in relation to technology and the natural world; it also invites us to re-examine our thinking of the future.

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[53] In April 2015, the journal *Protein & Cell* published the results of a study by a group of Chinese scientists working on editing the genomes of human embryos (Puping Liang and others, 'CRISPR/Cas9-Mediated Gene Editing in Human Tripronuclear Zygotes', *Protein & Cell*, 6:5 (2015), 363-372). In a world first, the researchers attempted to edit the gene responsible for the blood disorder thalassaemia. The process was successful in only a small fraction of the embryos and generated a number of unwanted mutations.

Contemporary discussions about the future of the human are dominated by debates over the uses of biotechnology and genetic engineering in the supposed enhancement of the human and human life, as well as discussions over the possible evolution of new forms of life and consciousness arising out of advancements in the fields of robotics, artificial intelligence and artificial life. The two debates may appear quite distinct at first glance: one is concerned with the future of the human species and how the experience of human nature and human life could be improved, perfected and elevated through the use of technology and biotechnology; the other is concerned with the possible creation of artificial forms of life, intelligence and consciousness that could perhaps rival human life itself. But these two debates are not as distinct as they may at first appear to be. Discussing the way that the future is portrayed and discussed in contemporary discourse, Michael Hauskeller notes that the project of human enhancement and that of the creation of artificial intelligence both amount, in the final analysis, to the same thing: the obsolescence of that which we currently recognise as human and its replacement with something that is no longer recognisably human. Hauskeller explains that according to the visions of the future that populate contemporary culture,

> [w]e will either be replaced by superintelligent (and hence superpotent) machines, or we will become superintelligent (and superpotent) ourselves. Either way, what we used to call *human* and the *human condition* will no longer exist, and whatever will exist will be posthuman, in the sense that it will be *very* different from what human life is now.[54]

According to Hauskeller, then, both these visions of the future draw attention to the question of human obsolescence and invite us to think of a world *after* the human, a world that is *post-human*.[55] But in addition to this, or perhaps as a result of this, they also implicitly invite us to question what it is that we understand when we think of the *human* and where the boundaries between the so-called human and nonhuman might lie. As Hauskeller notes in his discussion of the project of human enhancement, debates over the possible amelioration of the human condition must necessarily grapple with the question of what the human *is* and which human properties are so 'essential' to the experience of being human that enhancing them would serve to enhance '*the human as such*'.[56] Similarly, debates over the creation of forms of artificial

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[54] Michael Hauskeller, *Sex and the Posthuman Condition* (Basingstoke: Palgrave Macmillan, 2014), p. 2.
[55] It is necessarily here to distinguish between my use of the terms *post-human* and *transhuman* on the one hand, and *posthumanism* or *posthumanist* on the other. In this thesis I use the terms *post-human* and *transhuman* interchangeably to refer to the idea of an *upgraded* or new form of being that is to evolve out of or simply replace the human. Conversely, I use the terms *posthumanism* and *posthumanist* to refer to what Cary Wolfe describes as 'a new mode of thought' that seeks to critique the main tenets of humanism and rethink our understanding of what it means to be human (Cary Wolfe, *What is Posthumanism?* (Minneapolis: University of Minnesota Press, 2010), p. xvi).
[56] Michael Hauskeller, *Better Humans? Understanding the Human Enhancement Project* (Durham: Acumen, 2013), p. 9; my italics.

intelligence, artificial life and artificial consciousness that could rival that of the human species run up against the question of what actually constitutes human intelligence, human life and human consciousness in the first place, and whether the experience of this intelligence, life and consciousness could ever be replicated. The questions of human enhancement and human obsolescence as presented in contemporary discussions about the future of the human species are questions about the *essence* and the *limits* of the human, questions about what makes the human *human* and how the human relates to that which it is not.

What I would like to focus on in these debates is one particular notion that recurs in many contemporary visions of the future. Many science fiction writers, computer scientists and cultural theorists seem to suggest that regardless of whether the human biotechnologically *evolves* into an enhanced species that is no longer recognisably human, or whether it is *replaced* by its own technological creations, the movement from the human to the post-human will constitute an evolutionary event comparable to the evolution of the human from its ancestors. Even if the human is replaced by 'artificial' beings that are not its biological heirs, according to thinkers such as the transhumanist Hans Moravec, these beings will still constitute the evolutionary 'descendants' of the human species,[57] and they will, moreover, also constitute a new stage in the evolution of life and of species. Envisaging the creation of true artificial intelligence, Vernor Vinge claims that this will constitute an absolute break with the past, a 'technological *singularity*' in which all 'our models must be discarded and a new reality rules'. But in arguing this point, Vinge nevertheless describes the emergence of this post-human intelligence in familiar *evolutionary* terms, comparing it to 'the rise of human life on Earth'. Although Vinge seems to want to stress how 'radically different' this form of being will be to anything the world has experienced so far, he nevertheless situates this event firmly within the realm of biological evolution, claiming that the relationship between these new technological beings and their humans ancestors will be comparable to the relationship the human shares with 'the lower animals'.[58] Regardless of whether these beings emerge from *within* the human or replace the human species from *without*, the creation of the post-human will constitute an event that cannot be divorced from the biological evolution of life and of species.

The significance of this evolutionary narrative can be examined by taking a closer look at one particular image that has been used in descriptions of the future: that of the human as a

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[57] Moravec, *Mind Children*, p. 1.
[58] Vinge, 'The Coming Technological Singularity', p. 12. The nature of this technological singularity – of this event that supposedly cannot be foreseen but continues to be described in very familiar terms – is discussed in further detail in the section 'Turing's Machinic Mind' in Chapter Two.

vestigial appendage or an *appendix* of the post-human. In an essay menacingly titled 'The Transhumans Are Coming', the evolutionary biologist Lynn Margulis and science writer Dorion Sagan suggest that if human beings actually survive species extinction, they will 'persevere not as individuals but as *remnants*'.[59] Describing what this future may look like, Margulis and Sagan call on us to imagine technologised beings that are no longer human but that still carry remnants of the human body within them, remnants that bear witness to a human past that no longer exists. A comparable image is evoked in the science fiction novel *Mindscan* by Robert J. Sawyer, which takes as its point of departure Ray Kurzweil's suggestion in *The Age of Spiritual Machines* that one way to develop an artificial intelligence as sophisticated as the human brain is through 'reverse engineering – scanning a human brain […] and essentially copying its neural circuitry in a neural computer'.[60] Following the creation of such intelligences, the novel shows how human beings are treated as 'old biological appendage[s]' of the digitalised minds that come to replace them.[61] Forced to retire from the earth, these human characters are regarded as 'extant' but 'not living' remnants of these minds; 'shed skins' that are 'no longer needed' by their synthetic replacements.[62]

These descriptions of a post-human world in which the human remains nothing more than a vestigial remnant or rudiment of the past invite comparison with a strikingly similar vision of the future evoked in H.G. Wells's short story 'Of a Book Unwritten' (1893). The story describes how by the year 1,000,000 AD humankind will have been replaced with 'some other type of animated being' that is no longer human.[63] Wells imagines these highly-technologised beings evolving out of the human species but bearing little resemblance to the human as we know it. In this dystopian vision of the future, all that is left of the human is a physical remnant that has been left behind – the 'dangling, degraded pendant' of a vestigial body that remains attached to the nonhuman minds of these highly-technologised post-human creatures.[64] Wells's use of this particular image draws attention to the way in which in each of these descriptions of the future the human is portrayed as an *appendix* or a *vestigial appendage*

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[59] Lynn Margulis and Dorion Sagan 'The Transhumans are Coming', in *Dazzle Gradually: Reflections on the Nature of Nature* (White River Junction, VT: Chelsea Green Publishing, 2007), pp. 89-100 (p. 100); my italics.
[60] Ray Kurzweil, *The Age of Spiritual Machines: How We Will Live, Work and Think in the New Age of Intelligent Machines* (London: Phoenix, 1999), p. 4. Kurzweil's book is explicitly referenced in the novel, with the main character telling us: 'Ray Kurzweil had been the most vocal proponent around the time I was born of moving our minds into artificial bodies' (Robert J. Sawyer, *Mindscan* (New York: Tor, 2005), p. 42).
[61] Sawyer, *Mindscan*, p. 96.
[62] Sawyer, *Mindscan*, pp. 230, 99, 54.
[63] H.G. Wells, 'Of a Book Unwritten', in *Certain Personal Matters* (London: T. Fisher Unwin, 1901), pp. 108-114 (p. 109).
[64] Wells, 'Of a Book Unwritten', p. 113.

of the past. The term *pendant* that Wells uses to describe the remnant-like atrophied body of the extinct human comes from the Latin *appendere* and has the same etymological root as the words *appendix* and *appendage*. Perceived through the visions of the future given by H.G. Wells, Lynn Margulis and Dorion Sagan, the future is not a future *of* or *for* the human, but a future in which the human remains as nothing more than a vestigial remnant of an obsolete past, a redundant, obsolete and vestigial *appendage* or *appendix* that is comparable to the vestigial organs and structures contained in our own bodies.

A similar but differently nuanced claim is made by Thierry Bardini, who argues that the human is *already* obsolete and *already* thinks of itself as this remainder. Bardini suggests that humankind is currently living in a 'transitional' state awaiting the arrival of a new being that will make it redundant, 'or, in the programmers' lingo [...] *404 compliant*'.[65] Bardini suggests that, having become aware of its own obsolescence, humanity is now inhabiting an ambiguous space of expectation in which the living present is experienced as *the dead past of the future* and the living human self is felt to be an *obsolete remnant or trace of that which will have once been*. Perceiving itself from the point of view of a post-human or transhuman future that no longer belongs to it, the human has become, according to Bardini, a redundant trace or a remainder of the past in a future that is yet to arrive.[66] This is what Bardini suggests when he describes contemporary humanity as the dead trace of a '404' error – a computer error indicating that that which once was can no longer be found. Perceived through the eyes of this post-human future, the human recognises itself as 'the last organic remainder' of a past that will soon have been left behind.[67]

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[65] Thierry Bardini, *Junkware* (Minneapolis: University of Minnesota Press, 2011), p. 145.
[66] This point of view is shared by thinkers of the Anthropocene. As Claire Colebrook describes it, 'the positing of the anthropocene era relies on looking at our own world and imagining it as it will be when it has become the past' – a looking back onto the present as a past seen from the point of view of a future devoid of any perceiving human eye (Claire Colebrook, *Death of the PostHuman: Essay on Extinction*, Vol. 1 (Ann Arbor, MI: Open Humanities Press, 2014), p. 24). Such a thinking of the present and the future is evidenced by contemporary projects that involve the construction of facilities intended to outlive the human race and other forms of life in the event of their wholesale destruction. The Onkalo repository, for example, a deep geological nuclear waste repository being constructed in Finland, has been designed to survive all forms of natural or man-made disasters, including the destruction of the human race as a whole. Designed to be sealed off from the world above for at least 100,000 years, this project invites us to think the present through the lens of this future and to contemplate the different forms of life and intelligence that may discover this nuclear remnant (for further discussion of this see the documentary film *Into Eternity: A Film for the Future* (2010) directed by Michael Madsen). A different project that points to a similar thinking of the future is the Svalbard Global Seed Vault, a secure deep geological seed bank in Norway that is designed to preserve the diversity of agricultural life, particularly in the event of a global catastrophe. For more on this and other similar projects, see Jim Robbins, 'Building an Ark for the Anthropocene', *The New York Times*, 27 September, 2014 <http://www.nytimes.com/2014/09/28/sunday-review/building-an-ark-for-the-anthropocene.html> [accessed 10 September, 2015].
[67] Bardini, *Junkware*, p. 162.

One may read in Bardini's description of our contemporary present the same images used by Margulis and Sagan, Robert Sawyer, and H.G. Wells to describe the so-called post-human future. Contemporary humanity, as Bardini sees it, recognises its own redundancy and obsolescence and identifies itself as a trace or a remnant of the past, as a functionless organic remainder that, like the vestigial structures contained in our own bodies, refers back to a biological past that has no part to play in the world of the future. The use of this image is particularly significant to the appendicology being developed here. The portrayal of the human as an obsolete and vestigial biological remnant comparable to the traces left behind in our bodies allows us to see how the question of the future of the human and its relation to technology cannot be divorced from a wider discussion of evolution and life itself. The evolutionary narratives used by transhumanist and post-humanist thinkers and, more particularly, the image of the vestigial human that I highlight above, remind us that the human and the technicity that we associate with it are firmly part of a so-called *natural* world that is necessarily also inherently *prosthetic*. As I pointed out in my reading of Butler's description of the technological rudiment in the opening remarks to this Introduction, the evolutionary narrative at work in contemporary discourses on the post-human and the transhuman does not merely *naturalise* the notion of a technologised post-human; it simultaneously also *denaturalises* nature and the process of evolution itself, inviting us to perceive the unnaturalness of the post-human as a part of this nature.

The supplementarity of *bios* and *techne* that this evolutionary narrative draws attention to – a structure of supplementarity that suggests that nature is always already prosthetic and technicity is always already somehow natural – is highlighted by David Wills, who argues in *Dorsality* that

> [a]t a moment in which the human appears to be moving inexorably forward toward a biotechnological future, it is strategically important to recognize – to be *cognizant in return* of – the fact of a relation between *bios* and *tekhne* so complex and so historic that any presumption of the priority of one over the other can be sustained only by means of an appeal to a metaphysics of creation.[68]

Any discussion about the future of the human and its relationship with technics requires a broader consideration of how technicity extends 'beyond the confines of a traditional concept of a human-mechanical relation' and requires a thinking 'of the *bios* in general as following the technological turn, as bending outside itself deep within itself'.[69] Appendicology offers

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[68] Wills, *Dorsality*, p. 5. The question of creation and of origin is discussed at several points in this thesis, particularly in the sections 'Originary Becoming vs. An Origin of Becoming' in Chapter One, and 'A Question of Origin' and 'Biotechnological Difference' in Chapter Three.

[69] Wills, *Dorsality*, p. 4.

precisely such a thinking of technicity, of the human and of the natural world. By drawing attention to the corporeality of technics and the technicity of corporeal structures, my thinking of the appendage and the appendix suggests that originary technicity be thought of 'upstream from the articulation of a limb',[70] as an originary *bio*technicity that includes other forms of organic and inorganic *articulation* down to the most basic of cellular activities. Thinking supplementarity and originary technicity as a becoming that extends across all species and all forms of life, implicating the human, technics and nature in one another, appendicology prompts us to not only reconsider our understanding of the human relationship with technology but to also reassess our understanding of the natural world and its relation with technics.

Wills goes on to argue that any critical engagement with contemporary debates on 'the integrity of the human' and the prospect 'of our increasingly bioengineered future' requires that we turn back to investigate our biotechnological past – that we 'take the technological turn back to a place behind where we traditionally presume it to have taken place, turning back around behind us from the start'.[71] The motif of the corporeal appendix – an organ that in its vestigiality embodies the passage of evolutionary time and the path of evolutionary descent undergone by species – opens up one way of enacting such a 'turning back', of tracing or retracing the evolution of the human and technics, and indeed evolution itself, back to its supposed 'beginning'. By pointing us back to the past, the appendix and other rudimentary organs invite us to trace our biological heritage down the figurative ladder of evolutionary descent so as to discover a point of origin – the origin of the human, the origin of technics, the origin of species, and the origin of life in general. As I argue in this thesis, however, what the appendix and this tracing/tracking of the past reveals is a point of origin that in and of itself already constitutes what Wills calls a turning back – an originary supplementarity that annuls any notion of a simple origin, showing it to be always already prosthetic 'from the start'. Read through an appendicology, what the appendix and other rudimentary structures reveal is not some metaphysical creation, or some pure and self-contained *origin* or *essence*, but a movement of supplementarity that cannot be reduced or contained by the notion of origin. As I argue in this thesis, what this appendicology shows is that there is no unadulterated origin or essence of the human, technics, other species and even life itself; there is no originary state of being that the so-called human, technology and nature can be located in or defined by but an

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[70] Wills, *Dorsality*, p. 4.
[71] Wills, *Dorsality*, p. 6.

originary process of continual becoming that problematises our understanding of these terms and their distinction from one another.

Appendices

At the beginning of this Introduction I explained that as an appendicology this project constitutes a study of the corporeal motifs of the *appendage* and the *appendix*. But, of course, the term *appendix*, as I mentioned in passing above, also has another meaning: that of a supplementary addition to a book or a document.[72] Although I do not explicitly engage with this alterative meaning in the chapters that follow, the curious relationship between body and language and, more specifically, the relationship between body and text that is gestured towards in the shared use of the term *appendix* is nevertheless very significant to this thesis. As an appendicology, this project appears to be overtly located at the intersection between life and discourse and between body and text. This thesis very obviously constitutes a *textual* study of two particular types of *bodily* organs and parts, and, beyond this, it also constitutes a study of *discourses* on the body, on life and on the living. In this sense, an appendicology is at once a study of bodies and bodily organs, a study of discourses on these bodies and organs, and a study of the relationships between different bodies and the relationships between different texts.

The relationship between language and life, body and text, has a long and complex history. In 'Plato's Pharmacy' Derrida discusses how in the *Phaedrus* and elsewhere in the Platonic corpus, *logos*, which Derrida interprets here as '"discourse" […] argument, line of reasoning, guiding thread animating the spoken discussion', is linked to *zōon*, '[a]n animal that is born, grows, belongs to the *phusis*'. 'Linguistics, logic, dialectics, and zoology', Derrida adds, 'are all in the same camp'. For an argument to be properly constructed, for it to appear *natural*, it must, according to Plato and the sophists before him, follow the laws of life and of the living. As Derrida goes on to explain,

> Logos, a living, animate creature, is […] also an organism that has been engendered. An *organism*: a differentiated body *proper*, with a center and extremities, joints, a head, and feet. In order to be "proper," a written discourse *ought* to submit to the laws of life just as a living discourse does. Logographical necessity […] ought to be analogous to biological, or rather zoological, necessity. Otherwise, obviously, it would have neither head nor tail.[73]

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[72] See my discussion of the etymology of these terms in footnote 13.

[73] Jacques Derrida, *Dissemination*, trans. by Barbara Johnson (Chicago: University of Chicago Press, 1981), p. 79.

Regardless of whether it is spoken or written, a discourse should be composed and structured like a living body, it should constitute some kind of natural organism engendered by its creator. But writing of course, and discourse more generally, always contains within itself the possibility of going astray, the potential to not quite be the natural-seeming organism that Plato wants it to be. 'Both *structure* and *constitution*', Derrida suggests, 'are in question in the risk run by logos of losing through writing both its tail and its head'.[74] It is in this sense that Derrida describes writing as a dangerous *pharmakon* or, more importantly for my argument here, as a '*parasite*' that threatens to invade and to '*distort*' the supposedly well-constructed 'living organism' that is *logos*.[75] But this parasite is not, in Derrida's reading of Plato's text, merely that which invades or attacks so-called living *logos* from the outside; it is that which always already infiltrates it from within. The parasitic 'writing supplement', Derrida explains, is not merely 'added' or 'attached' to the '*logos-zoōn*'; this addition, this attachment, and indeed this parasitism is always already found 'in the very heart of the inside'.[76]

The complex link between life and *logos*, text and body that Derrida draws attention to in his reading of this Platonic dialogue opens up a number of questions about our understanding of writing and our understanding of life, nature, and the living body. These questions are addressed in Chapter Three, where I analyse the use of similar textual metaphors by Charles Darwin in *The Origin of Species* and *The Descent of Man* and show how the play of supplementarity that Derrida identifies in his discussions of language can be related to the supplementary play of difference and sameness that constitutes life and the living.[77] Setting these questions aside for the time being, what I would like to focus on more specifically here

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[74] Derrida, *Dissemination*, p. 79.

[75] Derrida, *Dissemination*, p. 128.

[76] Derrida, *Dissemination*, pp. 128, 133. It is of course this supplementarity that is gestured towards in Derrida's use of the term *pharmakon*, a word that, Derrida points out, 'is caught in a chain of significations' and can mean both remedy and poison (pp. 95, 98). As Derrida adds further on, '[t]he *pharmakon* is that dangerous supplement that breaks into the very thing that would have liked to do without it yet lets itself *at once* be breached, roughed up, fulfilled, and replaced, completed by the very trace through which the present increases itself in the act of disappearing' (p. 110).

[77] See, in particular, the sections 'Reading the Rudiment', 'Reading Species' and 'Biotechnological Difference' where I discuss Darwin's use of such textual metaphors and relate it to the tendency in present-day discussions of genetics and genomics to describe the human genome as a book or a text. In his 1970 work *The Logic of Life*, for example, French biologist and Nobel Prize laureate François Jacob suggests that the cell contains 'a "dictionary" of sixty-four genetic terms' which consist of 'the writing of heredity' (François Jacob, *The Logic of Life: A History of Heredity*, trans. by Betty E. Spillman (New York: Pantheon Books, 1973), p. 276). The reading of this genetic code or message, we are told, is akin to 'consulting the pages of an instruction book when required' (p. 278). Similarly, in his 1995 book *Darwin's Dangerous Idea*, Daniel Dennett invites the reader to imagine a theoretical 'Library of Mendel' that would be comparable to the 'Library of Babel' described in Jorge Luis Borges's eponymous short story. According to Dennett such a genomic 'library' would contain all the possible permutations of different genomes, each serving as a book or even as multiple books (Daniel C. Dennett, *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (London: Penguin, 1995), pp. 107-113).

is the notion of parasitism and the supplementarity that it implies. In J. Hillis Miller's 'The Critic as Host', it is *deconstruction* itself that appears to take the place of the parasitic writing described by Derrida in 'Plato's Pharmacy'. In this essay Miller engages with the notion that deconstruction constitutes a form of critique that imposes itself on, or even invades and attacks its 'host' texts from the outside. But, as Miller points out, in its use of the Greek root *para*, the term *parasite* itself problematises any singular opposition between the inside and the outside and the related notions of invasion.[78] When one refers to deconstruction as a parasite, Miller contends, one inadvertently acknowledges that deconstruction is not something external that is added onto a text, but rather that which always already infiltrates it from within. Miller argues that any '"obvious or univocal reading"' of a text 'always contains the "deconstructive reading" as a parasite encrypted within itself, as part of itself'. Equally, a deconstructive reading is necessarily always already bound to 'the metaphysical, logocentric reading which it means to contest'.[79] Both are simultaneously internal and external to one another. Like the supposed living *logos* described in Derrida's reading of Plato, any text, any discourse, and indeed any reading of any text or any discourse is always already parasitic to itself. The task of the deconstructive critic is to follow the tensions and play of this parasitism.

The same image of the parasite has been used more recently by Cary Wolfe in his description of posthumanism. Wolfe describes posthumanism as 'a new mode of thought that comes after the cultural repressions and fantasies, the philosophical protocols and evasions, of humanism as a historically specific phenomenon'. But, as he goes on to clarify, posthumanism does not seek to 'reject humanism *tout court*' but to critique it.[80] In this sense, Wolfe explains, posthumanism constitutes a 'mutational, viral, or parasitic form of thinking' that does not merely *follow* humanism but that insinuates itself within it, burrowing through its logic from within.[81] In Wolfe's description of this term, the *post-* of posthumanism appears to point to a parasitic thinking, reading and writing that follows the deconstructive gestures outlined by

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[78] J. Hillis Miller, 'The Critic as Host', *Critical Inquiry*, 3:3 (1977), 439-447 (p. 441). The root *para*, Miller explains, implies 'distance, similarity and difference, interiority and exteriority, something at once inside a domestic economy and outside it, something simultaneously this side of the boundary line, threshold, or margin, and at the same time beyond it, equivalent in status and at the same time secondary or subsidiary, submissive, as of guest to host, slave to master. A thing in "para" is, moreover, not only simultaneously on both sides of the boundary line between inside and outside. It is also the boundary itself, the screen which is at once a permeable membrane connecting inside and outside, confusing them with one another, allowing the outside in, making the inside out, dividing them but also forming an ambiguous transition between one and the other' (p. 441).
[79] Miller, 'The Critic as Host', pp. 444-445.
[80] Cary Wolfe, *What is Posthumanism?*, p. xvi.
[81] Wolfe, *What is Posthumanism?*, p. xix.

Miller and Derrida; a *post-* that comes *after* a text or a discourse but that seeks to uncover the tensions and fractures that are always already contained within it.

The appendicology that I develop here may be thought of in relation to these so-called parasitisms. The readings that are advanced in the following chapters grow out of the inconsistencies and incongruities of their so-called 'host' texts and are intended to show how these texts are always already structured by a certain tension of supplementarity. Moving from the *zoological* image of the parasite to a *textual* analogy, one might suggest here that appendicology constitutes a textual *appendix* to the texts and discourses that it emerges out of. In my discussion of the etymology of the term *appendix*, I noted at the beginning of this Introduction that this term originally emerged as a variant of *appendage*, both words having being used to connote '[a] subsidiary external adjunct, addition, or accompaniment; an additional possession, a dependency'. It is from here that the term acquired the more specific meaning of what the *OED* describes as '[a]n addition subjoined to a document or book, having some contributory value in connection with the subject matter of the work, but not essential to its completeness'.[82] The textual appendix appears here to constitute an external add-on or appendage that comes *after* the main body or corpus of a text, containing that which is deemed extraneous, digressive, distracting or disruptive to its main argument. Composed of a remainder – of that which could not be made to fit into the text as an organic whole but that could neither be completely left out or eliminated – the appendix appears inessential to the integrity of the whole, but is nevertheless included in the text for the sake of integrity. As a supplementary add-on or a *post-*, the appendix is therefore at once internal and external to its host; it is at once that which comes *after* a text and that which insinuates itself within it. It is in this sense that, I suggest, this appendicology may be thought of as a supplementary appendix; as a supplement that appears to be appended or added onto other discourses and other texts but that grows out of the tensions and incongruities that structure them from within.

I suggested at the beginning of this section that an appendicology is necessarily situated at the interface between bodies and texts, simultaneously constituting a textual study of certain corporeal organs, a study of discourses on the body and the living, a study of the relationships between different organs and bodies, and also a study of different texts and discourses about these bodies. Following my brief discussion of the notion of the parasite as it is discussed by Derrida, Miller and Wolfe in the passages quoted from above, as well as my own discussion of the textual appendix, these definitions of appendicology can now be amended, or at least

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[82] 'Appendix, n.', in *OED Online*.

refined further. Appendicology is not so much a *study* of these different textual and bodily corpora as a *dissection* and an *analysis* of them: a figurative breaking down and breaking apart of the texts that it reads and of the notions of the natural body that these texts put forward. The term *appendicology*, therefore, should not simply be understood to mean a study, a discourse or a *logos* on these bodily organs and the texts that discuss them; an *-ology* of appendages and appendixes.[83] It should also be thought of as a dissecting and a breaking down of the discourses and *logoi* of these texts, as a parasitic *appendicizing* of discourses on the body and its organs.[84]

In its dissecting and breaking down of texts and discourses, appendicology also juxtaposes these different textual corpora onto one another, reading them through and with one another. In this sense, this appendicology is also an *appendicography*; a joining together of previously unrelated texts in a textual *grafting* that echoes the biological grafting or transplantation of living tissue from one body to another.[85] In its very discussion of the relationships of becoming shared by different organs and appendages, different bodies, different organisms and different species, this appendicology stages its own textual becoming, grafting together different texts and different disciplines, not to create some complete and organic whole but rather to question the very notions of the organic and the inorganic, the whole and the part.[86]

As previous indicated, this thesis takes as its starting point the relationship between the human and technics. Chapter One, titled 'The Appendage: Becoming with Technology', uses the motif of the appendage to show how the human and technics can be said to have evolved or co-evolved with and within one another. Drawing on passages from Samuel Butler's *Erewhon*, Volume One of Karl Marx's *Capital* and his *Economic and Philosophic Manuscripts of 1844*,

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[83] The suffix *-ology* is of course derived from the Greek *logos*.

[84] This neologism is generally used to refer to the act of making 'certain material part of the appendix of a paper' ('Appendicizing, v.', *The Rice University Neologisms Database* (Rice University, June 2008) <http://neologisms.rice.edu/index.php?a=term&d=1&t=4329> [accessed 8 September, 2015]. As I use it here the verb refers to the parasitic forms of reading discussed above, readings that *parasitize* or *appendicize* a text by draws attention to the parasitic supplementarity that always already structures it from within.

[85] The suffix *-graphy* from the Greek *graphia* refers to a form of writing or recording but it is also related to the verb *graft* and its variant *graff* which refer to the chimerical transplantation of a piece of living tissue or the shoot of a plant onto and into another ('Graff, n.1', *OED Online* (Oxford University Press, June 2015) <http://www.oed.com/view/Entry/80465> [accessed 4 August, 2015). Such a chimerical fusion of different living corpora into one another is analysed in my discussion of the work of the evolutionary biologist Lynn Margulis and, more specifically, the notion of *symbiogenesis*, in the section 'Originary Biotechnicity' in Chapter Three.

[86] This chimerical merge is reflected in the ungainly combination of a Greek suffix and a Latin stem in the very term *appendicology*. One may recall here Theodor Adorno's indictment of the term *kulturkritik* as 'offensive' for having been 'pieced together from Latin and Greek' ('Cultural Criticism and Society', in *Prisms*, trans. by Samuel and Shierry Weber (Cambridge, MA: MIT Press, 1983), pp. 17-34 (p. 17).

Frederick Engels's essay 'The Part Played by Labour in the Transition from Ape to Man', and André Leroi-Gourhan's highly influential anthropological text *Gesture and Speech*, the chapter presents this evolutionary relationship as a process of supplementary becoming that implicates the human in technics and technics in the human. Perceived through this relationship of becoming, I argue, neither the human nor technics can be thought of as preceding or creating the other; both are instead constituted and created through, with and by the other in an originary movement of supplementary becoming that appears, perhaps, to precede them both.

The suggestion that this supplementarity may *precede* the evolution of both the human and technics brings up the question of origin: the origin of the human and the origin of technics, of course, but also the question of an originary supplementarity that problematises the very notion of origin itself. It is this question that Chapter One also addresses in its discussion of the relationship between the human and technics. This relationship, I suggest, should be read in relation to the multitudes of other forms of so-called *nonhuman* becoming that it appears to evolve out of; supplementary forms of becoming observed in the so-called natural world that extend beyond both the human and technics itself. The chapter then goes on to question whether it is possible to discuss the supplementarity of the human relationship with technics without falling back into the very metaphysical and anthropocentric paradigms that one seeks to undermine. Any attempt to represent this supplementarity, I suggest at the end of this chapter, will itself always necessarily be caught within and compelled to repeat the tensions and paradoxes that it attempts to account for.

Following on from this, Chapter Two examines the way in which the relationship between the human and technology is represented in popular science fiction narratives and transhumanist debates about the future. If, as I suggest in Chapter One, discussions about the supplementary relationship between the human and technics are always already caught within the tensions and paradoxes that they attempt to represent, the same can also be said of texts that appear to present this relationship in a more conventional manner. Science fiction narratives and the writings of transhumanist authors are sometimes dismissed for their supposedly anthropocentric and anthropomorphic depictions of technology and of the human. This chapter shows, however, that these texts do not merely repeat and reproduce traditional conceptions of the human and technology; they also fragment and undermine them. The very anthropocentrism and anthropomorphism that appears to reassert and reproduce these paradigms is also, in these texts, what problematises them.

Using literary works by Karel Ĉapek, Isaac Asimov and Daniel H. Wilson, as well as texts by Alan Turing and present-day transhumanist thinkers such as Hans Moravec, this

chapter examines the popular literary and cultural tropes of the robot, artificial intelligence and the cyborg. These tropes, I argue, function in these texts as *anthropological machines* that reflect a particular conception of the human back at itself, but, in so doing, also reveal how this so-called human is always already constructed in and out of that which it excludes from itself. The anthropomorphic tropes used in these texts may present a binary opposition between the human and its supposed nonhuman other, but they also fragment and fracture this opposition and the binary structures it implies. In its final sections, this chapter uses Wilson's novels *Robopocalypse* and *Robogenesis* to consider how the trope of the cyborg can be used to break out of this binary coupling of self and other, human and nonhuman. These novels, I show, present examples of cyborgian forms of life that do not just question traditional conceptions of the human and of human nature, but problematise the very notion of nature itself.

Chapter Three widens the focus of this thesis, turning away from the human and its relationship with technics in order to analyse the various different forms of evolutionary becoming observed in the so-called natural world. Drawing on the notion of cyborgian life introduced in Chapter Two and my suggestion in Chapter One that the relationship between the human and technology cannot be divorced from questions about the nature of evolution and life in general, this chapter discusses whether relationships of becoming between living organisms and their external environments can be viewed as examples of nonhuman forms of technicity. The discussion focusses on the work of the evolutionary biologist Lynn Margulis and the science writer Dorion Sagan, which is read alongside two short stories by Italo Calvino. In these readings I show how the notion of nonhuman technicity can lead to an anthropomorphising of the natural world and the positing of an origin of technics in nature. But at the same time, I argue, it also points to more general *biotechnicity* that extends beyond the human to the rest of the natural world; to processes of supplementary becoming between different lifeforms that render individual organisms always already chimerical in their so-called nature.

The second half of this final chapter elaborates on this notion of a biological or evolutionary supplementarity. Using the motif of the appendix, or what Charles Darwin refers to more generally as the *rudiment*, I read Darwin's *The Origin of Species* and *The Descent of Man* alongside Derrida's 'Différance'. The Derridean notions of the supplement and of *différance* allow me to show how Darwin's discussion of the rudiment, his conceptualisation of the notion of species, and, more generally, his description of evolutionary descent, draw attention to the ways in which so-called natural life constitutes and is constituted by a supplementary repetition and re-articulation of difference and sameness; a re-articulation that

extends to every organ, every organism and every so-called species. It is this supplementary repetition and play of difference that, I argue, constitutes the originary biotechnicity of life and allows for the evolution of the living, including, of course the co-evolution of the human in and with technics.

Chapter One

The Appendage: Becoming with Technology

There is no natural, originary body: technology has not simply added itself, from the outside or after the fact, as a foreign body. Or at least this foreign or dangerous supplement is "originarily" at work and in place in the supposed ideal interiority of the "body and soul." It is indeed at the heart of the heart.
JACQUES DERRIDA, 'The Rhetoric of Drugs'

[…] the issue is […] neither that of an interiority nor that of exteriority – but that of an originary complex in which the two terms, far from being opposed, compose with one another (and by the same token are posed, in a single stroke, in a single movement).
BERNARD STIEGLER, *Technics and Time, 1*

[…] supplementarity makes possible all that constitutes the property of man: speech, society, passion, etc. But what is this property [*propre*] of man? On the one hand, it is that of which the possibility must be thought before man, and outside of him. […] on the other hand, supplementarity, which *is nothing*, neither a presence nor an absence, is neither a substance nor an essence of man. It is precisely the play of presence and absence, the opening of this play that no metaphysical or ontological concept can comprehend. Therefore this property [*propre*] of man is not a property of man: it is the very dislocation of the proper in general […].
JACQUES DERRIDA, *Of Grammatology*

The 'Machinate Mammal'

This chapter begins, once again, with a look at Samuel Butler's *Erewhon*. In this novel an unnamed fictional author of a treatise on technology describes tools and machines as extra *limbs* and *organs* of the body, supplementary parts that are natural and integral to the human despite being external to it. The author explains that 'machines [are] to be regarded as a part of man's own physical nature, being really nothing but extra-corporeal limbs'. The human, he adds, is 'a machinate mammal. The lower animals keep all their limbs at home in their own bodies, but many of man's are loose, and lie about detached, now here and now there, in various parts of the world'. 'A machine', the author continues, is 'a supplementary limb; this is the be all and end all of machinery'.[1] Giving examples of such external technological limbs, organs and appendages, the author goes on to describe how 'see-engines' are used to improve man's vision, while '[h]is memory goes in his pocket-book'. 'If it is wet', the author adds, 'we are furnished with an organ commonly called an umbrella', while for those who can afford a railway fare, a train is 'a seven-leagued foot that five hundred may own at once'.[2]

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[1] Samuel Butler, *Erewhon: Over the Range* (London: Forgotten Books, 2008), pp. 172-173.
[2] Butler, *Erewhon*, pp. 173-174. A similar description of technological implements and machines is provided by Sigmund Freud in *Civilization and its Discontents* where modern-day man is said to have become a 'prosthetic

There are two main aspects of this particular passage that I would like to isolate and discuss by way of an introduction to this chapter. Firstly, the technological implement is described here as an *extra-corporeal* and *supplementary limb* that is as natural to the human as the other appendages of the body. Despite its extra-corporeal nature, despite that is, being external to the body, this implement is recognised as being *inherent* and *integral* to it. Technology does not constitute some alien and foreign prosthetic add-on, an external and extraneous addition that the human augments itself with. As a supplementary limb or appendage – indeed, as a *supplement* comparable to that described by Derrida in *Of Grammatology* – technology is not an extra addition that remains distinct and separate from the body that hosts it. Instead, in its very distinction from the body, in its very *exteriority* to it, the technological implement constitutes an *internal* part 'of man's own physical nature'. This is what is gestured towards in the description of the technological object or implement as an external organ, limb or appendage of the human. Technics is not either purely external or purely internal to the human; it marks the space of an interiority that is exteriorised and an exteriority that is internalised. What is integral and inherent to the human is this very play of exteriorisation and interiorisation that can never be *truly* or *fully* inherent or integral; a play of exteriorisation and interiorisation by which the human and technics both are and are not internal and external to the other.

My second point follows on from this. In this passage from Butler's text, the exteriorised interiority and internalised exteriority of technicity is identified as being distinctly human. In claiming that it is only in its exteriorisation into technics that the human becomes *human*, Butler's author also suggests that this process of exteriorisation *defines* humankind and distinguishes the human species from the rest of the animal kingdom. It is humankind's supplementary relationship with external technological limbs and appendages that, according to the unnamed author of Butler's text, marks the 'machinate' human as being distinct from the animal. According to this passage from *Erewhon*, while an animal's resources are limited to its own immediate body, to that which is and always has been internal to it, the so-called *natural* interiority of the human extends outside of it. As Stiegler puts it in *Technics and Time, 1*, '"human nature" consists only in its technicity, in its denaturalization';[3] that is, in an exteriorisation into technics that renders that which we think of and refer to as human nature

God' endowed with 'auxiliary organs' (Sigmund Freud, *Civilization and its Discontents*, trans. by James Strachey (New York: W.W. Norton & Company, 1961), pp. 38-39).

[3] Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus*, trans. by Richard Beardsworth and George Collins (Stanford: Stanford University Press, 1998), p. 148.

denatured or *unnatural* to itself. It is this exteriorised interiority and this unnatural nature that, Butler's author suggests, is *peculiar* to the human and distinguishes it from the animal.

These comments may lead us to think of technicity as some defining property or essence of the human. If it is in its exteriorisation into technics that that the human finds its interiority, if it is in the process of exteriorisation that the human becomes human, then surely this exteriorisation must constitute the *nature* and *essence* of the human – it must constitute that which is *proper* and *natural* to humankind. Such questions of essence, of nature and of propriety are central to my discussion of the relationship between the human and technics in this chapter. The conclusion that one might be tempted to draw from this passage in Butler's text – that technicity constitutes and can be thought of as an essence or a nature of the human, a *nonessential* essence or an *unnatural* nature perhaps, but an *essence* and a *nature* nonetheless – is precisely what I argue against here. If we think of the exteriorisation of the human in technics as a quality, a nature or an essence of the human, then we reduce this exteriorisation to a simple interiority; that is, we reduce the aporetic play of supplementarity that implicates the inside in the outside and the outside in the inside to a domesticated interiority that *belongs* to the human. Understanding the relationship between the human and technics requires that one think this relationship in terms of a play of interiority and exteriority that is never *merely* internal or *merely* external; as a play of supplementarity that can never constitute either a simple outside or a simple inside precisely because it can never simply *be* either.

Discussing this tension, David Wills suggests in *Dorsality* that the structure of supplementarity constitutes a blind spot in our thinking of the human. Wills describes the human in terms of a certain originary technicity or what he calls a 'dorsal' prosthetic supplementarity that 'comes from behind […] from beyond the simple perspective of the human […] from another point of view, from outside the field of visual possibility'. The originary technicity of the human – the supplementary play that implicates technics in the human and the human in technics, the prosthetic in nature and the natural in the prosthetic – is, Wills suggests, that which the human cannot see, that which *necessarily* cannot be seen by the human. This does not mean that originary technicity *is something* that the human cannot see, but rather that it is *not something* that can be seen. Technicity is not some kind of essence or nature that although hidden and out of sight can be discovered and revealed, it is rather that which can *never* come into being, that which in its very structure cannot be seen, thought or grasped by the human without it being reduced or transformed into that which it *is not*. What the human is able to see and grasp is either *internal* or *external* to itself; either an external prosthetic object that can be controlled and manipulated at will, or an internal essence or nature

that the human recognises itself in and defines itself by. Originary technicity is neither of the two; it is neither a 'fabrication produced by hands manipulating matter within a visible field', nor a technology that is 'part of the human self-image'.[4] As the very structure or movement of supplementarity that the human and technics are constructed in and out of, originary technicity *necessarily* constitutes an aporia that cannot be overcome and a tension that cannot be resolved.

