THEORY IN THE
NEW HUMANITIES

# Visceral Prostheses

## Somatechnics and Posthuman Embodiment

Margrit Shildrick

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# Visceral Prostheses

## Somatechnics and Posthuman Embodiment

**MARGRIT SHILDRICK**

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Acknowledgements are often slippery things, necessarily as incomplete, indeterminate and open-ended as any postmodernist would wish. A passing remark from a random encounter may be as influential as the most intensive academic engagement. Every book is an assemblage of planned and irregular inputs, and I hope the emergence of the quasi-finished product will strongly resonate with at least some of the multiple contributors. Given the difficulty of assigning any weight to individual influence, and the exclusionary nature of lists, I am keeping names to a minimum and begin at the more formal end of the scale.

The research that underlies *Visceral Prostheses* has been several years in the making, but a personal grant from the Swedish Riksbankens Jubileumsfond enabled me to explore how I might put it all together in a coherent form. The success of that application owes much to Silje Lundgren at my original base of Linköping University. A later grant from the KONE Foundation competed the book project. I have also been very fortunate in having two recent fellowships – one at the Humanities Research Centre, Australian National University and the other at the Helsinki Collegium for Advanced Studies – both of which provided a forum for rigorous discussion and critique. My affiliation to Stockholm University as a Guest Professor was negotiated by Lisa Käll, who has become not only a good friend (and thank you too to Ossian Käll for his hospitality) but is also an inspiring scholar of phenomenology. Lisa and I are both committee members of the Nordic Network for Gender, Body, Health, another source of valuable explorations. My longest lasting research commitment has been with the brilliant collaborative Canadian/UK team that formed to research the manifold dimensions of heart transplantation. Everyone played a crucial part, but I'm especially grateful to Pat McKeever for her foresight in cementing an unlikely transdisciplinary alliance and to Heather Ross and Susan Abbey for taking the risk of stepping beyond their clinical reputations. Thanks are also due to all those people who invited me to speak at conferences and seminars worldwide, and to all the attendees who asked provocative questions or shared their own observations, as have the many students I have taught or supervised. I often feel like a magpie collecting shiny fragments (though the good scholar in me is compelled to acknowledge that the ornithological myth has been debunked). So many things trigger a new productive thought.

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# Introduction

The question of prostheses – as interventions into human embodiment – has occupied both philosophical and cultural enquiry throughout the last two centuries offering both the promise of improvement and the intimation that there is something strangely inhuman and negative about the use of such supplements. That fundamental ambivalence was powerfully captured in Sigmund Freud's dictum that man has become a kind of prosthetic god (1961: 39), by which he meant that the technology contemporary to his own day had enabled the human race to acquire superhuman qualities that enhanced an already-exceptional status. The self-extensiveness of that godlike character did not, however, ensure happiness for human beings, according to Freud, but rather signalled something troubling. In the twenty-first century, we might no longer aspire to godlike status, but dreams of a *transhuman* futurity remain strong and still rely on the logic of prostheses, in which material supplements, advanced technologies and digital media (Foster 1997) allow us to imagine an enhanced, even perfected, state of human being. With fleshy limitations and vulnerabilities overcome and individual life extended, perhaps indefinitely, the promise outlined by the most optimistic proponents of transhumanism is at the same time unwelcome and unsettling to many, who wish to see a move away from the dimensions of human life as it is currently conceived. The alternative – and it is central to the explorations of this text – is an embrace of a *posthuman* future that instead of seeking to supplement and transcend the existing order prefers to uncover the multifarious ways in which embodiment already exceeds its established boundaries and meshes with non-human entities.

In the postmodern era, the interface of bodies, biologies and technologies increasingly challenges not only normative embodiment, but also the very understanding of what counts as human. And I emphasise 'what' here rather than 'who' to indicate that the posthuman no longer lines up human selfhood and human biology as the only facets that count. The deployment of prostheses, both inorganic and more significantly organic, is one major area which demonstrates how embodiment can be varied such that the usual markers of human being – bounded bodies, unique DNA, an enduring sense of self – can no longer be taken for granted. We are already familiar with the ways in which prosthetic technologies,[1] both external and internal to the body, have been utilised in relation to people with disabilities, and by those undergoing organ transplantation who may also experience mechanical aids prior to obtaining an organic prosthesis. What is less well-recognised is that research in the biological sciences indicates that each of us carries a variety of non-self, effectively prosthetic, cells and sub-cellular forms of life from multiple sources. Where prostheses once simply marked rehabilitation to normative practice or appearance, they now indicate transformative possibilities that both limit and extend the nature of the embodied self. *Visceral Prostheses* looks at the challenge to the Western understanding of the human that comes from those bodies that should be understood not as irregular forms of normative embodiment, but as the more visible cases of a common experience. The text engages with recent continental philosophy and feminist theory to open up the significance of prostheses in revaluing multiple variant forms and in thinking human and multispecies transcorporeality as the very condition of life.

Before outlining the way in which I shall problematise the conventional form, and then reimagine the technology and logic of prostheses, it is important to look at the recent history in which that technology has developed. Clearly the use of mechanical aids to human capabilities stretches much further back – one thinks of the many images of disabled people using wooden peg-legs, for example, or the discovery of prosthetic toes in ancient Egyptian tombs (Finch 2011) – but in the modern Western era public familiarity with many prosthetic apparatuses seems to have surged during and after the widespread bodily mutilations occasioned during the American Civil War. As enhanced anaesthetic techniques developed to preserve life, the need for reparative devices to rehabilitate wounded veterans – an estimated 60,000 men lost limbs alone in the war (Riordan 2004) – was met by a US government program named the ‘Great Civil War Benefaction’ which committed to provide all combatants disabled in battle with prosthetic aids (Hasewaga and Schmidt 2012). The financial incentive led to an acceleration in the design, production and use of artificial limbs, a development that was widely recognised and to an extent sentimentalised through the dissemination of the visual images fostered by glass-plate photography made available for public consumption. To the present day, armed conflict and war have remained among the primary drivers of prosthetic technologies,[2] with governmental-funded organisations like DARPA (Defense Research Projects Agency) and its *Revolutionizing Prosthetics* initiative for upper limb injuries, or the *Neural Engineering System Design* (*NESD*) program which is developing a machine–brain sensory interface for restorative and enhancement purposes, to the fore. DARPA is obligated to ensure that such advances percolate into the commercial market offering prosthetic relief, not so much to average people with disabilities, but to those able to afford cutting-edge technologies, until less sophisticated spin-offs are mass produced to offer improvements in everyday use. The coming together of militarism, capitalism and consumerism in the history of prostheses is a recurring thread.