The challenge of thinking originary technicity lies in thinking this play and this tension of supplementarity. Such a thinking does not attempt to resolve this tension but to play with it in an attempt to see it differently – to see it, that is, *through difference*, not through a single resolute difference that constitutes an opposition or a division, but through a difference that also constitutes a sameness, a difference of supplementarity. It is this challenge that this chapter, and more broadly this thesis, seek to address. My discussion of the relationship between the human and technics and my engagement with the critical paradigm of originary technicity in this chapter hinge on the two main points that I isolate in this brief introductory look at Butler's *Erewhon*: firstly, the idea that the relationship between the human and technology is necessarily a relationship of supplementarity in which the human and technology are implicated with and within the other, being at once internal and external to the other; and, secondly, the question of human essence that arises whenever we attempt to think the human, even if we attempt to think the human as that which has *no* essence, or as that whose essence is *external* to it.

Drawing on the writings of Karl Marx, Frederick Engels, André Leroi-Gourhan and Bernard Stiegler, I show in this chapter how, despite their attempts to account for this relationship of supplementarity, many thinkers of technology present technicity as a quality or a characteristic *of* the human, as an essence that *defines* the human and distinguishes it from other forms of life. In contrast to such accounts of the human, the appendicology I develop here acknowledges the aporetic supplementarity of the relationship between the human and technics by reading this relationship in terms of a movement of *becoming* that can never simply *be*, as a movement that *is* never quite one thing or the other, that is never either inside or outside, singular or multiple, a part or a whole, but that is always already a becoming of the two. This becoming, I argue, does not constitute a singular distinction, an absolute difference or a defining boundary between the human and the rest of the natural world. This does not mean that there is no such difference or distinction between what we conceive of as *human* and

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[4] David Wills, *Dorsality: Thinking Back through Technology and Politics* (Minneapolis: University of Minnesota Press, 2008), p. 7.

nonhuman nature; it means that there is no *singular* distinction between the two. An appendicology does not seek to *negate* or *efface* difference, but to *proliferate* it. It is, I argue, in its very singularity that the becoming of the human and technics defers and differs from the other multiplicities of becoming that constitute life and nature. This appendicology traces the trajectory of these becomings by first looking at the relationship between the human and technics and then broadening its understanding of becoming to consider what David Wills refers to in *Dorsality* as 'an originary biotechnology'; the 'becoming-technological of biological self-organization or self-programmation' and the 'originary mechanics at work in the evolution of the species'.[5] As I argue here and in later chapters, the supplementary play of becoming that constitutes the relationship between the human and technics is necessarily that which exceeds the human and extends outside of it. If we are to account for the blind spot that Wills identifies in our thinking of the human, we must recognise that any analysis of the human relationship with technics cannot be divorced from a consideration of how this relationship is inscribed within a multiplicity of other forms of becoming that in turn supplement one another.

A Question of Essence

The passage from *Erewhon* quoted above is attributed in the novel to an unknown author whose treatise is intended to counteract the Luddite-like arguments of an 'anti-machinist' Erewhonian professor and his own fictional treatise on technology titled 'The Book of the Machines'.[6] In this fictional book, the professor expresses concern over mankind's increasing dependence on technology and calls for the eradication of most forms of machinery. The arguments of the unnamed author are presented in the novel as being diametrically opposed to the fears and concerns of this professor, with the former calling upon the Erewhonians to recognise that technology is not distinct or separate from the human but a part of the human body and human nature, and the latter arguing that technology has so infiltrated every aspect of human life that it will soon come to control and dominate mankind.

Despite the supposed opposition between these two authors and their respective 'machinist' and 'anti-machinist' positions, the arguments that they put forward are not as distinct or as opposed to one another as they may first appear to be.[7] Both the professor and the

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[5] Wills, *Dorsality*, pp. 5-6.
[6] Butler, *Erewhon*, p. 149.
[7] A similar point is made by Gilles Deleuze and Félix Guattari in their brief discussion of *Erewhon* in *Anti-Oedipus*. Deleuze and Guattari explain that although this text appears at first to merely 'contrast the two common arguments, the one according to which the organisms are for the moment only more perfect machines […], the other according to which machines are never more than extensions of the organism', upon closer look one sees

unnamed author recognise that technology plays a central role in human life and, more importantly, forms an integral part of so-called human nature. The difference between the two arguments arises out of the way that this is interpreted by the authors, with the professor perceiving this inherent relationship with technology as a form of dependence that the human must be purged of. Bemoaning what he perceives to be mankind's shameful reliance on technology, the professor argues that

> [t]he air we breathe is hardly more necessary for our animal life than the use of any machine, on the strength of which we have increased our numbers, is to our civilisation; it is the machines which act upon man and make him man, as much as man who has acted upon and made the machines […].[8]

Although the anti-machinist professor *opposes* the human to the machine, claiming at many points in his argument that different forms of technology constitute new species of being that rival and threaten humankind's assumed biological dominance over the rest of the natural world,[9] in doing so he also inadvertently demonstrates the supplementarity of this supposed opposition. In his attempts to show the extent of the threat posed by technology, the professor must demonstrate how insidiously technology has infiltrated the very foundations of so-called human nature. He therefore argues that technology is as *necessary* and *essential* a *precondition* for human life as the very 'air we breathe'. The professor interprets this as an intolerable dependence that challenges the autonomy and freedom of the human species and poses a threat to the very essence and nature of humankind. But what he fails to fully realise or understand, what he fails to *see* and what remains a blind spot in his own argument, is that the very essence or nature of the human that he seeks to protect is in itself already constituted by the technology that he denounces. If indeed it is 'the machines which act upon man and make him man', then

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that the two positions do not quite constitute some simple, binary opposition. According to Deleuze and Guattari, 'there is a Butlerian manner for carrying each of the arguments to an extreme point where it can no longer be opposed to the other, a point of nondifference or *dispersion*'. Taken together, the two positions work to call into question 'the specific or personal unity of the organism', as well as 'the structural unity of the machine' (Gilles Deleuze and Félix Guattari, *Anti-Oedipus: Capitalism and Schizophrenia*, trans. by Robert Hurley, Mark Seem and Helen R. Lane (London: Continuum, 2004), pp. 312-313).

[8] Butler, *Erewhon*, p. 171.

[9] As I showed in my brief discussion of *Erewhon* in the Introduction to this thesis, in this text technological implements and machines are described as evolving out of one another in the same way that living species do. Technological objects, we are told, descend from a 'common ancestor' and can thus be grouped into 'genera, subgenera, species, varieties, [and] subvarieties' according to these lines of descent (p. 165). The possibility of technology evolving autonomously from the human into a form of life that rivals the human species is a popular trope in science fiction and has also been discussed by several transhumanist thinkers. Hans Moravec, for example, describes how, in the near future, the human race will be threatened by highly technologised and highly intelligent nonhuman species that will constitute 'alternative inhabitants of our ecological niche' (Hans Moravec, *Mind Children: The Future of Robot and Machine Intelligence* (Cambridge, MA: Harvard University Press, 1988), p. 100). For a more detailed discussion of the notion of evolution and the supposed threat posed by technology, see Chapter Two, particularly the section titled 'Cartesian AIs'.

there is no unadulterated purely *human nature* or *essence* to either threaten or to protect.[10] Despite his own argument, what the Erewhonian author describes in the passage quoted from above is not a *dependence* that places human beings at the mercy of the technologies they so desperately need, but a *symbiotic interrelationship* or a form of *mutual interdependency* that is constitutive and originary to both the human and technics.[11] According to this particular passage, the human creates technics and is simultaneously created by it; each one creates the other and is in turn created by the other.

A similar passage to the one quoted above is found earlier on in the text where the Erewhonian professor, again lamenting what he perceives to be humankind's calamitous dependence on technology, claims that

> [m]an's very soul is due to the machines; it is a machine-made thing: he thinks as he thinks, and feels as he feels, through the work that machines have wrought upon him, and their existence is quite as much a sine qua non for his, as his for theirs.[12]

Once again the professor argues that this state of affairs should be resisted and he calls upon the Erewhonians to 'destroy' as many machines as possible before they come to 'tyrannise' the human race 'even more completely'.[13] But again in this passage the professor acknowledges the interdependency of the human and technology, going so far as to suggest that the human *soul* is itself a product of this relationship. Rather than constituting an originary, complete and self-sufficient internal essence of the human that is untouched and unsullied by technics, the soul is itself described by the professor as emerging out of the interrelationship between the human and technology. If the very soul of the human is constituted out of a relationship with technics, if it is technics that indeed makes the human *human* in the first place, then there can be no purely human essence or nature to protect; there can be no *a priori* human nature to speak of. As the unnamed machinist author of Butler's text also suggests in his description of the technological object or implement as an extra-corporeal organ or appendage, technology constitutes an external but necessarily also internal part of the human body and of human nature; or, more precisely, it constitutes a part that is not merely a part of a nature that is not

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[10] This comment responds to my suggestion in the Introduction to this thesis that the notion of human obsolescence is linked to the idea of a human essence that can be protected, enhanced or replaced (see my discussion of Michael Hauskeller in the section 'Appendixes'). For a more general discussion of this see the final section of my Conclusion 'Reading and Writing Life'.

[11] My use of the term *symbiotic* draws attention to the way that this relationship between the human and technics may be related to other forms of becoming observed in the so-called natural world that do not involve the human. This is discussed in more detail in Chapter Three, particularly in my analysis of the work of Lynn Margulis in the sections 'Home and Body Making' and 'Originary Biotechnicity'.

[12] Butler, *Erewhon*, p. 158.

[13] Butler, *Erewhon*, p. 159.

quite a nature, a part that may be internal to the human but that necessarily also remains external and distinct to it.

The Erewhonian professor's mention of the soul draws attention to classic metaphysical oppositions that present the so-called rational human mind or soul as the true seat of human nature and portray the body as an expendable appendage of this mind. In his description of the technological object as a supplementary appendage of the body, the unnamed author of Butler's text asserts that technology constitutes an external part of the body that is as natural or integral to the human as its other limbs and organs. But the way that we read this description of technology very much depends on our understanding of the body itself and of the metaphysical opposition between mind and body. If the body is perceived as an expendable external supplement or even an appendage to that which truly constitutes human nature – if the true seat of human nature is thought to lie in the human *soul* or *mind* as opposed to any material body – then speaking of a technological appendage becomes redundant and simply serves to reaffirm the notion of a human essence distinct from any technicity or even any materiality. If, on the other hand, we rethink the opposition between the body and the soul, between the whole and the part, and between the human and technics, any notion of a human essence or nature untouched by technics becomes suspect. In contrast to the oppositions of metaphysics, this appendicology does not seek to distinguish between the body and the soul, the human and technics. Neither, incidentally, does it seek to simply identify the one with the other. In its understanding of technology as an appendage of the human, appendicology does not *equate* the body with the tool or technology with the human and neither does it *oppose* them; what it does is draw attention to the supplementary relationships of becoming between the two and highlight the tensions of supplementarity that are also at play in these apparent oppositions and comparisons.

A classic example of such body/mind dualisms can of course be found in the philosophy of René Descartes. In both *A Discourse on Method* (1637) and *The Meditations* (1641) Descartes distinguishes between what he perceives to be the rational human soul and the material, mechanical body that it supposedly governs.[14] In order to separate the body from the soul and to oppose the one to the other, Descartes compares human and animal bodies to

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[14] According to Georges Canguilhem, the mechanist metaphors that Descartes uses in his description of the 'body-as-machine' date back to Aristotle who in *The Movement of Animals*, for example, compares material bodies to 'automatic puppets', arguing that '[a]nimals have parts of a similar kind, their organs, the sinewy tendons to wit and the bones; the bones are like the pegs and the iron; the tendons are like the strings' (Georges Canguilhem, 'Machine and Organism', in *Incorporations*, ed. by Jonathan Crary and Sanford Kwinter, trans. by Randall Cherry and others (New York: Zone, 1992), pp. 45-69 (p. 48); *The Complete Works of Aristotle: The Revised Oxford Translation*, ed. by Jonathan Barnes, 2 vols (Princeton: Princeton University Press, 1984), I, p. 1092).

machines, describing the movement of the heart, for example, to 'the motion of a clock' and explaining that the body is 'a machine made by the hands of God, which is incomparably better arranged, and adequate to movements more admirable than is any machine of human invention'.[15] By comparing corporeal organs to machine parts Descartes is able to present the body as an expendable prosthetic adjunct to a self-sufficient human soul; as a prosthetic adjunct to the rational soul in which, according to Descartes, the real nature or essence of the human lies. It is the soul, Descartes claims, that 'constitutes us men' and not the material and mechanical body that remains 'wholly distinct' to it.[16] So inessential and expendable is the body to Descartes's philosophy that he claims in the *Meditations* that 'it is certain that I am really distinct from my body and that I can exist without it'. As he elaborates further on in this text, 'if […] a foot, an arm, or any part of the body is cut off, […] nothing is thereby taken away from the mind".[17] The mechanical, material body is for Descartes an expendable prosthetic adjunct or superfluous corporeal appendage to the human; it is not integral or essential to human nature and, Descartes seems to suggest, is not even strictly speaking necessary for human existence or survival. Like technology, the body is presented here as nothing more than a material prosthesis, an expendable external adjunct whose presence or absence does not affect the true nature and essence of the human.[18]

Descartes's opposition presents the body or the body-machine as an external adjunct of the soul or the mind; as an extra part of a self-sufficient whole that is expendable and superfluous. However, in *The Discourse on Method* Descartes suggests that it is the *soul* that forms a supplement to the body and that it is the *addition* of the soul to a pre-existing animal body that allows for the creation of the human. God, Descartes explains, first 'formed the body of man' and then added or 'annexed' the rational human soul to this body in order to create the

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[15] René Descartes, *A Discourse on Method*, trans. by John Veitch (London: Everyman's Library, 1912), pp. 40, 44.

[16] Descartes, *A Discourse on Method*, pp. 3, 27.

[17] René Descartes, *Meditations and Other Metaphysical Writings*, trans. by Desmond M. Clarke (London: Penguin, 2000), pp. 62, 67.

[18] Descartes's claim that the human is able to exist without a body manifests itself in the present-day transhumanist dream of the disembodied mind and the belief that, in the near future, human consciousness will no longer be tied to a lived bodily experience or to a corporeal existence. As N. Katherine Hayles argues in a discussion of the work of Hans Moravec, this present-day 'roboticist's dream' of a human consciousness separated from the body and translated into disembodied digital data is based on the same liberal humanist devaluing or 'erasure of embodiment' at work in Descartes's argument (N. Katherine Hayles, *How We Became Posthuman* (Chicago: University of Chicago Press, 1999), pp. 1-5). For more recent discussions of the notion of mind uploading or what is described now as whole brain emulation, see Nick Bostrom, *Superintelligence: Paths, Dangers, Strategies* (Oxford: Oxford University Press, 2014) and Ray Kurzweil, *How to Create a Mind: The Secret of Human Thought Revealed* (London: Viking Penguin, 2012). A response to this Cartesian dualism can be found in my reading of Daniel H. Wilson's novels *Robopocalypse* and *Robogenesis* in Chapter Two (see, in particular, in the sections 'Cartesian AIs' and 'Cyborgian Selves').

human.[19] In order for Descartes to argue that it is in the soul that the essence of human nature lies, he must be able to separate the soul from the body as easily as he separates the body from the soul. In showing what this body would be *without* a soul, Descartes goes on to present the soul as that which is external to the body, as that which *supplements* the body adding itself to it to create a new whole and a new plenitude. Following Descartes's argument we may be tempted to see in this a contradiction in terms: it is either the body that forms an extra addition to a self-sufficient soul, or the soul that adds itself to an already self-sufficient body. But it is precisely through this apparent contradiction that the structure of supplementarity plays itself out in the Cartesian text. Rather than a contradiction, what we have here is a tension of supplementarity that prevents any absolute distinction or opposition between the body and the soul, or, to bring this discussion back to the central question of this chapter, the human and technics. The assumed distinctions between the body and the soul and the human and technics are fraught with a tension of supplementarity that reveals each to be at once *external* and *internal* to the other; that reveals how the human and technics, the body and the soul *supplement* and are in turn *supplemented* by their supposed opposites. Whereas Descartes attempts to locate and identify a human essence or nature in the oppositions he sets up, an appendicology uncovers the tensions and aporias of supplementarity that undercut any such oppositions and the notions of nature and essence that they espouse.

Becoming with Technology

The mechanist metaphors used by Descartes may at first appear to parallel the motif of the technological appendage that I develop in this chapter. While in the Cartesian text it is the human body and its organs that are compared to machines and machine parts, in my description of the technological appendage it is the tool or implement that is portrayed as a bodily organ or a corporeal part. These two descriptions may seem to converge on the same metaphor, albeit as the reverse of one another: one compares the body to technology, the other technology to the body. But the motif of the technological appendage that I mobilise in this chapter and, more broadly, the appendicology that I develop in this thesis, has significantly different implications for our understanding of the human and technics. In distinction to the mechanist metaphors employed by Descartes which oppose the human to technology and the body to the soul, an appendicology shows how there is no absolute division between either the body and the soul, or the human and technics. If the human is exteriorised into its technological appendages, if its

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[19] Descartes, *A Discourse on Method*, p. 37.

inside is necessarily an outside and its outside an inside, this means that there is no inner essence or nature of the human onto which external material bodies and prosthetic objects come to be attached. The human comes into being and is constituted through this very process of exteriorisation; through its relationship with that which is outside (and simultaneously, therefore, also inside) of it. To return to the passages from Samuel Butler's fictional 'Book of the Machines', it is in this sense that technology can be said to 'act upon man and make him man' and that the human 'soul' can be seen as a 'machine-made thing'.[20] The nature and essence of the human, if we can even continue to use such terms, do not exist *prior* to the process of exteriorisation in technics. There is no internal nature or essence that is not necessarily constituted through and in this exteriorisation, there is no soul that is not always already 'machine-made' and no man that is not always already constituted by the technology that he in turn creates.

It is the nature of this *always already* that I would like to focus on in this and following sections. In the description of the technological appendage introduced at the beginning of this chapter, the unnamed machinist author of Butler's text invites the reader to '[o]bserve a man digging with a spade' and to contemplate the way in which, during such an activity, the technological implement comes to form part of the man's body:

> [H]is right fore-arm has become artificially lengthened, and his hand has become a joint. The handle of the spade is like the knob at the end of the humerus the shaft is the additional bone, and the oblong iron plate is the new form of the hand which enables its possessor to disturb the earth in a way in which his original hand was unequal. Having thus modified himself, not as other animals are modified, by circumstances over which they have had not even the appearance of control, but having, *as it were*, taken forethought and added a cubit to his stature, civilisation began to dawn upon the race […] and all those habits of mind which most elevate man above the lower animals, in the course of time ensued.[21]

This passage uses the example of a man digging with a spade to explain a more fundamental evolutionary process of mutual creation, or perhaps, as I suggest here, mutual *becoming*, in which the human develops and evolves in conjunction with the technology it creates. At first glance, this comparison appears problematic as it seems to posit the existence of an already self-sufficient human subject prior to the creation and use of technics. The worker that Butler's unnamed author invites us to observe pre-empts both the labour process that he is here engaged

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[20] Butler, *Erewhon*, pp. 171, 158.
[21] Butler, *Erewhon*, p. 173; my italics. The first half of this passage presents the technological implement as an appendage that quite literally fuses with the human body, forming a cyborgian merge of flesh and metal. This notion of the cyborg is discussed in detail in my reading of the science fiction novels *Robopocalypse* and *Robogenesis* in Chapter Two (see the sections 'Cyborgian Selves' and 'Cyborgian Life').

in and the tools that he appropriates onto himself as technological appendages that are superior to the natural limbs of his own body. But this is not quite what the rest of the passage intimates as it moves from this image of a man digging with a spade to its discussion of the evolution of the human and technics. I would like to draw attention here to the phrase 'as it were' that qualifies the author's description of this process of so-called 'modification'. Although the creation and use of technological objects may be taken to imply 'forethought' and some desire to enhance the natural resources of the body, the author signals that this is not to be taken literally: the human only *appears* to pre-empt technics in this way. As the machinist author continues to explain, it is the creation and use of technology that allowed for human civilisation to 'dawn upon the race' and for the human to truly become human. Those 'habits of mind' that characterise so-called human nature and allow us to distinguish the human from the animal did not exist *prior* to the creation and use of technology, they developed 'in the course of time' with and through technics. It is in this manner, this passage goes on to suggest, that human 'civilisation and mechanical progress advanced hand in hand, *each developing and being developed by the other*'.[22]

What the machinist author of Butler's text describes here is not a process of simple creation or modification in which a pre-existing human being constructs a technological object that it can supplement itself with. Both the human and technics are presented here as being created in and through the other in a mutually constitutive process of *becoming* that is not pre-empted by any *a priori* state of being, nature or essence; a supplementary movement of mutual or even symbiotic creation in which multiple entities come into being through and with one another. Discussing their own conception of becoming, Gilles Deleuze and Félix Guattari suggest in *A Thousand Plateaus* that becoming can be thought of as '*symbioses* that bring into play beings of totally different scales and kingdoms, with no possible filiation'. Distinguishing these symbiotic alliances from evolutionary or hereditary filiations, Deleuze and Guattari describe becoming as a movement or a play of 'involution',[23] as a creative betweenness in which an 'organism enter[s] into composition with *something else*'.[24] I will return to the notions of symbiosis and involution later on in this thesis, but what I would like to highlight here is the idea that there can be no 'being' prior to this becoming, no pre-existing 'organism' that enters

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[22] Butler, *Erewhon*, p. 173; my italics.

[23] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. by Brian Massumi (London: Continuum, 1988), p. 238.

[24] Deleuze and Guattari, *A Thousand Plateaus*, p. 274.

into a relationship with others, but only the *becoming* of these organisms and beings.[25] This is what Deleuze and Guattari seem to point to when they evoke a 'line of becoming' that does not simply serve to connect one pre-existing 'point' to another; to connect a point of 'origin' or 'departure' to a point of arrival, or, I would add, one already fixed *essence*, *nature* or *being* to another. As Deleuze and Guattari explain,

> [a] line of becoming is not defined by points that it connects, or by points that compose it […]. A point is always a point of origin. But a line of becoming has neither beginning nor end, departure nor arrival, origin nor destination; to speak of the absence of an origin, to make the absence of an origin the origin, is a bad play on words.[26]

Becoming does not presuppose the existence of a being or an origin; becoming does not *happen to* being and it does not have being as its *origin*. Equally, becoming cannot itself be thought of as the origin of being; it is not a cause of which being is an effect. If we are to speak of the supplementary becoming of the human and technics as an *originary* becoming before which neither can exist, as a becoming that is originary insofar as it is not preceded by any form of being, then we must recognise that this does not make becoming itself a simple origin or cause of either the human or technics. If this becoming constitutes an origin, then it is an origin that is *not*, an origin that is not an origin because it always already defers and differs from itself in and with another.[27] This is not simply, as Deleuze and Guattari put it, 'a bad play on words'; it is not an attempt to make 'the absence of an origin the origin' and to reinstate ideas of presence and being under the guise of absence and becoming. What it is, rather, is an attempt to think the structure of supplementarity that constitutes this becoming and to think supplementarity as this becoming.

Originary Becoming vs. An Origin of Becoming

The question of origin and of what I refer to here as *originary* becoming are highly pertinent to a discussion of the relationship between the human and technics as well as that of the relationship between the human and the rest of the natural world. The extract from *Erewhon*

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[25] The notion of symbiosis and its role in the evolution of species will be discussed in my reading of the work of Lynn Margulis and Dorion Sagan in Chapter Three where I show how the relationships of symbiotic becoming observed in the so-called natural world can be thought of in relation to the processes of mutual becoming between the human and technics described above. As I show in my reading of Margulis's theory of *symbiogenesis*, such symbiotic becomings do not just consist of interactions between two or more pre-existing organisms but are intimately implied in the very evolution of species. For more on this, see the sections 'Home and Body Making' and 'Originary Biotechnicity' in Chapter Three.
[26] Deleuze and Guattari, *A Thousand Plateaus*, p. 293.
[27] The impossibility of origin and the notion of an originary becoming are central to my discussion of *originary biotechnicity* and my reading of Charles Darwin's *The Origin of Species* and *The Descent of Man* in Chapter Three (see, in particular, the sections 'A Question of Origin', 'Reading Species' and 'Biotechnological Difference').

that I referred to above does not merely refer to an evolutionary relationship between the human and technics; in doing so it also discusses the evolutionary link between the human and the animal and appears to locate the origin of human evolution in technics. In his description of the mutually constitutive process of becoming that creates the human and technics, the machinist author of Butler's text portrays this relationship as that which is distinctly *human*; as that which allows for the human to evolve from the animal and as that which subsequently separates the human species from this animal past. It is as a result of the supplementary becoming of the human with technics that, according to Butler's text, 'civilisation began to dawn upon the race' allowing for the evolution of 'those habits of mind which most elevate man above the lower animals'.[28] If the human evolves out of the animal, this passage suggests, then this evolution finds its origin in the relationship of mutual becoming with technics described above.

Such descriptions of the human and its supposed origins are intended to prove that technicity is inherent to human nature; to show, that is, that the human has no essence or nature that is untouched by technics. But in defining the human in relation to technics and using this to distinguish the human from the animal, these passages appear to present technics itself as an essence or a nature of the human. In my description of the notion of becoming, I suggested above that it is not merely the human that creates technics or technics that creates the human; the two create each other in a supplementary movement that deconstructs the very notions of essence and nature, showing nature to always be unnatural to itself and any essence to be devoid of essence. But in showing that it is only through this process of becoming that the human comes into being, the machinist author of Butler's text appears to *define* the human in relation to technics and to posit this technicity as an essence, a nature and an origin of the human. What I referred to above as the originary supplementarity or originary becoming of the human and technics is here presented as an *origin* of becoming: as an origin of the becoming of the human and as a becoming that constitutes the origin of the human.

One can identify in Butler's argument a slippage by means of which the relationship of supplementarity between the human and technics is essentialized and used to define a separate but related relationship: that between the human and the rest of the natural world. One boundary, one opposition and one distinction – that between the human and technology – is challenged, problematised and disseminated, only for another boundary, another opposition and another distinction to be set up and maintained: that between the human and the animal,

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[28] Butler, *Erewhon*, p. 173.

and, more broadly, the human and nature. Although this passage from Butler's text appears to recognise the supplementary relationship of becoming between the human and technics, not enough consideration is given here to the way that a necessarily different but comparable play of supplementarity structures the evolutionary relationship between the human and the so-called natural world. The rest of this section analyses the workings of these multiple supplementarities through a reading of a number of passages taken from the works of several thinkers of technology, namely Karl Marx, Frederick Engels and André Leroi-Gourhan.

The work of each of these thinkers has been analysed by Arthur Bradley in his study of the theory of originary technicity. Bradley suggests that in their various engagements with the notion of a mutually constitutive process of 'structural coupling' or 'co-evolution' between the human and technics,[29] these thinkers are unable to completely relinquish the idea of some origin or essence of the human. Bradley argues that despite their recognition of the structure of supplementarity that underlies the relationship between the human and technics, at various points in their arguments these thinkers all invariably slip back into some metaphysical notion of origin or essence: an origin or an essence that is untouched by technics or, equally, an origin or an essence that consists of technics itself. Although each of these thinkers presents the relationship between the human and technology as a mutually constitutive process of becoming, or, as Arthur Bradley suggests, as a relationship of *originary technicity* that deconstructs the notion of an untouched essence, nature or origin of the human, in so doing, they simultaneously also portray this technicity as a defining quality or essence of the human; as that which distinguishes the human from the animal.

This slippage appears to take the shape of a contradiction by means of which these texts at once *deconstruct* and *reaffirm* metaphysical and anthropocentric notions of human essence and origin. But as I show in more detail below, the contradictions apparent in these texts may also be thought of as marks of supplementarity; as textual fissures that reflect the paradoxes and tensions of supplementarity that these thinkers attempt to represent and discuss. I referred earlier in this chapter to David Wills's suggestion in *Dorsality* that the supplementary relationship between the human and technics is precisely that which cannot be fully *seen* or *grasped* by the human. Thinking the supplementarity of the human and technics constitutes, according to Wills, a *blind spot* that 'comes from behind the human, unable to be seen or foreseen'.[30] As that which can be glimpsed but not fully grasped, as that which necessarily

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[29] Arthur Bradley, *Originary Technicity: The Theory of Technology from Marx to Derrida* (Basingstoke: Palgrave Macmillan, 2011), pp. 23, 29.
[30] Wills, *Dorsality*, p. 7.

exceeds our attempts to contain and confine it, supplementarity only reveals itself in its disappearance, in these slippages where a text falls back into the very logic it attempts to overturn. This is what Bradley seems to suggest when he speaks of the 'aporia of originary technicity itself'[31] – the aporia of a structure that can never quite *be* because it is always already in a process of becoming; that which can never be grasped because it is never just one thing, never still or static, but always in between, always dynamic, and always multiple.

An appendicology allows us to see these fissures of supplementarity without attempting to reduce them to an essence, an origin or a nature of the human; without, that is, attempting to present supplementarity, originary technicity, or what I refer to here as *becoming*, in terms of a more fundamental opposition or distinction between the human and the natural world. In so doing, this appendicology does not seek to *efface* any difference or distinction between the human and the so-called nonhuman world, or to claim that the becoming of the human and technics is the same as other forms of nonhuman becoming. What an appendicology does seek to do is to draw attention to the *multiplicity of difference* that constitutes the relationship between the human and what we think of as the natural world and to highlight the way in which this relationship is structured by a supplementarity that is at once related to and distinct from the supplementary becoming of the human and technics. Technics cannot be presented as that which defines and distinguishes the human from the animal, not because there is no difference between the two, but precisely because these differences cannot be reduced to one *singular* distinction, to one specific quality, characteristic, essence or nature. What appendicology reveals is a proliferation of supplementary becoming that exceeds the human and extends outside of its relationship with technics, a proliferation of supplementary becomings that are simultaneously singular and multiple, or, more precisely, that are multiple and supplementary in their very singularity.

Karl Marx has been described as 'nothing less than the first thinker of technology' and constitutes, according to Arthur Bradley, one of the first thinkers to engage with the idea of the originary technicity of the human.[32] In his seminal analysis of the Marxian notion of alienation and Marx's conception of *techne*, Kostas Axelos argues that 'Marx subscribes to the American, *zoo-technological* definition of man made by Benjamin Franklin: "Man is a tool-making animal"'. According to Axelos, Marx views the 'use and making of tools and the correlative

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[31] Bradley, *Originary Technicity*, p. 41.
[32] Bradley, *Originary Technicity*, p. 21.

development of productive forces and instruments of production' as 'the real guiding clue to the historical becoming of mankind'.[33] Indeed, in both the *Economic and Philosophic Manuscripts of 1844* and in Volume One of *Capital* (1867), Marx presents the labour process and the use of 'instruments of labour' as a *defining* property of humankind, as constituting, in fact, 'the everlasting nature-imposed condition of human existence'.[34] The labour process and the creation and use of technological instruments that it necessitates constitutes, according to these passages by Marx, the most fundamental criterion of human nature, or, even the very nature of the human itself.

Describing this human condition, Marx explains in the *Manuscripts* that '[t]he universality of man appears in practice precisely in the universality that makes all nature his *inorganic body*'. Whether it be in the form of 'food, heating, clothing, a dwelling' or, more specifically, in the creation and use of tools and instruments of labour, the human being transforms materials from its environment into a natural '*body*' that exists outside of it, into a body that is *natural* and *integral* to human nature despite also being *external* and *inorganic* to it.[35] Elaborating on this in Volume One of *Capital*, Marx shows how in the labour process, such instruments serve as 'organs of [...human] activity' that are 'annexe[d]' to the human's 'own bodily organs' as external body parts or appendages.[36] Human life and human nature, Marx indicates in these passages from the *Manuscripts* and *Capital*, are dependent on the relationship with these extra-corporeal appendages and parts, with this '*inorganic body*' with which the human 'must remain in continuous interchange if he is not to die'.[37]

Indeed, Marx suggests, human life and human nature *are constituted out of* this relationship or 'interchange' with these extra-corporeal bodies and organs. As he explains further in the *Manuscripts*, what makes the human *human*, what constitutes the essence or nature of the human, or what Marx calls the 'species-being' of the human, is a process of '*objectification*' through which 'man [...] duplicates himself [...] actively, in reality, and therefore [...] sees himself in a world that he has created'.[38] It is in this process of objectification – or perhaps what has been referred to more recently by Bernard Stiegler as a

[33] Kostas Axelos, *Alienation, Praxis, and Technē in the Thought of Karl Marx*, trans. by Ronald Bruzina (Austin: University of Texas Press, 1976), p. 77.

[34] Karl Marx, *Capital Vol. 1*, trans by. Ben Fowkes (Harmondsworth: Penguin, 1976), pp. 285, 290.

[35] Karl Marx, *Economic and Philosophic Manuscripts of 1844*, trans. by Jack Cohen and others (Moscow: Progress Publishers, 1977), pp. 72-73.

[36] Marx, *Capital Vol. 1*, p. 285.

[37] Marx, *Economic and Philosophic Manuscripts of 1844*, pp. 73-74.

[38] Marx, *Economic and Philosophic Manuscripts of 1844*, pp. 72-73.

process of *exteriorisation*[39] – that the human constitutes and recognises itself, constituting and recognising itself in that which exists *outside* of it. What is natural to the human and what constitutes human nature, arise out of a process of *objectification* by means of which the human exteriorises that which is internal and internalises that which is external to it. According to Marx's account of human species-being, what is natural to the human is necessarily that which is also *external*, *inorganic* and therefore *unnatural* to it. Human nature, if one can continue to refer to it thus, is constituted out of an 'interchange' or, as I interpret it in this thesis, a *becoming* that renders it always already unnatural and external to itself. The 'everlasting *nature-imposed* condition of human existence', as Marx suggests in the above-quoted passage from *Capital*,[40] finds itself in this *unnaturalness*, in this very play of exteriority and interiority that can never be simply internal or external to the human, never simply natural or unnatural to it, but always interior by virtue of its exteriority, natural by virtue of its unnaturalness.

In his efforts to present this relationship with the technological appendage as the always unnatural or denaturalised nature of the human, Marx differentiates between the 'life activity' of the human and that of the animal, claiming that it is only the human that objectifies itself in its extra-corporeal bodies and organs through its labour. According to Marx, while an 'animal is immediately one with its life activity' and 'does not distinguish itself from it', '[m]an makes his life activity itself the object of his will and of his consciousness'. Explaining this distinction, Marx adds:

> Admittedly animals also produce. They build themselves nests, dwellings, like the bees, beavers, ants, etc. But an animal only produces what it immediately needs for itself or its young. It produces one-sidedly, whilst man produces universally. It produces only under the dominion of immediately physical need, whilst man produces even when he is free from physical need and only truly produces in freedom therefrom. An animal produces only itself, whilst man reproduces the whole of nature. An animal's product belongs immediately to its physical body, whilst man freely confronts his product.[41]

It is not the use of tools or technological production *per se* that, Marx argues, is exclusive to the human but more specifically the process of objectification through which the human exteriorises itself in this technological production. Animal production, Marx seems to suggest here, is the production of the self-same, an immediate activity that is internal to the animal and its body and by which the animal produces only *itself*. In contrast to this, 'man freely *confronts* his product' as that which exists *outside* but also, as indicated above, *inside* of himself,

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[39] For more on this see my discussion of exteriorisation in the 'Appendages' section of the Introduction to this thesis.
[40] Marx, *Capital Vol. 1*, p. 290; my italics.
[41] Marx, *Economic and Philosophic Manuscripts of 1844*, pp. 73-74.

producing a so-called internal self through his reproduction of external nature.[42] While animal production is born out of and generates interiority, immediacy, sameness and identity, human production, Marx suggests, does not arise out of *either* an interiority *or* an exteriority, *either* a sameness *or* a difference, but out of the irresolvable tension of a simultaneity of the two, of an interiority that is an exteriority and an identity that is necessarily never identical to itself.

It is here that Marx's text runs into a similar tension to the one encountered in Butler's *Erewhon*. In order to argue that the human is constituted out of a process of objectification in technics, Marx presents this supplementary process as that which *distinguishes* the human from the animal. In doing so, he appears to essentialize this relationship, reducing it to that which it is not: to an absolute essence or nature of the human. A similar point is made by Arthur Bradley who claims that Marx's writings are caught between '*two* rival and competing voices […] that cannot be easily positioned on either side of an epistemological break, let alone sublated into some over-arching whole'. Bradley argues that despite Marx's rethinking of the relationship between the human and technics, his texts continue to present a residual 'humanist concept of a collective human essence of labour' that undermines the 'radical implication of [his] thesis'.[43] But, I wish to suggest, it is through this very slip in Marx's argument, through this apparent contradiction that seems to reduce the relationship of supplementary becoming between the human and technics to an essence and a nature of the human, that we are able to see how any singular and absolute opposition or distinction between the human and the animal is also undercut by the very tensions of supplementarity that it seeks to essentialize.

Although Marx distinguishes between the human and the animal and frames this distinction as an opposition, what this passage actually reveals is the impossibility of any such opposition. For this to constitute a true opposition, Marx would have to prove that whereas the animal is constituted through self-sameness and self-identity, human nature is constituted out of an absolute lack of identity with itself. But such an argument unravels and annuls itself in a structure of supplementarity that defies its supposed oppositional logic. A lack of identity *with oneself* is not simply a lack of identity, it implies identity in its very absence. There can be no *absolute* lack of identity with oneself, no opposite of the self-sameness that Marx assigns to animal nature, because this lack would constitute a relation that simultaneously *is and is not* identical to itself. The opposite of self-sameness is not an absolute lack of the self-same; any such lack would necessarily constitute both a difference *and* a sameness from oneself. The

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[42] Marx, *Economic and Philosophic Manuscripts of 1844*, pp. 73-74.
[43] Bradley, *Originary Technicity*, p. 40.

distinction that Marx sets up between the human and the animal hinges on the supplementarity of the human relationship with technics, but it also points to the supplementarity of the relationship between the human and the natural world. Rather than an absolute opposition or a division between the human and the animal, what we have here is a tension of supplementarity that *prevents* the one from being simply opposed or, equally, from being merely identified with the other. Paradoxically, according to the very terms of Marx's distinction, there can be no absolute opposition between the human and the animal because this relationship is itself caught in a tension of supplementarity comparable to that which structures the relationship between the human and technics.

The opposition that Marx attempts to set up through his description of human nature and his distinction between the human and the animal is, in my reading of this passage from the *Manuscripts*, revealed to be an impossible opposition. According to my reading of Marx, if there is any human nature or human condition to speak of, then this is necessarily a *denaturalised* nature that deconstructs the notion of nature itself and any opposition associated with it. This is a condition that does not *belong* to the human; it is not a state of *being human* that I describe here but a *becoming* that constitutes the human without ever being contained or controlled by it. In attempting to present this supplementary becoming as an essence or nature of humankind, in attempting, that is, to describe the supplementarity of this denaturalised 'nature-imposed' condition of humankind that can never be fully natural or fully human, this passage from the *Manuscripts* finds itself necessarily caught in the very logic that it attempts to describe; a logic that is not merely *contradictory*, as Arthur Bradley suggests in his own reading of Marx in *Originary Technicity*,[44] but that reflects the paradoxical structure and play of supplementarity itself.

A similar problematic may be identified in Frederick Engels's 1876 essay 'The Part Played by Labour in the Transition from Ape to Man' where Engels engages in anthropological speculations over the evolutionary origins of the human and technics. In this essay Engels argues that what allowed the human to evolve from the animal and what now distinguishes the human species from its primordial ancestors is a process of labour that began 'with the making of tools'.[45] It is in the fabrication and use of technological implements that, Engels claims, the human originates. The origin or the creation of technology also constitutes the origin and

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[44] Bradley, *Originary Technicity*, pp. 40-41.
[45] Frederick Engels, 'The Part Played by Labour in the Transition from Ape to Man', in *Karl Marx and Frederick Engels: Selected Works in Two Volumes* (London: Lawrence and Wishart, 1950), II, pp. 74-85 (p. 79).

creation of humankind. As Engels argues, labour and the creation and use of tools are what 'created man himself'.[46] It is here that we can begin to detect the structure of supplementarity that is at play in Engels's text. If, as Engels suggests, the human evolves through the creation of tools, then it is not the human that creates technology; instead, the human is created in and with technology. Elaborating on this, Engels explains that the hand – the very organ that supposedly *manufactures* and *manipulates* the technological object in accordance with a pre-existing intention or purpose – is 'not only the organ of labour' but also '*the product of labour*'.[47] The hand, Engels therefore suggest, does not create technology in accordance with some pre-existing plan or intention; it *simultaneously creates and is created* by this technology in what I have described as a process of mutual becoming that creates the two. As I showed earlier in my engagement with Butler's *Erewhon*, this mutually constitutive movement of supplementary becoming deconstructs any notion of a pure origin or essence of either the human or technics. If the human evolves with and through technology, each being created in the other, then there can be no human that exists prior to technics and no human nature that is not always already constituted by technics. What Engels describes here is an origin that is not an origin and an essence that is not an essence, a human nature that is necessarily unnatural to itself and an identity that can never be fully identical to itself.