The term 'prosthesis' itself (derived from the homologous Greek word meaning 'addition') first appeared in English in early-eighteenth-century medical texts, where it was used to denote the 'replacement of a missing part of the body with an artificial one' (Wills 1995: 215). In that sense it signalled a therapeutic use in which a specific loss or lack in the natural attributes and functions of the human body could be compensated to some degree by a mechanical and wholly external device. A prosthetic leg or even a simple crutch might aid mobility, while a glass eye, although non-functional, might give an approximation of facial normality. The split between appearance and functionality has been a long-standing issue in the pragmatics of prostheses with disabled users often having to choose between aesthetics – understood as the best resemblance to normative body image – and practicality. In the convention with its stress on simple substitution and rehabilitation to normality, prostheses are understood to operate primarily within the field of disability and its associated states of ageing and ill-health. That is not however where it can remain, and once the commonplace meaning of the term prosthesis is abandoned, we can engage instead with an expanded understanding of the 'prosthetic impulse' (Smith and Morra 2006) that marks out the energies and flows of usually – but not always – technological devices that are inseparable from human being. In short, our embodiment exemplifies a mode of somatechnics. As such, the operative arena opens on to a nexus of unexpected but constitutive assemblages that disorder the very idea of normative corporeality. Disability, as Chapter 1 will demonstrate, is far from being an unfortunate condition that can be ameliorated by mechanical aids, but rather the jump-off point for an adventure in applied posthumanism. This is not to belittle the discriminatory experiences of disabled people in mainstream society, but – as my adaptation of Eve Kosofsky Sedgwick's radical rethinking in *Tendencies* of the experience of her cancer as 'an adventure in applied deconstruction' (1994: 12) signals – to make a break with normative thinking.

My own exploration of the meaning and significance of prostheses is increasingly read through the diverse phenomena of disability, organ transplantation and the micro-biology of the immune system in the context of the microbiome and of microchimerism.[3] In biomedicine the latter refers to a small but significant presence of non-self-cells coexisting within a dominant population of self-cells in the same body but carrying different DNA. The phenomenon, which I elaborate in Chapter 3, is highly challenging in its disruption of biomedical, philosophical and socio-cultural expectations alike. Each of the three areas – disability, transplantation and micro-biology – has been explored in isolation, but I will examine their complex interfaces around the question of how our understanding of normative embodiment is being transformed in the age of advanced biotechnologies. Where conventional conceptions of prostheses refer to devices that replace or augment impaired parts of the body for rehabilitation purposes, I broaden the scope to encompass both mechanical and organic prostheses, which, going further, will include any material incorporated into the structure and performativity of the body – familiar examples are the microbes that inhabit the gut – that cannot be identified with what is understood as the substance of the biological self. I use the term *visceral prostheses* to indicate both the embodied physicality and, more metaphorically, the 'stickiness' of prosthetic assemblies. Whatever the context, such prostheses do not remain separate from the forms of embodiment under consideration, but signal a state of entanglement or hybridity that gives a depth of ontological meaning that cannot be reduced to its constituent parts. That perception is very clearly at work in the case of transplantation and in internal biology, as I shall go on to explore, but how does it enhance our understanding of the interface between putative disability and prostheses?[4] Although there is plentiful evidence of the desire to separate the embodied self from any technological aid – the mainstream disability community is careful to refer to a wheelchair *user*, for example – I would argue that that reflects a modernist mindset that pays scant attention to the phenomenology of embodied experience in which a prosthesis, whether high or low-tech, becomes integrated into selfhood. In that phenomenological mode, which draws on the work of Merleau-Ponty (1962), the common understanding of the self is problematised. As with the other registers explored in this book, the resultant prostheticised entity is best described as an assemblage in which the very concept of what is meant by human being is at stake.

*Visceral Prostheses*, then, proposes new understandings of the limits and possible enmeshments of human embodiment that alongside a philosophical theorisation encompass cutting-edge interdisciplinary research in critical disability studies, transplantation studies and in biomedicine. Although some initial work is underway that makes links between these fields, this is a largely unexplored area even in the medical humanities. At the same time, it is important to remember that the sphere of biomedicine itself cannot be thought of as a unified domain but more often one in which rigid disciplinary silos impede the cross-fertilisation of disparate insights. The mainly immunological research that has established the prevalence of microchimerism, for example, has been slow to gain recognition within the wider field (Martin 2010), though there are finally signs of growing credibility. My own position as a postmodernist and feminist philosopher and body theorist, with an extensive interest in the problematics of critical disability and heart transplantation, has long enabled me to engage with and draw out the significance of how those areas exemplify a rejection of the modernist notion of the singular embodied self. It is, however, with the further move into the highly complex and technical research of the biological sciences that new and often startling insights have begun to emerge that embed abstract speculations in the most material setting of flesh and blood bodies. It is not that science offers verification as such – for the biomedical imaginary is as entrenched as any other – but more that the different perspectives enrich understanding.

Even within contemporary scholarship, both feminist and postmodernist, and long after the materialist turn,[5] there remains nonetheless a surprising reluctance to think through a scientific lens lest it should diminish or essentialise the concerns of the humanities. And from the opposite direction, clinical researchers and practitioners are often deeply wary of the ambiguities and ambivalences associated with the humanities. The suspicion of science – and, for feminists, of bioscience in particular – as an authoritative and reductive discourse has been hard to shift, and it may feel that the traffic in ideas is not reciprocal. Bioscientists themselves, often for reasons of professional reputation, are usually highly reluctant to commit to extra-evidential thinking or to consider the non-medical implications of their research, although that cannot universally be the case. As Samantha Frost (2016) makes clear the concept of human life as intrinsically biocultural is well-established in many research labs, and in my own work, I have been fortunate to confer with several bioscientists working on the microbiome and microchimerism who are eager to share not just the empirical data but their more speculative reflections. What I hope to do in *Visceral Prostheses* – from an admittedly extra-scientific perspective – is to open up some of those tantalising pathways where bioscience and the humanities speak to each other. Perhaps the most innovative thrust of the enterprise concerns the least-known aspect of the problematic, specifically my development of the notion of microchimerism as a prosthetic process with implications for us all. The synergy of diverse research, both theoretical and empirical, can not only deliver new modalities of thought about the most pressing questions of human life and death, but also at the limit destabilise those very categories and point towards posthuman embodiment.

The expanded notion of prostheses, as both external and internal to corporeality, that the project explores is right at the cutting edge in understanding transformations of the body and in recognising the already-existent ubiquity of transcorporeality. Scholars as diverse as the feminist Katherine Hayles (1999), critical disability theorists David Mitchell and Sharon Snyder (2000) and philosopher Bernard Stiegler (1998) all play critically with the idea that we are all always already prosthetic. That notion underpins a challenge to the concrete, specific and material means and processes through which bodies appear as essentialised, and therefore as fundamentally unchangeable forms. What this means for either embodied individuals or for the socio-cultural imaginary is the focus of sustained debate, not least because while we cannot ignore the insight that the human body can be manipulated, extended or substituted seemingly without limits, there is, as Don Ihde (2008) insists, no certain outcome to such processes. At the present time, the expansive development of innumerable biotechnologies that intervene in the body is a matter of both optimism and caution, and deserve deep consideration, though many aspects fall beyond the scope of this book. The parameters I have set depend on tapping into and then pushing to new plateaus existing pockets of alternative and disparate thinking in a number of crucial arenas: transplantation studies, with its concern for ontological issues as well as cultural differences (Sharp 2006; Shildrick 2014); prosthetic theory (Smith and Morra 2006; Shildrick 2013a), which always contests the boundaries of the given body; critical disability studies, especially in its recent turn to a body-based phenomenological and/or Deleuzian approach (Goodley 2007; Shildrick 2009; Gibson *et al* 2012); and immunology, which has recently emerged as a powerful site of challenge to the singular embodied self in both political (Esposito 2008, 2013; Staikou 2014) and biomedical thinking (Bianchi 2007; Cohen 2009; Pradeu 2012).