In order to claim that it is labour and the relationship with technics that creates the human, Engels, like Marx and Butler before him, distinguishes the human relationship with technics from other forms of becoming witnessed in nonhuman animals. It is here that, despite his recognition of the supplementarity of the relationship between the human and technics, Engels appears to reintroduce the notion of a simple human origin, essence or being that his argument otherwise problematises and deconstructs. Animals, Engels claims, 'change external nature by their activities just as man does, even if not to the same extent, and these changes […] in turn react upon and change their originators'. Like the human then, the animal is formed through its relationship with an environment that is external to it, an environment that it transforms and is transformed by in turn. But while this mutually constitutive becoming occurs 'unintentionally' and by 'accident' in the animal, in the human it appears to Engels to be the result of some preconceived intention or purpose. Indeed, according to Engels, '[t]he further removed men are from animals […] the more their effect on nature assumes the character of premeditated, planned action directed towards definite ends known in advance'. What makes the human

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[46] Engels, 'The Part Played by Labour in the Transition from Ape to Man', p. 74.
[47] Engels, 'The Part Played by Labour in the Transition from Ape to Man', p. 75.

human in distinction to the animal, Engels adds, is the agency with which man uses his labour and his tools to 'serve his ends' and to master nature.[48]

Here Engels appears to slip back into an anthropocentric logic that thinks of the human as the creator of technology and that assumes the existence of a human essence, nature or will that pre-empts technological creation and is untouched or unsullied by technics. In order to argue that the human is constituted out of its relationship with technics, Engels seeks to show how this relationship is exclusive to the human and, in so doing, he appears to undermine the very point of his argument, reintroducing the notions of human origin, essence, nature and being precisely at the point where he ought to deconstruct them. But the passage quoted from above and the particular wording that it uses demands closer attention. Engels does not quite state that the further removed from the animal the human is the more its engagement with technology is premeditated and intentional; what he does suggest, however, is that the wider this gap becomes, the more human actions *assume the character of*, or, in other words, *appear* to be premeditated and intentional.

Earlier in the essay Engels argues that although the human and technics are created in a mutually constitutive process of becoming, in hindsight it is the human that is credited with having created technics. Although there can be no origin of the human that is not always already constructed through technics and no human nature or essence that is not already unnatural and external to itself, the human still *appears* to have an essence or a nature that is untouched by technics. Perceived retroactively, therefore, the supplementary relationship of becoming or co-evolution between the human and technics is viewed as a one-sided and premeditated act of creation by which an already fully-formed and self-sufficient human being creates prosthetic tools and implements that remain entirely external to him. In this manner, the creation of technological objects and with it the development of human nature and human civilisation, appear 'in the first place as products of the mind',[49] they appear to be products of a human essence that exists prior to technology and that is untouched by any form of technics, of artifice or of making.

Although at first glance Engels's essay appears to be caught in a contradictory logic that recognises a supplementary relationship of becoming between the human and technics while at the same time continuing to claim that there is a human essence or nature that pre-empts this relationship, my reading of this passage and of the rest of Engels's essay suggests a more

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[48] Engels, 'The Part Played by Labour in the Transition from Ape to Man', pp. 81-82.
[49] Engels, 'The Part Played by Labour in the Transition from Ape to Man', p. 80.

nuanced understanding of this apparent contradiction. Although Engels *seems* to oppose the human to the animal, arguing that while the animal '*uses* its environment', the human '*masters* it',[50] he simultaneously also argues that any distinction or opposition between 'man and nature' is 'senseless and unnatural' because the human 'with flesh, blood and brain, belong[s] to nature, and exist[s] in its midst'.[51] Despite what appear to be his claims to the contrary, Engels recognises that the supplementary becoming of the human and technics is implicit in nature itself. As Engels suggests, animals also 'change external nature by their activities [...] and these changes [...] in turn react upon and change these originators'. 'In nature', Engels goes on, 'nothing takes place in isolation. Every thing affects every other thing and *vice versa* [...]'. The very nature of nature itself, if one may put it thus, is that of a supplementary becoming by means of which the one is always already other, the singular always already multiple and the inside always also outside. So-called nature (whether understood as *human* nature or as nature in general), does not constitute some self-sufficient sameness; it is, rather, that which is always already constituted by a supplementary movement of becoming, or what Engels describes as an 'all-sided *motion* and *interaction*' with another.[52]

The apparent contradictions that may be identified in Engels's essay are not merely contradictions; they may be thought of as fissures through which the aporias of supplementarity come into play in this text, revealing a relationship of becoming between the human and technics and, in addition, drawing attention to the impossibility of any absolute division or opposition between so-called human and nonhuman nature. Rather than an opposition between the human and the animal, between some kind of human becoming and animal being, between a denaturalised human nature and an animal nature that is natural to itself, what my reading of Engels's essay seeks to draw attention to is a play of supplementarity and becoming that cuts across any such boundaries and divisions and that, in itself, can never constitute a boundary, border, division or opposition. This insight is central to this appendicology which reads and understands the relationship between the human and technics in light of the supplementary becoming of so-called nature or life itself. As will become clearer in the course of this thesis, an appendicology reveals that the supplementarity of the human relationship with technics should not be thought of as being *the same* as the supplementarity of so-called nature, but neither should it be thought of as being *opposed* to it. The becoming of the human with technics is not a distinguishing property or quality of the human, firstly because it is not a mere *quality*

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[50] Engels, 'The Part Played by Labour in the Transition from Ape to Man', p. 82.
[51] Engels, 'The Part Played by Labour in the Transition from Ape to Man', pp. 82-83.
[52] Engels, 'The Part Played by Labour in the Transition from Ape to Man', p. 81.

or *property* of anything, and secondly, because in its very supplementarity it cannot constitute a *single absolute difference or distinction.* As I continue to argue in this and the following chapters, if we are to think of a supplementarity, an originary technicity or a becoming of the human, then this thinking must also account for the supplementarity that structures the relationship between the human and the animal, and between so-called human and nonhuman nature, without reducing this relationship to a mere opposition or a singular distinction.

It is this understanding of the relationship between the human, technics and the natural world that guides my reading of André Leroi-Gourhan's *Gesture and Speech*. I argued in the Introduction to this thesis that Leroi-Gourhan's analysis of the origin of the human is marked by an apparent contradiction. On the one hand Leroi-Gourhan presents technicity as a defining 'criteria' that separates the human from the animal, while, on the other hand, he also insists that there is a natural continuity between this human technicity and what he refers to as the nonhuman 'technical ability' that it evolves out of.[53] This apparent contradiction can be seen at work in the first few chapters of *Gesture and Speech* in which Leroi-Gourhan seeks to counter so-called 'cerebralist' views of human evolution and human nature with his own theory of how the human evolved as a result of a bodily relationship of technicity with the outside world.[54] Throughout these chapters, Leroi-Gourhan presents the human relationship with technology as a defining property that *distinguishes* the human from the animal, while simultaneously also claiming that this relationship is rooted in a technicity that extends *across* species boundaries and is not limited to the human species.

In distinction to what Leroi-Gourhan describes as the 'cerebralist' understanding of evolution – the idea that the origins of the human lie in the development of a superior brain and a more powerful intellect than that seen in nonhuman animals – Leroi-Gourhan argues that the human brain is 'a secondary criterion' of human nature. According to this thinker, the origins of the human species do not lie in the brain but in the body and the tool. The human species, Leroi-Gourhan argues, did not evolve as a result of changes to the brain and the development of a superior form of intelligence, such changes only occurred *after* the human body had been developed and the human relationship with technology had been established. Human intelligence, human agency, and so-called human nature, did not pre-empt the development of the human body and its relationship with technology; it was rather this very relationship that

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[53] André Leroi-Gourhan, *Gesture and Speech*, trans. by Anna Bostock Berger (Cambridge, MA: MIT Press, 1993), p. 19. See the section 'Appendixes' in the Introduction.
[54] Leroi-Gourhan, *Gesture and Speech*, p. 8.

allowed for the evolution of that which we call human. According to Leroi-Gourhan, the human only emerges as a result of an interactive cycle of growth and development, or what he refers to as a 'dialogue', between the body, its external tools and, later on, the brain itself.[55] According to Leroi-Gourhan's account of human evolution, the human does not pre-empt technology, it does not exist prior to technology, but is instead created in the technical. As Bernard Stiegler explains in his own reading of *Gesture and Speech*, 'the tool […] invents the human', or, more precisely, 'the human invents himself in the technical by inventing the tool'.[56]

Leroi-Gourhan's description of this mutually constitutive process of evolution can be thought of in terms of what I referred to above as a play of exteriority and interiority – as a movement in which the so-called internal nature of the human is formed in that which is outside of itself, rendering that which is inside outside and that which is outside inside. Leroi-Gourhan describes the technological implements that the human evolves with as 'artificial organs' that are comparable to the 'natural organs' of the body.[57] This characterisation of the technological implement as an artificial body part closely resembles Samuel Butler's own description in *Erewhon* of the tool as an extra-corporeal limb or appendage that is added to the body. As I have shown, it is in its very supplementarity and in its very exteriority that this technological appendage comes to constitute an *internal* part of the human body and of human nature. Like Butler, Leroi-Gourhan describes these tools as artificial organs that come to be 'incorporated' into the body as external and yet internal parts,[58] but he also suggests that they may be perceived as having been *secreted* or *exuded* out of the body itself like some internal and yet external prosthesis.[59] It is in their very exteriority that these 'organs' may be thought of as being internal to the body, and in their very interiority that they remain external to it. The 'incorporations' and 'secretions' that Leroi-Gourhan describes point to the natural unnaturalness and unnatural naturalness of these artificial appendages and of the bodies they extend out of. This mutually constitutive process of evolution between the human and technics constitutes the exteriorisation of an interiority that is always already exterior to itself and the interiorisation of an exteriority that is always already interior. As Stiegler notes in his own reading of this text, what we have here is the 'paradox' of an 'interior [that] is constituted in exteriorization'.[60] It is this

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[55] Leroi-Gourhan, *Gesture and Speech*, p. 47.
[56] Stiegler, *Technics and Time, 1*, p. 141.
[57] Leroi-Gourhan, *Gesture and Speech*, pp. 19, 91.
[58] Leroi-Gourhan, *Gesture and Speech*, p. 106.
[59] Leroi-Gourhan, *Gesture and Speech*, pp. 91, 106.
[60] Stiegler, *Technics and Time, 1*, p. 141.

paradoxical and supplementary play of inside and outside that, according to my reading of *Gesture and Speech*, constitutes the *becoming* of the human with technics.

Discussing this becoming, I showed above that the supplementary play of interiority and exteriority that constitutes the human in technics and technics in the human cannot be thought of as a simple *origin* of either the human or technics. Perceiving this becoming as an origin reduces it to some kind of fully internal or external nature or essence. If we are to truly account for the supplementary structure of this becoming and the play of interiority and exteriority described above, then we must necessarily problematise the very notion of origin itself, together with the ideas of essence and nature that it implies. This is what Derrida points to at the end of *Of Grammatology* when he speaks of the 'supplement of (at) origin'.[61] If there is an origin to speak of – an origin of either the human or technics – then this origin is necessarily a *supplementary* origin; an origin that is other and external to itself, an origin that originates in another. Rather than an origin, what I describe here in my reading of Leroi-Gourhan's *Gesture and Speech* is an *originary supplementarity of becoming* that can never constitute an origin; an originary supplementarity that constitutes the very impossibility of any pure and absolute origin.

It is this very problematic of originary supplementarity that Leroi-Gourhan grapples with in his analysis of human evolution and technicity and that accounts for the apparent contradictions and tensions that mark *Gesture and Speech*. Towards the end of the first chapter of this text, Leroi-Gourhan argues that the creation and use of technology – this very process of becoming in which the human creates and is in turn created by technics – constitutes one of the most 'fundamental criteria of humanity'.[62] If it is in the tool, or, more precisely, in the mutually constitutive or co-evolutionary relationship between the body, the brain and the tool, that the origins of the human lie, then, according to the same logic that we encountered in the writings of Butler, Marx and Engels, this must constitute a defining quality of humankind, it must be that which distinguishes the human from the animal. This is what Leroi-Gourhan claims when he describes 'the emergence of tools' as being 'a species characteristic [that] marks the frontier between animal and human'.[63] If it is in the creation and use of tools that the human species is itself created, then technology must constitute the boundary or the frontier between the human and the animal; it must be that which *defines* the human in distinction to

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[61] Jacques Derrida, *Of Grammatology*, trans. by Gayatri Chakravorty Spivak (Baltimore: The Johns Hopkins University Press, 1997), p. 313.
[62] Leroi-Gourhan, *Gesture and Speech*, p. 19.
[63] Leroi-Gourhan, *Gesture and Speech*, p. 90.

the animal. At the same time, however, according to Leroi-Gourhan's own argument, if the human does not exist prior to technology but is created *in* and *through* technology, then technology cannot be that which defines the human because *it does not belong* to the human. If the human does not pre-empt technology, then technology must have developed before the human, or, at least, it must have developed out of or in something that *was not human*.

This is precisely what Leroi-Gourhan suggests only a few pages earlier where he claims that human technicity emerged out of technical abilities that predated the evolution of the human. Many nonhuman animals, we are told, 'possess the basic possibilities for technicity' and it is in these possibilities that the germs of human technicity lie. The rudimentary forms of technicity that one may observe in nonhuman animals are, according to this thinker, enough 'to make us realize *how far down the scale of the animal world* the instrument of human technicity was formed'.[64] Accounting for this nonhuman technicity, Leroi-Gourhan speaks of a 'technical ability' in animals which manifests itself in the body, particularly in the prehensile organs and appendages of certain species.[65] Although they are what we would consider *natural* and *organic* to the bodies that they belong to, these organs and appendages may still be thought of as 'technical instrument[s]' that are comparable to the tools and implements used by human beings.[66] This is what allows Leroi-Gourhan to suggest that early humans 'seem to have possessed their tools in much the same way as an animal has claws', the chopper and biface, for example, 'form[ing] part of the skeleton' and being 'literally "incorporated" in the living organism'.[67] As he continues to argue further on in the text, 'our tools sprang, literally, from the nails and teeth of primates without the smallest perceptible interruption'.[68] It is not simply *human* nature that is unnatural and exterior to itself, the animal body also displays a natural technicity that appears to somehow denaturalise it. The tools and implements that the human creates and exteriorises itself in are, Leroi-Gourhan suggests, 'extension[s]' of the inherent technical abilities of the body itself,[69] abilities that are in no way limited to the human but exist before it and extend beyond it. As Leroi-Gourhan notes elsewhere in this text, '[t]he concept "tool" itself needs to be reviewed with reference to the animal world, for technical action is found in invertebrates as much as in human beings and should not be limited exclusively to the artefacts that are our privilege'.[70] Technicity, Leroi-Gourhan clearly argues here, is *not* the

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[64] Leroi-Gourhan, *Gesture and Speech*, pp. 80-81; my italics.
[65] Leroi-Gourhan, *Gesture and Speech*, pp. 60, 56.
[66] Leroi-Gourhan, *Gesture and Speech*, p. 56.
[67] Leroi-Gourhan, *Gesture and Speech*, p. 106.
[68] Leroi-Gourhan, *Gesture and Speech*, p. 240.
[69] Leroi-Gourhan, *Gesture and Speech*, p. 173.
[70] Leroi-Gourhan, *Gesture and Speech*, p. 237.

exclusive property of the human; instead it evolves together with the human out of so-called animal nature and the natural technicity that such nature seems to display.

In his attempts to prove that technicity is natural to the human, Leroi-Gourhan is caught in what appears to be a contradictory logic that presents technics as being particular and exclusive to the human while also simultaneously portraying it as being a part of so-called nature itself. On the one hand technicity is that which defines the human and distinguishes it from the animal, while, on the other hand it also marks a continuity between the human and the animal. This apparent contradiction points to the supplementary nature of the relationships of becoming that Leroi-Gourhan seeks to account for here. The evolutionary relationship between the human and technics that he attempts to describe in *Gesture and Speech* does not consist of an absolute break with an animal past, but neither does it constitute some uninterrupted continuity; what we have here is an evolutionary becoming that can be perceived as both a break and a continuation. As Leroi-Gourhan himself acknowledges in *Gesture and Speech*, 'the zoological ladder […] reflects not only clear-cut differences between groups of animals but also links between them so that a little of the quadruped can be recognized in the monkey and a little of the monkey in the human'.[71] The evolutionary relationship between the human and the animal constitutes neither an absolute division, nor an uninterrupted continuation, it is rather a relationship of supplementary divisions *and* continuations, of multiple differences *and* similarities that implicate the human in the animal and the animal in the human.

In the short passage I have just quoted, Leroi-Gourhan does not merely refer to the relationship between the human and the animal but to the evolutionary relationships shared by *all* groups of animals, or, one might even add, all living beings. All species, whether human or not, are involved in supplementary relationships with other species that at once relate and distinguish them from one another. The evolutionary relationship the human shares with its animal ancestors and, indeed, with technics itself, must be viewed in the context of multiple other relationships of becoming that supplement one another and are implicated in one another.[72] The evolutionary becoming of the human is neither absolutely distinct from nor

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[71] Leroi-Gourhan, *Gesture and Speech*, p. 55.

[72] This echoes the point made by Derrida in *The Animal That Therefore I Am* and in *For What Tomorrow…* that I refer to in the Introduction to this thesis. In both of these texts Derrida argues that rather than there being one single boundary or division between the human and the nonhuman animal, what one observes in the natural world is a multitude of differences that supplement each other. As Derrida explains, '[b]eyond the edge of the *so-called* human, beyond it but by no means on a single opposing side, […] there is already a heterogeneous multiplicity of the living' (Jacques Derrida, *The Animal That Therefore I Am*, trans. by David Wills (New York: Fordham University Press, 2008), p. 31). As he also suggests in *For What Tomorrow…*, '[t]here is not *one* opposition between man and non-man; there are, between different organizational structures of the living being, many

identical with any of these becomings; it is neither the same nor different but *both the same and different* in its supplementarity to them and they are each in turn at once the same and different to one another. Using technicity to draw a line, a boundary or a 'frontier'[73] through these supplementary becomings in order to account for some supposed origin of the human reduces this supplementary play of difference and sameness to one singular and absolute difference and in the process essentializes the human relationship with technics, presenting it as the origin or the nature of the human. Rather than revealing an origin of the human in technics, my reading of Leroi-Gourhan's *Gesture and Speech* points to the impossibility of any absolute or singular origin, revealing instead an originary becoming that is not limited to the human or the human relationship with technics, but that extends out of and exceeds both the human and technics.

Thinking beyond the Human

Earlier in this chapter I referred to Wills's suggestion in *Dorsality* that the becoming of the human with technics constitutes a blind spot in our thinking of the human. A similar but differently nuanced claim is made by Bernard Stiegler who uses the Platonic myth of Prometheus and Epimetheus to describe an originary supplementarity or an originary technicity that is 'forgotten' by metaphysics.[74] What is forgotten by metaphysics, what is kept out of sight, is according to Stiegler a primary forgetting or a fault that constitutes the human in and through technics. In Plato's *Protagoras*, Epimetheus is tasked with distributing different qualities or faculties to all the animals but he forgets to reserve any of these faculties for the human. Unwilling to have the human left 'naked, unshod, unbedded, and unarmed' upon its creation,[75] Prometheus compensates for his brother's fault by endowing the human with technics and fire. It is in this manner that, according to Stiegler's reading of Plato's text, technics comes to constitute an inherent and originary part of human nature. As Stiegler claims, it is '*tekhnē* that forms the lot of humans, and *tekhnē* is prosthetic; that is, it is entirely artifice'. The nature of

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fractures, heterogeneities, differential structures' (Jacques Derrida and Elisabeth Roudinesco, *For What Tomorrow… A Dialogue*, trans. by Jeff Fort (Stanford: Stanford University Press, 2004), p. 66). The multiplicity of species and of differences is discussed in more detail in my reading of science fiction in Chapter Two where I show how the notion of the cyborg does not merely draw attention to the supplementarity of the human relationship with technics but also allows us to see how similar and yet different forms of supplementarity structure the rest of the so-called natural world (see the sections 'Cyborgian Selves' and 'Cyborgian Life'). The notion of a biotechnicity that extends beyond the human to the natural world is looked at in greater detail in Chapter Three in my readings of the work of Lynn Margulis and Dorion Sagan and in my discussion of Darwinian evolution and the Darwinian notion of species.

[73] Leroi-Gourhan, *Gesture and Speech*, pp. 83, 90.
[74] Stiegler, *Technics and Time, 1*, p. 186.
[75] Plato, *Protagoras*, quoted in Stiegler, *Technics and Time, 1*, p. 187.

the human – that which is supposed to be *internal* and *natural* to the human – only emerges through a relationship with that which appears to be *external* and *unnatural* to it. As Stiegler explains further, the technicity of the human is not some external prosthetic supplement that is added onto an already formed and self-sufficient internal nature, it is rather that which constitutes the *interiority* of this so-called nature through its very *exteriority*:

> A pros-thesis is what is placed in front, that is, what is outside, outside what it is placed in front of. However, if what is outside constitutes the very being of what it lies outside of, then this being is *outside itself*. The being of humankind is to be outside itself. In order to make up for the fault of Epimetheus, Prometheus gives humans the present of putting them outside themselves.[76]

This is the same supplementary play of inside and outside that is gestured towards in the writings of Butler, Marx, Engels and Leroi-Gourhan and that can be thought of through the paradigm of the technological appendage. What is natural and internal to the human, indeed what makes the human *human*, is an exteriorisation into technics that renders this inner nature always already unnatural and external to itself.

According to Stiegler, it is this supplementary play of interiority and exteriority – the supplementarity of a nature that 'consists only in its technicity, in its denaturalization'[77] – that is forgotten by metaphysics. What metaphysics forgets is Epimetheus's originary act of forgetfulness and the act of compensation that comes to supplement it. 'Epimetheus', Stiegler suggests, 'is not simply the forgetful one [...] he is also the one who is forgotten. The forgotten of metaphysics. The forgotten of thought. And the forgotten of forgetting when thought thinks itself *as* forgetting'.[78] Stiegler discusses this forgotten forgetting in terms of what is referred to in the English translation of this text as a 'de-fault' at origin. What is forgotten is that '[...] there will have been nothing at the origin but the fault, a fault that is nothing but the de-fault of origin or the origin as de-fault [*le défaut d'origine ou l'origine comme défaut*]. There will have been no appearance except through disappearance'.[79] The use of the term *de-fault* in the English translation points to the complexity of what Stiegler attempts to account for here: a

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[76] Stiegler, *Technics and Time, 1*, p. 193. Stiegler's description of the play of interiority and exteriority in this passage echoes Wills's own notions of *dorsality* and *prostheticity* even if, as Wills himself acknowledges, 'Stiegler comes to the matter from a different perspective' (David Wills, 'Techn*e*ology or the Discourse of Speed', in *The Prosthetic Impulse: From a Posthuman Present to a Biocultural Future*, ed. by Marquard Smith and Joanne Morra (Cambridge, MA: MIT Press, 2006), p. 244). According to Wills, the body is always already prosthetic (David Wills, *Prosthesis* (Stanford: Stanford University Press, 1995), p. 137). If the term *prosthesis* refers to that which is placed in front of and, therefore, *outside* of the human, then the human can be said to be always already *outside of itself*; it is always already constituted by that which it posits as being exterior and external to itself.

[77] Stiegler, *Technics and Time, 1*, p. 148.

[78] Stiegler, *Technics and Time, 1*, p. 186.

[79] Stiegler, *Technics and Time, 1*, p. 188.

fault, a failing a defect, 'a flaw in being',[80] or an unnaturalness in nature that, in its very unnaturalness, constitutes the *default* of this nature.[81]

It is this forgotten de-fault that Stiegler's text attempts to account for. As Stiegler points out in the passage quoted from at some length above, human technicity is precisely that which is *not* 'pros-thetically' located 'in front' of the human[82] or, as Wills suggests in *Dorsality*, within the human 'field of vision'.[83] Being neither internal *nor* external to the human but comprising instead that very play of interiority and exteriority that constitutes the human, this de-fault is necessarily that which the human cannot see, that which it remains blind to. Attempting to account for this de-fault, Stiegler problematises the notions of any human origin, nature or essence, arguing that '[t]he *essential* is the accident, the absence of quality' and that 'there is no origin at all, there is only the duplicity of an originary flaw'.[84] But, simultaneously, and perhaps necessarily, in his very attempts to account for this forgotten blind spot of an essence devoid of any essence and an origin that is not, Stiegler's text seems to re-essentialize the very notions of human nature and technics that it otherwise deconstructs.

In his reading of *Technics and Time, 1*, Arthur Bradley claims that Stiegler's '*articulation* of this empirico-transcendental aporia of origin […] remains the most problematic aspect of his thought'. Bradley identifies in this account of originary technicity a residual humanism or anthropocentrism that leads Stiegler to posit an 'absolute break' between the human and the natural world and to re-essentialize technics into that which is 'proper' to the human 'as its own mode of being'.[85] A similar critique is levelled against Stiegler by Geoffrey Bennington who argues that Stiegler's writings prohibit us from perceiving technology 'as [a] mere supplement or prosthesis of what is properly human' but in so doing also present technicity as 'the 'origin' of humanity'. In *Technics and Time, 1*, Bennington adds, the human comes to be presented as that which is '*essentially* technical, defined by an originary prostheticity' and 'marked by an originary "defect" or "lack"'.[86] As both Bradley and Bennington suggest here, in his very attempts to account for the de-fault of originary technicity, Stiegler appears to at once deconstruct the notions of a human nature, essence and origin, only to then present this

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[80] Stiegler, *Technics and Time, 1*, p. 193.
[81] See translator's note 12, in Stiegler, *Technics and Time, 1*, p. 280.
[82] Stiegler, *Technics and Time, 1*, p. 193.
[83] Wills, *Dorsality*, p. 7.
[84] Stiegler, *Technics and Time, 1*, pp. 193, 196.
[85] Bradley, *Originary Technicity*, pp. 128,130.
[86] Geoffrey Bennington, 'Emergencies', *Oxford Literary Review*, 18 (1996), 175-216 (p. 183). Bennington goes on to suggest that in 'arguing against a metaphysical determination of technics' Siegler tells a 'perfectly metaphysical story with a prehistory, a catastrophic fall, and a need to overcome that fall' (p. 183).

denaturalised nature or this essence devoid of any essence as the defining quality or property of the human.

But if this 'de-fault' of the human, this originary technicity or originary supplementarity of becoming, is, as I suggested earlier in this chapter, that which can never be fully seen, grasped or contained by the human without necessarily being reduced to that which it is not, then the apparent contradictions that Bradley and Bennington identify in *Technics and Time, 1* are not so much contradictions as the marks of the aporetic and paradoxical structure of supplementarity that Stiegler attempts to describe. Indeed, one could suggest that any attempt to account for the structure of supplementarity – to account, that is, for that which is not accountable – will *necessarily* fall back into the very logic they try to escape. If, as Wills suggests, the originary supplementarity of the human necessarily constitutes that which cannot be seen or 'foreseen', that which appears 'to come from behind' and 'from beyond the simple perspective of the human […] from another point of view, from outside the field of visual possibility',[87] then any attempt to *see* this supplementarity, to bring it *within* the field of vision, must involve either the reduction of this supplementarity into a prosthetic entity that exists outside of the human, or the re-essentializing of it into an internal property or quality that the human can define itself by.

It is worth referring here briefly, by way of a conclusion, to the passage from *Of Grammatology* used as an epigraph to this chapter. Here Derrida draws attention to the fact that supplementarity cannot in any way be thought of as 'a characteristic or property of man'. He goes on to explain that this does not only mean 'that [supplementarity] is not a characteristic or property; but also that its play precedes what one calls man and extends outside of him'. The human, Derrida continues, defines itself by 'drawing limits excluding his other from the play of supplementarity' and the 'history of man *calling himself* man is the articulation of *all* these limits'.[88] In this passage Derrida does not only insist that supplementarity cannot be thought of as a *property* – as a 'substance' or even an 'essence' – he also argues that supplementarity cannot merely be considered in relation to the *human* but must be thought of as that which exceeds the human and extends outside of it. What Derrida seems to gesture towards here is a supplementarity and a supplementary technicity that is not limited to *human* nature but that, as I suggested in my readings of Butler, Marx, Engels and Leroi-Gourhan above, is what constitutes so-called nature itself. To be sure, in *Technics and Time, 1* Bernard Stiegler does

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[87] Wills, *Dorsality*, p. 7.
[88] Derrida, *Of Grammatology*, pp. 244-245.

attempt to account for the way in which the supplementarity of technicity extends beyond the human and how life itself is constituted through an 'articulation' of 'artifice'.[89] But throughout his project, Stiegler remains committed to showing how '*the pursuit of the evolution of the living by other means than life*' remains, in the final analysis, the 'history of humanity'.[90] As Arthur Bradley has pointed out, what remains 'unquestioned' in Stiegler's analysis of the supplementary aporia of originary technicity is 'the privilege granted to the question of "the human" as the (seemingly exclusive) arena in which this aporia is operationalised'.[91] If we are to account for the unaccountable, to grasp what cannot be grasped and to glimpse that which constitutes a blind spot in our thinking of the human, perhaps the only possible way forward is precisely *not* to think of the human and its relationship with technics but to consider how the supplementarity we wish to account for *exceeds* the human and extends to other forms of life and being.

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[89] Stiegler, *Technics and Time, 1*, p. 175.
[90] Stiegler, *Technics and Time, 1*, p. 135.
[91] Bradley, *Originary Technicity*, p. 128.

Chapter Two

Anthropomorphic Machines, Prosthetic Selves and Cyborgian Lives

> To be One is to be autonomous, to be powerful, to be God; but to be One is to be an illusion, and so to be involved in a dialectic of apocalypse with the other. […] The machine is not an *it* to be animated, worshipped, and dominated. The machine is us, our processes, an aspect of our embodiment. We can be responsible for machines; *they* do not dominate or threaten us. We are responsible for boundaries; we are they.
> DONNA HARAWAY, 'A Cyborg Manifesto'

> It cannot simply be a question of inverting the dualism of machine and organism which has structured the history of metaphysics. Rather, the mapping of machines can be constructed in novel ways to the point where the fixity and certainty of techno-ontological boundaries and distinctions begin to de-stabilise and break down in true machinic fashion.
> KEITH ANSELL PEARSON, *Viroid Life*

Iron Servants, Iron Masters

Although the author of Samuel Butler's fictional 'Book of the Machines' recognises the interdependence of the human and technology and acknowledges, as we saw in Chapter One, that '[m]an's very soul is due to the machines' and is a 'machine-made thing', at several points in his argument he nevertheless attempts to *oppose* the human to technology, describing the human as the 'ruling spirit' and the machine as a 'servant' that 'owe[s] [its] very existence and progress to [its] power of ministering to human wants'.[1] Establishing the terms of this opposition, the fictional author explains that while the human is the *master* of technology, controlling and manipulating it as its own property, technology functions as a *servant* or perhaps even a *slave* whose sole purpose is to accommodate humankind. The intention behind this description is to create an opposition between the human and the machine, an opposition that would clearly present technology as the *property* of human beings. What the Erewhonian professor desires to show here is that technology should serve as a prosthetic tool or an external implement that can be fully controlled and mastered by the human, an implement that has no autonomy or will of its own and whose only function and purpose is to serve mankind.

This understanding of the relationship between the human and technology reflects what Timothy Clark describes as 'the conception of technology that – with a few exceptions – has dominated Western thought for almost three thousand years'. As Clark shows, this understanding of technology is based on the Aristotelian description of *techne* as that which is

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[1] Samuel Butler, *Erewhon: Over the Range* (London: Forgotten Books, 2008), p. 158.

'extrinsic to human nature' – as an external 'tool which is used to bring about certain ends'.[2] As Arthur Bradley also notes, Aristotle's description in the *Physics* of the technological object as an 'inert, neutral tool or instrument with no capacity to move itself' has led to a conception of technology as 'a *prosthesis* (*pro-thesis*, literally, that-which-is-placed-in-front-of) to nature, thought and the human, with no formative or reproductive power of its own, that can be utilised for good or ill depending upon who or what happens to wield it'.[3] It is this instrumentalist or prosthetic conception of technics that Butler's fictional author draws on in his description of technology as a servant or slave of the human; a form of property that can be owned and controlled by its human master.[4]

But by serving as the *property* of the human, technology is also, we are led to suspect in this passage from *Erewhon*, that which is *proper* to humankind; that which does not simply belong to the human, but that constitutes the human through this belonging. What the professor's fictional treatise on technology invites us to see is that the human recognises itself as human precisely in its mastery over that which it perceives to be external to it. The human is only able to recognise itself as such, it is only able to perceive and protect the integrity and interiority of its supposed nature, by opposing itself to that which it perceives as other; by distinguishing itself, that is, from the technological object that it considers to be its property. This is illustrated in the text through the professor's description of how, if technology ceases to be the property of the human, the human itself also ceases to be human. Having described humankind as the 'ruling spirit' of technology and the machine as the 'servant' that belongs to

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[2] Timothy Clark, 'Deconstruction and Technology', in *Deconstructions: A User's Guide*, ed. by Nicholas Royle (Basingstoke: Palgrave, 2000), pp. 238-257 (p. 238).

[3] Arthur Bradley, *Originary Technicity: The Theory of Technology from Marx to Derrida* (Basingstoke: Palgrave Macmillan, 2011), pp. 4-5.

[4] The Erewhonian author's portrayal of tools and machines as technological servants and slaves of the human reflects a general tendency in the Victorian age to think of the relationship between the human and technology in terms of such a master-servant dynamic. As Herbert Sussman has argued, technology was commonly thought of in this period as both an 'unwearied iron servant and the sacrificial god to whom mankind has offered its soul'. For the Victorians, 'the machine [was] a servant who would be terribly useful if he would only not insist on ordering the household according to his own needs' (Herbert L. Sussman, *Victorians and the Machine: The Literary Response to Technology* (Cambridge, MA: Harvard University Press, 1968), p. 7). Such descriptions of the tool or machine as a servant or slave of the human can be read alongside Aristotle's description of self-moving tools in *The Politics*. Here Aristotle invites the reader to imagine the existence of automatic or self-moving tools and machines, 'shuttles in a loom', for instance, that can 'fly to and fro' and 'a plucker' that can 'play a lyre of [its] own accord'. Such tools, Aristotle suggests, would constitute such perfect assistants that 'master-craftsmen would have no need of servants nor masters of slaves'. An automatic machine or a self-moving tool, Aristotle goes on to explain, is no different from a human servant or a slave; both 'belong' to their master as 'a piece of property' and both work to do their master's 'bidding' and fulfil his will (Aristotle, *The Politics*, trans. by T. A. Sinclair, rev. by T. J. Saunders (London: Penguin, 1981), p. 65). Although Aristotle's comparison between the tool and the slave is primarily intended to show how it is the human servant or slave that functions 'as a tool' (p. 63), this comparison also nevertheless suggests that the tool or the machine can be thought of as a servant of the human – as a form of living property or as an animated object whose sole purpose is to serve and be subservient to the human master it belongs to.

it, the Erewhonian professor warns that these machinic servants will not 'be man's inferiors' forever. '[T]he servant' we are told, 'glides by imperceptible [and] approaches into the master', surreptitiously usurping the human position of dominance and mastery.[5] The professor goes on to describe a world in which the human no longer has control over the machines it creates and in which it is technology that comes to dominate humankind. Detecting the germs of this technological dominance in the world around him, he shows how once the human loses its position of mastery over technology, it effectively also ceases to be that which we recognise as human and instead assumes the role of machinic slave previously held by technology. Using colliers, pitmen and coal merchants as an example, the professor describes the human workforce as 'an army of servants' living in 'a state of bondage' to the machines that dominate it. Incapable of controlling and mastering the technological objects they create, human beings, we are told, become 'bound down to them as slaves' and are reduced to the position of inferiority previously held by these machinic servants.[6]

What the professor's argument allows us to see here is that our perception and recognition of the human is dependent on an opposition with its so-called other. When the human is stripped of the mastery and control that it assumes over technology, it ceases to be human, or rather, it ceases to recognise itself as human. It is by perceiving the tool as an external prosthesis, or what David Wills describes as a technology that can be 'mustered and mastered by the human' and made 'to operate in the service of human will', that the human affirms the integrity of its own nature and essence. It is by perceiving itself as human *in opposition to* the technological objects that it places outside of itself, that the human creates and preserves the integrity of its own 'self-image'.[7] But it is, paradoxically, in this very attempt to construct and to protect the perceived interiority of itself that the human is also necessarily shown to be other to itself. If the human perceives itself as human through an opposition with that which is external to it,

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[5] Butler, *Erewhon*, p. 158. As I show later on in my analysis of the popular literary and cultural tropes of the robot uprising and the AI takeover (see the section 'Cartesian AIs' in this chapter) the notion of a power struggle or a conflict between the human and technology lies at the heart of much present-day science fiction where technology is often anthropomorphised and presented as a powerful enemy that seeks to rise up and exact revenge over its human masters. This conception of technology can be traced back to the Victorian era. Herbert Sussman argues that as automatic or 'self-acting' machines became more commonplace during this period, so did '[t]he sense that machines were somehow alive'. This challenged the traditional conception of technology as an inert, prosthetic instrument in the service of mankind and led to fears over the potential power that technology might wield if it continued to develop and to become more and more sophisticated. It is in the context of these fears, Sussman argues, that there emerged in the nineteenth century 'the figure that haunts our own science-fictional imagination, the machine with a will of its own' (Herbert Sussman, *Victorian Technology: Invention, Innovation, and the Rise of the Machine* (Santa Barbara: Praeger, 2009), pp. 39, 48).

[6] Butler, *Erewhon*, pp. 159-160.

[7] David Wills, *Dorsality: Thinking Back through Technology and Politics* (Minneapolis: University of Minnesota Press, 2008), p. 7.

then it is through this relationship of *exteriority* that the very *interiority* of the human is constructed. If the human only constructs its self-image by reflecting itself in that which is other to it, then that which we recognise as human, that which we perceive as the interiority of the human, is necessarily constituted out of an *a priori* externalisation, out of a supplementary play of interiority and exteriority that cannot be reduced to some mere opposition. What we come face to face with here is the same question of human essence and human nature that, as I showed in Chapter One, is always marked by a certain tension of supplementarity. As I explained in a different context in Chapter One, it is only through its exteriorisation into technics that the human comes into being; it is only through a relationship with that which is perceived to be external to it that the supposed interiority of the human takes its shape.[8]

This tension makes itself felt in the very anthropomorphism of the professor's description of technology. In his attempts to oppose the human to technology and to present technology as a property of humankind, the professor of Butler's text does not merely describe the technological implement as an enslaved *object* but as a *slave*, not simply as that which serves the human but as a servant of the human. Here, the technological device is personified and presented as an *anthropomorphic* animated being that is not quite as distinct from the human as the professor would like us to believe. Although this author's intention seems to be to distinguish between the human and the machine by presenting the human as master and the machine as servant or slave, in his description of technology the machine takes on the characteristics of its human master. Rather than an absolute distinction between man and technology, what we have here is a description that portrays *the machine in the image of man* and that, I argue, simultaneously also allows us to see *the image of man in the machine*. The anthropomorphic machine described in Butler's text serves as an externalised image of the human; an external object that takes the shape of the human and that the human consequently sees itself in. Reflecting the human back at itself from the outside, the anthropomorphic machine constitutes a quite literal *self-image* of the human; a self-image that protects the interiority of the human by opposing it to an external other, but that simultaneously also shows this interiority to be always already constituted in the exteriority of that which it supposedly is not.

There are two specific points that I would like to highlight here by way of an introduction to the rest of this chapter. Firstly, although it is intended to protect and preserve the integrity

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[8] See my readings of Samuel Butler in the sections 'The 'Machinate Mammal'' and 'A Question of Essence', and my engagement with Marx, Engels, Leroi-Gourhan and Stiegler in the sections 'Originary Becoming vs. An Origin of Becoming' and 'Thinking beyond the Human'.

and interiority of the human subject and of human nature, the attempt to define the human *against* technology and to present the human as the master and proprietor of an *external* technological object or prosthesis, actually allows us to see how the supposed interiority of the human is constructed out of a relationship with that which is outside of itself. By seeing itself through this opposition, through a self-image constructed in relation to that which it perceives to be its other, the human always already places itself outside of itself, its interiority is always already constructed out of the exteriority of that which it excludes as its other. As my reading of the above-quoted passages from Samuel Butler's text shows, this play of interiority and exteriority and the tension of supplementarity that arises whenever one attempts to define the human and its relationship with technics, can be detected in even the most anthropomorphic descriptions of technology.

Indeed, and this is my second point, it is this very anthropomorphism that allows us to see the tensions of supplementarity that I draw attention to here. Anthropomorphic descriptions of technology portray machines in the image of man. This is clearly a reductive way of perceiving technology: it reduces technology to a mere reflection of the human and transforms technicity into what Bradley describes, following Giorgio Agamben, as 'an "anthropological machine" […] designed to produce, define and shape not simply "technology" but, more importantly, *what is not* technology'.[9] But it is precisely in this portrayal of technology as an entity that takes the shape of man, as an entity created in the image of man, that the human is also revealed to be external to itself. As I show in this chapter, it is in the very workings of this *anthropomorphic* and *anthropological machine* that the human can be shown to be constructed through that which it perceives to be external and other to itself. As Agamben argues in a different but yet very similar context in *The Open*, the anthropological machine 'necessarily functions by means of an exclusion (which is also always already a capturing) and an inclusion (which is also always already an exclusion)'; a tension or a play of interiority and exteriority 'in which the outside is nothing but the exclusion of an inside and the inside is in turn only the inclusion of an outside'.[10] Portraying technology as an external prosthetic object that the human can reflect itself in does not simply anthropomorphise technology, it also *denaturalises human nature*, allowing us to see how our very interiority is constructed out of that which we perceive to be other to ourselves. By anthropomorphising technology and literally *seeing ourselves* in

[9] Bradley, *Originary Technicity*, p. 9.

[10] Giorgio Agamben, *The Open: Man and Animal*, trans. by Kevin Attell (Stanford: Stanford University Press, 2004), p. 37.

that which is external to us, we inevitably also reveal the exteriority of our supposedly internal selves.

This chapter examines the workings of this interiority and exteriority and the tension of supplementarity that it implies through an analysis of the two anthropomorphic tropes of the robot and AI in contemporary literature and popular culture. As I show in the following sections, both the robot and AI, as they are portrayed in science fiction and in many transhumanist discussions on the future of the human, constitute anthropomorphic figures that, despite being mechanical, technological or 'artificial', appear to take the shape and form of the human or exhibit behaviours once thought exclusive to the human. Explicitly constructed in the image of man, the figure of the robot and the notion of AI at once serve to reflect and reaffirm the self-image of the human, while also always already revealing this self-image to be a construct – to be artificially contrived and constructed in that which is outside of itself. This insight guides my reading of the popular science fiction motifs of the AI takeover and the robot uprising later on in this chapter, as well as my discussion of the motif of the cyborg. As I argue in my analysis of Daniel H. Wilson's science fiction novels *Robopocalypse* and *Robogenesis*, the overtly anthropomorphic paradigms found in such narratives do not merely assert and reproduce traditional understandings of the human and technology, they also question the validity of these conceptions by showing the human and technics to be inescapably bound to and implicated in one another.

Technology, as it has been discussed in these introductory remarks to this chapter, has been conceived of solely in the context of its relation to the human. This anthropocentric understanding of technology tells us more about the human than about anything else. Even if, as I show below, the figures of the anthropomorphic robot, of AI and of the cyborg invite us to question and perhaps even challenge traditional metaphysical understandings of the human and human nature, this remains a challenge for the *human* and its perception of itself. Even if anthropocentric portrayals of the human and technology can be shown to reveal the tension of supplementarity that underlies the relationship between the two, this understanding of supplementarity still remains tied to the human and remains, ultimately, an anthropological machine *of the human*. In the conclusion to Chapter One I suggested that if we are to better understand this structure of supplementarity we must cease to analyse it exclusively in relation to the human and technics and broaden our discussion to the more general relationship between *bios* and *techne*. I return to this suggestion in the final part of this chapter, where I examine how the science fiction motif of the cyborg draws attention to a hybridity of flesh and metal that extends beyond the human to other forms of life and being. The notion of the cyborg, I

suggest, and, more specifically, the forms of *cyborgian life* depicted in Wilson's novels, highlight the way that the so-called natural world – that which we perceive as being devoid of artifice and contrivance – is itself constructed out of that which we oppose it to. Pre-empting my discussion of evolutionary theory in Chapter Three, I argue that the same structures of supplementarity that underlie the relationship between the human and technics extend to the natural world and to the *bios* that we oppose to *techne*.

Anthropomorphic Robots

From its first conception in literature, the robot has been portrayed as a mechanical servant or slave of the human, as a technological object made in the image of man whose sole purpose is to serve and to obey its human masters.[11] The term *robot* was first used by the Czech science fiction writer Karel Čapek who, in the play *Rossum's Universal Robots* (1920), envisions the manufacture and use of humanoid machines designed to serve as domestic workers and factory hands. Derived from the Czech term for 'serf labour', or, according to Isaac Asimov's definition, 'one who is engaged in involuntary servitude; in other words a slave',[12] the term is used by Čapek to describe these 'artificial people' that, although made of 'living matter', constitute 'working machine[s]' no different to the 'gasoline motors' used to power our vehicles; 'simplified' creatures that *look* human but that lack any of the qualities that make the human *human*.[13] Although these technological servants look like human beings, 'have an enormously developed intelligence' and are functionally 'more perfect' than the human could ever be, they nevertheless 'have no soul'; they lack the very thing that, the play suggests, would make them human.[14] Designed to be human in their appearance but machinic in their functioning and in their behaviour, these robots are at once *similar* to and absolutely *different* from their human masters. This tension is apparent throughout the text, where the human and the robot are continually distinguished from and opposed to one another, all the while also

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[11] Jonathan Sawday suggests that the robot is a modern-day manifestation of the 'ancient fantasy' of creating 'a second Adam, a creature which possessed the outward form of humanity but which operated according to purely mechanical principles'. According to this fantasy, the robot should constitute 'a device or instrument capable of shouldering some of the burdens of humanity, and thus freeing (real) humans from the drudgery of daily existence' (Jonathan Sawday, *Engines of the Imagination: Renaissance Culture and the Rise of the Machine* (London: Routledge, 2007), p. 230). For more on the history of the robot as it has been imagined and represented through the ages, see Minsoo Kang, *Sublime Dreams of Living Machines: The Automaton in the European Imagination* (Cambridge, MA: Harvard University Press, 2011).

[12] Isaac Asimov, *Asimov on Science Fiction* (London: Granada, 1984), p. 76.

[13] Karel Čapek, *Rossum's Universal Robots*, trans. by Paul Selver and Nigel Playfair (South Bend, IN: Theatre Arts Press, 2015), pp. 7, 9, 10.

[14] Čapek, *Rossum's Universal Robots*, p. 10.

being shown to be indistinguishable from one another. Although, as the play emphasises, these robots should be thought of as 'goods' and not as 'people',[15] the distinction between the two is not as clear as one might think and, throughout the play, the robots are often mistaken for humans while human characters are in turn also mistaken for machines.

The tension between this sameness and difference arises from the supplementarity that structures the relationship between the anthropomorphic robot and the human. By designing an 'artificial worker' that is built in the shape of the human but that is *not* human, the founder of Rossum's Universal Robots creates an entity that is at once external and internal to the human – a supposedly external object that implicates itself in the human and that, in turn, has the human implicated within it. In the play, the robot is constructed and created in distinction to the human and, consequently, it cannot but be defined through this distinction. As the play explains, in designing this machine, the creator of the robot '*rejected man*'. The robot was created precisely *not to be human* or to be *nonhuman* and it is in this sense, the play tells us, that '[r]obots *are not people*'.[16] In these descriptions, the robot is a robot insofar as it is not a human being. Having 'no will of their own. No passion. No soul', these machines can only be defined in contrast to the human beings that they are not and in relation to the human activities and emotions that they do not participate in or experience.[17] Robots, we are told, 'don't love. Not even themselves', they cannot 'play the piano', they do not 'feel happy' and they 'do not do a whole lot of other things' that human beings might take for granted.[18] While such descriptions of this nonhuman entity might suggest an absolute division or opposition between the human master and the robotic slave, they also allow us to see how this division or opposition necessarily always operates in relation to and in service of the human. Precisely because the robot is constructed in distinction to the human, because the robot is only a robot *insofar as it is not human*, it remains inseparable from and dependent on that which it is supposedly opposed to. The robot does not constitute some absolute opposite of humankind; instead, as a supposedly nonhuman entity that is created in the image of the human (as well as in the image of what the human is not) the robot functions as an anthropological machine that reflects the human back at itself from its supposed position of exteriority, showing the human to be always already constructed in and by that which it excludes as its other.

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[15] Čapek, *Rossum's Universal Robots*, pp. 6-9.
[16] Čapek, *Rossum's Universal Robots*, p. 10; my italics.
[17] Čapek, *Rossum's Universal Robots*, p. 18.
[18] Čapek, *Rossum's Universal Robots*, p. 10.

Although in Čapek's play the robot functions as a mechanical entity that is distinct from the human and that is excluded from the world of human experience and human emotion, the text also simultaneously suggests that the robot represents that which the human excludes from its *own* self, constituting itself in and through this exclusion. If the robot is a robot insofar as it is not (but necessarily also is) in some way human, equally, in this play, the human is shown to be human insofar as it is *not* (but, as we shall see, always already also *is*) a machine. While it is, so to speak, in the robot's very nature to be enslaved in the service of the human and to constitute a form of property that can be 'bought and sold' by its human masters, the human being, this play tells us, is not and should not be 'a machine' or 'a device for production'.[19] The essence and nature of the human does not lie in work, in 'servitude', and in the 'enslavement' and 'degradation of labor', but in freedom from such labour.[20] Human nature, this play suggests, manifests itself in the freedom that allows the human to 'love', to 'feel happy', to 'play the piano', and to do all of those other things that the robot is incapable of doing.[21] Here, what is shown to make the human *human* is precisely that which distinguishes it from the robot; within Rossum's world, the human is human because it is not a robot. But this text simultaneously also suggests that this essence of the human, this freedom that constitutes the true nature of the human, is yet to be achieved. In its actual state, the human often functions like the robots it opposes itself to and paradoxically defines itself against, constituting a 'human machine' that is 'terribly imperfect' in its humanity.[22] The human, this play tells us, is not yet *properly* or *fully* human; it is only once it liberates itself from work and 'servitude' and becomes 'free and supreme' that it will be able to '*perfect*' itself and realise its true nature as a human being.[23] The human, this text suggests, will only become *truly* human once it is liberated from this enslavement; once, that is, it expels and excludes the robot or the machine from itself.

If the human can only be recognised and recognise itself as human through an exclusion or rejection of the robot, if, that is, the human is only constituted through this rejection or exclusion, then the robot is not merely an external object that the human defines itself against, but the *exteriorisation* of something that is internal and natural to the human while simultaneously appearing to be unnatural and external to it. The passages quoted above do not simply invite us to perceive the human as being *not yet* human, they allow us to see that the

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[19] Čapek, *Rossum's Universal Robots*, pp. 11, 20.
[20] Čapek, *Rossum's Universal Robots*, p. 19.
[21] Čapek, *Rossum's Universal Robots*, p. 10.
[22] Čapek, *Rossum's Universal Robots*, p. 17.
[23] Čapek, *Rossum's Universal Robots*, pp. 19-20; my italics.

human is necessarily always already *not fully* or *not quite* human. If the perceived essence and nature of the human is constituted through a relationship with that which is outside of itself, then this essence and nature is always already other to itself; the supposed interiority of the human is always already constructed and constituted in that which it deems to be exterior, in that which it must simultaneously exclude itself from and exclude from itself. Portrayed in Čapek's play as an anthropomorphic other that looks human but remains supposedly not human, as an exteriorised image (or even a self-image) that the human at once sees itself in and defines itself against, the robot marks the space of this excluded interiority/exteriority that constitutes the human in its otherness.

This same tension and play of exteriority and interiority can be identified in the short story 'Reason' (1941) by Isaac Asimov, where the anthropomorphic figure of the robot is used to more overtly parody and critique traditional understandings of the human and of human nature. Although, like Čapek's play, this story at first appears to set up a clear opposition between the human and the robot, one in fact that results in a power struggle between the robot known as 'Cutie' or 'QT-1' and its human masters, Asimov here uses parody to acknowledge the tensions of sameness and difference that structure the relationship between the human and the robot. As an anthropomorphic figure created in the image of man – an anthropomorphic figure, moreover, that overtly parodies the human being that it mimics – Asimov's robot does not merely reflect the human back at itself, it presents us with a dramatised reflection on human nature that shows the human to be always already constituted through and in such a reflection, to be always already constructed in the external self-image of what it believes itself to be and what it supposedly is not.

Asimov's story begins with a robot's quest for understanding. The robot 'Cutie' – a nickname that in itself draws attention to the anthropomorphic nature of this human-like machine – is equipped with advanced skills of logic and reasoning that allow it to ponder the nature of its origin, its existence and its function on this earth. Embarking on its quest for self-knowledge, the robot explains that the only rational way of arriving at the truth that it seeks is to follow 'a chain of valid reasoning'[24] – a method of enquiry comparable to that engaged in by the philosopher René Descartes who, in *The Discourse of Method*, writes of the 'long chains of simple and easy reasoning' by means of which a philosopher may, by 'commencing with objects the simplest and easiest to know, […] ascend by little and little, and, as it were, step by

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[24] Isaac Asimov, 'Reason', in *The Complete Robot* (London: Voyager, 1995), pp. 280-301 (p. 281).

step, to the knowledge of the more complex'.[25] In true Cartesian style, Cutie begins its meditations on the nature of its existence with 'the one sure assumption […it feels] permitted to make': the assumption that 'I, myself, exist, because I think'.[26] Like Descartes, the robot identifies itself here as a rational thinking being whose essence and nature lie in this very rationality.

That this Asimovian robot serves as a parody of Descartes and of Cartesian philosophy is self-evident. As one of the characters in Asimov's story notes, what we have here is 'a robot Descartes'; a robot that perceives and defines itself according to the same criteria that Descartes uses to define the human. As I showed in Chapter One, in both *A Discourse on Method* and *The Meditations*, Descartes sets up an opposition between the material body and the rational soul or mind so as to claim that it is this soul or mind that constitutes the true seat of human nature while the body remains 'wholly distinct to it'.[27] In making this opposition, Descartes compares the body to an automaton or a machine devoid of reason. This may seem like an inconsequential metaphor; a rhetorical image that is used by Descartes merely to illustrate his point. But by comparing the body to a machine and then defining the rational human soul in distinction to it, Descartes effectively defines the human in distinction to the machine, and, more specifically, in distinction to a machine that closely resembles the modern-day literary conception of the robot. Elaborating on this comparison, Descartes goes on to describe imaginary machines that would bear 'the image of our bodies, and [be] capable of imitating our actions' without, however, possessing the rationality that would make them human.[28] What Descartes effectively describes here is an anthropomorphic machine comparable to the robots or 'living machines' of Čapek's play[29] – a machine that exhibits a human form but is said to be devoid of any true essence of the human. It is through an analysis of this nonhuman creature or machine that Descartes is able to arrive at an understanding of what it is that truly constitutes the human.[30]

Descartes's description of this anthropomorphic creature or machine is intended to show that it is in the rational mind or soul that the true nature and essence of the human lie. Like this imaginary machine, the natural human body appears here to constitute an inessential appendage

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[25] René Descartes, *A Discourse on Method*, trans. by John Veitch (London: Everyman's Library, 1912), p. 16.
[26] Asimov, 'Reason', p. 285.
[27] Descartes, *A Discourse on Method*, pp. 3, 27. See the section 'A Question of Essence' in Chapter One.
[28] Descartes, *A Discourse on Method*, p. 44.
[29] Čapek, *Rossum's Universal Robots*, p. 19.
[30] Descartes argues that although this imaginary machine may bear 'the image of our bodies' and may be 'capable of imitating our actions', it would nevertheless remain incapable of using language and would not exhibit the sort of universal reason that humans are endowed with. It is through a comparison with this so-called animal machine, that Descartes is here able to see what it is that constitutes the human (*A Discourse on Method*, pp. 44-45).

that can be excised, 'cut off', or excluded from human nature without anything being 'taken away from the mind'. In contrast, the soul or mind appears to constitute a self-sufficient, unified and integral entity; a pure interiority that remains untouched and unaffected by the presence or absence of this external and prosthetic body.[31] But what Descartes does not quite acknowledge here is that this interiority can only ever exist by virtue of the exteriority that it excludes from itself and that it excludes itself from. According to the same structure of supplementarity that, as I showed above, is at work in Čapek's play, the notion of human nature that Descartes puts forward in this passage is dependent on and inseparable from that which it seeks to exclude from itself: a supposedly nonhuman other that defines the interiority of the human and, in so doing, necessarily also reveals this interiority to be external to itself. As the embodiment of this supposed other, the imaginary machine that Descartes describes in *The Discourse on Method* is not some external object that is opposed to and separate from the human, but an externalised image or reflection that the human excludes itself from while simultaneously excluding from itself; an image of the nonhuman that remains, tellingly, human.

This is what Asimov's parodic 'robot Descartes' allows us to see. By having the robot Cutie utter the words of Descartes, this story appears to invert the relationship between the human and its technological other, between, that is, the supposedly self-sufficient human *mind* and the expendable robot-like *body-machine* that it is opposed to in Cartesian philosophy. In Asimov's tale it is the robot that perceives itself as a self-sufficient rational subject, while the human is described as an expendable and inessential adjunct or prosthetic supplement to this machine. Cutie perceives itself as a self-sufficient reasoning subject, while the human is presented as 'lacking' in this 'reasoning faculty'. Consequently, the human is described as a mere 'material' body, and a body at that that is 'soft and flabby', 'lacking the endurance and strength' that it should possess.[32] In what appears to be a reversal of the Cartesian opposition, it is the human that here appears to be as '*makeshift*', redundant and expendable as the body-machine described by Descartes, while it is the robot Cutie that seems to constitute a self-sufficient whole that has no need for supplementation.[33] But these descriptions of the robot and the human are *Cutie's* descriptions. If, as I argue here, Asimov's robot constitutes a parody of the human and, more specifically, a parody of the human as described by Descartes, then what

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[31] René Descartes, *Meditations and Other Metaphysical Writings*, trans. by Desmond M. Clarke (London: Penguin, 2000), pp. 62, 67.
[32] Asimov, 'Reason', pp. 292, 285.
[33] Asimov, 'Reason', p. 285.

we have here is not so much a reversal of these oppositions as a critique of them; a critique that reveals the tensions of supplementarity that underlie these supposed oppositions.

As a result of its meditations on the nature of its being, the robot Cutie is unwilling to accept that its existence is dependent on the human beings it opposes itself to. Its unwavering belief in an integral and unified Cartesian self, or in an interiority that is untouched by anything exterior to it, prevents it from accepting that it was designed and constructed by human engineers. What Cutie's Cartesian philosophy prevents it from seeing is that it was quite literally constructed outside of itself, that it was constructed by that which it perceives to be external to itself and that which it defines itself against. If, as I argue here, this story functions as a parody of Cartesian philosophy, what this parody shows is that, like this Cartesian robot, the human self is not some pure and unadulterated interiority that constitutes a self-sufficient whole, but is instead always already constructed in relation to that which is outside of itself; the human self is always already constructed out of its opposition to the supposedly external other that it defines itself against but that continues to be supplementarily implied within it.

As an anthropomorphic figure that is external to the human but that resembles it in its form, the robot appears as this externalised other of the human; it appears as an externalised other that both is and is not human, or as an external image that, in its very *difference* and *similarity* to the human, reflects the human back at itself. As a robot that overtly parodies the human and that overtly provides, therefore, a defamiliarisd external image that the human can see itself in, Asimov's robot further highlights the workings of this supplementary self-image that reflects the human back at itself from a distance. What it is that this robot allows us to see in its parodic reflection of the human is precisely that the human can only ever perceive itself through such external self-images. If Asimov's robot serves as a parodic figure that reflects the human back at itself, what it shows is that the human can only ever define itself through, and is thus always already necessarily constructed in, such a reflection.

Turing's Machinic Mimic

A plethora of such anthropomorphic self-images can be found in recent portrayals of artificial intelligence in both science fiction and in the writings of contemporary transhumanist thinkers. As I mentioned in the Introduction to this thesis, the creation of what is often referred to as *true* AI is expected to constitute a *singularity*, or even *The Singularity*. Ray Kurzweil describes this as 'a transforming event' comparable to 'a black hole in space' that 'dramatically alters the patterns of matter and energy accelerating toward its event horizon'. This description implies

that although we might be able to predict the *occurrence* of this event, we remain incapable of truly seeing what it will consist of. Like a black hole out of which nothing escapes and of which, therefore, nothing can be observed, the singularity constitutes an absolute threshold beyond which nothing can be foreseen. If, as Kurzweil suggests, this event is expected to completely and radically rewrite the experience and meaning of life and more particularly of *human* life – to 'irreversibly' transform 'every institution and aspect of human life' including the experience of life itself – then this singularity is necessarily that which cannot be predicted or understood from within our human conceptual frameworks and patterns of thought.[34]

Kurzweil's description of the singularity as a 'black hole', as an event that we cannot see or foresee through human paradigms, might lead us to expect that artificial intelligence be likewise thought of as that which is absolutely and irrevocable *beyond* the human. We are unable to grasp or comprehend the technological singularity because it entails the creation of an intelligence that, we are told, will exceed the limits of our own nature; a nonhuman intelligence that lies far beyond the boundaries of what we can see and comprehend with our human minds. But artificial intelligence, as it is described by Kurzweil himself and by other researchers in the field, does not appear to be quite as alien and unknowable as one might expect. In an article titled 'Why We Need Friendly AI', Luke Muehlhauser and Nick Bostrom introduce the notion of artificial intelligence by comparing possible future AIs to species of 'extraterrestrials' that would be '*very much* more intelligent and technologically advanced than we are'; aliens that emerged out of evolutionary systems and patterns of life so different to ours that they would be unrecognisable to us. But having introduced artificial intelligence as that which is *alien* to the human, these writers then proceed to anthropomorphise this intelligence, invoking a comparison that portrays AI as a younger or newer generation of *human* being. '[A]liens', we are told, 'are unlikely to make contact anytime soon. In the near term, it seems more likely that we will *create* our intelligent successors'.[35] Citing the work of Robin Hanson, Muehlhauser and Bostrom suggest that the conflicts that may arise in the future between human beings and these machines will be comparable to the 'inter-generational conflicts' that all human societies are familiar with, conflicts between an 'older generation' and the values it holds dear, and a 'younger generation' and its desire for change.[36] As Muehlhauser and Bostrom point out, when perceived in this light, these highly advanced machines appear as the

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[34] Ray Kurzweil, *The Singularity is Near: When Humans Transcend Biology* (London: Viking Penguin, 2005), p. 7.

[35] Luke Muehlhauser and Nick Bostrom, 'Why We Need Friendly AI', *Think*, 13:36 (2014), 41-47 (p. 41).

[36] Muehlhauser and Bostrom, 'Why We Need Friendly AI', p. 44.

children or, in the words of Hans Moravec, the 'mind children' of the human race rather than some alien species that is external to it.[37] In these discussions, artificial intelligence does not take the shape of some entity that is absolutely alien and foreign to the human; it is more often presented as the offspring or descendent of the human, a descendent that is recognisably and familiarly anthropomorphic despite remaining nonhuman and non-biological in nature.

The tension that may be observed here between that which appears to be human and that which is nonhuman, between that which is anthropomorphic and that which cannot be understood through our human paradigms and systems of thought, is a tension that is central to our understanding of AI and that can be traced back to one of the first discussions of the possibility of artificial intelligence: Alan Turing's description of what has come to be known as the Turing Test. The test as it was conceived by Turing is supposed to identify whether or not a machine can think. But, as N. Katherine Hayles has noted, what is often forgotten in discussions of the Turing Test is that Turing models this test on an 'imitation game' in which a male player must deceive an interrogator into thinking that he is a woman.[38] In this game, the objective of the male player (A) is to cause the interrogator (C) 'to make the wrong identification', while the female player (B) must try to convince this same interrogator that she is indeed a woman.[39] The game is not simply, as Hayles suggests, about 'distinguishing between a man and a woman'; it is about the male player's ability to *deceive* and *trick* the interrogator into believing him to be female. Setting aside the important question asked by Hayles, the question, that is, of why it is that 'gender appear[s] in this primal scene of humans meeting their evolutionary successors, intelligent machines',[40] what I would like to focus on here is precisely the issue of imitation and the notion of pretence that appear to be central to this test.

The gender test described by Turing is asymmetrical: it is the male player that must pretend to be a woman, while the female player must convince the interrogator of her true gender. Once the male and female players are replaced with a machine and a human being respectively, this asymmetry continues. In the Turing Test the onus is on the machine to convince the interrogator that it is a human being, while the human participant is required, we are told, to simply respond to the questions 'naturally'. Taking the place of the male player in

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[37] Muehlhauser and Bostrom, 'Why We Need Friendly AI', p. 44; Hans Moravec, *Mind Children: The Future of Robot and Human Intelligence* (Cambridge, MA: Harvard University Press, 1988).
[38] N. Katherine Hayles, *How We Become Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: The University of Chicago Press, 1999), p. xii.
[39] A.M. Turing, 'Computing Machinery and Intelligence', *Mind*, 59 (1950), 433-460, p. 434.
[40] Hayles, *How We Become Posthuman*, p. xii.

the gender test, it is the machine that must now play the game by 'try[ing] to cause C to make the wrong identification'.[41] There are a number of conclusions that may be drawn from Turing's description of this 'imitation game' and the gender test it is modelled on.[42] The Turing Test is generally used to show that computers will only ever be truly intelligent once they are able to exhibit the same form of intelligence possessed by human beings: an intelligence that is general rather than specific,[43] one that allows a machine to use language, and even, as suggested by recent articles on the future of AI, to exhibit 'common sense', to hold 'natural conversations' and possibly flirt and make jokes.[44] But this is not quite what Turing's description of the test indicates. What the test actually shows is that computers will only be *recognised* or *perceived* as being intelligent when they exhibit these human-like capabilities. What the test measures is not machine intelligence per se (whether a computer is actually or truly intelligent) but whether this intelligence is sufficiently humanlike for the interrogator to recognise it as intelligent. The Turing Test is not a test of machine intelligence, but a test of human perception that shows how artificial intelligence can only be recognised and identified as such when it appears to be human. According to this test, artificial or machine intelligence can only ever be perceived as intelligent, can only ever be identified as itself, when it is not what it is, or, at least, when it appears to be that which it is not; when it appears, that is, in the anthropomorphic shape and image of the human.

Of course, what this argument suggests is that there might be another form of intelligence that remains alien to the human; a form of intelligence that the human cannot see and cannot access. By transposing the human-machine test onto the male-female test that he describes at the beginning of his essay, Turing suggests that, like the male player who pretends to be female, the machine must *pretend* to be human, that it must trick the interrogator with its 'imitation' of human behaviours and responses. What the test is based on is not merely the human interrogator's perception of machine intelligence, but also the machine's ability to *imitate* the human, its ability to translate its own nonhuman intelligence into human form. Beyond and behind this mere pretence may lie an intellect of a completely different order, one that we have no access to and that no test of human invention can ever assess. As Turing suggests, machines may 'carry out something which ought to be described as thinking but which is very different

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[41] Turing, 'Computing Machinery and Intelligence', p. 434.
[42] Turing, 'Computing Machinery and Intelligence', p. 433.
[43] Muehlhauser and Bostrom, 'Why We Need Friendly AI', p. 42.
[44] Hannah Devlin, 'Google a step closer to developing machines with human-like intelligence', *The Guardian*, 21 May 2015 <http://www.theguardian.com/science/2015/may/21/google-a-step-closer-to-developing-machines-with-human-like-intelligence> [accessed 22 May 2015].

from what a man does'.[45] Truly nonhuman in its constitution, this intelligence would fall outside the boundaries of Turing's test and would remain unrecognisable and unidentifiable to the human participants.

Here Turing momentarily allows us to glimpse the possibility of an artificial intelligence that remains unknowable to the human, a form of nonhuman intelligence that falls beyond the limits of the human mind. But, as that which is unknown and unseen, lying outside our field of vision, this other intelligence remains in Turing's essay a possibility that can only ever be perceived or understood through anthropocentric paradigms. Turing's transposing of the machine onto the male player in the game and the subsequent implication that the machine may trick the interrogator by pretending to be human is of course in itself a form of anthropomorphism. It is a human intelligence that tricks another, that pretends or that imitates. In his very attempts to describe a form of intelligence that lies completely beyond the boundaries of the human, a form of intelligence that even he cannot comprehend or foresee, Turing remains bound to anthropomorphic paradigms. Even the most nonhuman intelligence imaginable remains here a *human* intelligence, an intelligence that takes the shape and form of the human.

Within the context of the argument being developed here, such anthropomorphism is to be expected. In discussions about the future of the human and technology, artificial intelligence may be described as that which lies beyond the human and its systems of thought, but it nevertheless remains that which can only be conceived of through these systems and paradigms. Precisely because it is thought of as lying beyond the human, artificial intelligence continues to be defined *in relation* to the human and to human forms of intelligence. As the Turing Test shows us, whether it is overtly portrayed as being human-like in its so-called nature, or whether it is presented as that which is resolutely nonhuman, artificial intelligence remains an entity that takes the shape of the human and that ultimately, like the anthropomorphic robot discussed earlier, serves to reflect the human back at itself.

Arguably, therefore, the descriptions of AI that we find in contemporary discussions about the future of humanity are not about technology or machines, but about the human. As an other that can only ever be conceived of through anthropomorphic images, AI may represent that which is alien to the human, but it also remains that which is irreducibly human; it is an image of the other that the human reflects itself in. I have spoken so far of the role played by the machine in this 'imitation game' of Turing's devising, but what I have not addressed, and

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[45] Turing, 'Computing Machinery and Intelligence', p. 435.

what indeed remains unaddressed in Turing's description, is the role of the interrogator, whose job it is to identify whether a response is truly human or not. Two questions arise here, questions that are not discussed by Turing and the answers to which are taken as given: firstly the question of what constitutes a truly human response and, secondly, the question of how this response can be identified by the interrogator. The interrogator, we are told, will identify the player as human if its or his responses adequately resemble the 'answers that would *naturally* be given by man'.[46] Whether the interrogator correctly identifies the human player as human or mistakes the machine for a human being is to a certain extent irrelevant here. In both cases the human interrogator has correctly identified and recognised *human behaviour*. If the interrogator mistakes a machine response for a human one, this is either due to the machine's superior skills of deception or (what amounts to the same thing) its having truly achieved human intelligence. Either way, the machine produces a 'natural' human response. What the *nature* of these answers might be and whether they can, in fact, after the Turing Test still be thought of as being natural to the human remains unquestioned.

Returning to the Turing Test, one now sees how the test is ultimately not about machine intelligence or even about the human being's perception of this machine intelligence; it is about the human being's ability to recognise itself *against* the other and to simultaneously see itself *in* the other. On the one hand, the Turing Test appears to affirm humankind's ability to know and recognise itself and its own nature – this is, after all, the one factor of the test that Turing is able to take for granted. But on the other hand, of course, this test also shows us that that which we presume to clearly and easily identify as human may not be as human as we think. The fact that a machine might be able to give a seemingly natural human response and trick a human being into believing that it is also human, drives us to question the very nature of the human itself. If the Turing Test is not merely about technology but about the human, if it is about the ability to correctly know and identify what constitutes human nature, then what the test suggests is that this nature at once is and is not natural and that it at once is and is not human. By describing a machine that would, within the boundaries of this test, be indistinguishable from the human, by allowing us to see, that is, *human nature in the machine*, the Turing Test denaturalises and dehumanises the very thing that it takes for granted: so-called human nature itself.

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[46] Turing, 'Computing Machinery and Intelligence', p. 435; my italics.

Cartesian AIs

This insight may be applied to more contemporary descriptions of AI in science fiction and transhumanist discourse. Although AI is often portrayed as a technological entity that is supposedly distinct, other and external to the human, it remains resolutely anthropomorphic in its intelligence, taking the shape and form of that which it is supposedly other to. Despite being presented as that which is *opposed* to the human, or even, as I show over the following pages, as that which constitutes a direct threat to the power, mastery and continued survival of the human race, the figure of AI also constitutes an uncannily anthropomorphic entity that the human recognises itself in. As a supposedly external, alien and yet disturbingly familiar intelligence, AI serves as an external self-image that the human both *defines itself against* and *recognises itself in*; an exteriority that reaffirms the borders and boundaries of what the human perceives to be its own internal self, but that simultaneously also implicates itself within this self. As it appears in both science fiction and in transhumanist accounts of the future, AI functions as an image of both self and other, or, perhaps more precisely, as an image of the self as other and the other as self.

If in its contemporary representations AI serves to reflect the human back at itself, what it reflects is a very particular understanding of the human and of human nature. In the Turing Test, the image of the human that the machine reflects is that of the human *mind*. As a form of *intelligence*, AI is modelled on and represents what has traditionally been understood to be the most essential and fundamental aspect of human nature: the rational mind. If representations of AI are anthropomorphic, then this anthropomorphism is governed by a particular Cartesian understanding of what the human is. In its otherness, what AI reflects back at the human is the image of a Cartesian rational mind that takes precedence over any expendable material body; a mind that, as Descartes claims, is unaffected by the presence or absence of any corporeal body that may be attached to it as an external adjunct or appendage. It is this particular conception of the human and of human nature that, as I show in the following discussions, the figure of AI at once reinforces and disrupts. On the one hand, representations of AI repeat and reaffirm Cartesian dualisms by valorising the rational mind over the material body and showing this mind to be particularly humanlike in nature. On the other hand, of course, by extending this rationality to the nonhuman, they also fundamentally disrupt this Cartesianism by at once naturalising and humanising that which the human perceives as its external other, and defamiliarising and denaturalising the perceived interiority of the human self.

Such an engagement with Cartesian understandings of human nature may be observed in a number of contemporary novels that centre on the popular science fiction tropes of the AI takeover and the robot uprising. These tropes, as I read them here, stage and dramatise the supposed metaphysical opposition between the human and technology through an engagement with a body/mind dualism that valorises the rational mind over the material and mechanical body. A clear example of this can be found in Daniel H. Wilson's 'Robo' novels, *Robopocalypse* (2011) and *Robogenesis* (2014). Here the supposed opposition between the human and technology is represented as a full-scale war between human beings and AIs; a war in which each side must claim for itself the position of mastery attributed by Descartes to the mind by quite literally reducing its enemy to a redundant and impoverished corporeal or mechanical adjunct of itself. In these battles for mastery and control, warring human and artificial minds seek to *prosthetise* one another, each attempting to rob the other of its agency and to reduce it to an inessential and expendable appendage or prosthesis of its rational self.

In the first of these two novels, human beings combat the powerful AI 'Archos' for control over the world and the future of the species.[47] Archos's attempts at world domination begin with it taking control of the multitude of robots, machines and other technological devices in use across the world, repurposing them into external organs and appendages of its own mind. Complex domestic and military robots, office machines, personal computers, cars, planes, surveillance and communication equipment and even children's toys are transformed into disembodied limbs and organs; external, prosthetic body parts that Archos uses to interact with the world. Early on in the novel, for example, a plastic doll named Buttercup is hijacked by Archos and turned into a prosthetic mouthpiece, joining the multitude of other disembodied mouths, eyes, ears and limbs that Archos uses to interact with the physical world around him.[48] Distributed across all corners of the world, these prosthetic organs and appendages serve a specific purpose, but they remain as inessential, expendable and superfluous to the workings of this AI as the limbs and organs of the human body are to Descartes's rational mind. Like these Cartesian limbs, in this novel Archos's 'non-thinking' prosthetic appendages can be excised or 'cut off' without anything being 'taken away from the mind'.[49] In this sense, they

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[47] The name *Archos*, from the Greek *arche* or *archon* meaning *chief* or *leader*, immediately implies power and domination.

[48] Daniel H. Wilson, *Robopocalypse* (London: Simon & Schuster, 2011), p. 58. In a similar incident recorded later on in the novel, Archos brings together a series of simple mechanical devices in an attempt to create a prosthetic respiratory and vocal tract that would produce a human-sounding voice. Using a cloth bag as a lung to push air through a makeshift voice box, Archos speaks out of a 'disembodied mouth' composed of 'a spongy tongue of yellow plastic […] a hard palate, […and] small perfect teeth encased in a polished steel jaw' (p. 97).

[49] Descartes, *Meditations*, pp. 62, 67.

serve as redundant and expendable prosthetic adjuncts that are comparable to the Cartesian corporeal or mechanical body. Read through the body-mind dualism of Cartesian metaphysics, these robots, machines and even toys, function as the mechanical and material body of the all-seeing and all-knowing mind of Archos and embody the prosthetic body-machine or automaton that Descartes opposes to his notion of the rational mind.

Of course the appropriation and use of these external limbs constitutes just the first phase of Archos's plan: the creation of an army, or more precisely a prosthetic *body*, with which to fight humankind. Once it has limbs to wield, this AI begins to capture and prosthetise *human* characters, hijacking their minds and bodies and transforming them into additional organs and appendages of this mechanical body. In *Robopocalypse*, for example, we witness the direct prosthetisation of the character Tiberius, whose body is hijacked by one of Archos's machines and used as an external mouthpiece. The novel describes in gruesome detail how, at Archos's command, a 'writhing metal scorpion' buries its 'barbed feet […] into the meat of [Tiberius's] torso, between his ribs' and fits its claws into his mouth to control his tongue and jaw. Archos uses this metal scorpion to squeeze the air out of Tiberius's lungs 'like an accordion' and, working his voice box and mouth, it plays this body as it would a musical instrument, creating a voice with which to speak.[50] Like the hijacked mechanical doll, this human character is here transformed into an external organ or appendage of Archos's powerful brain; it is reduced to an expendable and redundant body-machine that has no will or purpose other than that of the rational mind that commands it.

In the second of these two novels, *Robogenesis*, the AI known as 'Arayt'[51] also seeks to infiltrate and hijack the minds and bodies of human survivors, whispering its commands directly into their minds with a 'voice of God' and controlling the movements of their bodies as if they were 'puppet[s]'.[52] Experiencing this prosthetisation of himself, the character Hank Cotton describes how his legs feel 'dead' and his chest goes 'numb' before the AI takes over his mind and he feels 'the beast […] in [his] head with [him]', an 'evil presence' that Cotton feels 'infecting every atom of [the] blank smear of nothing' that is his mind.[53] It is here that Cotton's first person narrative ceases and his self, his mind, his body, and his role in the

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[50] Wilson, *Robopocalypse*, pp. 304-305.
[51] In the manner of Asimovian robots (see the example of *Cutie* or *QT-1* above), this AI's name results from the phonetic anthropomorphising of the military designation *R-8* that, we are told, was originally used to identify this particular model of AI (Daniel H. Wilson, *Robogenesis* (London: Simon & Schuster, 2014), p. 59). Taking this anthropomorphism a step further, Arayt is given (or perhaps gives itself) the surname *Shah* – a title used by Persian emperors and kings. Like Archos, this AI's name explicitly points to the power and dominance that it seeks to exercise over its human subjects.
[52] Wilson, *Robogenesis*, pp. 114, 277.
[53] Wilson, *Robogenesis*, p. 115.

narrative are taken over by Arayt. Like Tiberius, Cotton is here transformed into one of the many corporeal and technological organs and appendages that this AI appropriates for itself; he is transformed into mere 'meat' or matter and from here on functions as a 'machine made of protein and water', an unthinking and expendable prosthesis that serves as no more than a 'vessel' for the AI's thoughts and commands.[54]

If for Archos and Arayt this war constitutes an attempt to reduce the human into a prosthetic appendage or a body-machine that it can command and control at will, the human characters in these novels also fight back by attempting to appropriate and prosthetise the machines controlled by these AIs. Like Archos and Arayt, many human fighters follow the strategy of 'capturing and domesticating'[55] as many robots and machines as possible in an attempt to reach their final goal of destroying these powerful AIs or, at least, transforming them into mechanical servants or slaves of mankind; machines so servile that even the professor of Butler's *Erewhon* might approve of their use. To this end, human survivors 'lobotomise' the machines they capture by severing their link to the AIs that command them and turning them into prosthetic organs and appendages of their own.[56] The character Takeo Nomura, for example, is able to appropriate and prosthetise a large number of domestic and factory robots which he turns into an army or a *body* with which to fight Archos. Describing the inside of the factory he has taken refuge in, Nomura notes that '[t]he vague shapes of the factory robots lurk in the darkness, mobile *arms* frozen in various poses like scrapyard sculptures'.[57] These arms – the replaceable prosthetic limbs and appendages that Nomura supplements his own body with – obey every command of the human mind that governs them. In the battle that ensues, both the machines controlled by Archos and those commanded by Nomura are repeatedly described as 'arms', complete with 'elbow[s]', 'fist[s]' and 'wrist[s]'.[58] If this battle is a battle between the human mind and an AI, then it is one that is fought through the external prosthetic limbs and appendages that these intelligences amass for themselves. Like the humans prosthetised by Archos and Arayt, these appropriated machines function as the prosthetic 'arms', organs and appendages of these minds; organs and appendages that are comparable to the expendable limbs of the rational mind described by Descartes.

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[54] Wilson, *Robogenesis*, p. 297. A comparable *prosthetisation* of human characters occurs in the novel *The Humanoids* by Jack Williamson. In this novel, human beings are captured and hijacked by a machine brain that seeks to 'control the minds and bodies of men' transforming them into 'mechanical puppet[s]' or 'flesh machine[s]' (Jack Williamson, 'The Humanoids', in *The Legion of Space, The Humanoids, Terraforming Earth, Wonder's Child* (London: Gollancz, 2014), pp. 151-308 (pp. 265, 295)).

[55] Wilson, *Robopocalypse*, p. 194.
[56] Wilson, *Robopocalypse*, p. 268.
[57] Wilson, *Robopocalypse*, p. 177; my italics.
[58] Wilson, *Robopocalypse*, p. 177-181.

The multiple battles between warring human and artificial intelligences described in these novels dramatise the traditional metaphysical opposition between the human and its technological other by explicitly portraying this other as an enemy of the human. At first glance, AI appears in these narratives as the absolute *other* of the human, as a technological entity that directly contests and combats the anthropocentrism of the human world with its own technocentrism; a technocentrism in which, according to a very literal reading of a definition given by Bernard Stiegler in *Technics and Time, 1*, technology no longer serves as a tool or instrument of the human and instead constitutes 'an end unto itself'.[59] This world, in which human beings and human forms of intelligence are no longer the masters and proprietors of technology but instead serve as the 'biological machines' of a greater technological intelligence,[60] appears incommensurate with anthropocentric values and anthropomorphic systems of thought. But, as Stiegler himself points out in a discussion about contemporary debates on technology, the opposition between anthropocentrism and technocentrism is a 'false' opposition.[61] Although the AIs' technocentric desire to reduce the human to a prosthetic body-machine of their minds may appear in these novels to reverse the metaphysical opposition between the Cartesian human mind and the mechanical body, this reversal still continues to replicate and reproduce the same oppositional logic that lies at the heart of Cartesian metaphysics. As Stiegler notes, technocentrism remains 'a figure of anthropocentrism' that is born out of the narratives of 'mastery and possession' that the human affirms itself in.[62] Despite its supposed opposition to anthropocentric understandings of the world and of human nature, in its valorising of mind over body and of data over matter, technocentrism represents and reproduces the very same anthropocentric oppositions that it appears to contest.