Donna Haraway's question 'Why should our bodies end at the skin?' (1991: 178) has become ever more relevant and has particular significance in the extended context of prostheses, which I understand as both exceeding the putatively 'natural' body and being located deep inside its very biology. As such transformatory processes accelerate in their soma-technological capacities, or simply come to light as existing facets of the body, we urgently need to address the issue of posthuman embodiment. What makes the approach of *Visceral Prostheses* truly innovative is that under the umbrella concept of the prosthesis, I will tease out the interconnections between the areas of the lived experience of disability, and of organ and tissue transplantation – both of which I extend into other conditions of embodiment – with the emergent field of microchimerism. The point is to show how thinking them together can mobilise more adequate theoretical perspectives on the issue of transcorporeal embodiment – and indeed transspecies embodiment – and more importantly how those postconventional scenarios underpin a reconfigured bioethics. The potential shift in our understanding of the highly heterogeneous material conditions of embodiment, which nevertheless yield some striking commonalities in relation to transcorporeality, constitutes a major opportunity to move scholarship forward. By most accounts, the horizon of the posthuman is not far distant and I would urge that academia has an ethical responsibility to respond to it, not least by exploring the extended parameters offered by posthumanist discourse.

However prostheses are conceived; they have the potential to shake our faith in corporeal integrity even when they are enlisted with the aim of simply restoring the clean and proper body. My claim is that prostheses can always effect powerful transformations of the embodied subject that move beyond mere modification towards the far more radical step of rethinking the limits of the human. In invoking at very least an inevitable – yet troubling and productive – hybridity, such supplements to the human embodiment raise the question of identity to another register. Leaving aside for a moment the micro-biological aspects referred to above which greatly extend our understanding of prostheses, the descriptive history of the use of mechanical, and latterly organic, aids, to replace missing or faulty parts, and more recently of enhancement technologies to ‘improve’ bodily appearance or functionality, focuses on the matter of instrumental expediency. Such histories offer deceptively simple classifications that fail to engage with contemporary body theory, and even as a prosthesis evokes a sense of the human/technological interface, the concomitant notion of hybridity is itself already limited in its allusion to two or more separate entities that come together to form a new whole. As will become clear in the text, what concerns me instead is the generation of a deep ambiguity and final undecidability that mark an ontological as well as epistemological shift. In either sense, however, the notion of the prosthesis tellingly plays out an infinite confusion of identities and boundaries between the human, animal and machine, where each category itself is already highly complex and indeterminate. The once-astonishing notion of the cyborg as a form of technologised human being is now greatly complicated by the realisation that biotechnologies, nanotechnologies, information technologies and cognitive science are potentially mutually implicated in a model that raises the fundamental philosophical question of what constitutes the human as such. As Smith and Morra put it:

> Prostheses … have the potential to form an integral part of certain speculations on the corporeal surface, the psyche, and the interior and exterior limits of the body and to the ways that these efforts to renegotiate discourses on ‘the human’ might attend to the edges between these material and immaterial surfaces and limits.
>
> (2006: 6–7)

My purpose in bringing together disability, micro-biology, transplantation and their subsets is to suggest ways in which insights from each area can combine to shed light on the philosophical and cultural meanings and significances of prosthetic embodiment. In many senses the centuries-old project of the European Enlightenment has reached the point of inadequacy – not necessarily redundancy, as there are still many facets to carry forward – and what is now urgently needed is a thorough reconfiguration of the bioethics, epistemology and ontology of what has hitherto been understood as ‘proper’ human embodiment. In the postmodern era, the purity of strictly ‘human’ embodiment is highly contested and it is necessary to think a different future that does not take for granted the wholeness, separation and independence of the body. By gaining a deeper understanding of the conceptual underpinnings of the prosthetic experience, which are fundamentally about the relation between self and otherness, and less obviously about the nature of life and death, and indeed our deference to linear temporality – at least within the confines of Westernised thought – I want to suggest ways forward in the task of welcoming prostheticised embodiment, whether in the context of disability, donated body parts or internal biology. That final domain is of particular significance for although the troublesome aspects of the human/machine interface have already generated much critical commentary, my further complication of the term prosthesis takes up the implicit challenge set out by many of the contributors to the edited collection, *The Prosthetic Impulse* (Smith and Morra 2006). While reasserting the 'phenomenological, material and embodied nature of the "prosthetic impulse"' (2006: 3), the editors explicitly caution against dismissing the speculative potential of the term. In my own use, I give particular weight to the philosophical significance of wholly organic prostheses as in transplanted material and more specifically to the largely unexplored arena of cellular translocation. As my attention turns inwards, the viscerality of prostheses becomes increasingly evident.

In each modality I want to focus not just on how the incorporation of non-self elements that cause disruption must be negotiated, but more challengingly on whether incorporation – which implies a primary agent – remains the appropriate term. On a pragmatic level, disabled people who deploy prostheses, and especially those with non-congenital disabilities, must always strive to accommodate something alien to their own prior lived experience (Sobchack 2010). Yet rather than simply achieving a re-integration of the embodied self and a rehabilitation of their practices, such people often feel marked by the unfamiliar experiential input and capabilities that construct the prosthetically embodied self (Serlin 2006). The patterns of inclusion and exclusion, and categories of normal and abnormal, and natural and artificial, that generally circulate in societies of the global North contribute further to such inherent ambiguities and contradictions.[6] The turn to transplantation, where the prosthesis is most usually organic, reveals a similar disturbance to the conventional binary pattern in that when the donor organ crosses the threshold of the recipient body, ontological questions of self and other frequently arise. This is not simply an abstract subjective concern insofar as the transplant organ brings to its new site an alien DNA that will persist for life (Shildrick *et al* 2009). Full integration is never possible, for as the donor DNA circulates in the peripheral blood supply, enduring microchimerism – the major concern of my third modality – is likely to occur. The event of microchimerism, which causes both philosophical and biomedical trouble, inevitably invokes and radically challenges the fundamental tenet of immunology that self and non-self are fully distinguished at the cellular level. Although in each area the ideal is integration – effectively a reconstruction of any existing personal or socio-cultural identity – what constitutes the embodied self is no longer clear.

The use and/or incorporation of prostheses cannot be read, then, as simply utilitarian and in both disability and organ transplantation they are often associated with a dysphoria that indicates the difficulties of identity reformation (Sharp 2006; Ross *et al* 2010; Sobchack 2010). Despite a biomedical reading of prostheses as always therapeutic and often literally life-saving, recipients may tell a different story not just of enduring physical discomfort but of mental/psychic distress that far exceeds the positivist claims made for biotechnological interventions. The phenomenon of microchimerism, in contrast, is so little known or acknowledged that its immediate physical or psychic effects cause no psycho-social difficulty; yet, biomedically it is believed to be concomitant – both positively and negatively – with a range of autoimmune diseases, Alzheimer's disease and much unexplained morbidity. In biomedical literature, microchimerism is variously associated with transplantation (Starzl *et al* 1992), pregnancy (Maloney 1999; Bianchi 2007), non-irradiated blood transfusions (Nelson 2002), bone marrow transplants (Nikolic and Sykes 1997) or the fusion of two zygotes that develop into a single body with two distinct sets of DNA (Norton and Zehner 2008), with further suggestions that lactation and fluid sexual exchanges can also generate the phenomenon (Yan *et al* 2005). More to the point of this study, it relocates the self-other problematic of prostheses away from the 'whole' body to the viscerality of the cellular level (Nelson 2012). In short, as the prevalence of microchimerism is slowly being recognised as ubiquitous, it raises challenges to our belief in genetic singularity and inviolability, just as the microbiome is doing on another sub-cellular level.

The overriding question is to ask what kinds of re-embodiment are being enacted. Can chimeric embodiment, for example, break free of origin narratives (place/nation, gender, race, culture, genetics) and overcome their persistence in the imaginaries (socio-cultural, psycho-social and bioscientific) that underlie the prevalent modes of thought in the global North? The realisation that the parameters of the modernist forms of knowledge that are habitually deployed in the context of prostheses are in any case highly limited is something that Western-based or educated scholars, such as myself, must always keep in mind. A fully decolonial critique and an expert appreciation of non-Western practices would, I believe, open up exciting new possibilities of how we understand the fragility, indeed the impossibility, of the singular self, which other cultures have long accepted.[7] My ambitions outrun my expertise and what I offer here is a stepping-stone to a differently realised project that would not be primarily reliant on contesting some forms of colonial thought from an ostensibly more sensitive position within the same colonising system. With that in mind, the aim of demonstrating how all the key areas of my investigation both contest and sustain Western imaginaries – in which only those who are normatively embodied as whole, independent, separate and distinct are afforded the privileged status of human – remains both necessary and urgent. Based on the differential material practices, the problematic demands a detailed critique of the socio-cultural processes at work in each field as a tension is generated between disruption and successful transposition in relation to prosthetic phenomena. The aim is to shake up the familiar certainties of modernist thought by exposing all the gaps, fissures and aporia between the ideal and the actual that render some lives unsustainable. In attending to the actual uncertainty of the human body, the objective is to instantiate a new understanding of transcorporeal embodiment that challenges the assumed purity – or at least the clarity – of the human as such and moves towards what is loosely called the posthuman. In short, by rethinking the transformatory potential of prosthetic embodiment in its various guises, it becomes possible to go beyond the dominant conventions of modernism and enable an entanglement with otherness and difference that is the mark of posthuman assemblage. And once the ontological and epistemological bases are reconfigured, it becomes apparent that what is required is a differently composed and intrinsically flexible bioethics.

My own grounding in philosophy is always apparent, but tracking the potential transition from the conventional body of modernist thought towards the becoming body of posthumanist speculation is a highly interdisciplinary enterprise which requires a range of cross-cutting resources, which among others acknowledges broader debates around such issues in ontological anthropology, new materialism and STS (Mol 2003; Barad 2007; Woolgar and Lezaun 2013) without clearly aligning with any of them. Given such substantive areas as disability (either physically or cognitively marked); organ and tissue transplantation; and the public understanding – and to an extent the biomedical one – of the immune self as a defensive system protecting against otherness, I will move between material registers as much as theoretical ones. Each of the major areas will be addressed through the notion of prostheses to uncover the extent to which embodiment is already reliant on both organic and non-organic augmentation and supplementation, and in the case of supposed immunity already shot through with microchimeric and microbiomic non-self internal components at a cellular and sub-cellular level. The problematic spans across interlinked questions of foreignness and intrusion; the relation between host and guest; the meaning of hospitality; the question of corporeal generosity; the time of life and death; and the inevitable matter of sex and gender. Embodiment is never neutral, but the aim is to demonstrate the inadequacy of binary categories without collapsing difference in itself. The interconnections and mutual interests with the territory and agency of the animal and the inorganic are plain to see, but the foremost concern of *Visceral Prostheses* is to uncover the consequences for human beings of recognising their non-human aspects – and particularly the otherness within – and to promote an acceptance of the unstable nature of embodiment. The realignment is one from the illusion of singularity associated with the modernist self to the multiplicity of assemblage and rhizomatic linkages (both in the Deleuzian sense) of actual bodies. Moving inexorably towards the posthuman, the project is concerned to justify and set out a new paradigm that celebrates conditions of linkage, interdependence and collectivity and that is responsive to both present and anticipated transformations.

To satisfy the overall purpose of the project, the following specific approaches are in play: (1) a critical analysis of existing empirical sources; (2) the development of new theoretical pathways and modalities; and (3) an exploratory signposting of potential outcomes. I give more detail below to each of these in turn, but in reality there are no hard and fast distinctions to be made between the empirical, theoretical and speculative perspectives, and Sections 1 and 2 in particular move constantly between theory and practice. I am, of course, well aware of the propensity to privilege the supposed utility of empirical research over other modes of knowledge production, and particularly when material issues are at stake, but it is my firm conviction that if we are unable to change the ways in which we think – effectively to transform our psychosocial imaginaries – then no amount of substantive reorganisation will fully remodel the differential and damaging devaluation of those forms of embodiment considered alien to expectations. That is not to say that there is any desire to arrive at a fixed point that resolves tensions and contradictions, and indeed to imagine reaching a stable outcome would be contrary to the postconventional theoretical context in which the research is situated. The intention is not to deliver a route map to a better life in which all lives are equally valued, but to think against the epistemological and ontological conventions and set out the grounds for substantive transformation. In thinking differently, what I propose is no less than a move towards a new imaginary in which the traditional closure of the embodied self against the putative threat of external otherness gives way to an acknowledgement that the self is never pure or internally immune but is always shot through with otherness within. My aim is to raise questions, and stimulate further speculation, rather than to provide answers.

One major part of my critical analysis, nonetheless, relies on existing empirical sources that have already been published or are data from projects with which I have been involved in the past. More specifically, I have drawn on my own prior collaborative research over several years, in particular with the *PITH* (Process of Incorporating a Transplanted Heart) and *GOLA* (Gift of Life Analysis) projects in Canada which have conducted detailed and methodologically innovative research with organ recipients and donor families. Much of that work has already been published and I have not engaged in further formal empirical research, but in this text have simply used a limited number of illustrative observations. I have further developed some crucial insights, however, relying on ongoing dialogue with bioscientific colleagues and contacts, especially in the field of immunology, to help ensure that my exploration of the meaning and significance of microchimerism is solidly grounded in contemporary developments and practice. There is in general a wealth of accessible material to hand across all the areas of my interest: experiential disability narratives in documentary, cinematic and literary contexts, many of which directly refer to the deployment of prostheses whether as technological aids to the body such as artificial limbs, hearing devices and pacemakers, or as human or animal assistants;

clinical and public discourses of transplantation; interviews with transplant recipients and donor families; the everyday language of immunology; the apprehension of the chimeric body and more specifically the clinical controversy around microchimerism, the microbiome and immunology, and its impact on biomedical thought. The arena of prostheses is inherently intersectional both in its sources and in the coming together of ethnicity, gender and bodily difference across its range. The concern with *how* things work is never fully satisfying and I am more interested in *why* they work as they do. Accordingly, much of the empirical data was examined initially (and I preserve some of that analysis) through the lens of an phenomenological analysis drawn from Merleau-Ponty (1962, 1968) – an approach that is in itself somewhat innovative in the context of conventional disability and transplantation studies, but over time has come to feel inadequate to the pointers to posthumanism that began to emerge strongly. Subsequently, the materiality of primarily a more Deleuzian-based understanding of the body and its supplements as constituting forms of assemblage that exceed the human has become my preferred perspective, although I have no hesitation in mining the insights of many other philosophers and critical cultural theorists.