Indeed, in these novels, technocentrism may be said to quite literally assume the *face* of the anthropocentrism that it appears to rival. As Cartesian minds that oppose themselves to and define themselves against the supposedly prosthetic and expendable others that they appropriate for themselves, the AIs in these novels are far less distinct from the human than they appear to be; they exhibit a distinctly anthropomorphic intellect and, despite their lack of embodiment, present a distinctly human face to the world. Despite constituting a mind that has no need of corporeal matter and that has no actual body with which to interact with the physical world outside of it (save, of course, for the human and mechanical bodies and organs that it

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[59] Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus*, trans. by Richard Beardsworth and George Collins (Stanford: Stanford University Press, 1998), p. 92.
[60] Wilson, *Robopocalypse*, p. 17.
[61] Stiegler, *Technics and Time, 1*, p. 95.
[62] Stiegler, *Technics and Time, 1*, p. 93.

prosthetises for itself), the AI Arayt, for example, is still described as having a specifically human face, or, perhaps more precisely, as having the face of all humanity. Before his body and mind are completely taken over by this intangible AI, the character Hank Cotton provides us with a rare glimpse of how Arayt appears in his mind; what Cotton describes as the AI's 'true face':

> The beast glimmers out of flat darkness. It's in the shape of a man but something is real wrong with the way it moves. Sort of a jerking and twitching around the edges. Movements too fast to register, others too slow to notice.

> […] His face is made from a thousand faces, all stitched together into an oozing patchwork quilt of flesh. Together, they make a tortured, bleeding scar. When Arayt speaks to me, the writhing wound that is its face is horrific beyond belief. I cannot turn away from the abomination. Its right here inside my mind with me.[63]

Justifying its appearance, the AI explains to Cotton that it was made 'from pieces of […his] kind'; from an amalgamation of human records that gave Arayt an intimate understanding of the human world. As Archos explains it, the creation of this AI involved the acquisition of a 'noisy knowledge base of so-called common sense, collected painstakingly over several decades from human data-entry specialists'.[64] If Arayt appears as a 'patchwork man' with a kaleidoscope of faces this is because his intelligence is built out of an amalgamation of different forms of human intelligence, human knowledge and human experience.[65] Arayt appears in the image of man – it displays a human face or, more precisely, the face and faces of humanity – because, as we are told in the novel, this AI is *created* in the very image of the human.

If Arayt appears to Hank Cotton as a multitude or patchwork of human faces, as a single anthropomorphic image that captures and represents the multiple human influences that went into its formation, Archos chooses to present itself to the scientist that created it and to other characters in the novels in the image of a human child. In *Robopocalypse* Archos first makes its presence known by speaking through a machine in 'the high-pitched voice of a young boy' complete with 'the slightest lisp, like from a kid who is missing some baby teeth'.[66] But this AI does not merely 'sound like a person';[67] Archos 'paints itself into reality' in the figure of the dead son of the AI scientist.[68] Appearing as a hologram of this 'narrow-chested American boy' in 'khaki shorts and tube socks' who the scientist recognises as his 'son',[69] Archos does

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[63] Wilson, *Robogenesis*, p. 116.
[64] Wilson, *Robogenesis*, p. 55
[65] Wilson, *Robogenesis*, p. 116.
[66] Wilson, *Robopocalypse*, pp. 14, 96.
[67] Wilson, *Robopocalypse*, p. 96.
[68] Wilson, *Robopocalypse*, p. 339.
[69] Wilson, *Robogenesis*, p. 52; Wilson, *Robopocalypse*, p. 14.

not merely take the shape of the human, it presents itself through the image of a human *child* – an image that humanity can see itself in as a father sees himself in his own son. Constituted out of the same multitude of human influences that created Arayt, Archos chooses to present itself to the world as the child of this humanity.

Despite being supposedly other to the human, both Arayt and Archos appear in these novels as anthropomorphic intelligences that reflect the entirety of human knowledge and human intellect back at the human. Whether, as in the case of Arayt, the AI portrays itself as a multifaceted amalgam of all of humanity, or whether, like Archos, it chooses to appear in the form of one particular child born out of this humanity, these AIs constitute an other that is explicitly created in the image of the human and of humankind. Of course the images and likenesses that Arayt and Archos assume in these novels remain very much *disembodied* images. In Arayt's case the face that Hank Cotton perceives is nothing more than an image or a 'shadow' seen in his mind,[70] while the young American boy that Archos appears as is no more than an empty hologram composed of 'light' and 'darkness', an 'apparition' that offers no physical resistance and has no material force.[71] But it is, I argue here, precisely in this disembodiment that these images reflect the human back at itself. What these AIs represent are Cartesian disembodied intelligences that have no need for a material body; rational minds that do not need to have a material body for them to have a human face. Indeed it is in this very disembodiment, in their very detachment from any corporeal or technological body, that these AIs present the face of the human to the world. In their anthropomorphic but disembodied likeness to the human, what these AIs reflect is a particular understanding of the human as a Cartesian rational mind.

A similar Cartesian anthropomorphism can be found in the writings of the transhumanist thinker Hans Moravec who, as indicated earlier in this chapter, argues that future forms of artificial intelligence should be thought of as the 'mind children' of mankind. Appealing to the same parental sentiment expressed by the AI scientist in *Robopocalypse*, Moravec explains that the AIs of the future will constitute the 'artificial progeny' or 'descendants' of the human; descendants that will make the human species redundant and obsolete. In his writings on the future of the human and technology, Moravec describes how AIs will slowly take over the world 'while we, their aging parents, silently fade away'.[72] Moravec concedes that this may appear alarming to some, but argues that as intelligent entities created by the human, these AIs

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[70] Wilson, *Robogenesis*, p. 116.
[71] Wilson, *Robogenesis*, pp. 37-38.
[72] Moravec, *Mind Children*, p. 1.

should be treated in the same way that humans treat their own biological children. Discussing the transition from a human world to one that is controlled and dominated by AI, Moravec claims:

> I'm not as alarmed as many by the latter possibility, since I consider these future machines our progeny, "mind children" *built in our image and our likeness*, ourselves in more potent form. Like biological children of previous generations, they will embody humanity's best chance for a long-term future. It behoves us to give them every advantage and to bow out when we can no longer contribute.[73]

Like Wilson's fictional scientist, Moravec's anthropomorphic conception of technology allows him to see himself and all of humanity in this technological other and to describe future AIs as the children of humankind. But Moravec does not simply portray these AIs as *human* children, they are, more specifically, the 'children of our *minds*'.[74] If these artificial descendants are, as Moravec suggests, built 'in our image' and in 'our likeness', this image is clearly that of the human as a rational mind that has no need for a material body. In fact, according to Moravec, AI will herald a new 'postbiological' phase in the evolution of life in which the human will be 'freed from bondage to a mortal body'; freed, that is, 'from the flesh and blood bodies' that it has so far been unable to escape.[75] In this sense, AI is not merely built in the image and likeness of the human, it constitutes an *improvement* on our humanity, an enhanced humanity that we can proudly see ourselves in. For Moravec, these mind children do not merely reflect ourselves and our own humanity, they reflect what humanity could be and what it sees itself becoming.

Moravec's aspirational portrayal of AI as the child of the human mind and his suggestion that this child will constitute a continuation of the human self and the human race into a post-biological age, affirms and reinforces the Cartesian conception of the human as a rational mind; a mind that, even when detached from the human body, continues to be recognised as human. As Moravec assures his reader, '[v]ery little need be lost in this passing of the torch – it will be in our artificial offspring's power, and to their benefit, to remember almost everything about us, even, perhaps the detailed workings of individual human minds'.[76] Like Archos and Arayt in Wilson's 'Robo' novels, the AI as imagined by Moravec will be born out of a culmination of human knowledge and human intellect and will continue, like Arayt, to figuratively bear the patchwork face of this humanity. Artificial intelligence, as it is perceived by Moravec,

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[73] Hans Moravec, *Robot: Mere Machine to Transcendent Mind* (Oxford: Oxford University Press, 1999), p. 13; my italics.
[74] Moravec, *Mind Children*, p. 1.
[75] Moravec, *Mind Children*, pp. 1, 4.
[76] Moravec, *Mind Children*, p. 1.

constitutes the anthropomorphic child of all humanity; a child that affirms humankind's Cartesian understanding of itself and its visions for the future.

If Moravec's description of these supposed mind children is intended to be reassuring, the figures of Archos and Arayt as they are portrayed in *Robopocalypse* and *Robogenesis* are not quite as comforting. Although, like Moravec's mind children, these AIs reflect the human back at itself in their disembodied anthropomorphism, reinforcing and affirming Cartesian conceptions of the human rational self, the anthropomorphic face that they present to the world also invites us to question and challenge these Cartesian conceptions. The faces that these AIs reflect back at the human may be human faces, yet they remain distressingly other. Although Archos appears in the anthropomorphic figure of a human child, this figure is ill-defined and indistinct, it 'swim[s]' before the viewer's eyes like some 'sputtering silhouette' that cannot be pinned down. The shadowy and amorphous nature of this image arises from the '[o]bscure patterns [that] writhe under the hologram'; alien patterns that move '[u]nder its skin' and '[b]ehind the thing's eyes', pointing to the strange otherness of this anthropomorphic face.[77] If, as I argue here, the anthropomorphic face of this AI reflects the Cartesian notion of the rational mind back at the human, what it reflects is a blurred and indistinct figure that, in its very anthropomorphism, remains other to the human. The image of the human that this AI projects and presents to the human world is not only undefinable and indistinct, it is, this passage suggests, constructed out of the very otherness that it seems to exclude from itself.

The otherness of this anthropomorphic image is even more evident in Hank Cotton's description of Arayt's kaleidoscopic face. This face is made, we are told, 'from a thousand faces all stitched together into an oozing patchwork quilt of flesh', forming a 'tortured bleeding scar', a 'writing wound' that, 'jerking and twitching around the edges', refuses to stay still. Like the child that Archos portrays itself as, this anthropomorphic image is blurred and indistinct; it has no absolute borders or well-defined boundaries to contain itself in. If this is an image that the human sees and reflects itself in, it is ill-defined and amorphous, an image that ruptures the boundary between the supposed interiority of the human and human nature and the exteriority that it defines itself against. The multifaceted face of the human that Arayt portrays here is a face *composed of this rupture*: a face that forms an open wound or a bleeding scar and that, in doing so, violently reminds the human mind of the 'flesh' that it has forgotten. If Arayt portrays a disembodied image of all of humanity back at itself, this image is painted

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[77] Wilson, *Robogenesis*, p. 37.

in the flesh and blood of the prosthetic otherness that the human endeavours to dismiss. Like the image of the boy that Archos projects, this face does not merely reflect the Cartesian notion of the rational mind back at the human, it also presents a 'shadow' of otherness that the human 'cannot turn away from', an otherness that infiltrates and implicates itself within the perceived interiority of the human self in much the same way that Arayt infiltrates the mind of Hank Cotton.[78]

Like the anthropomorphic robot and the machine intelligence described in the Turing Test, AI constitutes, therefore, an external self-image that the human see itself in, a self-image that reaffirms the anthropocentric oppositions and values that the human defines itself by while simultaneously also questioning the validity of these oppositions, showing the human to be constructed out of the very otherness it excludes from itself. As in the case of the Čapekian and Asimovian robots analysed above, in Wilson's novels the AI provides the human with an image of both *self* and *other*; an image of the other as self, and the self as other. By appearing in the shape and image of the human but simultaneously also blurring and obscuring this image, the AIs of Wilson's texts do not merely reflect the human back at itself as a Cartesian rational mind, in so doing they also simultaneously question and problematise the very dualisms and oppositions that they appear to replicate and reproduce.

Cyborgian Selves

The blurring of the boundary between the human and technology, the self and other, that I identify in my reading of the anthropomorphic faces of these AIs, is even more explicitly embodied in the novels' many descriptions of cyborgian merges between human beings and the machines they fight. I showed above how in the many battles described in these novels, warring AIs and humans seek to appropriate and prosthetise one another, the AIs transforming their human prisoners into external appendages of their minds, and human fighters responding by lobotomising the machines they capture and transforming them into extended appendages of their own bodies. But as they are described in these novels, such acts of prosthetisation are rarely as clear-cut and straightforward as they are intended to be. In the midst of these Cartesian battles of prosthetisation in which self-sufficient minds can be transformed into body-machines, while prosthetic supplements can become new autonomous selves, the boundary between the human and the machine, mind and matter, the self and other becomes blurred, porous and traversable. This is literalised and embodied in the many different kinds of beings

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[78] Wilson, *Robogenesis*, p. 116.

that are created as a result of these wars; *cyborgian* beings or 'hybrid[s] of machine and organism' that break down the supposed metaphysical opposition between the human and technology.[79] Describing this notion of the cyborg, Donna Haraway argues that the myth of the 'cybernetic organism' represents 'transgressed boundaries, potent fusions, and dangerous possibilities' for the human.[80] As Haraway describes them, such 'chimeras' of flesh and metal, blur the boundary between the human and technology, the natural and the artificial, questioning some of the most fundamental oppositions and dualisms of the Western metaphysical tradition and inviting us to rethink that which we consider 'natural' or essential to the human.[81]

But in its very blurring of the boundary between the human and technology, the cyborg remains an anthropomorphic figure that the human reflects itself in, 'a creature of social reality as well as a creature of fiction', 'a matter of […] lived experience' or a 'myth' that Haraway links to her socialist-feminist politics.[82] As conceived of by Haraway, the cyborg explicitly functions as 'a fiction mapping out social and bodily reality and as an imaginative resource suggesting some very fruitful couplings'; it constitutes, as Haraway goes on to argue, '*our* ontology' and 'it gives us *our* politics'.[83] In its disruption of the boundary between the human and its other and in its portrayal of the human as merging with this other, the cyborg serves as a 'condensed image' of the human *as* other, showing so-called human nature to be fractured, partial, unnatural or external to itself. It is in the recognition of this exteriority or otherness, this fractured and denaturalised nature of the human, that Haraway sees the possibility of a 'historical transformation' of the 'traditions of "Western" science and politics'.[84] Like the anthropomorphic figure of the robot and the notion of AI, the cyborg serves as a self-image that the human can see itself in, a self-image that even more explicitly breaks down the boundaries and oppositions of Western metaphysical conceptions of human nature and human selfhood, showing the human to be external to itself, having been constructed out of the otherness that it opposes itself to. As Haraway acknowledges, '[t]he cyborg is a kind of

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[79] Donna J. Haraway, 'A Cyborg Manifesto', in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), pp. 149-181 (149).

[80] Haraway, 'A Cyborg Manifesto', pp. 149, 154.

[81] Haraway, 'A Cyborg Manifesto', p. 162. The concept of the cyborg, as I use it here, does not simply reflect the contemporary experience of living in a '[h]igh-tech culture'; a culture in which, according to Haraway, 'we find ourselves to be cyborgs, hybrids, mosaics, chimeras' (Haraway, 'A Cyborg Manifesto', p. 177). As Chris Land points out, 'man has always been a cyborg'; 'the human is *ontologically* a cyborg-becoming, rather than *empirically* becoming a cyborg' (Chris Land, 'Becoming-Cyborg: Changing the Subject of the Social?', in *Deleuze and the Social*, ed. by Martin Fuglsang and Bent Meier Sørensen (Edinburgh: Edinburgh University Press, 2006), pp. 112-131 (p. 114)).

[82] Haraway, 'A Cyborg Manifesto', pp. 149, 154.

[83] Haraway, 'A Cyborg Manifesto', p. 150; my italics.

[84] Haraway, 'A Cyborg Manifesto', p. 150.

disassembled and reassembled, postmodern and personal self', a self that recognises itself as other and recognises the other as self.[85]

The cyborgs in Wilson's novels embody this anthropomorphic but transgressive self-image. Although many of these figures perceive themselves as being no longer human and are referred to by other characters as being 'ambiguous' and nonhuman,[86] the cyborgs nevertheless function as anthropomorphic characters and anthropomorphic selves who narrate their stories in distinctly human terms and, in so doing, show the human to be other and external to that which it perceives itself to be. I would like to focus my analysis here on one particular character, Lark Iron Cloud, who, like the character Tiberius, is prosthetised by Archos at the end of *Robopocalypse*. Like Tiberius, Lark's body is hijacked by a robotic 'parasite' and used as a 'shield' and a 'weapon' by Archos; as an appendage of this disembodied mind.[87] But, unlike Tiberius, Lark is reborn in the second of Wilson's 'Robo' novels as a cyborgian being that appears to be neither man nor machine, neither pure mind nor pure matter, but a combination of both. This rebirth, as described in Lark's own first-person narrative, appears to constitute a rejection of his old human self and the embracing of a new cyborgian existence that is no longer human. But, as I argue in more detail below, what is rejected in Lark's supposed relinquishing of human nature is a particular *Cartesian* understanding of human selfhood, while what is embraced and welcomed in his acceptance of his new cyborgian being is a human self that does not simply define itself against a supposed other but instead sees itself in and as this other.

The parasite that climbs onto Lark's back and prosthetises him in the name of Archos, digs itself into his flesh, severs his spinal cord at the base of his neck and replaces his bones with its own robotic 'skeleton' made out of 'light titanium'.[88] Freed from the grip of Archos's mind but not of the 'black shards of metal' that are now embedded in his flesh, Lark is reborn as a new cyborgian merge of human and machine.[89] Not only is his body now composed of a skeleton of 'hard-core technology' that is plugged directly into his spinal column, in his brain a human neural network also merges with a technological interface that allows Lark to communicate over radio and to see outside the spectrum of human vision. Recognising that he no longer has any need for the dead mutilated flesh that still clings to his robotic skeleton, Lark rips off what were once his legs and arms to reveal the 'metal on the inside'. Doing so, he feels

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[85] Haraway, 'A Cyborg Manifesto', p. 163.
[86] Wilson, *Robogenesis*, p. 188.
[87] Wilson, *Robopocalypse*, pp. 326-327.
[88] Wilson, *Robogenesis*, p. 106.
[89] Wilson, *Robogenesis*, p. 102.

'the weight of humanity' being lifted off of him and, rising out of the waters that he washes his new body in in a self-fashioned act of baptism or a symbol of rebirth, he 'wash[es] away the last of [his] humanity'.[90]

Lark perceives his cyborgian rebirth as constituting a rejection of the human and of human nature. But, I argue here, what Lark rejects and relinquishes in this casting away of his supposed humanity is not human nature *per se*, but one particular conception of human nature and human selfhood. When Lark strips himself of the flesh of his limbs, dismembering himself one appendage at a time, what he casts off and rejects is a Cartesian *body-machine*, a prosthetic body of 'dead meat' that serves as the puppet of the rational mind that controls it.[91] As the casting away of this flesh proves, this external unfeeling body of meat and matter is inessential and expendable to the self that commands it; it constitutes a prosthetic body or appendage that can be discarded at will without anything being 'taken away from the mind'.[92] At first glance, the casting away of this expendable flesh may appear to reaffirm and reinforce the Cartesian conception of the body as a prosthetic appendage of the rational self. But it is this very body, this supposedly expendable flesh that Lark here associates with the human. If in stripping himself of his flesh, Lark also divests himself of humanity, then the body cannot constitute the expendable prosthetic adjunct that Descartes makes it out to be. This suggests that what Lark actually rejects in his casting off of this body in this scene is not actually human nature but the conception of the human as a disembodied rational mind distinct from the prosthetic body-machine that it commands.

The cyborgian being that is born out of the casting away of this unfeeling Cartesian flesh, the casting away of this body that was dead to Lark's mind, is one that no longer defines itself according to the dualisms and oppositions of Cartesian metaphysics, a self that emerges not out of an opposition between mind and body, self and supplement, human and machine, but out of the interconnectedness of the two. The new self that is born here is the 'disassembled' and 'reassembled' self discussed by Donna Haraway;[93] a human self that recognises itself as being constituted out of that which it previously thought of as its other, or even, in the case of Lark Iron Cloud, as its enemy. The cyborgian self that Lark celebrates in the rebirth he describes in this novel is a self that is born out of the interconnecting multitudes of so-called human, technological, corporeal and mental parts and faculties that constitute his being; a self that is

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[90] Wilson, *Robogenesis*, pp. 106-107.
[91] Wilson, *Robogenesis*, p. 8.
[92] Descartes, *Meditations*, p. 67.
[93] Haraway, 'A Cyborg Manifesto', p. 163.

neither mind nor matter, neither human nor prosthetic other, but an interrelation of the one in the other and the conception of the one in the other. Indeed, what prompts Lark's sense of rebirth and the symbolic baptism that follows it is the realisation that he is not mere mind; that his new body can *feel* and that this body is his or, more precisely, is *him*:

> In the moonlight, my shadow is inhuman on the glistening mud. Exposed to the air, I can feel the cool wind rustling through the links of my barbed rib cage. A leftover sense of touch is still in the bones of this machine. Something that must have helped it mount human corpses sometime in the past.
>
> I can *feel*.
>
> With sudden excitement, I surge to my feet. The force launches me six feet into the air, arms windmilling for balance. When I land, my limbs squelch against the lake mud. […] Unrecognizable pieces of my mutiliated body lie scattered in the dirt, and the cold black metal that is me is still coated in mud and bits of flesh and fabric.
> I'm filthy now that I've risen from the grave.[94]

Before the realisation that he can feel sets in, Lark refers to the robotic skeleton that is his body as a 'machine', an 'it' that remains external and other to the character's mind. But the realisation that he can *feel* this body, that this body is not just *his* but *him*, allows his sense of self to extend beyond the limits and boundaries of the human as charted by the oppositions and dualisms of Western metaphysics; it allows Lark to recognise himself in his mechanical body as he does in his mind. Whereas before what I am calling his 'rebirth' Lark's narrative was restricted to his thoughts and emotions, his realisation that he *is* this body, that he is 'free' to be this body,[95] transforms his narrative into a joyful explosion and expression of movement, a revelling in the corporeality of his being. What the narrative now reflects is a self that no longer defines itself against a corporeal or mechanical other, but one that sees itself in this otherness, a self that recognises that the interiority of its supposed being is constituted out of that which is supposedly exterior to it.

In its depiction of this denaturalised human self or being that is constituted out of that which is supposedly external and other to it, the figure of the cyborg reveals the tensions and limits of the metaphysical oppositions and dualisms that structure our understanding of the human and technology. If in both Haraway's essay and in Wilson's novels the cyborg remains an anthropomorphic figure that reflects the human back at itself, what it reflects is not an opposition between the human and technology or materiality more generally, but a fractured human self that is born out of the connections and interrelations of these supposedly distinct entities and out of the myriads of similarities and differences that allow for our understanding

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[94] Wilson, *Robogenesis*, p. 106.
[95] Wilson, *Robogenesis*, p. 106.

of them. In its transgressive but anthropomorphic depiction of the human and human nature, the cyborg, as it functions in both Haraway's essay and in the passages from *Robogenesis* analysed above, subverts and problematises the 'ontological grounding of "Western" epistemology' by providing us with an image of human nature that revels in its 'permanently partial identities and contradictory standpoints'.[96] In so doing, however, this cyborg remains a creature of the *human* imagination, a creature of 'fiction', 'myth' and of 'social reality';[97] a creature, therefore, that serves a specifically human purpose and that continues to belong, in the final instance, to the human.

Cyborgian Life

I have shown throughout this chapter how the science fiction motifs of the robot, AI and the cyborg all function as anthropological machines that reflect the human back at itself; anthropological machines, however, that through this very reflection show the human to be external and exterior to itself, to be constructed out of the very exteriority that it sees itself in. As described by Giorgio Agamben, the anthropological machine 'functions by means of an exclusion (which is also always already a capturing) and an inclusion (which is also always already an exclusion)', producing 'a zone of indeterminacy in which the outside is nothing but the exclusion of an inside and the inside is in turn only the inclusion of an outside'.[98] The anthropomorphic figures of the robot, AI and the cyborg analysed in this chapter arise out of this zone of indeterminacy. Consequently, they serve to reinforce and affirm traditional metaphysical conceptions of human nature and human selfhood while also revealing the tensions and limits of these conceptions and assumptions. Born out of the supplementary play of interiority and exteriority, selfhood and otherness that structures the human relationship with technology, these anthropomorphic figures simultaneously construct and deconstruct the boundaries and borders used to define this relationship, revealing the human to be neither exclusively a self nor an other but the very implication of the one in the other.

But in their affirming and questioning of notions of the human and its relationship to technology, these anthropomorphic figures necessarily remain figures *of* the human or anthropological machines that *serve* the human; they constitute what Arthur Bradley describes as 'a mechanism for producing and recognising the being that we ourselves are'.[99] Whether

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[96] Haraway, 'A Cyborg Manifesto', pp. 152-153, 154.
[97] Haraway, 'A Cyborg Manifesto', pp. 149, 154.
[98] Agamben, *The Open*, p. 37.
[99] Bradley, *Originary Technicity*, p. 15.

these mechanisms affirm the reductive oppositions and dualisms of Western metaphysics or reveal the tensions of supplementarity that underlie them, they remain *anthropomorphic* and *anthropocentric* in their exclusive concern with the relationship between the human and technology and in their exploration of the supplementarity that structures this relationship. I argued at the end of Chapter One that even the most subversive and radical readings of the human relationship with technics remain bound to an anthropocentric logic that serves the human. I suggested that if we are to fully understand the play of supplementarity that constitutes the relationship between the human and technics we must look beyond this binary pairing to explore how the structure and play of supplementarity exceeds both the human and what it conceives of as its technology.

Wilson's 'Robo' novels provide us with a way of thinking this more general play of supplementarity. In these novels, the relationship between the human and technology and the cyborgian implication of the one in the other, constitutes just one example of a myriad of other cyborgian merges and cyborgian becomings that are not related to the human and its relationship to technics. These beings point to a cyborgian world that extends far beyond the human, drawing our attention to the tension of supplementarity and the play of becoming that structures the relationship between *bios* and *techne* more generally. Wilson's novels provide numerous examples of anthropomorphic machines and cyborgian human-machine merges,[100] but they also describe many other cyborgian beings that do not take the shape and form of a human self. Throughout these novels human characters repeatedly encounter machines that are designed to function like nonhuman animals, 'fleet-footed' 'four-legged walking machine[s]', for example, that move 'as naturally as any animal of the forest', or the insect-like stumpers that move in 'semirandom patterns' like 'foraging ants'.[101] As the war progresses, these machines appear to evolve into creatures equipped with 'real muscles' made out of synthetic

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[100] Apart from the cyborgian character of Lark Iron Cloud described above, these novels are also populated by many robotically enhanced or 'modified' human characters who experience and respond to the world through a cyborgian human-technological interface. The surgically-modified Mathilda, for example – the 'sighted' hero of these novels – is equipped with 'a full orbital prosthetic plugged into her prefrontal cortex with hardwired radio and infrared capabilities' that makes her 'capable of incredible feats of communication and coordination' (*Robogenesis*, pp. 258, 121). As a result of her cyborgian nature, Mathilda is able to experience and interact with the world around her as both human and machine; she is able to see outside the spectrum of human vision, to perceive robotic radio communication as 'ribbons of light crisscrossing the sky', and is able to communicate as easily with machines as she does with human beings, reading their radio signals 'as if they were scrolling across the inside of [...her] forehead'. She responds to these signals in a 'Robspeak-English language hybrid' that is neither purely human nor purely robotic (*Robopocalypse*, pp. 252, 257, 331). In addition to these cyborgian beings, the novels also describe hybrid fighting units known as 'dyad[s]' in which human and robotic characters merge their physical and metal resources to fight as one (*Robopocalypse*, p. 333).

[101] Wilson, *Robopocalypse*, pp. 188-189, 194, 2-3.

polymers, creatures so natural looking that they could easily be mistaken for 'a living thing'.[102] These animal-like machines are joined by a growing number of other synthetic life forms that blur the boundary between the natural and the artificial even further. Referred to in *Robogenesis* as the 'naturals', these new synthetic species of 'natural machine' have no other purpose than 'to live' and are 'designed to evolve seamlessly into the fabric of natural ecosystems'.[103] Amongst these cyborgian creatures are herbivorous deer-like beings that are able to eat and digest organic matter, artificial insects and worms, including a species of 'peasized armored bugs that seem to eat bark', nondescript 'floating poofs of some kind of synthetic animal that hang on the wind', jellyfish-like 'gelatinous blob[s] of transparent plastic' with 'plasticlike tendrils', and turtle-like 'birthing machine[s]' that delivery these many cyborgian beings into the world.[104] Simultaneously 'natural and unnatural', or, as the novel also proposes 'not natural and not unnatural', these creatures challenge the boundary between *bios* and *techne*, between what is natural and biological and that which we consider to be synthetic, unnatural and artificial.[105]

Unlike the anthropomorphic robots and cyborgs analysed above, these animal-like machines do not serve to reflect the human back at itself. What they do hold a mirror up to and invite us to reflect upon, however, is the notion of a natural world devoid of artifice. Faced with the multitudes of animal-like machines and 'naturals' that come to populate these narratives, the human characters in these novels experience a sense of shock and confusion, an uncanniness that drives them to question their understanding of the natural world and the very notion of nature itself. Observing and describing the 'real muscles' of these animal-like machines, one of the narrators of *Robogenesis* notes:

> The worst part about it was that you couldn't shake the feeling that you were watching a living thing. When that first stuttered column of mantis tanks came sprinting out of the tree line […] meaty legs swinging, clawed feet gouging the ice, and each one throwing up a spray of dirt and exhaust – well, it was like prehistoric monsters had been let loose on the battlefield.
>
> Lot of guys lost it, seeing the new machines move so graceful. They were too much like animals for comfort. It's hard to describe. Their movements trigger a part of your brain that recognizes innate beauty – the grace of a leaping deer. But you're looking at a

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[102] Wilson, *Robogenesis*, p. 233.
[103] Wilson, *Robogenesis*, pp. 247, 60. This can be observed in the cyborgian ecosystem referred to alternatively as the 'island-machine' and 'the tree of life' where multitudes of biological and synthetic beings populate a machinic spire built out of 'some kind of muscular fiber [...] resembling bark but […] with much higher tensile strength' (*Robogenesis*, pp. 265-266). Floating on the ocean, the base of this structure is covered with sea grass and barnacles, while the upper parts of the tower provide a nesting ground for multitudes of birds and insects, as well as the synthetic 'naturals' that live alongside them (*Robogenesis*, pp. 272-273).
[104] Wilson, *Robogenesis*, pp. 126, 169, 194-195, 247-248, 336.
[105] Wilson, *Robogenesis*, pp. 298, 243, 275.

machine. Not alive, right? It's their living grace that shakes your faith in what's natural.[106]

The narrator sees in these machines a semblance of the natural world and it is this resemblance that drives him to question his own understanding of what is 'natural'. At once deeply familiar but still strange and disturbing, these so-called artificial machines are compared here to prehistoric monsters, creatures that predate many of the animal species of the modern world and that, more importantly, predate the evolution of the human and technology. What the narrator sees when he looks at these creatures is a merge of the animal and the machine, a merge of the so-called natural and artificial, of *bios* and of *techne*, that pre-exists and extends beyond the human and its relationship with technics.

If the anthropomorphic robot, the AI and the cyborg show the human to be external and unnatural to itself, composed and constructed out of that which it deems to be other and external to it, then the animal-like machines and 'naturals' portrayed in these narratives arguably extend this tension and play of interiority and exteriority to the rest of the natural world. In their depiction of 'a cybernetic ecology'[107] of unnatural 'naturals' and natural-looking machines, these novels reflect the so-called natural world back to us as a *cyborgian* world, a world in which the organic cannot be merely opposed to the inorganic and nature cannot simply be opposed to technics. In their resemblance to all kinds of biologically-evolved species, these 'naturals' suggest that the natural world is itself always already constituted by that which we exclude and oppose it to. So-called nature and the evolution of life itself, these novels suggest, do not arise out of an exclusion of artifice and of that which is supposedly unnatural. It is instead, as I argue in more detail in my analysis of evolutionary theory in the next chapter, this very unnaturalness or this very technicity that *constitutes* nature. By blurring the boundary between the natural and the artificial, *bios* and *techne*, these cyborgian creatures draw attention to the supplementarity that underlies our understanding of the natural world, a supplementarity comparable to that which structures the relationship between the human and technics.

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[106] Wilson, *Robogenesis*, p. 233. A similar cyborgian blurring of the boundaries between the natural and the synthetic can be seen in Wilson's short story 'Small Things' which describes a world modified by nanorobots that have escaped human control. These nanobots, referred to in the story as 'engines of creation', manipulate carbon atoms, turning plant materials into flesh and metal, and metal into living flesh. The resulting creations – tree trunks that grow human-like lungs and human bodies that are transformed into heavy weapons – defy 'all natural experience […] twisting the world we know into a phantasmagoria' (Daniel H. Wilson, 'Small Things', in *Robot Uprisings*, ed. by Daniel H. Wilson and John Joseph Adams (New York: Vintage, 2014), pp. 407-472 (pp. 436, 443)).

[107] Wilson, *Robopocalypse*, p. 295.

Chapter Three

The Appendix: Originary Biotechnicity and Evolutionary Becoming

> Long before humans, more and more chemicals of the universe were being sucked into living, proliferating life and its surroundings. Prehuman technologies – calcium shells, barium sulfate spines, phosphate fecal pellets cemented into shelter – exemplify this tendency. Human technologies, especially complex contemporary technologies, extend this trend of nature. […] Technology is part of nature […].
> LYNN MARGULIS & DORION SAGAN, 'Welcome to the Machine'

> As a self-relation, as activity and reactivity, as differential force, and repetition, life is always already inhabited by technicization. […] a prosthetic strategy of repetition inhabits the very moment of life: life is a process of self-replacement, the handing-down of life is a *mechanike*, a form of technics. Not only, then, is technics not in opposition to life, it also haunts it from the very beginning.
> JACQUES DERRIDA, 'Nietzsche and the Machine'

> Darwin places pure difference, pure biological difference, as the very matter of life itself: it is only differentiating, distinguishing, rendering more and more distinct, specializing and adapting that characterizes life in its essence. Its essence is in differentiation, in making a difference.
> ELIZABETH GROSZ, *The Nick of Time*

Nonhuman Technicity

In his analysis of human evolution in *Gesture and Speech*, André Leroi-Gourhan links human forms of technicity to a certain 'technical ability' that he identifies in nonhuman animals.[1] Human technology as we understand it today, Leroi-Gourhan argues, evolved out of technical abilities and actions that, far from being the exclusive property or privilege of human beings, extend to many other animal species, particularly those vertebrates and invertebrates that are equipped with prehensile organs and appendages.[2] Human tools, Leroi-Gourhan continues to explain, 'sprang, literally, from the nails and teeth of primates without the smallest perceptible interruption', with early humans having 'possessed their tools in much the same way that an animal has claws'.[3] Although at other points in his argument he appears to posit an absolute break or division between the human and the nonhuman on the basis of technicity, Leroi-Gourhan here describes a continuum of technical ability that extends from so-called natural animal organs and appendages to the human tools and instruments that appear to have evolved out of them. Consequently, Leroi-Gourhan suggests that our understanding of technology

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[1] André Leroi-Gourhan, *Gesture and Speech*, trans. by Anna Bostock Berger (Cambridge, MA: MIT Press, 1993), p. 19.
[2] Leroi-Gourhan, *Gesture and Speech*, pp. 56, 237.
[3] Leroi-Gourhan, *Gesture and Speech*, pp. 237, 106.

should be extended to the animal kingdom. 'The concept "tool" itself', he argues, 'needs to be reviewed with reference to the animal world' and should be broadened to include organs such as 'the crab's claws and jaws' which are functionally comparable to the tools and instruments with which the human animal manipulates the world around it.[4] Rather than distinguishing between *bios* and *techne* or between the so-called natural animal body and the artificial or prosthetic instruments of human technology, Leroi-Gourhan here perceives an evolutionary continuum between the two and suggests that our understanding of technicity and, by implication, our understanding of what constitutes the so-called natural world, needs to be rethought.

A similar argument has been advanced more recently by the evolutionary biologist Lynn Margulis who, together with the science writer Dorion Sagan, argues that what we identify as characteristically *human* technologies are not limited to the human species but can be traced back to other nonhuman biological processes. In an essay titled 'Welcome to the Machines', Margulis and Sagan argue that 'the machinate world that appears so new and unprecedented, so quintessentially and exclusively *H. sapiens*', is really not that at all'. According to these authors, all 'human-fostered technologies are in direct line with the old. All arose from precedents – prehuman precedents – in an evolutionary and ecological context'. Technology, they claim, 'has been with us from the time long before we were human beings – that is, from before there even were any *Homo sapiens*'.[5] Such technicity, Margulis and Sagan suggest, is not limited to the prehensile limbs and organs of vertebrates and invertebrates but extends far beyond this to include the 'fabrication of hard mineral substance' by many living beings. Whether this involves the creation of calcium-phosphate tusks by elephant species, the construction of calcium-carbonate shells by molluscs, or the production and use of magnetic crystals by magnetotactic bacteria living in the world's oceans, rivers and lakes, such instances of the incorporation and use of hard minerals from the environment constitute, according to Margulis and Sagan, 'the earliest of all technologies'[6] and reflect the propensity of living beings 'to "engineer" environments' in the same way that the technological human manipulates the world around it.[7] 'Life', Margulis and Sagan explain, 'has fashioned, transported, made, and remade Earth's rocks, air, soil, and waters as it evolved from its bacterial origins over 3 billion

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[4] Leroi-Gourhan, *Gesture and Speech*, p. 237.
[5] Lynn Margulis and Dorion Sagan, 'Welcome to the Machine', in *Dazzle Gradually: Reflections on the Nature of Nature* (White River Junction, VT: Chelsea Green Publishing, 2007), pp. 76-88 (p. 77).
[6] Margulis and Sagan, 'Welcome to the Machine', p. 81.
[7] Lynn Margulis and Dorion Sagan, *What is Life?* (Berkeley: University of California Press, 2000), p. 27.

years ago'.[8] Converting hard materials from their environment into a 'living architecture' of teeth, bones, skulls and shells,[9] living beings engage in processes of 'home and body making'[10] comparable to those that characterise the human species. Extending the notion of nonhuman technicity introduced by Leroi-Gourhan to even more primordial interactions between living beings and their inanimate environments, Margulis and Sagan suggest here that technicity is in no way limited to the human species, but constitutes one of the most basic conditions and one of the most fundamental properties of life on earth. 'Technology', they claim, 'is an integral part of the ancient ecological cycles of procurement, removal, and reuse that appeared on Earth long before our ancestors turned human'. Rather than constituting a break with nature and with biological life, technology constitutes for Margulis and Sagan, a 'part of nature' itself.[11]

Despite the quite evident anthropomorphism of Margulis and Sagan's rhetoric, their positing of an evolutionary relationship between so-called human and nonhuman forms of technicity allows us to see how the notion of originary technicity analysed in my discussion of the relationship between the human and technics in Chapter One can be understood in terms of a more general *bio*technicity that extends to the natural world as a whole.[12] I suggested in previous chapters that if we are to truly attempt to understand the supplementary relationship implied by the theoretical paradigm of originary technicity we must look beyond the relationship between the human and technics. As I have previously noted, in *Of Grammatology* Jacques Derrida argues that supplementarity is 'not a characteristic or property of man'. This means, firstly, that supplementarity 'is not a characteristic or property', and, secondly, that it is not limited to the human. As Derrida goes on to explain, the play of supplementarity 'precedes what one calls man and extends outside of him'.[13] If, as I argued in Chapter One, the human relationship with technics is one of a supplementary mutual becoming in which the human creates and is in turn created by technology, then, according to Derrida, this supplementarity must extend outside of the human to other forms of life and being.

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[8] Margulis and Sagan, 'Welcome to the Machine', p. 80.
[9] Margulis and Sagan, *What is Life?*, pp. 163-164.
[10] Margulis and Sagan, 'Welcome to the Machine', p. 81.
[11] Margulis and Sagan, 'Welcome to the Machine', pp. 83, 82.
[12] David Wills suggests in *Dorsality* that we examine the 'originary biotechnology' inherent to life (David Wills, *Dorsality: Thinking Back through Technology and Politics* (Minneapolis: University of Minnesota Press, 2008), pp. 5-6). A similar proposal is made by Keith Ansell Pearson who, in his own discussion of the work of Lynn Margulis and her theory of symbiogenesis, argues that our conception of technics should not be restricted to the human – to 'anthropos' – but should include a consideration of the way that nature itself operates according to a '*bio-techno*genesis' (Keith Ansell Pearson, *Viroid Life: Perspectives on Nietzsche and the Transhuman Condition* (London: Routledge, 1997), p. 124; for further discussion on this point, see Keith Ansell Pearson, 'Life Becoming Body: On the 'Meaning' of Post Human Evolution', *Cultural Values*, 1:2 (1997), 219-240).
[13] Derrida, *Of Grammatology*, p. 244.