More broadly recent continental philosophy and feminist theory come together with queer theory to open up the significance of revaluing multiple variant forms and in thinking transcorporeality as the very condition of life.[8] The theoretical framework that best addresses the concerns of posthuman embodiment devolves on the postconventional work of Derrida (2000, 2003), Braidotti (2006, 2013) and Deleuze and Guattari (1987), with more targeted input from Varela (2001), Jean-Luc Nancy (2002), Roberto Esposito (2008) and Smith and Morra (2006), as well as my own extensive work on biotechnologies, hybrid embodiments and the transformation of the self. In all cases, the most cogent issue is to tease out the relationship between the embodied self and its supposed others, and to explore whether the boundaries between self and other on which the Western logos has relied are sustainable. The illusion of separation and distinction and the binary divisions between the organic and inorganic, between the human and animal and between whole and incomplete are radically contested in forms of thought that move strongly towards undecidability, ambiguity and the ongoing dynamic processes of assemblage. There is nothing new in the concept of prostheses as such, but the growing sophistication of usage in the age of advanced biotechnologies has encouraged a re-imagination that goes right to the heart of what embodiment is or can be. Derrida's work on supplementarity is especially provocative in this respect, while his notion of hospitality – the welcome to the radically unknowable stranger/other who disturbs the subject in her own home – suggests an alternative ethical way forward that takes account of the intrinsic intermeshing of bodies. Above all, Derrida deconstructs the notional purity of the human body showing that it is always incomplete and inherently caught up in its connectivity to both external extensions and the otherness within.

These are themes that are central to understanding and re-evaluating the interface of disability and prostheses, and the lived experience of transplant recipients which I explore in Section 1. Where in the past such modes of embodiment would have been seen as at very least non-normative and devalued, and at best struggling to regain wholeness and independence, the reconfiguration of the prosthetic experience refuses that hierarchy and positions all embodiment as similarly prosthetic. Many critical disability theorists have long since rejected the notion of embodied autonomy, arguing that it is misdirected, and studies in transplantation further contest the self–other binary by noting the internalisation of the prosthetic effect. Section 1 concludes with the further turn to micro-biology, which in taking apart the conventional paradigm of immunity, that is the supposedly protective division between the self and its others, consolidates the insight that we need to think in terms of connection and inter- and intradependence, rather than separation and distinction. The move to thinking in terms of ecosystems has a strong resonance with many aspects of contemporary scholarship, but it is the work of Deleuze (with and without Guattari) that most effectively provides a theoretical framework for new ways of understanding embodiment in a posthuman form. The Deleuzian stress on the notion of assemblage and rhizomatic networks figures the dynamic of a provisional but never-ending mesh of connections and symbiotic functionality that always exceeds the present moment. I should stress, however, that I offer no loyalty to any canon, but simply rummage in the Deleuzian toolbox.

Deploying an underlying assemblage model to ground the ecosystems that I investigate in Section 2 entails a further elaboration of innovative theoretical pathways, again tracing the interaction of technological prostheses with organic ones. I have deliberately resisted imposing any teleological ordering of the chapters, the better to demonstrate the increasing internalisation of prosthetic conjunctions. My aim is to open up to innovative concepts that mobilise a postconventional bioethics for arguably posthuman forms of embodiment and that begin the task of outlining and instantiating an alternative psychosocial imaginary. I have found the scope of somatechnics – which goes where Deleuze never ventured – highly productive. At a basic level, somatechnics describes the irreducible interconnections and mutual influences of bodies, biologies and technologies, and indicates an approach to corporeality which considers it as always already bound up with a variety of technologies, techniques and technics. Since the late twentieth century, body theory has been a vibrant and constantly evolving area, particularly within feminist thought, and it has convincingly set up an interdisciplinary and intersectional approach that brings together any number of hitherto unthinkable combinations of methodologies and thought. Nonetheless, scholarly analysis of the concept of crafting the body through substantive technological transformations has tended to become arrested at the stage of descriptive wonder. Stuart Murray's recent monograph *Disability and the Posthuman* (2020) is a welcome exception, but its Insights are firmly situated – even as he pushes at the limits – within the field of disability studies. For the most part, however, the focus is too often on describing what inorganic technologies can do to the body alone, rather than asking what such interventions mean for the embodied self, both within conventional parameters of the human and as a move towards a posthuman future. In an age of increasing deployment of biotechnologies with a concurrent accelerating deconstruction of the binary of natural and artificial, it becomes ever more urgent to analyse the full parameters of somatechnics.

In the final section of the text, the question of the posthuman takes centre stage reflecting on some substantive issues, but more clearly focused on exploring the implications of new ways of thinking about corporeality and life itself in the light of the ubiquitous status of prosthetic embodiment. The problematic of life and death that has threaded through the previous chapters is approached more directly through a radical questioning of that binary. In clinging to a putatively clear distinction in which one state is superseded by the other, Westernised societies already fudge the issue of differential rates of tissue and cellular demise within a single body, implicitly relying on a very specific understanding of selfhood. But who is the 'I' whose life might be said to end; crucially, what does it mean for a prostheticised body to die? While such vital issues push the notion of the posthuman to its limits, at any level the implications of visceral prostheses call for a transformed ethical approach that responds a new imaginary. What is at stake in establishing a different way of encountering non-normative forms of embodiment – with their entanglement of the human/animal/machinic – devolves on the willingness to move beyond a self-centred bioethics to enact more inclusive ways of living together without fear, anxiety and suspicion, or devaluing those who are different. The worldwide conditions of what is disavowed as abject embodiment vary greatly, but all forms could be alleviated once the fixity of normative human corporeality is challenged at its roots. In the twenty-first century, prosthetic embodiment can no longer be seen as the exceptional case but as the certain condition of us all. Going well beyond the somewhat banal observation that many of us use spectacles, mobile phones or hearing aids as prosthetic enhancement, it speaks to domains where the relations of power might be undercut by the queering of corporeal norms. Can we already begin to think – and think ethically – about posthuman modes of living that are not just a matter of a transformed futurity, but are always already our present?

What a fully committed prosthetic theory shows is that an acceptance of entangled corporeality – impartially crossing, as Deleuze would insist, human, animal and the inorganic – demands a reconceived imaginary that is the starting point for a future bioethics. It would have little in common with existing texts associated with corporeal transformation which typically enquire into the permissibility of human enhancement (Karpin and Mykitiuk 2008; Koch 2010), and nor would it offer a normative program. Instead, my aim is to tease out an innovative bioethics of engagement that adequately addresses the multiple specificities and commonalities of disability, transplantation and chimerism and that situates them in relation to their embeddedness within substantive contexts of the global North, including prevailing biomedical and psycho-social imaginaries. Where categories of hegemonic knowledge within the dominant epistemological frameworks promote a normativisation of embodiment that relentlessly privileges the human, the move to dismantle the segregation of thought in conventional modes of enquiry – in effect to embody extension rather than individual identity – calls attention to unexpected sites of challenge and informs new visions of liveable social orders. The deprivileging and reconfiguration of human being enacted by the notion of assemblage might better describe the vitality of embodiment in all its forms and figure the restlessness of corporeality as a future foundation for ontology, ethics and politics.

## SECTION ONE

# From mechanical to visceral prostheses

The three chapters of this section set out the challenging path that I want to follow both in our understanding of what constitutes a prosthesis and how a prosthesis in turn constitutes its ‘host’. The conventional view would simply reject the latter aspect in favour of a one-sided relationship at best in which a user ideally gained enhanced functionality or normalised appearance, but remained essentially unchanged by the experience. Certainly there would be no expectation that her sense of self would undergo any ontological transformation, even though the body itself might be considerably altered. That confidence in the enduring stability of selfhood speaks to a resilient set of binaries that have dominated modernist thought – in its very Western sense – for many centuries, and which continue to underpin the privileging of human agency, indeed the belief that there is no other form of agency. The major philosophical category of self and other is mirrored in a similar adherence to the binary distinction between subject and object, inside and outside, natural and artificial, organic and non-organic, mind-driven and machine-driven, to name just a few of the opposing categories in play. Prostheses on this reading are simply inanimate objects created by human beings and endowed with no independent agency of their own.

Historically speaking, that conventional viewpoint has been relatively unchallenged, from the outside at least, until the mid-twentieth century when Merleau-Ponty’s development of corporeal phenomenology began to question the traditional mind/body split that reinforced the notion that prostheses were fully exterior to the self. His famous thought experiment about a blind man navigating a city street with a cane raises the question of the relationship between the cane and the man’s own perceptual apparatus. It is not that he suggests agency as such for the cane, but that its tip ‘is transformed into a sensitive zone, it increases the scope and the radius of the act of touching and has become analogous to a gaze’ (Merleau-Ponty 1962: 178). The prosthesis, in other words, is no longer an inanimate object but has become integrated into the human’s experiential schema. The cane remains external to the body only in the case that we imagine human corporeality as being bounded by the skin and as having a distinct inside and outside. As far as tactility is concerned – and if we were to ignore Merleau-Ponty’s own complex understanding of touch (1968) – we might simply say that the capabilities of the man’s arm have been extended beyond the skin. The question of the analogous gaze, however, raises the issue to another level in which the embodied incorporation of the prosthesis is undeniable. The mechanical nature of the cane is still evident – it can be laid aside at night – but it is no longer clear that all it provides is a technological mediation between a user and an exterior world. In his lecture notes from Collège de France, subsequently recreated and published as ‘Philosophy and Non-Philosophy since Hegel’, Merleau-Ponty (1988) defines ‘non-philosophy’ against the canon as a mode that does not oppose human consciousness to the natural world, body to mind, nor subject to object. Instead he describes the world itself in corporeal terms – what he calls ‘the flesh of the world’ (1968: 77) – as a living web of interconnections in which we are all implicated. In focusing on the body in terms of its lived experiences, individual being is not split apart from collective others, and that encompasses not just human beings but technological (and now digital) interfaces.

In both my major theoretical research interests in disability and in organ transplantation, Merleau-Ponty's reconsideration of philosophical givens has proved an invaluable take-off point for more disruptive approaches. As many critics have pointed out, not least feminist (Young 1984) and disability scholars (Patterson and Hughes 1999; Reynolds 2017) among others, his rethinking of bodily difference is not as radical as his new slant seems to promise and remains rooted in the perspective of healthy and able-bodied adults. His work is nonetheless an important building block for breaking away from the traditional understanding of prostheses as no more than objects used at will by human beings in search of better ways of negotiating the world. Although the adoption of prosthetic devices throughout history has most often centred on the putative need of disabled people to overcome obstacles – the artificial leg to replace an amputated limb, the spectacles to offset visual difficulties – many such technologies have moved on from their initially intended use and negative marking to become valued items of everyday life. Telephones, for example, were designed to aid those with hearing impairments, while the earliest typewriters offset sight impairments. In reality there is virtually no human activity that is not reliant on prostheses – at a common-sense level it encompasses any tool designed to enhance effectiveness or efficiency, though they are rarely named as such, and the term still signifies devices associated with specifically non-normative embodiment. In our own time, the ubiquity of technological interventions into the body – heart monitors, Bluetooth earbuds, breast implants and the like – is most often greeted with enthusiasm, rather than any intimation that such developments might demand a reconfiguration of the concept of human corporeality in all its forms. For much of my text, I do concentrate on prostheses as they are used in biomedical and quasi-health care contexts, but it is important to remember that there is nothing extraordinary about them. Present-day users of wearable technologies such as Fitbits or Smart Glasses may not see the connection to hearing aids or heart monitors but they are different in degree of sophistication, not in kind. Whatever the context, many such technologies are fully or partially self-tracking and, as Dolezal and Oikkonen put it, 'loaded with normative assumptions regarding the human body and its health, ability, gender, and class' (2021: 4). People with disabilities utilise a range of prosthetic devices that are seen to compensate directly for a perceived loss or lack of functionality, but the distinction between that compensation and the enhancement offered by prostheses to all of us is not self-evident. In any case, I shall, in the chapter ahead, deconstruct the very notions of compensation and enhancement to offer a quite different reading of prostheses that explores instead the meaning of supplementarity.

In turning to the process of transplantation, the instability of the binaries between inorganic, mechanical prostheses and fully organic, 'natural' prostheses, and between exteriority and interiority becomes much clearer. Above all it is the viscerality of organ transplantation that comes to the fore, pushing aside rational explanation of the specific processes, arguments of expediency or unquestioning faith in heroic medicine alike to open up to ambiguity and ambivalence. My own research has focused on primarily heart transplantation in which the disturbance of the normative expectations of embodiment is at its most acute, but that is not to say that other types of organ grafts do not throw up similar issues. One relatively unique feature of heart transplantation – though there is a similar procedure with lung replacement – is that recipients may receive a mechanical heart, sometimes as an end therapy but usually prior to getting a donor organ.[1] The split phenomenological experience and expressed hopes of such recipients highlight precisely the confusion that many feel about the relation between incorporating artificial or organic grafts. What heart transplantation does not encompass, which other procedures may, is the possibility that an organ donor may not be deceased but quite likely is a living relative. The matter of coincident life and death that all heart recipients must face is avoided, but different concerns and anxieties may take their place. The chapter on stem cell transplants in Section 2 will address some of those issues. For all the confusing affect that marks both sides of the transplantation experience, there is very little recognition that the existential problematic of the relation between self and other has a biological counterpart. The discovery that microchimerism plays a role in transplantation is scarcely acknowledged in the pragmatics of the clinic, with patient awareness lagging even further behind; yet, it has the capacity to demand a radical reappraisal not just of medical practice but of what recipients and donors, or their proxies, understand of their experiences.

As the intermingling of parallel but genetically diverse cell types within a single body, microchimerism marks the point at which I find support in biology for the problematisation of the distinction of self and other that my theoretical development of prostheses intends. Instead of thinking in terms of original self cells and invasive other cells – a formula that preserves the binary – I instead cast microchimeric material not as add-ins but as visceral prostheses that radically disturb the supposed constitution of any such originary self. To date, the major research on microchimerism has explored the structures and extent of human to human diffusion, though there is little reason to suppose that differential cells should not cross the human/animal barrier given that transmission may be something as simple as a kiss. In any case the genetic entanglement microchimerism figures is mirrored in another form of prosthetic material, namely the myriad eukaryotic and non-eukaryotic organisms[2] – undeniably non-human elements – that comprise the microbiome. It has become increasingly clear that a highly diverse microbiome is an essential component of human health that does not simply augment existing biological structures but fundamentally drives their production and maintenance. And together the microbiome and microchimerism fatally undermine individual identity and selfhood and contest human exceptionalism. They are the starkest forms of visceral prostheses, wildly exciting in their implications, even though they have been there, largely unnoticed, in each of us from the beginning.