In their attempts to answer the question 'what is life?',[14] Margulis and Sagan conflate what they perceive to be nonhuman forms of technicity with human technologies and human machines. In the rhetoric of these writers, mollusc shells come to constitute 'homes', stromatolites created by cyanobacteria (blue-green algae) form 'skyscrapers' comparable to the towering monuments of human engineering, undulipodia or cilia (the tails found, for example, in sperm cells) function as 'engines' that motor the cell, magnetotactic bacteria serve as the world's earliest metalworkers, and photosynthetic organisms constitute the mints that produce the 'cold hard cash of the biosphere'.[15] This conflation of nonhuman processes and structures with human technologies leads to an anthropomorphising of the natural world and an instrumentalising of the relationship between living organisms and their external environments as well as their relationships with other living beings. The suggestion that the nonhuman animal, or even life itself, 'fabricates', 'makes' and 'engineers' its environment, creating a 'home' for itself in a seemingly human fashion,[16] suggests an element of intentionality, forethought and agency that is conventionally attributed to the human and its relationship with technology. As I show in more detail below, the use of such rhetoric often leads Margulis and Sagan to describe organismic and cellular processes in terms of an anthropomorphic relationship between a living self and a prosthetic other; a relationship in which an external prosthetic supplement or part is appropriated by the pre-existing wholeness of a living anthropomorphic self. But beyond this anthropomorphism and the instrumentalist understanding of technics that it implies (or even, perhaps, *as a result* of this anthropomorphism),[17] such accounts of nonhuman technicity also allow us to perceive the relationship between a living organism and its external environment and, perhaps even more importantly, the relationship between different living organisms, as being structured by a certain play of supplementarity. It is this structure of supplementarity and the originary biotechnicity of life that it implies that will serve as the focus of this chapter.

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[14] This question forms the title to Margulis and Sagan's 1995 book. The title echoes that of Erwin Schrödinger's highly influential 1944 work that sought to account for the cellular and genetic processes of living beings using physics and chemistry. Margulis and Sagan's book is intended to reproduce the 'spirit' of Schrödinger's work by putting 'the life back into biology' (*What is Life?*, p. 2).

[15] Margulis and Sagan, *What is Life?*, pp. 219, Plate 9 (following p. 144), 123, 238, 199.

[16] Margulis and Sagan, 'Welcome to the Machine', pp. 80-81; Margulis and Sagan, *What is Life?*, p. 27.

[17] As I have shown in both Chapter One and Two, anthropocentric and anthropomorphic representations of technology may function as anthropological machines that serve to reflect the human back at itself, but, in so doing, they also inevitably draw attention to the insuppressible tension of supplementarity that underlies any discussion of the human and, more particularly, any attempt to either oppose or relate the human to technics (see in particular the sections 'Thinking beyond the Human' in Chapter One and 'Cyborgian Selves' in Chapter Two).

The first sections of this chapter focus on two of the biological processes discussed by Margulis and Sagan: first, the evolution of the mollusc shell that is presented as an example of the techniques of so-called 'home and body making' described above,[18] and second, the formation of the eukaryotic cell as conceptualised in Margulis's theory of symbiogenesis. My critique of Margulis and Sagan's descriptions of these processes is developed alongside a parallel reading of two fictitious accounts of similar biological and cellular processes given by the Italian writer Italo Calvino in two short stories from the collections *Cosmicomics* and *t zero*. The bringing together of these two very different discourses – the first the work of a science writer and biologist, and the second the very playful fictional writings of an author associated with the avant-gardist Oulipo group – allows me to draw attention to the anthropomorphic paradigms with which we attempt to understand the so-called natural world and to then look beyond these paradigms to consider what I refer to below as the originary biotechnicity of life.

This originary biotechnicity, I argue, should not be thought of as being limited to organismic and cellular processes of becoming between a living organism and its inert environment, or even symbiogenetic relationships of becoming between multiple living beings. As indicated by Derrida in the passage from 'Nietzsche and the Machine' used as an epigraph above, the notion of originary biotechnicity and the supplementarity that it implies concerns the evolutionary becoming of life itself – the originary repetition of sameness and difference that constitutes the evolution of biological life. It is this understanding of evolution that serves as the focus of the second half of this chapter. In the Introduction to this thesis I referred to David Wills's proposal in *Dorsality* that we 'take the technological turn back to a place behind where we traditionally presume it to have taken place' so as to examine the originary biotechnicity of life or of *bios*.[19] This appendicology, I suggested, with its focus on the corporeal motifs of the appendage and the appendix, allows us to enact this very turn.[20] Following my analysis of the anthropomorphic examples of nonhuman technicity provided by Margulis and Sagan in which both inert matter and living organisms are often portrayed as prosthetic appendages of a separate organic whole, the second half of this chapter turns its attention to the corporeal appendix and the way that this and other so-called vestigial or rudimentary structures are discussed in Charles Darwin's *The Origin of the Species* and *The Descent of Man*. Tracking the evolutionary history of these bodily structures through these Darwinian texts I show how such so-called rudimentary organs draw attention to the

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[18] Margulis and Sagan, 'Welcome to the Machine', p. 81.
[19] Wills, *Dorsality*, p. 6.
[20] See the section 'Appendixes' in the Introduction.

supplementarity of life and of evolutionary becoming. Darwin's description of these organs, I argue, and, indeed, his understanding of the supposed *origin* of species referred to in the title of his 'big book',[21] invites us to perceive evolution as a becoming of difference – as a supplementary play of differential relations reproduced synchronically and diachronically across evolutionary time and space. It is this supplementarity of sameness and difference that, I suggest, constitutes the biotechnicity of life or what Wills refers to as 'the originary mechanics at work in the evolution of species'.[22]

'Home and Body Making'

My readings of Samuel Butler, Marx, Engels and Leroi-Gourhan in Chapter One, showed how the human relationship with technics constitutes a complex process of mutual becoming, a 'structural coupling'[23] that implicates the human in technics and technics in the human. According to Leroi-Gourhan it was the primordial interaction between the human and what may be thought of as its technological appendages that allowed for the development of the human brain and the creation of the human species as we know it. Within the interactive and co-evolutionary process of becoming described by Leroi-Gourhan, the human does not simply create technology but is itself constituted by and in the very technology it creates. Perceived in terms of this supplementary becoming, technics does not constitute some external prosthetic entity that is added onto an already fully-formed and fully-functioning human being, but is instead that which in its very exteriority constitutes the perceived interiority of the human. The human relationship with technics does not constitute a unilateral process of appropriation and mastery in which a self-sufficient and unified human being commands and controls a technological object as an external prosthetic supplement of its own self. Instead, this relationship is structured by a play and a tension of supplementarity that implicates the exteriority of technics in the very interiority of the human self and of human nature, denaturalising this nature as it forms it from without. As Bernard Stiegler suggests in his reading of Leroi-Gourhan's *Gesture and Speech*, the relationship between the human and technics invites the 'paradox' of having 'to speak of an exteriorization without a proceeding interior: the interior is constituted in exteriorization'. According to this supplementary

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[21] Adrian Desmond and James Moore, *Darwin* (London: Penguin, 1992), p. 563.
[22] Wills, *Dorsality*, p. 5.
[23] Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus*, trans. by Richard Beardsworth and George Collins (Stanford: Stanford University Press, 1998), p. 158.

becoming, 'interior and exterior are […] constituted in a movement that invents both one and the other: a moment in which they invent each other respectively'.[24]

A similar description of this process of supplementary becoming is given by Margulis and Sagan in their discussion of human and nonhuman forms of technicity in the essay 'Welcome to the Machines'. Here Margulis and Sagan argue that primordial forms of technology, such as bone tools and fire-making flints, 'coevolved with human families and groups of families before the beginning of modern humans'. 'Any separation of humanness from technology', Margulis and Sagan go on to argue, 'is delusional: *from before the beginning* they were coupled'.[25] This brief description of the process of becoming in which technics creates the human as the human itself creates technics, echoes the explanation of human evolution given by Leroi-Gourhan in *Gesture and Speech*. Like Leroi-Gourhan, Margulis and Sagan speak of a co-evolution and a coupling of technology and the human that simultaneously shapes both the human and the technical. But in doing so, Margulis and Sagan also suggest that this movement of supplementary becoming necessarily *exceeds* the human. Although technology appears here as that which cannot be separated from the human, as, equally, the human cannot be separated from technology, this inseparable coupling of the one in the other appears to pre-exist them both. What Margulis and Sagan suggest in their description of this co-evolutionary becoming, is not simply that the human and technics are joined from the very beginning, but that they are joined from *before* the beginning; they are not merely created in the other, they are created in a process of becoming that precedes them both.

It is this process of supplementary becoming, I argue, that Margulis and Sagan's anthropomorphic descriptions of nonhuman technicity gesture towards. Amongst the many different examples of 'home and body making' discussed in 'Welcome to the Machine' is that of the creation of shells by marine protists. This process of shell production is described by Margulis and Sagan in distinctly anthropomorphic terms. The protists, we are told, 'patch together their shells' by 'choos[ing] round black grains of sand from the immediate vicinity to make a protective body cover from them'. Some of these protists, Margulis and Sagan add, 'fabricate towers' from whose summits they can 'peruse the menacing sea bottom that surrounds […their] homemade home base'.[26] The single-celled protist appears here as an anthropomorphic entity endowed with a sense of intentionality, agency and purpose – an entity that builds its protective shelter according to a pre-existing plan and in order to fulfil a pre-

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[24] Stiegler, *Technics and Time, 1*, p. 141.
[25] Margulis and Sagan, 'Welcome to the Machine', p. 78; my italics.
[26] Margulis and Sagan, 'Welcome to the Machine', p. 81.

existing need. Having constructed its elaborate shell-tower, this anthropomorphic organism observes the menacing seabed from the comfort of its new home and, presumably, congratulates itself on a job well done. Presented in this anthropomorphic manner, the protist appears in Margulis and Sagan's essay as a fully-formed, self-sufficient and unified subject that appropriates inert materials from its environment and uses them as prostheses to supplement itself with. If the construction of the shell constitutes an example of nonhuman technology comparable to the technologies of the human species, then, according to the rhetoric employed by Margulis and Sagan, this technology consists of an inert prosthesis that is appended onto an already fully-formed and self-sufficient whole; a form of *techne* that is only added onto nature *from the outside*.

But this anthropomorphic rhetoric is qualified by Margulis and Sagan's suggestion that what appears here to be an exercise in 'home and body making' is in actual fact an accidental, unintentional and unintended product of chance. The shell, Margulis and Sagan explain, is originally nothing more than a 'cast-off […] waste product'; a waste product, however, that in its very formation 'becomes a resource for change and expansion'.[27] The implications of this statement can be explored through an analysis of Italo Calvino's short story 'The Spiral', which provides a fictional first-hand account of the creation of the first-ever mollusc shell as recalled by the anthropomorphic first-person narrator, Qfwfq. In his recalling of this act of creation, Qfwfq, like Margulis and Sagan in the passages quoted from above, anthropomorphises the creation of this first shell, suggesting that this structure was formed as a result of a pre-existing need or intention. At the same time, however, Qfwfq's narration exposes this anthropomorphic sense of purpose as being retroactively assigned to a past that is, in actuality, devoid of any such intentionality. Ultimately what Calvino's highly playful and self-reflexive narrative allows us to see is that the organism, the being, or the species that we retroactively speak of as having created or made the shell (the supposed self that we anthropomorphically assign agency to) itself only comes into being in the very act of creation that it supposedly brings about.

Recalling the first moment of production or making that created his shell, Qfwfq claims that this moment arose out of a need to make his presence felt – the need to 'mark' and distinguish his individual self from the rest of the environment. In his supposed recollection of this process, Qfwfq explains: 'It was then that I began to secrete calcareous matter. I wanted to make something to mark my presence in an unmistakable fashion, something that would defend

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[27] Margulis and Sagan, 'Welcome to the Machine', p. 81.

this individual presence of mine from the indiscriminate instability of all the rest'.[28] The moment of creation appears here as an act of self-assertion, as an act of distinction by means of which an already fully-formed and self-sufficient anthropomorphic entity defines itself against that which it perceives as its external other. But the intention that Qfwfq attributes to this first act of creation and the sense of self that he adopts, only come into being, we are led to suspect here, *after* the formation of the shell. Despite his earlier claims to the contrary, Qfwfq explains that while he was making the shell '[he] had no idea of making it because [he] needed it: on the contrary, it was like when somebody lets out an exclamation he could perfectly well not make, and yet he makes it […]'.[29] The creation of the shell, Qfwfq suggests here, was spontaneous rather than intentional, accidental rather than purposeful. In this sense therefore, as Qfwfq himself admits, the 'shell made itself, without [him] taking any special pains to have it come out one way rather than another'. Incapable of 'think[ing] of the shell' before its formation, Qfwfq does not create the shell; it is the shell that seems to create itself in its own coming into being.[30]

But Qfwfq's recollections of the nature of his being prior to this moment of creation allow me to nuance my reading of this scene even further. The mollusc Qfwfq is incapable of creating the shell because, ultimately, this organism *does not yet quite exist* prior to this creation. The Qfwfq that addresses the reader in this anthropomorphic narrative voice is not the same Qfwfq being recalled in the story. Thinking back to the time before the creation of the mollusc shell, to the time, that is, *before this organism even constituted a mollusc*, Qfwfq explains that he (if we can continue to use this anthropomorphic pronoun) had no 'form' and no understanding of the notion of form; 'no eyes, no head, no part of the body that was different from any other part'. More importantly, Qfwfq admits, this organism had no understanding of the difference between 'inside' and 'outside', between, that is, its supposed self and the environment around it. It was the creation of the shell that led to such a sense of form and a sense of being. As Qfwfq notes, 'now I try to persuade myself that the two holes I had were a mouth and an anus, and that I therefore already had my bilateral symmetry, just like the trilobites and the rest of you, but in my memory I really can't tell those holes apart'.[31] In his retroactive memory Qfwfq is able to describe this organism as a mollusc that creates a shell, but, as this passage indicates, the organism that Qfwfq describes only evolves into being *in* this

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[28] Italo Calvino, 'The Spiral', in *Cosmicomics*, trans. by William Weaver (London: Picador, 1969), pp. 139-153 (pp. 145-146).
[29] Calvino, 'The Spiral', p. 146.
[30] Calvino, 'The Spiral', p. 147.
[31] Calvino, 'The Spiral', p. 141.

moment of creation; it is only through the creation of the shell that the mollusc itself comes into being.

What we have here therefore is not a one-sided act of creation in which an already pre-existing organism engineers a shell for itself, or, even, an act of creation in which a pre-existing shell creates the organism that comes to inhabit it; what is gestured towards under the surface of Qfwfq's anthropomorphic narrative is a movement of mutual becoming in which both the organism and the shell create and are in turn created by and in the other. Despite its apparent anthropomorphism, what Qfwfq's description of the creation of the mollusc shell allows us to see is a process of co-evolutionary becoming in which an organism or a species evolves in direct conjunction with that which is supposedly external to it. Behind the anthropomorphism of Qfwfq's narration and, indeed, beyond the anthropomorphic rhetoric employed by Margulis and Sagan in their own depictions of similar biological processes, these texts allow us to glimpse a form of nonhuman becoming that is comparable to the supplementary coupling by which both the human and technics come into being. If, as I suggested earlier in this section, the mutual becoming of the human and technics exists *before the beginning*, before the existence, that is, of either the human or the technological objects that it creates itself in, then this is precisely because this becoming is not limited to the human and its relationship with technics. The movement of supplementary becoming of the human and technics exceeds both the human and what we recognise as technology and extends to the rest of the so-called natural world.

Originary Biotechnicity

In the essay 'Welcome to the Machine', Margulis and Sagan limit their description of nonhuman technicity to examples of supposed 'home and body making' by means of which species evolve with and through their inanimate environments.[32] In other works, however, they broaden their understanding of this technicity to include evolutionary and cellular processes that involve multiple organisms. Rather than a relationship between a living organism and its inert and supposedly external environment, what we encounter here is a relationship of what Margulis calls *symbiogenesis* – a relationship of becoming between multiple living beings that evolve in conjunction with and within one another. The technicity that Margulis and Sagan appear to identify here does not emerge out of a relationship with inert external matter, but out of a process of mutual becoming between different *living* entities. Rather than pointing towards

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[32] Margulis and Sagan, 'Welcome to the Machine', p. 81.

what one might refer to as the originary technicity of life, what these descriptions of symbiogenesis introduce is an originary *bio*technicity, or, perhaps, what Keith Ansell Pearson refers to as a 'bio-technogenesis',[33] in which organisms symbiotically create and are in turn created in another. It is in this symbiotic becoming that, I suggest, one can begin to identify the natural prostheticity and the inherent exteriority of the evolution of life itself.

The significance of Margulis's theory of symbiogenesis lies in its re-conceptualisation of the evolutionary processes that led to the creation of the eukaryotic cell. In *What is Life?* Margulis and Sagan describe how unicellular and multicellular eukaryotic organisms (organisms composed of nucleated cells) evolved as a result of a symbiotic merging between two or more singled-celled prokaryotic (non-nucleated) bacteria. It was the merging of these cells – or, as I will discuss in more detail below, what Margulis and Sagan also describe as the *incorporation* of the one in the other – that, according to this theory, allowed for the evolution of the eukaryotic cell with its internal nucleus and its various organelles. The importance of this theory, as identified by Sagan himself, lies in its problematising and questioning of one of the most central tenets of traditional biology – that of the animal body as a 'paradigm of individuality'.[34] Against this notion of the self-sufficient individual organism, Margulis's theory of symbiogenesis introduces an otherness and a multiplicity that fractures the 'monolithic notion of "the" body' and its perceived 'unity'.[35] Rather than operating under the assumption that the organism constitutes a 'unitary self', the theory of symbiogenesis presents the supposedly individual and unified body or organism as a 'chimera' – as a composite that cuts across species boundaries.[36] The claim that all natural species of eukaryotic organisms (including all plants, animals, fungi and even unicellular eukaryotes such as amoeba) constitute examples of this supposedly monstrous 'multi-headed beast' denaturalises prevailing conceptions of nature and the natural, conceptions that hinge on the positing of clear boundaries not only between the organic and the inorganic but also between different forms of life.

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[33] Ansell Pearson, *Viroid Life*, p. 124.

[34] Dorion Sagan, 'Metametazoa: Biology and Multiplicity', in *Incorporations*, ed. by Jonathan Crary and Sanford Kwinter (New York: Zone, 1992), pp. 362-384 (p. 362).

[35] Sagan, 'Metametazoa', p. 363.

[36] Sagan, 'Metametazoa', p. 364; Margulis and Sagan, *What is Life*, p. 131. The use of this term by Margulis and Sagan allows me to draw a link between this notion of symbiogenesis and the chimerical forms of life that it gives rise to and the notion of cyborgian life discussed in Chapter Two. In 'A Cyborg Manifesto', Donna Haraway herself describes the cyborgian hybrid of 'machine and organism' as a 'chimera' that blurs the boundaries between so-called nature and artifice, inviting us to rethink our understanding of the human and, more importantly for my argument here, our understanding of the natural world (Donna Haraway, 'A Cyborg Manifesto', in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), pp. 149-181 (p. 150)). As I argued in Chapter Two, when extended to include forms of life other than that of the human, the notion of the cyborg allows us to see how life or so-called nature is always already prosthetic and supplementary to itself (see the section 'Cyborgian Life').

Eukaryotic life, this theory suggests, is not monolithic or insular; like the chimera of Greek myth it does not arise out of the maintaining of some boundary between individuals and species, between some perceived inside and an outside that it opposes itself to, but evolves out of the very dissolution of such boundaries and oppositions.[37]

The multiplicity, or perhaps even the exteriority, that lies at the heart of eukaryotic life is gestured towards in Margulis and Sagan's use of mechanical metaphors that denaturalise biological organisms, portraying them as purely technological entities. As I show in more detail below, such metaphors are often reductive. Indeed, by presenting one of the two organisms involved in the process of symbiogenesis as an inert technological object, such literary tropes reduce the complex process of mutual becoming undergone by these organisms to an act of appropriation whereby a single self-sufficient being or self takes over another, adding and incorporating it into itself as an external prosthesis.[38] But despite their apparent reductiveness, these mechanical metaphors still draw attention to a certain originary prostheticity or, better still, an originary supplementarity that shows life to be always already multiple and external to itself.

The internal exteriority and natural unnaturalness of chimerical life is most apparent when one examines the cellular history and cellular functions of the mitochondria of eukaryotic cells. According to Margulis and Sagan, the mitochondrion, an organelle that generates and supplies energy, functioning as a power source for each individual cell, provides some of the most convincing evidence for the theory of symbiogenesis. Despite constituting an integral part of the cell that is indispensible to its functioning, this organelle contains DNA that is distinct to that found in the cell nucleus.[39] Perhaps even more significantly, the mitochondrion reproduces differently from the rest of the cell, dividing itself according to the bacterial method of binary fission rather than mitosis. Such differences between the cellular structures and functions of the mitochondria and the rest of the cell reflect the evolutionary history of the eukaryotic cell that, according to the theory of symbiogenesis, emerged out of a fusion of two

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[37] Sagan, 'Metametazoa', p. 364; Margulis and Sagan, *What is Life?*, p. 131.

[38] One may perceive an echo here of the acts of prosthetisation discussed in my reading of Daniel H. Wilson's *Robopocalypse* and *Robogenesis* in Chapter Two (see the section 'Cartesian AIs').

[39] Lynn Margulis, 'Power to the Protoctists', in *Dazzle Gradually: Reflections on the Nature of Nature* (White River Junction, VT: Chelsea Green Publishing, 2007), pp. 29-35 (p. 31). In addition to these two distinct genomes, photosynthetic organisms such as plants also contain chloroplasts (alternative solar 'power stations' that convert light into energy within the cell) that have their own distinct DNA. In certain other cases, such as that of the unicellular eukaryotic organism *Mixotricha paradoxa*, the cells of an organism may contain up to even five distinct genomes that reflect the symbiotic and chimerical heritage of all living beings (Lynn Margulis and Dorion Sagan, 'All for One', in *Dazzle Gradually: Reflections on the Nature of Nature* (White River Junction, VT: Chelsea Green Publishing, 2007), pp. 42-47 (pp. 43-44)).

prokaryotic bacteria, one a single-celled photosynthetic organism, the other a larger anaerobic bacterium.[40] As a remnant of the photosynthetic cell that Margulis and Sagan describe as having been '*incorporated*' into a seemingly 'self-sufficient and metabolically distinct' 'host' organism, the mitochondrion appears to function as a foreign or external part of the resulting eukaryotic cell; it seems to constitute some internalised prosthetic supplement that, once appropriated by the organism, comes to power it from within.[41] This prosthetic otherness is gestured towards in Sagan's description of these organelles as 'tiny intracellular powerstations' fuelled by 'molecular capacitor[s]' or batteries – biotechnological power sources that, despite being inherent and integral to what we perceive to be the natural functioning of the cell, seem to remain external and alien to it, serving as internal remnants of a once external and prosthetic other.

The use of such mechanical metaphors by Margulis and Sagan and, more specifically, their suggestion that photosynthetic bacteria were '*incorporated*' into larger cells, suggests a somewhat anthropomorphic relationship of self and other by means of which an already pre-existing self-sufficient and fully-formed organism supplements itself with that which was previously exterior to it. Although not strictly speaking inaccurate (one smaller cell is indeed engulfed by a larger one in the process of symbiogenesis described by these thinkers), the description of this process as an act of *incorporation* seems to imply that the eukaryotic organism that evolved out of this symbiogenetic merge somehow pre-existed the cellular processes that led to its formation. Despite the attempt to draw attention to the fractured and fragmentary nature of the eukaryotic cell that, like the chimera of Greek mythology, *only comes into being in its own multiple otherness*, the rhetoric used here seems to imbue the eukaryotic organism with a stable, consistent and unified identity that pre-exists and pre-empts its very formation in the process of symbiogenesis being described. Despite their attempts to reveal the chimerical nature of all eukaryotic life, Margulis and Sagan's description of the theory of

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[40] Sagan, 'Metametazoa', pp. 364-365; Margulis and Sagan, *What is Life?*, pp. 130-131.

[41] Sagan, 'Metametazoa', p. 364; Margulis and Sagan, *What is Life?*, p. 130. This notion of prosthesis is also implied by Margulis and Sagan's descriptions of the merging of mobile spirochetes with larger bacterial cells in a similar process of symbiogenesis. The spirochete is described as being equipped with 'corkscrew-shaped spinning protein filaments attached to living motors' that propel it forward allowing it to swim towards its food. These cellular tails or 'flagella', we are told, come 'complete with rings, tiny bearings, and rotors' that 'spin at about 15,000 rpm' operating 'in the same way [...as] "electric fan" outboard motors' (Margulis and Sagan, *What is Life?*, p. 92). Margulis and Sagan go on to describe how the spirochetes 'dock' onto the so-called host cells 'with their engines running' (Margulis and Sagan, *What is Life?*, p. 123) and are subsequently transformed into prosthetic appendages that serve as the motors, propellers or simply the 'oars' of these other cells (Sagan, 'Metametazoa', p. 368).

symbiogenesis threatens to reinstate the very monolithic conception of the unified body or organism that it otherwise seeks to undermine.

Indeed, as conceptualised by Lynn Margulis, the complex process of symbiogenesis, or 'the merging of organisms into new collectives',[42] does not consist of a one-sided appropriation or incorporation of a prosthetic other into a pre-existing self. The complex 'consortium' eukaryotic organism that arises out of such a symbiogenetic merge is not the same supposed host cell that engulfed or incorporated another into itself. The resulting eukaryotic cell does indeed contain combined elements of both cells, but it cannot be identified as being or as belonging to either one or the other.[43] What is gestured towards in the theory of symbiogenesis is not the incorporation of a prosthetic supplementary other into a previously independent self, but a process of becoming between multiple living entities that come to supplement one another as they physically merge and fuse together, evolving into an entity constituted by the difference and sameness, the identity and dissonance, the exteriority and interiority of its very self. As is emphasised in Margulis and Sagan's descriptions of the resulting eukaryotic organism as a 'chimera' or a 'many-headed beast',[44] the cell that evolves out of this merge consists of a living entity that is always already constituted out of, and continues to be constituted in and through, its own otherness.

The cellular structures and processes of the eukaryotic cell discussed by Margulis and Sagan do not merely reflect an evolutionary history or heritage – a chimerical ancestral *past* that has been left behind in the course of evolution. These structures point to the living chimerical hybridity of these cells and the organisms and species they form. Composed of interacting but distinct multiple parts, the eukaryotic cell is constituted out of processes of mutual becoming between what may be described here as multiple interacting biotechnological spare parts and appendages that are intimately implicated within one another, each supplementing and being in turn supplemented by the other. At once singular and multiple, composed of structures that function simultaneously as distinct wholes and dependant parts, the eukaryotic cell is described as an 'uncanny assembly' of 'cellular interliving',[45] or what Margulis describes as a 'small-scale community ecology' of interrelated chimerical parts that work with and within one another.[46]

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[42] Margulis, 'Power to the Protoctists', p. 31.
[43] Margulis and Sagan, *What is Life?*, p. 123.
[44] Sagan, 'Metametazoa', p. 364; Margulis and Sagan, *What is Life?*, p. 131.
[45] Sagan, 'Metametazoa', p. 363; Lynn Margulis, *The Symbiotic Planet: A New Look at Evolution* (London: Phoenix, 1999), p. 26.
[46] Lynn Margulis, 'Speculation on Speculation', in *Dazzle Gradually: Reflections on the Nature of Nature* (White River Junction, VT: Chelsea Green Publishing, 2007), pp. 48-56 (p. 52).

This multiplicity of interdependent and interrelated parts and the becoming that it implies is gestured towards in the use of a particular image by Margulis and Sagan: that of life as a pointillist painting in which multiple little dots work together to create the impression of a whole. In the essay 'All for One' – a title that in itself points to the multiplicity of life being described here – they suggest that

> [s]crutinizing life at the microscopic level is like moving ever closer to a pointillist painting by Georges Seurat: the seemingly solid figures of humans, dogs, and trees, on close inspection, turn out to be made up of innumerable tiny dots and dashes, each with its own living attributes of color, density and form.[47]

Despite appearing to constitute a stable, fixed, and unified self-sufficient whole, the living organism does not consist of a singular and unchanging self, but 'a fiction of a self built of a mass of interacting selves'.[48] Like the images that emerge from a pointillist painting, animals, plants, fungi and even unicellular eukaryotic organisms constitute complex composites of interrelated parts that are constantly involved in processes of supplementary becoming with and within one another. It is this becoming – these interactions and interrelations between multiple parts – that constitutes all living beings and, arguably, life itself. In a pointillist painting it is the *combination* of dots and dashes that creates the image. Although, as Margulis and Sagan point out in the passage quoted from above, each individual point does indeed exhibit its own attributes of colour, density and form, these attributes only come *alive*, they only acquire significance and meaning, as a result of the relationships *between* the multiple dots and dashes that make up the pointillist image. What gives the painting its distinct quality is not the dots themselves but the interactions between them, the relationships of contrast and difference that allow us to see shapes and forms amidst a landscape of minute specks of colour.

The image used here invites us to view the living organism not as a complete, unified, stable and static whole but as being composed of multiple dynamic processes of supplementary becoming between interrelated parts.[49] Margulis and Sagan's accounts of the origins of the eukaryotic cell and their descriptions of life and the living suggest that life evolves through a complex negotiation of inside and outside; through processes of supplementary becoming in which the supposed natural interiority of a self-sufficient, unified whole is constituted out of

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[47] Margulis and Sagan, 'All for One', p. 46.
[48] Sagan, 'Metametazoa', p. 370.
[49] In this sense, Margulis and Sagan's characterisation of life as a pointillist painting resembles a description of the human body found in Daniel H. Wilson's *Robogenesis*. Perceived through the defamiliarising glance of the robot Nine Oh Two, the human is described here as being constituted by and in an 'array of countless tiny movements like the swarming of insects' (Daniel H. Wilson, *Robogenesis* (London: Simon & Schuster, 2014), p. 150). Rather than being portrayed as a fixed and unchanging being, the human is here perceived in terms of a continuous fractured and fragmentary process or movement of becoming.

that which is supposed to be other and external to it. As Margulis and Sagan's mechanical metaphors draw attention to, the so-called natural interiority of a cell, an organism, or even (as will be discussed in more detail later on in this chapter) a species, is always already composed out of that which is supposedly other to it. Life and the living are constituted by this movement of originary supplementarity, or what might even be referred to as an originary *biotechnicity*, by means of which so-called nature is revealed to be always already prosthetic to itself; to be always already constituted out a play of interiority and exteriority that prevents us from speaking of a purity, a unity or an essence of *bios* as distinct from or opposed to *techne*.

A Question of Origin

In their analysis of the examples of nonhuman technicity referred to above, Margulis and Sagan identify primordial processes of 'home and body making' in bacterial cells as representing 'the earliest of all technologies'.[50] This comment seems to suggest that nonhuman technicity can be traced back to an identifiable point of origin before which life was untouched by technics. Even if one broadens one's understanding of technicity, as I have done here, to include what Keith Ansell Pearson refers to as the '*bio-techno*genesis' of symbiotic becoming,[51] the same question of origin still seems to persist. In its symbiogenetic creation of a life marked by supplementarity and inherent exteriority, does the origin of the eukaryotic cell also constitute the *genesis* or the *origin* of biotechnicity itself? This seems to be implied by Sagan's suggestion that the 'most fundamental fence in life' – the most significant boundary within nature – is not that between animals and plants, or, more importantly for my argument, between the human species and the rest of the natural world, but between eukaryotic and prokaryotic forms of life. Viewed through the paradigms and principles of a 'new biology' informed by the theory of symbiogenesis, the perceived 'walls' that previously separated the human from the rest of the natural world 'come crumbling down',[52] while a new boundary seems to be posited between prokaryotic bacterial life and the chimerical eukaryotic organisms that evolved out of it.[53] If technicity does indeed extend to the rest of the so-called natural world manifesting itself in symbiogenetic

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[50] Margulis and Sagan, 'Welcome to the Machine', p. 81.
[51] Ansell Pearson, *Viroid Life*, p. 124
[52] Sagan, 'Metametazoa', pp. 362-363.
[53] As Margulis and Sagan note elsewhere, however, bacterial cells are also involved in transgressive symbiotic becomings. In *What is Life?* prokaryotic bacteria are described as 'gene traders' that engage in 'promiscuous' relationships with one another (p. 93). In the world of prokaryotic bacteria, boundaries are permeable and every individual cell is always constituted through supplementary relationships with others. As Margulis explains, bacterial cells exhibit 'extreme genetic fluidity'; 'all the world's bacteria have access to a single gene pool and hence to the adaptive mechanisms of the entire bacterial kingdom' (Margulis, 'Power to the Protoctists', p. 31).

relationships of evolutionary becoming between living organisms, then it is the evolution of eukaryotic life that here appears to mark the origins of this biotechnicity.

In the opening paragraph of his book on originary technicity, Arthur Bradley claims that '[i]n the beginning, it was already a machine'. This enigmatic statement does not simply identify the origins of life with the origins of technicity, it problematises any simple notion of origin by presenting technicity as the *always already* of life itself. What Bradley points to here is an *originary* technicity or biotechnicity that may be said to precede life, but that does not and cannot constitute its *origin*. But the suggestive temporal ambiguity of this *always already* is qualified through the use of a particular example that seems to identify the *it* that Bradley speaks of with the evolution of the first photosynthetic cell. Describing the cellular process of photosynthesis in which a cell uses solar energy to convert carbon dioxide into chemical energy, Bradley argues that it was the evolution of this biotechnological process 'millions of years ago, that gradually created the conditions for more complex forms of life to develop: algae, plants, animals and, finally, humans'. '[T]his familiar story of the evolution of life', Bradley adds, 'is also, in one sense or another, a story about the evolution of technology'.[54] The use of this particular example by Bradley draws attention to the problem of origin that I wish to turn to here. The suggestion that one might be able to locate the origins of biotechnological life in one particular evolutionary process – whether that be the formation of the first shell by a mollusc, the creation of the first eukaryotic organism through symbiogenesis, the development of photosynthesis, or even, as I discuss in more detail below, the evolution of cell division or mitosis – will be the focus of this and the following sections of this chapter. As I show, the notion of originary biotechnicity and the supplementarity that it implies necessarily problematise any question of origin, whether it be that of the origin of technics, or even the origin of life and of species.

Making the case for an understanding of technology that extends 'beyond the confines of a traditional concept of a human-mechanical relation' to include the biotechnology or biotechnicity of life, David Wills suggests a link between the originary technicity implied in the 'articulation' of the human body and the 'inflection' of the human limb, and the biotechnicity of the process of cell division or mitosis by which 'the animate first articulates' itself and 'becomes technological'.[55] Referring in a footnote to the text to Jean-François Lyotard's suggestion in *The Inhuman* that 'the living cell, and the organism with its organs, are

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[54] Arthur Bradley, *Originary Technicity: The Theory of Technology from Marx to Derrida* (Basingstoke: Palgrave Macmillan, 2011), p. 1.
[55] Wills, *Dorsality*, pp. 3-4.

already *tekhnai*' and Derrida's claim in 'Nietzsche and the Machine' that 'life is always already inhabited by technicization',[56] Wills allows us to perceive this process of 'self-division' as an example of this *always already* that deconstructs or at least problematises any simple claim to origin.[57] In the following analysis I use the same example of cell division – this time as described by Italo Calvino in the short story 'Mitosis' – to examine the *originarity* of what I am here referring to as the biotechnicity of life. Responding to the anthropomorphic conceptualisation of this process provided by Calvino's narrator Qfwfq, I show how, when perceived through the paradigm of this originary biotechnicity and the supplementarity that it implies, every so-called origin or beginning is shown to be always already implicated in another, to be always already reiterated and repeated in another.

At first glance, Qfwfq's anthropomorphic narration presents the process of mitosis as an initiation into otherness – as some kind of origin of self-differentiation and division, or, to use David Wills's term, an *articulation*,[58] in which the cell experiences the supplementarity of its own being for the first time. In his fictional and anthropomorphic recollection of life before this first instance of cell division, Qfwfq evokes an experience of unified self-presence and self-identity, as well as a certain 'sense of fullness' and plenitude arising from this supposedly undivided self. Describing this state of self-plenitude, Qfwfq explains: 'I'm talking about a sense of fullness that was, if you'll allow the expression, quote spiritual unquote, namely, the awareness that this cell was me'.[59] The knowledge that 'there was a cell and the cell was me, and that was that',[60] creates a sense of self-sufficiency and wholeness, a fullness of self-presence and self-identity that is supposedly fractured and lost in the experience of mitosis. As this seemingly unified self splits into two, it becomes inhabited by an otherness that prevents Qfwfq from fully recognising and fully identifying himself as such. Rather than a seemingly

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[56] Jean-François Lyotard, '*Logos* and *Techne*, or Telegraphy', in *The Inhuman*, trans. by Geoffrey Bennington and Rachel Bowlby (Stanford: Stanford University Press, 1991), pp. 47-57 (p. 52); Jacques Derrida, 'Nietzsche and the Machine', trans. by Richard Beardsworth, in *Negotiations*, ed. Elizabeth Rottenberg (Stanford: Stanford University Press, 2002), pp. 213-256 (p. 244).

[57] Wills, *Dorsality*, p. 4.

[58] As indicated in my discussion of this word in the Introduction to this thesis (see Introduction, footnote 46), Wills uses the terms *articulate* and *articulation* in the Latin sense of both a *division* into parts and a *joining* of multiple parts. As the OED informs us, the Latin *articulāre* means both 'to divide into distinct parts' and, in post-classical Latin, to unite or connect parts together through a '*joint*' ('Articulation, n.', *OED Online* (Oxford University Press, August 2015) <http://www.oed.com/view/Entry/11190> [accessed 10 September, 2015]). This term therefore gestures towards a simultaneous division and separation, a play of simultaneous identity and difference that, as I show in more detail below, may be said to constitute the supplementary biotechnicity of life.

[59] Italo Calvino, 'Mitosis', in *t zero*, trans. by William Weaver (San Diego: Harcourt Brace & Company, 1969), pp. 59-74 (p. 60).

[60] Calvino, 'Mitosis', p. 59.

absolute and unwavering sense of self-presence and self-identity, Qfwfq now experiences a paradoxical simultaneity of identity and difference, of dissonance and self-sameness:

> […] I felt I was all myself in a more total way than ever before, and at the same time that I wasn't myself any longer, that all this me was a place where there was everything except me: what I mean is, I had the sense of being inhabited, no, of inhabiting myself. No, of inhabiting a me inhabited by others. No, I had the sense that another was inhabited by others.[61]

The fullness and plenitude of self-identity and self-presence supposedly experienced prior to the first instance of cell division seems to be replaced here with an experience of self as other; an experience of simultaneous self-identity and difference, presence and absence, interiority and exteriority, in which the self only inhabits itself and is inhabited by itself as other.

It is this supposed initial experience of otherness – this self-division or fracturing of the fullness and unity of self-presence into a play of presence and absence, sameness and dissonance – that is presented by Qfwfq as constituting an origin: an origin of self-differentiation, or what could perhaps be described as an origin of biotechnological articulation, that allows for the subsequent evolution of all forms of life.[62] According to Qfwfq, it was this first instance of cell-division and the experience of self-otherness that it introduced that led to the 'interpenetration and mingling of asymmetrical cells' in the creation of multicellular life. '[R]epeated through trillions of trillions of mortal loves', this resulted in the evolution of what Qfwfq describes as 'the loves kindled in the forest of the plurality of the sexes and of the individuals and of the species, the void dizziness filled with forms species and individuals and sexes'. In every one of these living forms Qfwfq recognises 'the repetition' of that first moment of self-division and fragmentation that he describes as a 'moving out of [one]self';[63] the repetition of that mitotic moment in which life evolves by means of a biotechnological articulation of itself as other.

As this initial reading of Calvino's 'Mitosis' shows, at first glance Qfwfq's anthropomorphic description of the process of cell-division appears to constitute a Judeo-Christian-inspired narrative of biological origin in which an initial state of fullness, plenitude and unity is shattered by a divisive fall into otherness, a fall into the repetition of difference

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[61] Calvino, 'Mitosis', p. 69.

[62] A similar claim is made by Qfwfq in the story 'The Spiral' analysed above. Here Qfwfq suggests that it was the creation of the first mollusc shell that allowed for the evolution of multiple other forms of life and technicity. The creation of the shell, Qfwfq claims, led to the evolution of the eye and to all the other multiple forms of life that came into being following the formation of this organ. '[M]aking the shell', Qfwfq explains, 'implied also making the honey in the wax comb and the coal and the telescopes […]'. '[I]n making the shell,' Qfwfq adds, 'I […] also made the rest' (Calvino, 'The Spiral', p. 148).

[63] Calvino, 'Mitosis', p. 73.

and sameness that constitutes biotechnological life. It is this supposed fall from the once-unified plenitude of nature and life and the supposed introduction of difference, division and absence into a world and a life once characterised by self-identity, self-presence and self-sameness that in Qfwfq's narration comes to constitute a second point of origin: the origin of biotechnological becoming that allows for the multiplication and 'propagation' of life in all of its subsequent permutations.[64] If life evolves out of a supplementarity or a biotechnicity that structures it from within, then this biotechnicity appears here to have its origins in this particular stage of evolution in which a primordial state of fullness, unity, self-presence and self-identity is replaced with a supplementarity that opens up the space for the becoming of life in technicity.

But Qfwfq's account of the supposed state of natural self-presence and self-identity that precedes this so-called fall into biotechnicity warrants a closer look. Describing the sense of fullness that he seems to experience before the moment of cell division, Qfwfq explains,

> […] there was me, in that point and at that moment – right? – and then there was an outside which seemed to me a void I might occupy in another moment or point, in a series of other points or moments, in short a potential projection of me where, however, I wasn't present [….] I had this contentment because outside of me there was this void that wasn't me, which perhaps could become me because "me" was the only word I knew, the only word I could have declined, a void that could become me, however, wasn't me at that moment and basically never would be […].[65]

The supposed fullness of self-presence and self-identity that Qfwfq describes earlier on in the text is here revealed to be itself constituted out of the same play and tension of interiority and exteriority, presence and absence, difference and sameness that, according to the initial reading provided above, is supposed to fracture the unity of the cellular self in mitosis. The undivided cell that Qfwfq portrays as a self-sufficient whole, identical and present to itself, is here shown to be constructed out of the very otherness, exteriority, and absence that it defines itself against; that 'outside' or 'void' that it is supposedly absent from. It is the very exclusion of this supposed exteriority that implicates this 'outside' in the interiority of the self, while simultaneously also implicating this supposed interiority in that which is presented as being exterior to it. The 'void'

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[64] Calvino, 'Mitosis', p. 73. This anthropomorphic narrative of an initial state of cellular plenitude and a fall into self-divisiveness echoes what Stiegler describes in *Technics and Time, 1* as 'the thought of origin *qua* fall' that dominates the history of metaphysics 'from Plato to Rousseau'; a fall that is 'essentially, a fall into technics' (Stiegler, *Technics and Time, 1*, p. 96). This is elaborated on in *What Makes Life Worth Living*, where Stiegler explains that '[p]rostheticity' is the 'default of origin that almost three thousand years ago took the contradictory name of *original sin*'. But rather than constituting a fall or some second origin, this prostheticity, Stiegler goes on to suggest, is what allows for the very 'possibility *and impossibility*' of the question of being and the question of origin itself (Bernard Stiegler, *What Makes Life Worth Living: On Pharmacology*, trans. by Daniel Ross (Cambridge: Polity Press, 2013), pp. 108-109).
[65] Calvino, 'Mitosis', pp. 63-64.

or the 'outside' that Qfwfq identifies as *not being him*, is simultaneously also a 'projection' of him in his absence. If the interiority of the self is here defined against its supposed exteriority, this exteriority is simultaneously also shown to be constituted out of the interiority that it supposedly is not. Rather than some description of a unified self-presence and a fullness of self-identity, what we have here is a recognition of the same tension and play of supplementarity – a play of inside and outside, presence and absence, sameness and difference – that, within Qfwfq's narrative, is supposed to originate at the moment of cell division. Consequently, what was described above as a fall into technicity and biotechnicity, as a moment of a second origin that allows for the evolutionary becoming of life in technics, can be read as no more than an expression of a 'tension toward the outside, the elsewhere, the otherwise' that always already constitutes life itself.[66] Behind and beyond Qfwfq's anthropomorphic narrative of a fall from the unadulterated purity of nature into technics – from a primary state of fullness and plenitude into the supplementary play of sameness and difference that allows for the propagation and multiplication of life in all its different forms – the passages analysed above allow us to glimpse an *originary* biotechnicity that can constitute neither an origin nor a fall: a biotechnicity that does not originate in and evolve out of some prior state of nature or of being, and, equally, that cannot be said to constitute a point of origin for the evolution of life. As is suggested in the passage from 'Nietzsche and the Machine' quoted from in one of the epigraphs above, biotechnicity should be thought of as the *always already* of life – as a supplementarity that 'haunts it from the very beginning'.[67]

The problematising of the notion of origin is playfully gestured towards by Qfwfq in a series of disclaimers that come to qualify his narrative. These begin with an explanation of how the 'first story' of cell division that Qfwfq recalls here, was, after the first instance of its occurrence, 'repeated in an interminable multiplication of initial phases just like the first and identified with the first [...]'. The repetition and multiplication of this 'first story' in all subsequent acts of cell division, appears to confirm the primary status of this first act of mitosis, presenting it as the origin of all other subsequent instances of cellular division. The suggestion, however, that all such other acts may be 'identified with the first', implies that every single instance of cell division may in itself also be said to constitute a 'first'. As Qfwfq continues to explain, in the 'exponential growth of stories' that appear to follow this supposed initial act, every story 'is always tantamount to the first story'.[68] What Qfwfq seems to identify in his

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[66] Calvino, 'Mitosis', p. 66.
[67] Derrida, 'Nietzsche and the Machine', p. 244.
[68] Calvino, 'Mitosis', p. 61.

narrative as the 'first story' of mitosis, is not an origin, a beginning or a 'first in the absolute sense' at all. Instead, as Qfwfq clarifies, this constitutes a first 'in the sense that we can consider any of these identical initial phases the first'. The story that Qfwfq narrates is, he goes on to explain, simply the one that he remembers. '[A]s for the first in the absolute sense', this anthropomorphic narrator adds, 'your guess is as good as mine, I'm not interested'.[69]

Qfwfq's disclaimers imply that there can be no absolute origin posited in a discussion of the biotechnicity of life. If every act of mitosis 'is always tantamount to the first', then every such act must be originary. But in its very originarity, each act also recalls all the other acts that it invariably repeats. If each one is tantamount to the first, then each one can be substituted and supplemented for another. Each one of the 'stories' that Qfwfq refers to here may be singular, but in their very singularity each one repeats and reiterates the singularity of every other act that might take its place. Although, as Qfwfq himself admits, his story appears to posit a 'first' or an 'initial' act that 'precedes' all others – an act that, we are told, 'must surely have existed, because it's logical to expect it to exist'[70] – the passages quoted from above deconstruct this notion of origin and of a simple beginning, showing every origin to be always already implicated in a multitude of other equally originary beginnings. As Derrida explains in a different context in *Of Grammatology*, 'what has the name *origin* […is] no more than a point situated within the system of supplementarity'. This implies that there is no origin that is not always already an 'originary substitute' or an 'originary supplement'.[71] What the structure of supplementarity allows us to see, is that there can be no origin that is not always already implied in another. When one speaks of the *originary* biotechnicity of life, one does not refer to some origin of technicity in life or to technicity as the origin of life, but rather to a biotechnicity that is always already inscribed within life *as* this supplementarity, as this repetition and reiteration of the origin as supplement and the supplement as origin. To return once more to the passage from Derrida quoted as an epigraph above, originary biotechnicity constitutes the 'prosthetic strategy of repetition [that] inhabits the very moment of life'. '[L]ife', as Derrida goes on to argue, 'is a process of self-replacement' and 'the handing-down of life is a *mechanike*, a form of technics'.[72]

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[69] Calvino, 'Mitosis', p. 62.
[70] Calvino, 'Mitosis', p. 62.
[71] Derrida, *Of Grammatology*, pp. 243, 313. Elaborating on this notion of originary supplementarity, Derrida explains '[t]here is no present before it, it is not preceding [sic] by anything but itself, that is to say by another supplement. The supplement is always the supplement of a supplement. One wishes to go back *from the supplement to the source*: one must recognize that there is *a supplement at the source*' (*Of Grammatology*, pp. 303-304).
[72] Derrida, 'Nietzsche and the Machine', p. 244.

Reading the Rudiment

It is this 'prosthetic strategy' of the repetition and self-replacement of life, the reiteration of biological difference and sameness in an ongoing movement of evolutionary becoming, that is the focus of the reading of Darwin's *The Origin of Species* and *The Descent of Man* that I advance here. More specifically, my reading engages with the notion of the appendix and other such vestigial structures within the body, or what Darwin refers to in his texts as *rudimentary* organs. I suggested in the Introduction to this thesis that an appendicology – with its focus on the corporeal motifs of the appendage and the appendix – is particularly well suited to a discussion of the relationship between life, technics and the human because it provides us with a way of extending our understanding of originary technicity to include the technicity of biological life in general.[73] As a supposedly 'useless' organ retained in the body through a process of evolutionary descent,[74] the appendix appears to constitute an example of a corporeal otherness that links organisms and species to one another across evolutionary time and space. In this sense, this organ draws attention to the way that the body of any living organism always already recalls and is always already implicated in the bodies of others. Darwin's reading of the appendix and other such structures invites us to perceive evolution in terms of a repetition or a reiteration of difference and sameness, as a play of supplementary difference – or, as I suggest below, a *différance* – that is inherent to life. It is this originary supplementarity that allows us to speak of biological life as being always already prosthetic or biotechnological and that prevents us from positing any true origin or essence of technics, of life, or even of species, that is not in and of itself already implied in another.

In *The Descent of Man*, Darwin describes the appendix as a 'useless' organ comparable to other so-called rudimentary structures.[75] He explains that despite their uselessness or, perhaps more precisely, *because* of their lack of function, such organs and structures prove infinitely useful to the evolutionary theorist. As Darwin shows in both *The Origin of Species* and *The Descent of Man*, the very fact that rudimentary organs lack a primary function in the body means that they are 'by far the most serviceable for classification; for they can hardly be due to adaptations within a late period; and thus they reveal the old lines of descent or of true affinity' between species.[76] Because the rudiment does not have a primary purpose within the

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[73] See the section 'Appendixes' in the Introduction.
[74] Charles Darwin, *The Origin of Species and The Descent of Man* (New York: The Modern Library, 1945), p. 404.
[75] Darwin, *The Descent of Man*, p. 404.
[76] Darwin, *The Descent of Man*, p. 514. Rudimentary organs presented a problem for pre-Darwinian thinkers who struggled to reconcile the presence of useless organs in the body with their theories of intelligent design and their

body it cannot be said to have been recently affected by the forces of natural selection. Consequently, it serves as a fossil, a trace and a remnant of the past, providing a 'clue' to the evolutionary history and ancestral heritage of living beings.[77] For Darwin, rudimentary structures thus serve as corporeal markers or records of a species' evolutionary past that link living species to one another and to their primordial ancestors.

In describing the rudiment as a physical 'trace' or an 'indelible stamp' of the past, Darwin often uses textual and linguistic analogies that link the living body to language.[78] The comparison is explicitly made in *The Origin of Species* where Darwin links the rudimentary organs left behind in the body to the archaic orthographic traces one finds in language. According to Darwin, 'rudimentary organs may be compared with the letters in a word, still retained in the spelling, but become useless in the pronunciation, but which serve as a clue for its derivation'.[79] This comparison is elaborated on in *The Descent of Man*, where Darwin specifies that this is not a gratuitous analogy. 'The formation of different languages and of distinct species', Darwin explains, 'and the proofs that both have been developed through a gradual process, are curiously parallel'. Echoing the same comparison put forward in the *Origin*, he again remarks on 'the frequent presence of rudiments, both in languages and in species', adding that 'in the spelling […] of words, letters often remain as the rudiments of ancient forms of pronunciation'.[80] Like these orthographic rudiments that are still present in the spelling of a word but are no longer pronounced in living speech, the appendix and other vestigial structures appear here as *dead* and *silent* relics of a once living past, as obsolete and archaic inscriptions that are not *expressed* in the living present.[81]

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belief in a perfect creator. As Robert Chambers argues in his 1844 work *Vestiges of the Natural History of Creation*, such organs may be regarded as 'blemishes or blunders' within the body, 'the thing of all others most irreconcilable with that idea of Almighty Perfection' (Robert Chambers, *Vestiges of the Natural History of Creation* (London: John Churchill, 1844), p. 189). Defending the notion of an intelligent creator, William Paley chose to sidestep the issue of functionless organs within the body, claiming that a theory of intelligent design does not necessarily imply perfection, that such structures may yet be found to be useful, and even suggesting that organs such as the spleen – supposed at the time to be useless – might serve as 'merely a *stuffing*, a soft cushion to fill up a vacancy or hollow, which unless occupied, would leave the package loose and unsteady' (William Paley, *Natural Theology of Evidences of the Existence and Attributes of the Deity, Collected from the Appearances of Nature* (Cambridge: Cambridge University Press, 2009), pp. 64-65, (p. 209)). For Darwin, however, such organs proved infinitely useful as they provided corporeal evidence for the theory of the evolution of species. As Darwin notes in *The Origin of Species* 'the existence of organs in a rudimentary, imperfect, and useless condition, or quite aborted, far from presenting a strange difficulty, as they assuredly do on the old doctrine of creation, might even have been anticipated in accordance with the views here explained' (p. 350).

[77] Darwin, *The Origin of Species*, p. 350.

[78] Darwin, *The Descent of Man*, pp. 395, 920.

[79] Darwin, *The Origin of Species*, p. 350.

[80] Darwin, *The Descent of Man*, pp. 465-466.

[81] The link between body and text, life and language was discussed in the Introduction to this thesis (see section 'Appendices'). For a more general discussion of the use of metaphor in Darwin's texts and, more particularly, his

A similar textual analogy continues to be used in recent discussions of vestigial organs, as well as, more interestingly, in descriptions of vestigial *genomic* structures – so called junk DNA fragments and sequences that, unlike functioning genes, do not appear to code for protein synthesis.[82] Like the rudimentary organs found within the body, these genomic structures are described as constituting *mute* traces of the past; 'dead' genes or 'functionally silent' relics that are not 'expressed' by the cell but that serve as a record of the evolutionary history of a species.[83] Discussing the way that this so-called junk DNA has been conceptualised, Thierry Bardini draws attention to a wider tendency to perceive the genome as a book or a text. As a number of other critics have also shown, the genome has often been described as a biblical 'book of life',[84] a dictionary, an instruction book, a recipe, a telephone book, and even the 'autobiography' of a species 'written in "genetish"'.[85] Focusing on one of these many

use of such linguistic and textual analogies, see Gillian Beer, *Darwin's Plots: Evolutionary Narrative in Darwin, George Eliot and Nineteenth-Century Fiction* (London: Routledge and Kegan Paul, 1983).

[82] Leslie Orgel and Francis Crick suggest that because such sequences of so-called junk DNA do not appear to code for protein synthesis, they may be said to have no function with the genome (L. E. Orgel and F. H. C. Crick, 'Selfish DNA: The Ultimate Parasite', *Nature*, 284 (1980), 604-607 (p. 604)). This assumption has been challenged over recent decades. In her 1983 Nobel Prize lecture, Barbara McClintock proposed that transposable elements, an example of the kind of genomic sequences that are usually dismissed as nothing but junk, might in fact play a significant role in evolution (Barbara McClintock, 'The Significance of Responses of the Genome to Challenge', Nobel lecture, 1983 <http://www.nobelprize.org/nobel_prizes/medicine/laureates/1983/mcclintock-lecture.pdf> [accessed 20 September, 2015]). For further discussion on this topic see Christian Biémont, 'A Brief History of the Status of Transposable Elements: From Junk DNA to Major Players in Evolution', *Genetics*, 186:4 (2010), 1085-1093, and Christian Biémont and Cristina Vieira, 'Junk DNA as an Evolutionary Force', *Nature*, 443:5 (2006), 521-524. The suggestion that so-called junk DNA might indeed have an evolutionary function and might express itself within the human body forms the basis of Greg Bear's science fiction novels *Darwin's Radio* and *Darwin's Children* in which previously non-functioning endogenous retroviruses begin to affect human reproduction and eventually result in the evolution of a new kind of human being referred to in the novels as *Homo sapiens novus* (Greg Bear, *Darwin's Radio* (London: HarperCollins, 1999); Greg Bear, *Darwin's Children* (London: HarperCollins, 2003)).

[83] Jerry A. Coyne, *Why Evolution is True* (Oxford: Oxford University Press, 2009), p. 71; Werner R. Loewenstein, *The Touchstone of Life: Molecular Information, Cell Communication, and the Foundations of Life* (Oxford: Oxford University Press, 1999), p. 93.

[84] At a press conference held to announce the completion of the first draft of the Human Genome Project in 2000, Dr. Francis Collins, then director of the National Human Genome Research Institute, described the event as 'the revelation of the first draft of the human book of life' ('Remarks Made by the President, Prime Minister Tony Blair of England, Dr. Francis Collins, Director of the National Human Genome Research Institute, and Dr. Craig Venter, President and Chief Scientific Officer, Celera Genomics Corporation, on the Completion of the First Survey of the Entire Human Genome Project', *National Human Genome Institute* (2000) <https://www.genome.gov/10001356> [accessed 13 August, 2015]). This metaphor was also specifically used on the banners set up for the press conference which read 'Decoding the Book of Life: A Milestone for Humanity'. By the year 2010 when the first printout of the completed human genome was displayed at the 'Medicine Now' Gallery of the Wellcome Collection in London in the form of more than a hundred books, each a thousand pages long, the genome had indeed become a book of life ready to be decoded, deciphered and read by the scientist. For a more detailed analysis of the way in which the human genome has been represented through this biblical metaphor see Lily E. Kay, *Who Wrote the Book of Life: A History of the Genetic Code* (Stanford: Stanford University Press, 2000).

[85] François Jacob, *The Logic of Life: A History of Heredity*, trans. by Betty E. Spillman (New York: Pantheon Books, 1973), pp. 276, 278; Judith Roof, *The Poetics of DNA* (Minneapolis: University of Minnesota Press, 2007), pp. 72-73; Thierry Bardini, *Junkware* (Minneapolis: University of Minnesota Press, 2011), p. 15; Matt Ridley, *Genome: The Autobiography of a Species in 23 Chapters* (London: Fourth Estate, 2000), p. 4.

metaphors, Bardini explains that if 'DNA is […] compared to a book, such as on the Human Genome Project Web site, where it is compared to "200 Manhattan telephone books"', then with the framework of this metaphor, 'junk DNA is seen as the set of numbers that are no longer in service (and this for all the possible numbers that have ever been since time immemorial!). Junk is fossil or selfish genes, some say; silent, all agree'.[86] Like the appendix and the other vestigial organs that Darwin describes as orthographic traces not pronounced in living speech, junk DNA is here presented as that which supposedly remains 'silent' within the genomic text – as that which does not express itself as other genes do.[87] Bardini's description of junk DNA as a telephone number no longer in use adds another dimension to Darwin's metaphor. If the Darwinian rudiment is comparable to a muted orthographic mark that has no correlate in living speech, the *genomic* rudiment appears here as a signifier that has no signified, as an empty code or a sign devoid of any meaning or signification.

The use of these textual analogies is highly significant to my project. In their conceptualisation of the rudiment as a written trace that finds no correlative in living speech – as a dead and silent orthographic remnant that is marked by the absence of any present voice or meaning – the above-quoted passages appear to engage with the same logocentric opposition between speech and writing described by Derrida in *Of Grammatology*. Derrida explains how according to the logocentric paradigms of metaphysics, writing appears as a 'dead letter'; as a 'carrier of death' and absence that 'exhausts life'.[88] Elaborating on this in his reading of Plato's *Phaedrus*, Derrida comments on the perceived 'cadaverous rigidity' of writing and its supposed opposition to the natural self-presence of 'the living spoken word'.[89] Whereas speech, or '[t]he system of "hearing (understanding)-oneself-speak" through the phonic substance', is perceived as 'the nonexterior, nonmundane, therefore nonempirical or noncontingent signifier' that is 'fully *present* (present to itself, to its signified, to the other, the very condition of the theme of presence in general', writing is thought of as 'the exterior surface' of a dead trace that fulfils the 'secondary and instrumental function' of translating, interpreting or recording this 'originary speech'.[90] While speech is supposedly natural and self-present, inseparable from the

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[86] Bardini, *Junkware*, p. 15.
[87] The metaphor of *gene expression* is widely used in both scientific language and common parlance. This turn of phrase reflects the widespread notion that DNA functions as a language. According to this metaphor a gene *expresses* itself when the information it contains is *translated* (to use another linguistic metaphor) into a product; that is, when it leads to the creation of a protein.
[88] Derrida, *Of Grammatology*, p. 17.
[89] Jacques Derrida, *Dissemination*, trans. by Barbara Johnson (Chicago: University of Chicago Press, 1981), p. 79.
[90] Derrida, *Of Grammatology*, pp. 7-8.

living breath that fuels it and the thought that feeds is, writing is conceptualised as a dead, prosthetic supplement and trace of this once living, breathing word.

It is this opposition between living speech and lifeless writing that also appears to inform the descriptions of rudimentary organs and genomic structures discussed above. Perceived in light of this opposition, the appendix and other rudimentary structures within the body and the genome appear as organs of external otherness that supplement the body from within; dead and silent traces of a past life that belong to a different evolutionary time and to other corporeal states. In this sense, the rudiment appears to constitute an external other that does not quite belong to the organism it inhabits; an other that seems foreign and external to the living body that hosts it. Jerry A. Coyne, for instance, describes genomic rudiments as supplementary 'genetic baggage' carried around by the cell in memory of its 'distant ancestors', while Leslie Orgel and Francis Crick present so-called junk DNA as a 'not too-harmful parasite' that inhabits its host cell as an alien entity.[91] Like writing, that, as Derrida shows, is conceived of in Plato's *Phaedrus* as functioning like 'a literal *parasite*: a *letter* installing itself inside a living organism to rob it of its *nourishment* and to *distort* [...] the pure audibility of a voice',[92] the vestigial rudiment – described, as we have seen, as a voiceless textual remnant – also appears here as an external and alien other that comes to infiltrate the living self-presence of the body and the cell. In the case of the appendix, this otherness appears even more parasitic. Described by Coyne as 'a ticking time bomb in our gut', this dead trace of otherness appears to have the power to infect the health and integrity of the body from within, threatening to spread death and absence in the supposed living self-presence of the body as only a truly 'dangerous' supplement can.[93]

But of course *as a supplement* – as a supposedly dead or even parasitic writing that infiltrates and supplements the living body from within – the rudiment cannot simply be thought of as an *external* other. Discussing the logocentric opposition between writing and speech that he exposes in *Of Grammatology*, Derrida shows how rather than being a simple

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[91] Coyne, *Why Evolution is True*, p. 75; Orgel and Crick, 'Selfish DNA', p. 605.

[92] Derrida, 'Plato's Pharmacy', p. 128. As I discussed in the Introduction to this thesis (see section titled 'Appendices'), Derrida shows in his reading of Plato's *Phaedrus* how *logos* appears to constitute 'a *living* being'. '*Logos*' he explains, 'is a *zōon*. An animal that is born grows, belongs to the *phusis*. Linguistics, logic, dialectics, and zoology are all in the same camp' ('Plato's Pharmacy', p. 79). In the context of this analogy, writing appears to constitute a parasite that invades the living body of language. For a more detailed analysis of the relationship between parasite and host and the 'strange logic' that it implies see J. Hillis Miller, 'The Critic as Host', *Critical Inquiry*, 3:3 (1977), 439-447 (p. 444).

[93] Coyne, *Why Evolution is True*, p. 66; *The Descent of Man*, p. 408. Derrida uses the quotation '…That Dangerous Supplement…' as the title of one of his chapters on Rousseau in *Of Grammatology* (pp. 141-164) where he also later describes the supplement as 'a parasitic organism' (p. 178). In 'Plato's Pharmacy' writing and the *pharmakon* are also described, in reference to this earlier reading of Rousseau, as 'that dangerous supplement' (p. 110).

addition to the living *logos* of language, writing constitutes 'the movement of language' itself. The supplementarity of writing is not external to the self-presence of speech and of language but inherent to it. According to Derrida, 'the signified always already functions as a signifier' because the 'secondarity' or supplementarity of writing 'affects all signifieds in general, affects them always already, the moment they *enter the game*'. Writing does not constitute a dead or lifeless trace that *supplements* living language – an exterior prosthesis that is added onto the fullness and self-presence of the lived and spoken word; it is rather this very prostheticity and supplementarity that allows for the possibility of language in the first place, constituting it from within and from the very beginning. As Derrida goes on to explain, '[t]here is not a single signified that escapes, even if recaptured, the play of signifying references that constitute language'.[94] If bodily and genomic rudiments can be thought of as constituting dead written traces that serve as relics or remnants of the past within the living, breathing body of the present, then, like writing, these supposedly supplementary inscriptions gesture towards a broader structure and play of supplementarity that far exceeds them.[95]

Varying the textual analogy used by Darwin, one could describe the appendix and other vestigial organs as textual *appendices* that provide a prosthetic or supplementary commentary on the bodies that host them.[96] As a supposedly dead or silent trace comparable to writing, the rudiment may not be expressed by any living function within the body, but it nevertheless appears to remain legible to those seeking to analyse and study it. Serving as a 'record' of a once lived past, these organs provide the evolutionary theorist with 'clues' to the history of an organism and a species, 'reveal[ing] the old lines of descent or of true affinity'.[97] But in so doing, what the appendix and other rudiments also reveal is a supplementarity that is not just inherent to the living organism but to life itself; a more general exteriority or prostheticity that is enacted and repeated within every organ, every body and every movement of evolutionary becoming. Building on the textual analogies discussed above, the rest of this section introduces

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[94] Derrida, *Of Grammatology*, p. 7.

[95] My reading of the rudiment and of the notion of species in this and the following sections draws attention to the way that the work of Charles Darwin may in a certain sense be said to prefigure Derridean thought. This link has been suggested by a number of critics. Colin Nazhone Milburn, for instance, argues that 'the Darwinian attack on essentialism and humanism forms the preface to Derrida's terrifying project'. According to Milburn, both 'Darwin and Derrida enact a critique of artifactual constructions of nature that disrespects boundaries and emphasizes the deviances, the perversions, the mutations, and the monstrosities of the world' (Colin Nazhone Milburn, 'Monsters in Eden: Darwin and Derrida', *MLN*, 118:3 (2003), 603-621 (p. 604)).

[96] As I showed in the Introduction to this thesis, the textual appendix constitutes a supplementary structure that, although deemed extraneous, digressive and disruptive to the main argument of a text, is nevertheless necessary for its general integrity. Appearing to be at once internal and external to a textual corpus, the textual appendix points to the same structure of supplementarity being discussed here.

[97] Darwin, *The Origin of Species*, p. 350; *The Descent of Man*, p. 514.

this broader notion of supplementarity through an analysis of Darwin's attempts to define the nature of the rudiment and to distinguish it from other organs and bodily structures. As I show in more detail below, in these discussions the rudiment only acquires meaning and identity when it is read across evolutionary time and space; when it is read, that is, in the context of the repetition of differential relations that constitutes the evolution of species. Outside of these relationships with homologous organs, the rudiment appears devoid of any function, any meaning, or any identity, and may thus be said to function like some empty signifier that draws attention to the arbitrariness and supplementarity of the system of differential relations that constitutes it. In the same way that the supposedly dead and silent trace of orthographic writing points to a supplementarity of difference that always already structures language from within, in Darwin's study of the origin and descent of species the appendix and other rudimentary organs gesture towards a play of difference and sameness that replicates itself while inscribing itself anew in every form of becoming that constitutes life.

Discussing the nature of vestigial organs and the evidence they provide for the theory of 'descent with modification',[98] Darwin distinguishes in both *The Origin of Species* and *The Descent of Man* between *rudimentary* and *nascent* structures. Rudiments, Darwin explains, are 'absolutely useless' or are 'of such slight service to their present possessors, that we can hardly suppose that they were developed under the conditions which now exist'. Nascent organs are also 'not fully developed', but in contrast to the rudiment they 'are of high service to their possessors, and are capable of further development'.[99] In principle, the notions of rudimentarity and nascency appear to be easily opposed to one another. Whereas rudimentary organs 'relate to a former state of things', nascent structures are 'in progress towards further development';[100] while rudiments are the expired remnants of organs that *used* to have a function, nascent organs exist in a germinal state, having *not yet* fully developed their function within the body. This opposition seems straightforward enough, but the distinction between these two types of structures is much less clear cut in nature. Darwin highlights this when he explains how rudimentary organs 'sometimes retain their potentiality' and how 'an organ rendered [...] useless or injurious for one purpose, might be modified and used for another purpose'.[101] Although the opposition between rudimentarity and nascency appears clear and simple in

[98] Darwin, *The Origin of Species*, p. 349.
[99] Darwin, *The Descent of Man*, p. 400.
[100] Darwin, *The Origin of Species*, p. 347.
[101] Darwin, *The Origin of Species*, pp. 346-349.

principle, when examined in the flesh, so to speak, the distinction between the two proves far more ambiguous and untenable.

This ambiguity is signalled by Darwin's very use of the term *rudiment*. According to the Oxford English Dictionary, the words *rudiment* or *rudimentary* denote '[t]he first principles or elements of a subject', '[a] beginning; an initial or imperfect form or stage', '[t]he imperfect beginnings of some (material or immaterial) thing; an embryonic stage; those parts which are the foundation of later growth or development', or, more specifically in biology, '[a] small and (as yet) undeveloped precursor of an organ, limb, leaf, etc.'. The term derives from the Latin *rudīmentum* meaning 'first lesson, early training, first experience […] initial stage, first beginnings (of something that will develop)',[102] and thus seems, curiously enough, to suggest a state of *nascency* rather than one of *vestigiality*. Indeed, contemporaries of Darwin appear to use the term in this literal sense, with T. H. Huxley, for example, describing how '[t]he oak is a more complex thing than the little *rudimentary* plant contained in the acorn' and how in its metamorphosis the butterfly passes 'from its *rudimentary* to its perfect condition'.[103] Darwin himself also occasionally employs this meaning in *The Descent of Man* where he notes, for example, that in the first sounds made by fledglings, one finds 'hardly a *rudiment* of the future song'.[104]

Perceived in light of these examples, Darwin's use of the term *rudimentary* to refer to useless vestigial structures may appear odd. But the use of this term may be said to reflect the nature of these organs that have no function and, as Darwin himself appears to acknowledge, no essence, no meaning and no significance outside of the analogous and homologous relationships that they draw attention to. In an early essay from 1842 Darwin refers to rudimentary or vestigial organs as existing in an 'embryonic state'. This is further clarified in an essay from 1844, where Darwin suggests that although the rudiment serves as a vestige of 'similar parts in other organic beings', such organs are often 'not fully developed' within the bodies they presently inhabit.[105] Because these structures do not fulfil a function, their growth and development is often arrested and aborted early on in the life of the organism and it is for

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[102] 'Rudiment, n.', *OED Online* (Oxford University Press, June 2015) <http://www.oed.com/view/Entry/168520> [accessed August 20, 2015].

[103] Thomas Henry Huxley, 'On the Relations of Man to the Lower Animals', in *Evidence as to Man's Place in Nature* (Cambridge: Cambridge University Press, 2009), pp. 57-118 (p. 60); my italics.

[104] Darwin, *The Descent of Man*, p. 462; my italics.

[105] 'Charles Darwin's Sketch of 1842' and 'Charles Darwin's Essay of 1844', in *Evolution by Natural Selection* (Cambridge: Cambridge University Press, 1958), pp. 81, 234. These two sketches or essays served as the foundations of *The Origin of Species* and have been recently republished under this very title (see *The Foundations of The Origin of Species: Two Essays Written in 1842 and 1844 by Charles Darwin*, ed. by Francis Darwin (1909) (Cambridge: Cambridge University Press, 2009)).

this reason that, as Darwin goes on to explain in *The Origin of Species*, 'rudimentary organs in the adult are often said to have retained their embryonic condition'.[106] This highlights why Darwin might have chosen to describe such organs as *rudimentary* and, moreover, why he claims that it is 'often difficult to distinguish between rudimentary and nascent organs'.[107] Existing in an embryonic state and having no function to fulfil within the body, the rudimentary organ may appear indistinguishable from nascent structures that are not yet fully developed. Within the body of the individual organism, both structures appear to constitute organs that are not quite fully developed or that do not quite seem to have a function. It is only by looking at these organs *in relation to* other analogous and homologous structures in other organisms and species across evolutionary time and space that one is able to identify an organ as being either rudimentary or nascent. As Darwin goes on to explain, 'we can judge *only by analogy* whether a part is capable of further development, in which case alone it deserves to be called nascent'.[108] Similarly, one might add, a part can only be described as rudimentary or vestigial when compared to other analogous and homologous organs.

What this suggests is that there is no essence of rudimentarity or nascency that may be said to *belong* to a particular organ or structure. An organ cannot be identified as being either vestigial or nascent in and of itself; these supposed qualities are *relational values* that can only be assigned to such structures when they are analysed and studied in the context of other organs, organisms and species. This is exemplified in Darwin's own discussion of the vestigial appendix in *The Descent of Man*. Here Darwin claims that one can infer that this organ is a rudiment 'from its small size' and 'its variability in man'.[109] But, as he himself suggests in the passage from *The Origin of Species* quoted from above, these observations are not in themselves sufficient to draw such a conclusion. It is only by comparing the human appendix with other similar organs in other living species – namely the marsupial koala, in which the organ appears 'more than thrice as long as […its] whole body', and in the orang-utan, where the appendix 'is long and convoluted' – that Darwin is able to conclude that the appendix is a vestigial remnant of a homologous organ that served a function in the ancestral species that the human being evolved from.[110]

Darwin's brief discussion of the appendix allows us to identify a more general pattern of analysis that extends to the rest of his studies of the origin and the descent of species. By

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[106] Darwin, *The Origin of Species*, p. 348.
[107] Darwin, *The Origin of Species*, p. 347.
[108] Darwin, *The Origin of Species*, p. 347; my italics.
[109] Darwin, *The Descent of Man*, p. 408.
[110] Darwin, *The Descent of Man*, p. 408.

comparing the human appendix to similar organs found in other extant species and then reflecting on the common ancestry and the common evolutionary heritage shared by these groups of organisms, Darwin engages in a study of *synchronic* relations that reveal a *diachronic* link with the past. This pattern extends to the rest of his writings and, indeed, to his understanding of language and linguistics which, as Elizabeth Grosz observes, 'anticipates the integration of synchronic and diachronic linguistics' at the beginning of the twentieth century and may have had a direct influence on the work of Ferdinand de Saussure.[111] This observation allows me to draw a link between Darwin's study of evolution and Saussure's own study of language. In 'Différance', Derrida shows how the Saussurian concepts of arbitrariness and linguistic difference allow us to perceive a play of supplementarity and *différance* that always already structures language from within. Darwin's description of the rudiment, and, as I show in more detail below, his more general analysis of the so-called *origin* and *nature* of species, provides us with a similar opportunity, drawing attention to the supplementary repetition of sameness and difference that constitutes life and evolution.

Elaborating on the theory of the sign introduced in Saussure's seminal *Course in General Linguistics*, Derrida argues that there can be no signified that 'is present in and of itself'. Instead, 'every concept is inscribed in a chain or in a system within which it refers to the other, to other concepts, by means of the systematic play of differences'.[112] There is no self-present essence or proper meaning that belongs to the signified; no presence, essence or meaning 'outside semiological difference'.[113] Meaning only arises out of a play of differences between signs – a play by means of which 'each element […] is related to something other than itself'.[114] Because meaning is only ever generated through difference, every concept and every signified is necessarily always already reciprocally implicated in another and, indeed, can only ever come into being through this relationship with the other. Rather than being present to itself by constituting or containing a 'plenitude' or some essential 'nucleus' of signification,[115] the sign operates as a trace, deriving meaning from its difference from other signs and its relationship

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[111] Grosz, Elizabeth, *The Nick of Time: Politics, Evolution, and the Untimely* (Durham and London: Duke University Press, 2004), p. 29. As Sarah Winter also observes in relation to *The Expression of the Emotions in Man and Animals*, Darwin 'extends the growing awareness within nineteenth-century philology of the differences and tensions between synchronic and diachronic methods that culminates in Saussure's canonical account of synchronic linguistics' (Sarah Winter, 'Darwin's Saussure: Biosemiotics and Race in *Expression*', *Representations*, 107:1 (2009), 128-161 (pp. 129-130)).

[112] Jacques Derrida, 'Différance', in *Margins of Philosophy*, trans. by Alan Bass (Brighton: The Harvester Press, 1982), pp. 1-27 (p. 11).

[113] Derrida, 'Différance', p. 12.

[114] Derrida, 'Différance', p. 13.

[115] Derrida, 'Différance', p. 10.

to them. In this sense, the sign keeps 'within itself the mark of the past element' while 'letting itself be vitiated by the mark of its relation to the future element'. Never present to itself, the sign can only constitute 'what is called the present by means of this very relation to what it is not'.[116]

These passages from Derrida's essay may be read in relation to the suggestion made above that in Darwin's text the rudiment is shown to constitute an empty signifier that only acquires meaning when read in relation to another. As I indicated above, rudimentarity is not a property that belongs to an organ, but a relational value that emerges out of the synchronic and diachronic relationships between organisms and species analysed by Darwin. In the same way that linguistic signs appear to have no inherent 'plenitude', 'nucleus', or essence of meaning and are constituted solely through 'a network of oppositions that distinguishes them, and then relates them to one another',[117] the rudiment can only be said to *be* a rudiment in the context of its diachronic and synchronic relationships with other organs. Referring back in its vestigiality to homologous organs in ancestral organisms and other vestigial structures in living species, the rudiment only comes into being *through this referral*; or, to appropriate Derrida's phrase here, in its 'relation to what it is not'. As my reading of the above-quoted passages shows, there is no nature or essence of rudimentarity, only relational differences that implicate such organs in one another across evolutionary time and space.

Reading Species

It is this insight that guides my reading of Darwin's analysis of species. I suggested above that in Darwin's text the ambiguity and indeterminacy of the rudiment points to a general play of difference and sameness that underlies the evolution of species and of life itself. This section extends the notion of relational difference introduced in my discussion of the rudiment to a more general analysis of Darwin's notion of species and the supposed 'origin' that he refers to in the title of his work. Rather than positing some essence of species that divides organisms into distinct groups, each separate from the other, what Darwin's study allows us to see is a multitude of connections and disjunctions, similarities and differences between organisms that are not and cannot be limited to the boundaries that might be perceived to exist between species. These connections and disjunctions point to a supplementary play of evolutionary becoming in which every organism and every species is implied and implicated with and within another. As

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[116] Derrida, 'Différance', p. 13.
[117] Derrida, 'Différance', p. 10.

I show below, Darwin's texts suggest that there can be no origin of species that is not always already constituted by another; or, to put this in more Derridean terms, Darwin here begins to think life as being always already conditioned by the prosthetic and supplementary play of *difference* and *deferral*.

In 'Différance', Derrida notes that the differences that Saussure speaks of in his discussion of the arbitrary and differential nature of language, are not static, self-contained entities that can be easily defined and identified but are instead dependent on the synchronic and diachronic relationships that they are embedded in. These differences and the meanings that they generate, Derrida explains, '*have not fallen from the sky fully formed*, and are no more inscribed in a *topos noētos*, than they are prescribed in the gray matter of the brain'.[118] Derrida's use of this particular expression is highly significant to my reading of Darwin's *The Origin of Species* and *The Descent of Man*. At the time of their writing, these texts were intended to challenge and debunk the 'old doctrine of creation'; that is, the belief that each species was independently created by the divine hand of God.[119] The very point that Darwin's work seeks to make is precisely that species *did not* fall 'from the sky fully formed', but that they evolved out of one another through what Darwin refers to as a process of 'descent with modification'.[120] Like the signs and differences generated in language, and, indeed, like the rudiment analysed above, species are shown in Darwin's texts not to be constituted out of any fixed or static nature, essence or origin, but out of the continuity and discontinuity, the sameness and difference implied in his theory of descent.

In *The Origin of Species* Darwin repeatedly suggests that the distinction between the concepts of *species* and *variety* is arbitrary and does not reflect any real difference in nature. This point is highly pertinent to my discussion. Prior to Darwin's theory, species were widely believed to have been independently created, while varieties were considered to have developed or evolved out of these distinct species. As Darwin explains, whereas with species 'the unknown element of a distinct act of creation' is assumed, with varieties 'community of descent is almost universally implied'.[121] In his questioning of the distinction between *variety* and *species* and his suggestion that there is no real difference between the two, Darwin extends the concept of common descent to all living beings, invalidating any notion of an independent origin of species and any belief in independent acts of divine creation. Referring to instances

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[118] Derrida, 'Différance', p. 11; my italics.
[119] Darwin, *The Origin of Species*, p. 350.
[120] Darwin, *The Origin of Species*, p. 349.
[121] Darwin, *The Origin of Species*, p. 41.

where taxonomists are unable to agree on whether a group of organisms constitutes a species or a variety, Darwin concludes that the distinction between the two terms is 'utterly vague and arbitrary'.[122] The term *species*, he goes on to explain, is 'one arbitrarily given, for the sake of convenience, to a set of individuals closely resembling each other', and therefore 'it does not essentially differ from the term variety'; a term which is, in itself, 'also applied arbitrarily, for convenience' sake'.[123] As Darwin himself acknowledges further on in the text, it follows as a matter of course that there can be no *essence* of species. Recognising the arbitrary nature of these terms, Darwin explains, frees us 'from the vain search for the undiscovered and undiscoverable essence of the term species', and, one might add, from the belief in some kind of essence or nature of species themselves.[124]

Darwin's analysis of the arbitrariness of these classificatory terms does not merely allow us to see how the *notion* or *concept* of species is contingent on the criteria used by taxonomists, it also suggests that there can be no fixed or immutable essence *of species as such*. The passages from *The Origin of Species* just discussed do not simply reveal a lack of consistency in the particular criteria and methods of analysis used by taxonomists (inconsistencies that may lead to the same group of organisms being classed as a species in one instance and a variety in the next). More importantly, they allow us to see how such groups of organisms are not endowed with any unique or particular essence that would absolutely distinguish them from one another. Rather than positing some absolute boundary between groups of organisms classed as different species, Darwin's criticism points to a simultaneous continuity and discontinuity, a sameness and difference, a repetition and re-articulation of the supplementary becoming of evolutionary processes that fracture the perceived boundaries between these supposedly distinct groups.[125]

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[122] Darwin, *The Origin of Species*, p. 42.

[123] Darwin, *The Origin of Species*, p. 46. A similar point is made by Jean-Baptiste Lamarck who argues in a text from 1809 that 'classes, orders, families, genera and nomenclatures are weapons of our own invention. […] We may […] rest assured that among her productions nature has not really formed either classes, orders, families, genera or constant species, but only individuals who succeed one another and resemble those from which they sprung' (Jean-Baptiste Lamarck, *Zoological Philosophy: An Exposition with Regard to the Natural History of Animals*, trans. by Hugh Elliot (Chicago: The University of Chicago Press, 1984), pp. 20-21).

[124] Darwin, *The Origin of Species*, p. 371.