Where my theoretical commitment to Merleau-Ponty eventually wavers in the context of transplantation and begins to give way to potentially more relevant theory, the notion of assemblages that Deleuze introduces extends backwards to the context of disability and onwards to the still emerging field of micro-biology. What a Deleuzian reading promotes – although the term first appeared in the work of later scholars – is an effective queering of *all* embodiment that entails both deconstructing individual identity and liberating the prepersonal elements that are usually repressed. Although Merleau-Ponty and Deleuze are rarely thought together, there are nevertheless some strong resonances: our bodies are ambiguous and are never entirely our own. In effect, both philosophers are exploring the meaning-making practices of somatechnics. The trajectory from Merleau-Ponty through Deleuze to microchimerism might seem at first glance a thoroughly disjointed step but the transition through forms of visceral prostheses demands bold moves and an openness to the unexpected.

# CHAPTER ONE

# The disabled body and the prosthetic imaginary

Just as critical understanding of prostheses has evolved from its historic connection to disability to an appreciation of the prosthetic nature of all lives, disability studies has similarly traced a path from the medical model which studied individual pathologies to an ongoing split between two major perspectives that reject that approach. The first to emerge – the social constructionist model – has firmly identified societal structures of oppression and discrimination as constituting disability (though not the specific impairment), while critical disability studies (CDS) has embraced postconventional thought and is more concerned with the phenomenology of the body and with contesting the modernist, and very Western-based, psycho-social imaginary that distinguishes between normative and non-normative categories of embodiment. Unlike conventional disability studies which focuses on the structural inequalities of Western societies that are seen to produce, or at least cement, disability, CDS is a diverse entity that goes beyond the social model. It encompasses both material *and* discursive underpinnings, the psycho-cultural imaginary as much as law and social policy, and the lived experience of the embodied subject as well as any identification with a socio-political category. My own approach is underpinned by such a framework and recognises both the importance of emotion and affect, and the inherent leakiness and impurity of any putative boundaries. If the aim is to productively critique rather than simply reform existing structures, then it is necessary to make use of – and go beyond – elements of feminist, queer, poststructuralist and postmodernist theory to disrupt the conventional meanings of the terms associated with disability, including prostheses themselves.

Whatever the mode of enquiry, the question of what comprises ‘disability’, or simply anomalous embodiment, is far from self-evident. Even though disability may be perceived as an estrangement from the *proper* form of one's own body as given in modernist thought, contemporary representations of disability increasingly resist that propriety and shift the terrain towards new forms of knowledge production. The base category itself is highly complex and multi-faceted in its forms, many of which have no external manifestation, and what counts as a disabling anomaly has no universal reference across varying socio-historical and geo-cultural contexts (Shildrick 2009). The search for definitive parameters is in any case inconsistent with a postconventional framework which is committed to opening up a shifting nexus of both physical and mental states that resist normalisation. In postmodernist thought, the status of both disabled and able-bodied embodiment is no more than a provisional identity. It should be clear that I focus on disability in this chapter not because it is an exceptional state, but on the contrary because it is both a traditionally recognised arena for the use of prostheses and the site of extensive scholarship around the shared ubiquity of human vulnerability and the incompletion of embodiment that grounds the need and desire for such technologies. Against a biocultural imaginary that rests on the organisation of knowledge around binary oppositions, and the epistemic – and sometimes very material – power that devalues overt anomaly, I want to expose the entanglements that weave together apparently distinct forms of embodiment. Given that Rosi Braidotti recognises disability studies as emblematic of the posthuman predicament, it is a small step to see disabled embodiment as a becoming machine that 'bears a privileged bond with multiple others and merges with one's technologically mediated planetary environment' (Braidotti 2013: 92). The point is to queer normative structures and forms and constitute a new imaginary that is not focused on narrow conceptions of proper human being, but is instead open to the potentialities of multiple and diverse embodiments and practices.

## Bodies in technology

The notion of the bodily integrity of human beings has been taken for granted and of little interest to philosophy for many centuries, until the corporeal turn of the late twentieth century initiated a new critical theorisation. The reassuring and yet fundamentally illusory image of the Cartesian body as the unified, unchanging material base of continuing existence has been radically contested not simply by postconventional modes of theoretical enquiry, but more pragmatically and disturbingly by contemporary bioscientific developments. Technologies, in the sense of the tools, machines and devices that intervene in the course of daily living, have always disrupted bodies, but their exteriority and the ultimate human control over them have rarely been questioned. A new recognition has emerged more recently, however, that, as Don Ihde notes, 'we are our bodies – but in that very basic notion one also discovers that our bodies have an amazing plasticity and polymorphism that is often brought out precisely in our relations with technologies. We are bodies in technologies' (2002: 137). One area in which the polymorphism of bodies is most apparent is in the deployment of various kinds of prostheses. Both the materiality and the imaginary of prostheses force us to address the always ambivalent relationship between human beings and biotechnologies, and to question whether the two can always be prised apart. The interface is clearly evident in case of disability, but for all of us, everyday embodiment is always already technologically inflected and has been since the first use of tools. Bernard Stiegler is among those insisting that the prosthesis 'is not a mere extension of the human body; it is the constitution of this body *qua* "human"' (1998: 152–3), and it is instructive for my further argument that he has revised his earlier understanding of technology as 'organized inorganic matter' (1998: 82) to define biotechnology as 'the reorganization of the organic' (2017: 136). This corresponds with my claim that we must begin to think of prostheses as a technology – and vice versa – that goes beyond the idea of simply external functional add-ons. Despite the historical definition that a prosthesis was an external material object that effected some utilitarian compensation for a perceived lack in embodiment, the emphasis now is firmly on enhancement and supplement, and, more radically, the recognition that they are neither always inorganic entities nor exterior to the body. Prostheses may continue to be operative both externally as either conventional synthetic 'replacements' for missing limbs, and internally as pacemakers or stints, for example, or they be fully organic as with transplanted organ, and we are beginning to see that the microbiome that flourishes in each individual's gut is inherently prosthetic. The point is that in all cases of prosthetic supplementation, the modernist illusion of corporeal integrity is disturbed, even as we endeavour in some cases to restore the normativity of the clean and proper body.

At this point in time, critical disability studies has established anomalous embodiment as a major area in which we can reimagine human corporeality in the era of postmodernity. The lived experience of disability – with its potential absences, displacements and prosthetic additions to the body – generates, among other things, its own specific possibilities that both limit *and* queer the notion of the embodied self. As the widely predicted, but by no means certain, event horizon of technological singularity approaches – the point at which exponential progress in computer/brain superintelligence produces cognitive abilities that may qualitatively greatly exceed human intelligence – it might be easy to see a productive connection between the transhumanist desire to optimise embodiment and the aim of ameliorating any negative consequences of disability. Nonetheless, transhumanism's implicit – and often explicit – fear of death slips into an abjection of disability and the ageing body rather than an embrace of anomaly.[1] In any case, I am less interested in the transhumanist dream of superhuman cognition and eternal life than in the arrival of a time when the capacities of bodies can no longer be distinguished as either natural or technologically produced. Given a history of deadly oppression against disabled people, the science of techno-prostheses and biorobotics alike should be treated with great caution, but in practical terms they could mean the end of the very concept of anomalous embodiment. And on an everyday level, the current fascination with the prostheticised body too often runs in parallel with the continuing disregard for disability and arises not from any radical development which would demand a reconfiguration of the concept of human corporeality, but rather from the ubiquity and availability of technological interventions into the body that have pushed the issue into lay consciousness.