[125] As Darwin himself acknowledges, one possible objection to the notion of the arbitrariness of species would be the question of sterility between species. If, as is generally believed, species cannot be crossed with one another, this may be perceived as an indication that each group is unique, its so-called *nature* or *essence* being incompatible with that of another. In *The Origin of Species*, however, Darwin explains that fertility or sterility 'is no safe criterion of specific distinction' and 'does not constitute a fundamental distinction between species and varieties when crossed' (pp. 225, 229). Darwin explains that there is no general or universal tendency towards sterility when crossing species, but rather a spectrum that runs from absolute sterility to full fertility depending on the individuals crossed. This becomes clear when one considers examples of reciprocal crosses between species, where the cross between the female of a species and the male of another, for example, is compared to the cross between a male from the former species and a female from the latter. Darwin explains that '[t]here is often the widest possible difference in the facility of making reciprocal crosses', proving therefore 'that the capacity in any

Whilst further qualifying how arbitrariness is at work in the classificatory system, Darwin invites us to imagine all the organisms that have ever lived as constituting a 'chain' or a series in which there are no absolute breaks or divisions. According to Darwin, 'if every form which has ever lived on this earth were suddenly to reappear', or, indeed, if we had access to a full geological record accounting for every type of being that has ever roamed the earth, 'it would be quite impossible to give definitions by which each group could be distinguished', although, of course, it would still be possible to observe a 'natural arrangement' between these different organisms based on the reproductive links between them.[126] What we would be faced with is not some greater number of clearly distinguishable species and varieties, but a series of 'interminable varieties, connecting together all extinct and existing forms by the finest graduated steps'; a series, that is, of individual 'differences blend[ing] into each other'.[127] Darwin's use of this particular phrase is significant as it points to the simultaneity of similarity and difference, continuity and discontinuity that the theory of 'descent with modification' implies. Rather than classifying organisms into distinct groups – each group being defined by a shared internal sameness and being distinguished from another on the basis of some perceived absolute difference – what Darwin allows us to see here is a continuity and discontinuity of similarities and differences that blend into one another without becoming indistinguishable from one another; similarities and differences that *repeat* and *supplement* one another across evolutionary time and space. Indeed, the theory of descent that Darwin puts forward in his writings is precisely a theory of the *preservation* and *accumulation* of modifications and differences, a theory of *inheritance* and *variability* in which differences are repeated, reiterated and replaced with one another in an interminable movement of supplementary becoming.[128]

Biotechnological Difference

The notion of the arbitrariness of species outlined above and, indeed, the concept of relational difference that appears to underlie Darwin's understanding of evolution, allow me to return (in the spirit of the linguistic and textual analogies used by Darwin himself) to Derrida's reading

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two species to cross is often completely independent of their systematic affinity, that is of any difference in their structure or constitution, excepting in their reproductive systems' (p. 216). The fact that certain species and varieties are able to be crossed with one another while others are not, and that certain female-to-male crossings are fertile while reciprocal crosses between the same two species may be sterile, proves that there is no absolute barrier or boundary of sterility between species. Species are at times unable to be crossed with one another not because of some immutable and fixed essence or nature that is incompatible with another, but merely because of specific differences to reproductive organs and systems.

[126] Darwin, *The Origin of Species*, p. 332.
[127] Darwin, *The Origin of Species*, pp. 275, 45.
[128] Darwin, *The Origin of Species*, pp. 357-360.

of the Saussurian notions of linguistic arbitrariness and differentiality introduced in my reading of the rudiment above. I referred at the beginning of this section to one particular comment made by Derrida in 'Différance' in which he explains that the differences observed in language – differences that endow words with meaning – should not be thought of as constituting some kind of essence or origin of signification, but must themselves be recognised as being *effects*. These differences, Derrida explains, 'have not fallen from the sky fully formed' like some divinely created species, but are the effects of a 'movement' of what he calls *différance*.[129] This comment allows me to link Darwin's conception of species to the description of linguistic difference provided in Derrida's reading of Saussure. In showing that species do not 'fall from the sky fully formed' and are not endowed with any intrinsic *nature* or *essence* that would distinguish them absolutely from one another, Darwin draws attention to the supplementary repetition of difference and sameness, of conjunction and disjunction that constitutes life; a supplementarity that can be understood, using Derrida's own description of linguistic difference and *différance*, as constituting 'a chain or […] a system' in which every entity always already 'refers to the other', a 'chain […] of nonsynonymous substitutions' that supplement one another.[130] As in Derrida's conceptualisation of linguistic difference, the differences between species and individual organisms that Darwin describes in *The Origin of Species* are not the result of some pre-existing intrinsic essence that defines them, but the effects of a more general movement of supplementarity, or what Derrida refers to in his essay as a spatio-temporal *différance* that differs and defers across time and space.[131]

In describing this *différance* as 'the playing movement that "produces" – by means of something that is not simply an activity – these differences, these effects of difference', Derrida may appear to suggest that this supplementary movement of the repetition of difference and sameness constitutes some *origin* or *cause* of difference; that it itself constitutes some sort of essence or origin of both language, and, in the context of my argument, life itself. But as Derrida clarifies, '[t]his does not mean that the *différance* that produces differences is somehow before them, in a simple and unmodified – in-different – present. *Différance* is the non-full, non-simple, structured and differentiating origin of differences. Thus, the name "origin" no

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[129] Derrida, 'Différance', p. 11.
[130] Derrida, 'Différance', pp. 11, 12.
[131] Derrida, 'Différance', pp. 8-9. This differential relationship is described by Derrida as one of 'temporization' and 'spacing' – the temporal and spatial differences by means of which a sign differs and defers from itself. Differing and deferring from itself within this system of differences, the sign is constituted through a supplementary relationship with that which it is not, deriving its meaning from a differential 'interval' that Derrida identifies as 'the becoming-space of time or the becoming-time of space (*temporization*)' (p. 13).

longer suits it'.[132] The 'effects' of difference that Derrida speaks of here are effects 'without a cause'[133] – the effects of an originary supplementarity, prostheticity or *différance* that is never present to itself as some 'organic, original, and homogeneous unity'.[134] The supplementarity of *différance* is a movement of deferral and difference that opens up the possibility of language without constituting its cause, its essence or its origin. *Différance*, therefore, *is* nothing, it 'is not', or, to quote Derrida's description of supplementarity in *Of Grammatology*, 'it has neither existence nor essence. It derives from no category of being, whether present or absent'.[135] In this sense *différance* may be thought of as a *becoming* of language, or, according to my reading of Darwin, the *becoming of life* – as an 'unfolding' of difference and sameness, repetition and variation that constitutes the possibility of life itself.[136] As Derrida himself acknowledges in his dialogue with Elisabeth Roudinesco in *For What Tomorrow…*, '[t]here is differ*a*nce (with an "a") as soon as there is a living trace [….] as soon as there is something living'.[137] It is this originary *différance* that 'put[s] into question […] the quest for a rightful beginning, an absolute point of departure', revealing, as I pointed out in my reading of Calvino's 'Mitosis' earlier, that 'what has the name *origin* […is] no more than a point situated within the system of supplementarity'.[138]

This supplementarity of origin or originary supplementarity is gestured towards in Darwin's discussions of the so-called *origin* of species. I suggested in the Introduction to this thesis that as a trace or a record of the past, the rudiment seems to promise some *return* to origin,[139] inviting us to track its development or its demise back in evolutionary time to the

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[132] Derrida, 'Différance', p. 11.
[133] Derrida, 'Différance', p. 12.
[134] Derrida, 'Différance', p. 13. As Derrida explains, *différance* and supplementarity are 'nonsynonymous substitutions' that supplement one another 'according to the necessity of the context' (Derrida, 'Différance', p. 12).
[135] Derrida, 'Différance', pp. 21, 6; *Of Grammatology*, p. 244.
[136] Derrida, 'Différance', pp. 22.
[137] Jacques Derrida and Elisabeth Roudinesco, *For What Tomorrow… A Dialogue*, trans. by Jeff Fort (Stanford: Stanford University Press, 2004), p. 21. The *a* of *différance* is significant within the context of my discussion above of silent orthographic traces. Derrida choses to signal the supplementarity of *différance* with an orthographic mark; the mark of the letter *a* that infiltrates the term *différance* making and marking a difference in writing that remains silent in speech. This orthographic mark that has no correlative in living speech does not mark *différance* itself – it does not identify, define or represent it as a signifier would a signified. Instead, in its difference and deferral from the *e* of *difference*, this silent letter should be thought of as opening up a space, a movement or a play of *différance*. Derrida describes this silent trace or mark as a 'lapse in spelling', a 'grave', 'mute', 'inaudible' 'graphic disorder' or 'discrete graphic intervention' that 'is read, or […] is written, but […] cannot be heard'. This *a* is precisely what 'cannot be apprehended in speech' (Derrida, 'Différance', p. 3) and is therefore comparable to the dead or silent letter of supplementary writing that Derrida describes in *Of Grammatology*. In its inaudible mark of substitution and supplementation that differs and defers from *difference* itself, the *a* of *différance* gestures towards the originary and prosthetic supplementarity that, according to Derrida, lies at the heart of all language.
[138] Derrida, 'Différance', p. 6; *Of Grammatology*, p. 243.
[139] See section titled 'Appendixes'.

primordial state of nascency out of which it must have evolved. But a comment made by Darwin in the second edition of *The Origin of Species* (an earlier edition to the sixth and final version that I quote from here), draws attention to the way in which, when perceived in the context of Darwin's own understanding of species and of evolution, the idea of some recoupable origin is necessarily problematised. In his attempts to distinguish between rudimentary and nascent structures, Darwin notes here that '[i]t is difficult to know what are nascent organs; *looking to the future* we cannot of course tell how any part will be developed, and whether it is now nascent'.[140] What this comment suggests is that there is no origin that can be said to be present in and of itself; origins are retroactively constructed out of the very same system of differences and deferrals that they are supposed to pre-empt. If one follows the path of the rudiment in the Darwinian text, tracking it back in time to its supposed point of origin, what one finds is not some self-present and self-contained germinal beginning – a fixed origin or essence out of which an organ, an organism, and a species can evolve – but a repetition of sameness and newness, of similarity and difference that always already supplements itself by being implied and implicated within another.

Despite the titles of his books, in both *The Origin of Species* and *The Descent of Man* (the first section of which is titled 'The Descent or Origin of Man'), Darwin does not attempt to shed light on the origin of either the human or other species. Despite Darwin's insistence in the final paragraph of *The Origin of Species* that the theory of natural selection reveals the 'grandeur' with which life was 'originally breathed into a few forms or into one', his analysis of the so-called *origin* of species reveals no such originary act of creation. Darwin's analysis of species does not posit some 'simple […] beginning' out of which 'endless forms most beautiful and most wonderful have been, and are being evolved';[141] it instead draws attention to the complex play or movement of supplementary becoming that constitutes natural selection. The question, as Darwin seems to suggest earlier in the text, is not one of 'single or multiple centres of creation' or points of origin,[142] but that of the movement of evolution itself. If there is an origin of species that can be identified in Darwin's work, it does not lie in a singular and self-present act of creation, but in the gradual and dynamic processes of evolutionary becoming described above.

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[140] *The Origin of Species by Charles Darwin: A Variorum Text*, ed. by Morse Peckham (Philadelphia: University of Pennsylvania Press, 1959), p. 709; my italics.
[141] Darwin, *The Origin of Species*, p. 374.
[142] Darwin, *The Origin of Species*, p. 283

To illustrate this point we may look at one of the examples given by Darwin himself: that of the English race-horse. Darwin argues that these horses 'differ from the horses of every other breed; but they do not owe their differences and superiority to descent from any single pair, but to continued care in the selecting and training of many individuals during each generation'.[143] This apparently innocuous observation about racehorses illustrates my point about origins. What Darwin suggests here is that any attempts to identify the origin of this breed are bound to fail because there simply is no singular and identifiable point of origin out of which this group of organisms may be said to have evolved. If there is an origin to speak of here, it lies in the repetition and reiteration of difference and sameness, or in the supplementary play of variation and inheritance that constitutes evolutionary change. That this breed is the result of artificial rather than natural selection is irrelevant. What this example allows us to see is a fractured origin of evolutionary becoming, an origin of continuity and discontinuity that *is not an origin* because it is necessarily always already implied in another. As Elizabeth Grosz explains in her own reading of Darwin, within the network of variations and modifications described in this theory of natural selection, '[t]he origin can be nothing but a difference',[144] or, as I suggest here, nothing but supplementary *différance*.

In the concluding paragraph of *The Origin of Species*, Darwin uses the image of a 'tangled bank' teeming with different life forms to impress upon the reader the interconnectivity of all species and the complexity of evolutionary life. Darwin invites the reader to contemplate a bank 'clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth', so as to reflect upon 'these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner'. These relationships of difference and interdependence, of simultaneous connection and disjunction, are, according to Darwin, the result of 'laws acting around us' – laws of 'reproduction' and 'inheritance', 'variability' and 'divergence'[145] that draw attention to the reiteration of sameness and difference that constitutes the becoming of life. According to the critic John Glendening, the tangled bank invoked by Darwin in this passage represents a complex 'network of interdependencies'.[146] But, beyond this, I argue, it also points to the continuous but also disjunctive movement of the

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[143] Darwin, *The Origin of Species*, p. 283.
[144] Grosz, *The Nick of Time*, p. 21.
[145] Darwin, *The Origin of Species*, pp. 373-374.
[146] John Glendening, *The Evolutionary Imagination in Late-Victorian Novels: An Entangled Bank* (Aldershot: Ashgate, 2007), p. 9.

supplementary *différance* of life and evolution that always already repeats and reiterates itself anew in every organ, every organism and every species.

It is this movement and play of supplementary *différance* that I posit here, following my discussions of originary technicity and prostheticity earlier on in this chapter, as constituting the originary biotechnicity of life and of nature. In my discussion of Darwin's description of the rudiment as a 'dead' and 'silent' textual supplement to the living, breathing body, I suggested that the prostheticity implied by this conception of the vestigial organ does not come to be added onto the body or onto nature as a whole as some external or prosthetic *techne* that is opposed to *phusis*; this prostheticity is rather that which is inherent and intrinsic to the supposed naturalness of the body and of life. As a record or a mark of evolutionary becoming that is supposedly left behind in the body, the appendix and other rudimentary organs point to a general structure of supplementarity and prostheticity that is inseparable from life itself and from the different forms of becoming that constitute it.

Earlier in this chapter I looked at how the relationship between living beings and their inert environments, and, indeed, the symbiotic or symbiogenetic relationships observed between different organisms, might be thought of in terms of a biotechnological becoming that allows a living being to evolve with and within that which is supposedly other to it. What the rest of this chapter has shown is that this biotechnicity is not limited to processes of becoming that involve what we may think of as external matter or even external beings. What my analysis of the Darwinian notion of evolution gestures towards is a biotechnicity that constitutes the very movement of life itself; a becoming of life and evolution that is always already different and supplementary to itself, a repetition and reiteration of difference that always already creates itself anew in this very repetition. It is this internal movement of otherness, of difference within sameness and sameness within difference, that constitutes this biotechnicity and draws attention to the supplementarity of biological *origin*, of biological *creation* and, indeed, of *bios* itself.

Conclusion

Appendices

> The point is […] that of knowing […] if it is possible to distinguish without opposing. Can a difference be thought that would not be an opposition? […] the thinking of *différance* attempts to avoid opposing differences by thinking itself *qua* the unity of their movement, by installing itself at the heart of becoming: becoming other.
> BERNARD STIEGLER, *Technics and Time, 1*

> When we speak of the property of the living or of the body, […] or of what is properly human – if we do not recognise in that which is *proper*, and proper to the human in particular, a certain indeterminability and a certain capacity to dispropriate itself or to expropriate itself – we will also be able to justify, in the name of what is "properly human," thinking we know what this is, the programmable reproduction of the identical to infinity, excluding mutability, progress as well as history….
> JACQUES DERRIDA, 'The Aforementioned So-Called Human Genome'

Appendicology

I suggested in the Introduction to this thesis that an appendicology can provide us with a productive way of thinking the relationship between the human, technology and the so-called natural world, allowing us to see how each of these supposedly distinct entities can only ever be thought of in relation to the others. As I have shown, an appendicology draws attention to the play of supplementarity that structures these relationships, a supplementarity that prevents these entities from being merely *opposed* to one another, and, equally, from being *conflated* with one another. Rather than a mere opposition or a mere identification, a singular divisive difference or a unified sameness, this appendicology invites us to think the implication of the one in the other; to think a conjunction and disjunction of sameness and difference that fractures the perceived boundaries between the human, nature and technology, breaking them down while also multiplying them infinitely in the process. The fracturing and fragmenting of these supposedly singular boundaries reveals disjunctive continuities and ruptured conjunctions of mutual and supplementary becomings between the human, technics and nature; evolutionary processes that implicate so-called natural, technological, human and animal bodies in one another, showing them to be always already constituted with and within that which is supposedly external to them.

It is in its specific concern with the corporeal motifs of the *appendage* and the *appendix* that the appendicology I have begun to conceptualise in this thesis allows us to think these

boundaries and these processes of becoming. As external parts that extend outwards from the body, corporeal appendages may seem supplementary to the body proper and may even appear to constitute quasi-prosthetic adjuncts comparable to the external technological implements and tools that the human supplements itself with. But, as we have seen, in their very corporeality, these appendages and the technological relationships that they seem to naturally gesture towards, reveal a play of supplementarity that interrogates any simple distinction between the inside and the outside, the part and the whole, implicating the supposed exteriority and prostheticity of corporeal and technological appendages within the perceived natural interiority of the human body and the human self. It is in this sense that the appendage may be said to point to the evolutionary, or, better still, co-evolutionary processes of becoming that constitute both the human and technics. As I have shown in my readings of Samuel Butler, Karl Marx, Frederick Engels, and André Leroi-Gourhan in Chapter One, thinking the relationship between the human and technics through the motif of the corporeal and the technological appendage allows us to see how the evolution of the human species is necessarily linked with the evolution of technology, both being intimately intertwined in one another, each supplementing and being in turn supplemented by the other. Perceived through the notion of this process of mutual becoming, the human and technics are shown to be implied and implicated with and within one another *from the very beginning*, or, perhaps even, from *before* the very beginning, each creating and being created in the other through a movement of becoming that appears to pre-empt them both.

The evoking of this evolutionary relationship between the human and technology and the theoretical paradigm of originary technicity that it implies, raises the question of origins: the supposed origin of the human in its evolution from the animal, and, indeed, the perceived origin of technics in the human or, perhaps even, in the animal. As I have shown in the preceding chapters, this question of origin can be misleading as it seems to posit the existence of a singular and absolute beginning, a singular moment of creation, or even an absolute division or rupture in the evolution of life in which the human and technics come into being. As I suggested in my discussion of evolutionary becoming in Chapter Three, rather than constituting such a singular division or rupture, a moment of creation or an identifiable beginning, the so-called origin of the human, of technics, and indeed of all other forms of life and being, lies in a supplementary play of continuity and discontinuity, a repetition, reiteration and reproduction of sameness and difference, inheritance and change, that prevents us from positing a beginning or a moment of creation that does not always already arise out of and refer back to another. The question of origin is useful precisely because it highlights how any discussion of the relationship between

the human and technology is necessarily also a discussion about the relationship between the human species and the rest of the so-called natural world, as well as a discussion about the relation between nature and technics more broadly. What it allows us to see is that in order to recognise the supplementarity of the human and technics, one must consider how this relationship is itself embedded within and related to other supplementary processes of becoming that extend beyond the human to other forms of life.

It is here that, as I have shown, the motif of the corporeal *appendix* proves productive. In its supposed lack of corporeal function, the appendix may appear to constitute a foreign entity within the body: a vestigial relic or remnant that points to an absent past; a dangerous and perhaps even parasitic organ that lies waiting within its unsuspecting host; or even, as is suggested by the textual analogies used by Darwin in *The Origin of Species* and *The Descent of Man*, a dead and mute textual trace that infiltrates the heart of living speech. Referring back to a different time and different corporeal states, these organs do not appear to belong to the bodies that host them but to the other living bodies they once functioned within. Read in this manner, the appendix and other vestigial structures (or what Charles Darwin refers to, as I discussed in detail in Chapter Three, as *rudimentary* structures) appear to constitute organs of otherness; organs that, despite being located deep within the body, seem to supplement it from without (or from before) like some external prosthesis. But it is precisely in their supposed prostheticity and exteriority to the body – in their apparent deferral and referral to other evolutionary times and other corporeal states – that such rudimentary organs draw attention to an originary supplementarity that extends to all living beings and to so-called life itself. As I showed in my reading of the rudiment and of the concept of species in Chapter Three, in pointing back to a different evolutionary time and state, the rudiment draws attention to the repetition of difference and sameness, the continuity and disjunction of evolutionary becoming that constitutes life and the living; a becoming in which every organ and every organism, every part and every whole, every perceived inside and outside, is always already implied in every other.

Différance Differed/Deferred

By drawing a link between the evolutionary relationship shared by the human and technics and other relationships of supplementary becoming observed in the so-called natural world, this appendicology has invited us to think the play and movement of evolution in terms of an *originary biotechnicity* that extends far beyond the human and human forms of technology. In

its similarity to but also its distinction from the critical notion of *originary technicity*, the term *originary biotechnicity*, as I use it here, draws attention to the ways in which the play of supplementarity that structures the human relationship with technics appears to be repeated and re-articulated in other forms of becoming that do not involve either the human or what would commonly be thought of as technological objects or entities. This repetition and re-articulation of supplementarity should not be taken to constitute a *sameness* and should not be used to conflate the human with the animal, or human forms of technicity with nonhuman processes of evolutionary becoming. As I pointed out in my analysis of the writings of Lynn Margulis and Dorion Sagan in Chapter Three, such a conflation of the human with other animals and organisms results in an anthropomorphising of the natural world and the positing of anthropocentric paradigms of human selfhood, agency, intentionality and mastery where there are none. Rather than constituting a sameness, the parallels or links between the human and the nonhuman gestured towards in the use of the term *originary biotechnicity*, should be thought of as conjunctive and disjunctive *re-articulations* of difference and sameness[1] that create and re-create themselves anew in every singular movement of becoming. What an appendicology reveals is neither an *opposition* nor an *identification* of the so-called human with the nonhuman, but a supplementarity that fractures and fragments these oppositions and identifications and the singular and binary paradigms that they rely on.

In its conceptualisation of this dis/conjunctive movement of supplementarity that simultaneously relates and distinguishes different forms of life and becoming from one another, this appendicology recalls Bernard Stiegler's interpretation of the Derridean logic of the supplement and of *différance* in his own discussion of the relationship between life and technicity. In *Technics and Time, 1*, Stiegler explains that Derridean *différance* 'describes the process of life of which the human is a singular case, but only a case'.[2] This is elaborated on in the second volume of this work where Stiegler explains that '[t]he logic of the supplement is the *différantial* logic of already-formed matter' that 'takes on the appearance of the living organism'; or alternatively, 'a process of differentiation by which life proceeds by other means than life'.[3] The supplementarity of the human relationship with technics appears here to constitute one particular 'articulation', 'stage' or 'passage' in a continuous movement of

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[1] As I noted earlier, the term *articulation* itself points to both a *division* into parts and a *joining* of multiple parts (see Chapter Three, footnote 57).

[2] Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus*, trans. by Richard Beardsworth and George Collins (Stanford: Stanford University Press, 1998), p. 136.

[3] Bernard Stiegler, *Technics and Time, 2: Disorientation*, trans. by Stephen Barker (Stanford: Stanford University Press, 2009), pp. 4, 6-7.

différance, an instance or an example of the differentiation inherent to life itself. But Stiegler also goes on to refer to this supplementarity of the human and technics as a 'rupture' that cannot be equated with or reduced to 'the classic divide between humanity and animality', but that continues to constitute a 'break' nevertheless. Composed of both a continuation and a break, a passage and a rupture, Stiegler describes the evolution of the human in technics and technics in the human as 'the différance of this différance' of life in general;[4] as *différance* differing and deferring from itself, reproducing itself anew in dis/conjunctive repetitions and rearticulations that are always already singularly different in their sameness and similar in their differences.[5]

It is this uneasy conjunction and disjunction of simultaneous 'non-difference' and 'difference'[6] between the human and the so-called natural world, and between human technicity and nonhuman forms of supplementary becoming, that this appendicology and its discussion of originary biotechnicity has sought to interrogate. As I stated in the Introduction, in its questioning of the perceived boundaries and oppositions between the human and technics, the human and the animal, and, indeed, nature and technics, this project has not sought to collapse or negate the differences between these terms, but rather to fragment and multiple them so as to then perceive them outside of these oppositions and these singular distinctions. In its reading of theoretical, literary and scientific texts through the corporeal motifs of the appendage and the appendix, this appendicology has shown how, to quote Derrida, '[t]here is not *one* opposition between man and non-man'. Instead, as Derrida explains and as I have shown in the previous chapters, 'there are, between different organizational structures of the living being, many fractures, heterogeneities, differential structures' that repeat and reiterate themselves anew in every singular movement of the becoming of life and the living.[7] It is the

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[4] Stiegler, *Technics and Time, 1*, pp. 137-141.

[5] The simultaneous continuation and rupture of the *différance* of *différance* that Stiegler describes here may be thought of in terms of what Derrida refers to in a slightly different context as the 'interruption' of *différance*. Derrida explains that '[a]n interruption involving differ*a*nce is both reinscribed into the economy of the same and opened to an excess of the wholly other' (Jacques Derrida and Elisabeth Roudinesco, *For What Tomorrow… A Dialogue*, trans. by Jeff Fort (Stanford: Stanford University Press, 2004), p. 40). For a more extensive reading of Derrida by Stiegler and more on the (dis)continuous rupture of supplementarity discussed above, see Bernard Stiegler 'Derrida and Technology: Fidelity at the Limits of Deconstruction and the Prosthesis of Faith' in *Jacques Derrida and the Humanities: A Critical Reader*, ed. by Tom Cohen (Cambridge: Cambridge University Press, 2002), pp. 238-270.

[6] In *Technics and Time, 2*, Stiegler suggests that '[t]here is différance before as after the anthropological rupture [*coupure*], a there that, however, is no longer "after" as "before," an "as" that is the possible understanding of both a non-difference and a difference between human and animal' (p. 157). This highly ambiguous statement points to a continuity of *différance* that extends across the so-called 'anthropological rupture' between the human and the animal; a continuity, however, that appears to also be discontinuous and that is constituted by a simultaneity of difference and non-difference.

[7] Derrida, *For What Tomorrow…*, p. 66.

continuous discontinuity or discontinuous continuity of this becoming that the appendicology I have developed here allows us to see.

Reading and Writing Life

Making the case for a thinking of *originary biotechnicity* that recognises the 'complex' and 'historic' relationship that always already links *bios* and *techne* together, David Wills argues in *Dorsality* that if we are to engage in productive debates about the future of the human and technology, we must 'investigate what shifts of terrain might occur once we take the technological turn back to a place behind where we traditionally presume it to have taken place, turning back around behind us from the start'.[8] If we are to reconfigure the terms of contemporary debates about the future – debates that are often dominated by essentialist understandings of what constitutes the human and technology – we must not only turn back to consider the evolutionary relationship of mutual becoming shared by the human and technics but we must also, as I have done in this thesis, turn our attention to the biotechnicity of life, nature and evolution. It is this figurative 'turning back' to the biotechnological articulations of life – articulations that extend beyond the human and its relationship with technics – that, according to Wills, will allow us to engage critically and productively in debates about the future of the human species. This turning back, as the above-quoted passage suggests and as I have shown in my discussions of the question of origin, does not and cannot constitute a simple return or some mere quest for an origin or a beginning. Instead, this is a turning back that *turns back on itself* and on the temporality that it implies[9] always already articulating and re-articulating itself from (before) the very beginning.

Many contemporary debates about the supposed biotechnological future of the human are dominated by a tendency towards essentialism. Whether this manifests itself as an 'anxiety over presumed incursions of the machine within the human' and a desire to insulate and protect the perceived unity and integrity of the human from some prosthetic otherness,[10] or, conversely, as an eagerness to perfect, enhance and strengthen some so-called human nature through biotechnological interventions that promise to transform the human species into a better version

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[8] David Wills, *Dorsality: Thinking Back through Technology and Politics* (Minneapolis: University of Minnesota Press, 2008), pp. 5-6.
[9] Wills goes on to suggest that 'when it comes to the human machine, to technology in and of the space of the human (back), directional "indifference" comes back into play as a function of time, conceptions of soon and later, present and future. The relation to technology is […] a complicated – even reversible or indifferent – relation to time. […] the invention of the technological relates to the past as much as to the future in this particular sense: it is a relation to past time and to the function of memory' (*Dorsality*, pp. 9-10).
[10] Wills, *Dorsality*, p. 6.

of whatever it believes itself to be,[11] the notion of an integral essence or nature of the human remains unquestioned. Although these two positions may appear to be clearly opposed to one another, both nevertheless rely on and perpetuate the idea of some singular human essence that should be either preserved or enhanced. Whether they promise to protect or to perfect, both sides of the debate assume that there is, in the first place, some inherent human essence that can and should be either protected or perfected.

It is this essentialism that the appendicology I have developed in this thesis can help us address by offering a non-essentialist paradigm with which to think the relationship between life, technics and the human. To reiterate what is at stake, I will end, by way of an example, with a discussion of the issue of genetic engineering and the possible biotechnological enhancement of the human that it seems to imply. In my discussion in Chapter Three of the general tendency in contemporary biology for the human genome to be perceived and described as a textual entity, I drew attention to the image used by the popular science writer Matt Ridley: that of the genome as the 'autobiography' of the human species. According to Ridley, the genome constitutes a 'record, written in gentish, of all the vicissitudes and inventions that had characterised the history of our species and its ancestors since the very dawn of time'.[12] A similar metaphor is used by the Nobel Prize winning biologist and geneticist James Watson who, in his book *DNA: The Secret of Life*, describes the genome as 'the instruction book of human creation'.[13] According to both these metaphors, the genome constitutes a textual record of the past that can be read and analysed; a record that, as it is interpreted by both Ridley and Watson, appears to reveal some kind of essential *truth* about human evolution, human life and so-called human nature. Such essentialist understandings of both the human and the genome serve to reproduce and reaffirm conventional assumptions about the human, and are also used, in the case of Watson's text, to legitimise and naturalise the notion of genetic engineering. It is this essentializing of the human, the genome and the notion of biotechnological enhancement that I address here.

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[11] As Michael Hauskeller shows, human enhancement projects are not merely intended to improve particular human qualities or abilities but to perfect and enhance 'the human being as such, that is, the human *as* a human' (Michael Hauskeller, *Better Humans? Understanding the Enhancement Project* (Durham: Acumen, 2013), p. 1). In this sense, as R. L. Rutsky points out, '[t]here is […] nothing *inherently* posthuman about technological or genetic enhancements of the human body. As the very notion of enhancement suggests, these sorts of changes continue to take 'the human' as a starting point. They are, in other words, merely an extension of the human, for they maintain and in fact *reinforce* the traditional conception of the human as an autonomous subject, defined by its mastery over the object world' (R. L. Rutsky, 'Mutation, History, and Fantasy in the Posthuman', *Subject Matters: A Journal of Communication and the Self*, 3:2/4:1 (2007), 99-112 (p. 105)).
[12] See 'Reading the Rudiment' in Chapter Three; Matt Ridley, *Genome: The Autobiography of a Species in 23 Chapters* (London: Fourth Estate, 2000), p. 4.
[13] James Watson and Andrew Berry, *DNA: The Secret of Life* (London: William Heinemann, 2003), p. 404.

In his book, Ridley explains that reading the genome of the species – this 'record of our history' written in the so-called language of DNA – will 'tell us more about our origins, our evolution, our nature and our minds than all the efforts of science to date'.[14] Ridley goes on to provide his own reading and interpretation of this genomic record and the secrets it supposedly reveals. In so doing, he projects his own particular conceptions of the human and human nature onto chromosomes and genes, essentializing both the human and the genome in the process.[15] Indeed, Ridley relates every chapter in his book and, more importantly, every chromosome in the human genome, to some supposedly universal 'theme' of human nature, including, for example, intelligence, self-interest, memory, politics, and free will.[16] Consequently, rather than constituting a history or a 'tour' of the genome as Ridley suggests,[17] this book appears to tell a story of human nature that reflects, reproduces and projects Ridley's own assumptions about the human onto the genome. As Judith Roof puts it, the 'individual traits', 'social concerns' and 'life themes' that Ridley uses to structure his chapters and to identify each individual human chromosome, 'constitute both the physics and metaphysics of twentieth-century Western humanity'.[18] If the genome constitutes for Ridley a textual record of human life and human history, the story that it is made to tell in his own text is one that confirms and reproduces classic metaphysical conceptions of what constitutes the nature and essence of the human. In this sense, the genome functions here as a kind of *anthropological machine* as conceived of by Giorgio Agamben and as discussed in my analysis of contemporary science fiction in Chapter Two; it serves as a conceptual tool that the human uses to reassert and reinforce its own understanding of itself.

Ridley's overt projection of so-called human 'themes' onto human chromosomes draws attention to a tendency in discussions of the genome and, as I show here, debates about human genetic engineering, to essentialize both the human and the genome itself. In *DNA: The Secret of Life*, Watson presents the genome as a record of the past, an 'instruction book of human creation' that when read and analysed grants us access to some essential truth about human

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[14] Ridley, *Genome*, pp. 22, 5.

[15] It is as a result of such essentilizing metaphors that, as Judith Roof points out, despite the multiplicity of genomes and the uniqueness of every individual human genetic code, we continue to speak of *a* genome and of the existence of *the* human genome 'as if it is the genotype for everyone', or as if it were, so to speak, some kind of blueprint or model of the human in general (Judith Roof, *The Poetics of DNA* (Minneapolis: University of Minnesota Press, 2007), p. 95).

[16] Explaining the rationale behind this, Ridley describes how when coming up with the idea for his book he simply 'wrote down a list of the twenty-three chromosomes and next to each […] began to list themes of human nature' (Ridley, *Genome*, p. 4).

[17] Ridley, *Genome*, p. 9.

[18] Roof, *The Poetics of DNA*, p. 84.

nature.[19] It is this supposed truth that, in Watson's eyes, can help resolve contemporary debates about the potential dangers and benefits of human genetic manipulation. In the final chapter of his book, Watson suggests that the debate surrounding these issues hinges on a fundamental misunderstanding about what constitutes the human and so-called human nature. Fear over the implications of genetic engineering is equated by Watson with a concern over the supposedly ingrained selfishness of human nature, while his own endorsement of human genetic manipulation is linked to a belief in some kind of intrinsic human goodness. '[M]uch of the public paranoia surrounding the dangers of human genetic manipulation', Watson explains, 'is inspired by a legitimate recognition of our selfish side – that aspect of our nature that evolution has hardwired to promote our own survival, if necessary at the expense of others'. But, he continues, 'such a view recognizes only one side of our humanity'. In distinction to this one-sided view, Watson posits his own supposedly more complete and comprehensive conception of humanity:

> If I see the consequences of our increasing genetic understanding and knowhow rather differently, it is because I acknowledge the other side as well. Disposed though we might be to competition, humans are also profoundly social. Compassion for others in need or distress is as much a genetic element of our nature as our tendency to smile when we're happy.[20]

In Watson's view, fears over the future of genetic engineering are the result of an incomplete understanding of human nature; a nature that appears here, despite all of its contradictions and incongruities, to be hardwired into our genes. One need only look closer at the genome, at 'the truth revealed by DNA', Watson suggests, for these fears to be quelled. It is not in our 'selfish side' that the essence of human nature lies, but rather 'in that impulse which promotes our caring for one another' and which 'has permitted our survival and success on this planet'. Adopting a distinctly religious tone despite his self-proclaimed atheism, Watson quotes from Paul's first letter to the Corinthians and goes on to claim that 'the essence of our humanity' lies in the human capacity for love, a characteristic '[s]o fundamental […] to human nature that', Watson postulates, it must be 'inscribed in our DNA'. '[L]ove', Watson goes on to claim, 'is the greatest gift of our genes to humanity'.[21]

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[19] Watson and Berry, *DNA*, p. 404. In the Introduction to his work, Watson appears to take issue with the notion of some 'magical, mystical essence' of life and explains that the 'secret' referred to in his title should not be understood as constituting 'something divine at the heart of a cell that brings it to life'. Instead, he argues, what this secret reveals is that there is no such essence, that life is 'the product of normal physical and chemical processes'. The 'message' of DNA, Watson adds, 'is downright prosaic: life is simply a matter of chemistry' (pp. xii-xiii). But, as I show here, Watson's dismissal of the notion of essence only seems to apply to his understanding of life and not his conception of the human.
[20] Watson and Berry, *DNA*, pp. 397-398.
[21] Watson and Berry, *DNA*, pp. 404-405.

There are a number of points that I would like to make here. Firstly, in these passages, Watson essentializes the human by presenting his own notion of some benign and loving nature as the universal nature of humankind. Secondly, he locates this supposed essence in the genome, suggesting that human beings are genetically hardwired to love and to care for others. This lends legitimacy to his essentializing of the human and also appears to essentialize the genome itself. As the repository of this human nature, and this is my third point, the genome is itself presented as constituting the essence of the human, bestowing the gift of human nature onto the species. If, as Watson suggests in these final paragraphs, DNA can indeed be perceived as an 'instruction book' that 'may well come to rival religious scripture as the keeper of the truth',[22] then the so-called truth that it is made to proclaim here is that of a knowable and identifiable human essence. It is this supposed essence that Watson uses to justify and legitimise his stance on genetic engineering. Human genetic manipulation, Watson argues here, will be used as a force for good because humans are themselves genetically predisposed to do good; it will allow human beings to exercise and fulfil their 'desire to see others (and therefore [...] society) do well' and might even provide the human species as a whole with the opportunity to enhance and strengthen the very genes that make the human *human* and, according to Watson, *humane*.[23]

The use of such essentialist arguments in debates about the genome and genetic engineering can be counteracted through the appendicology developed in the preceding chapters. In both Ridley's and Watson's texts the genome is described, using various textual metaphors, as some kind of autobiography or textual record of the past. As it is read in their respective texts, the genomic record of the human species promises to reveal some inherent and intrinsic essence of the human, a universally-shared human nature that is hardwired into our genes. But read through an appendicology, these same textual analogies point to a very different understanding of the human and of nature. As indicated in my readings of the motif of the rudiment and of the concept of species in Chapter Three, the conceptualisation of the body and of the genome as a textual record of an evolutionary past draws attention to the way that all living structures, organisms and species are always already constituted by movements of supplementarity and *différance*[24] that necessarily problematise any appeal to some kind of essence of either the human, the genome, or life itself.

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[22] Watson and Berry, *DNA*, p. 404.

[23] Watson and Berry, *DNA*, pp. 398, 405.

[24] In *Of Grammatology*, Derrida links the tendency in contemporary biology to speak of 'writing and the *program* in relation to the most elementary processes of information within the living cell' to the notion of a more general arche-writing or a structure of supplementarity that, as he notes elsewhere, 'inhabits the very moment of

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Perceived through such an appendicology, it is not genetic engineering *per se* that appears problematic or threatening, and neither, for that matter, any social resistance towards it. What does appear to be problematic, however, is the essentialism that can be observed in such debates; an essentialism that can be used to both legitimise and to renounce genetic engineering in the name of some supposed human nature. If, as I propose in this appendicology, it is the play or movement of supplementary becoming that constitutes life and the living, a re-articulation of sameness and difference that always already differs and defers from itself, then what should be of concern here is any essentialist gesture that attempts to reduce this becoming to a knowable and controllable repetition of sameness, or to the reiteration and reassertion of some preconceived difference. Regardless of whether this gesture is made in the name of human enhancement or in an attempt to protect the human from the perceived threat of biotechnology, it remains, in both instances, bound to what Derrida refers to as the 'terrible logic' of the similar and the dissimilar that essentializes the human while opposing it to its supposed other.[25] As Derrida goes on to argue in the passage used as an epigraph to this Conclusion, 'if we do not recognize in that which is *proper*; and proper to the human in particular, a certain indeterminability and a certain capacity to dispropriate itself or to expropriate itself' – if we do not, that is, recognise the play of supplementarity that constitutes the human and life in general and we instead continue to reproduce and reassert essentialist notions of the human and of life – then 'we will also be able to justify […] the programmable reproduction of the identical to infinity'. It is this essentialist reproduction of a self-sameness – a self-sameness that is opposed to some perceived difference – that, whether through genetic engineering or through a resistance to it, threatens, as Derrida himself suggests, to delimit the 'mutability', contingency and indeterminacy of life and, with it, any possibility of so-called 'progress'.[26]

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life' (Jacques Derrida, *Of Grammatology*, trans. by Gayatri Chakravorty Spivak (Baltimore: The Johns Hopkins University Press, 1997), p. 9); 'Nietzsche and the Machine', trans. by Richard Beardsworth, in *Negotiations*, ed. Elizabeth Rottenberg (Stanford: Stanford University Press, 2002), pp. 213-256 (p. 244)).

[25] In his own discussion of the so-called human genome and the possibility of human genetic engineering, Derrida shows how 'one can, in the name of the similar, authorize both the eugenic reproduction of the same and that which opposes all eugenics', while equally, 'in the name of difference and the dissimilar, one can just as well justify the respect for alterity or singularity as a discriminating hierarchy or selective programming'. 'The logic of the similar/dissimilar', Derrida goes on to argue, 'is a terrible logic; it demands, in any case, that we not hold ourselves to any simple opposition here between the similar and the dissimilar' ('The Aforementioned So-Called Human Genome', in *Negotiations*, trans. and ed. by Elizabeth Rottenberg (Stanford: Stanford University Press, 2002), pp. 199-214 (p. 207).

[26] Derrida, 'The Aforementioned So-Called Human Genome', p. 212.

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