The familiar understanding that many disabled people use the medium of prostheses to negotiate the interface between body and world remains in play, but it is no longer confined to the mode of rehabilitation to normative practice. Paralympian athletes, for example, can in many cases – such as marathons – outperform their non-disabled counterparts. In this chapter I shall briefly theorise the experience of prostheticised life with reference to Derrida's insights into prosthetic supplementarity and his reimagination of corporeal boundaries, and then move to a Deleuzian understanding of embodiment as necessarily entailing assemblage – incorporating organic, non-organic and hybrid forms – as a mode of existence that speaks to us all. One important point, in Derridean and Deleuzian thought respectively, is that the multiple non-determined possibilities, and the dis-organisation, of bodily being should not be a matter of nostalgia for lost certainties, but should signal a potentially celebratory reimagining of the manifold potentials of corporeal extensiveness. In uncovering the inherent plasticity of the body and its multiple possibilities of transcorporeality, prosthetic modes of corporeal transformation can comprehensively undo the conventional limits of embodiment and invoke a form of hybridity that questions the very attribution of *human* being.

In recent years contemporary body theory has provided the tools to see the human/technological interface in terms not of material usefulness but as another site of postmodern indeterminacy. In every sense, the notion of the prosthesis tellingly plays out an infinite confusion of boundaries between the human, animal and machine and creates ontological as well as epistemological undecidability. That does not imply, however, that a postmodern analysis has no traction on historical usage for despite a prevailing socio-cultural imaginary that has taken the wholeness of the body for granted, the use of prostheses has always indicated that human corporeality can be manipulated, extended or substituted in its parts. The significant upsurge in prosthetic developments associated with the casualties of the two world wars of the twentieth century demonstrates both positive expectation and anxiety at what was becoming apparent. The emerging figure of the New Man in the inter-war period in Germany – a figure often synonymous with 'recovered' veterans – promoted the notion of prostheses as offering something superior to the natural body (Biro 1994; Fineman

1999; Neumann 2010).[2] The work of the cartoonist Umbo demonstrates, for example, a radical privileging of extraordinary function over normative human form. As Mia Fineman remarks: 'Umbo reinvents the body as an assemblage of separate parts, tools, and devices, each corresponding to a particular and nonfungible function. His modem man, the prosthetic god, takes the form of a humanized Swiss army knife' (1999: 103). Where that manifestation stressed extra-human enhancement, the emphasis given to the therapeutic nature of prostheses and their potential to renormalise the appearance of disabled bodies and ensure that male amputees could pass as virile 'normal' men and competent citizens served as a counter-weight to psychosocial anxiety. David Serlin has noted that in the Second World War prosthetic practice in the United States operated within what he calls 'the fiercely heterosexual culture of rehabilitation medicine, especially [in] its orthodox zeal to preserve the masculine status of disabled veterans' (2006: 170). To be valued was to look 'normal', but just as importantly, the stigma of effeminate dependency was to be avoided at all costs. And as Katherine Ott points out, the success of mid-century prosthetics was often measured in professional literature by the extent to which the wearer was enabled to engage in normal gender activities like dating, dancing and ultimately marriage. In general, the functionality of prostheses is still often trumped by a concern with appropriate appearance – as for example in the expectation that following mastectomy, women will want to reassert their femininity through the use of breast prostheses, not to mention the popularity of breast implants or penile extensions. This may seem very different to more recent developments, where it is clearer that the prostheticised body – as an aspect of human enhancement technologies – can ostensibly transcend considerations of both normalising power and gender itself, but in either case it is the socio-cultural imaginary that is at stake.

Like Haraway's cyborg (originally dating from the early 1980s), that once astonished in its imaginative implications, the prosthetic body inherently contests boundaries and transgresses binary distinctions. Speaking of the 'illegitimate fusions of animal and machine', Haraway writes, 'these are the couplings which make Man and Woman so problematic, … subverting the structure and modes of reproduction of "Western" identity, of nature and culture, of mirror and eye, slave and master, body and mind' (1991: 176). Haraway, of course, has long since abandoned the cyborg, seeing endless enhancement as heralding a postbiological future which, while appearing to deconstruct the autonomous subject, carries the Cartesian self to new heights of disembodiment. What she has not dismissed is the extensiveness of embodiment; as she puts it, 'even the most reliable western individuated bodies … neither stop nor start at the skin' (1989b: 18). What she suggests is that our sense of ourselves can no longer exist as an interior and isolated certainty, and nor is our interface and interactivity with the things of the world a negotiation between two or more separate entities. At a fundamental level, the intercorporeality of self and other exposes the oppositional relation as a pragmatic and linguistic convenience – as an imaginary construct – rather than as an epistemologically meaningful notion. That critique is already familiar to phenomenologists, but what Haraway adds is an insistence that we queer what counts as nature to include not just other beings like myself, but a whole range of diverse interconnections between humans, animals and machines. Whether exterior and interiorised, organic or inorganic, technology is interactive. It is not in other words that the human body simply exists and functions *alongside* all the apparatus of high technology, nor that it is simply uncertain and decentred; instead, the two spheres have become so intertwined and interdependent that any meaningful distinction is fast becoming redundant. Both contemporary biotechnologies and parallel theories of somatechnics make clear that embodiment is always a highly complex and indeterminate state, held in place only by particular forms of the imaginary that privilege corporeal wholeness and integrity – and of course the notion of the Human. The human/machine *interface* does have some troublesome aspects, but the scope and meaning of visceral prosthesis move towards other horizons of possibility. It heralds a prosthetic imaginary.

Even the conventional deployment of prostheses – in disability and elsewhere – has staged the simultaneous maintenance of the *status quo* through the promise of therapeutic restoration and the inevitable transformation of that very same imaginary. A phenomenological approach has always indicated that to rely on a prosthesis is not a matter of a self using an exterior technology, but of incorporation, of becoming embodied as hybrid. The work of Merleau-Ponty fundamentally challenges the Cartesian split between mind and body and the assertion that an originary core self is immune from transformations of the corporeal substance to the extent that, as Descartes (1980: 97) famously put it, '(a)lthough the whole mind seems to be united to the whole body, nevertheless, were a foot or an arm or any other bodily part amputated, I know that nothing would be taken away from the mind'. In consequence, procedures that disassemble, cleave, suture or augment the body, particularly when it is reduced to its component parts, are deemed to have limited impact on the transcendent self, whose interest in the corpus is predominantly that of a property relationship. It is not that such interventions are without significance but that the materiality of their effects exists alongside a belief that it is within the power of biomedicine to restore not just health but the well-Being[3] of a subject temporarily disarrayed by corporeal breakdown. Once the body itself has healed, then the core self is enabled to re-emerge unscathed. For Merleau-Ponty, in contrast, the embodied self is reducible to neither mind nor body alone; a human being is not 'a consciousness *in* a body', but rather establishes what he calls being-in-the-world through the potentialities of bodily activity. As he puts it: '(w)e have no idea of a mind that would not be *doubled* with a body, that would not be established on this *ground*' (Merleau-Ponty 1968: 259). Moreover, what we understand as 'I' – our sense of self-identity – comes into being through our corporeal engagements with the world: 'There is no inner man,

man is in the world, and only in the world does he know himself' (Merleau-Ponty 1962: xii). Each one of us is enmeshed in what Merleau-Ponty calls the 'flesh of the world' (of which more in Chapter 2) which intimately links us into a prosthetic relationship with the materiality – human, animal and inorganic – of other elements.

In illustration of these points, an autobiographically based article by Vivian Sobchack (2010) – whose left leg was amputated several years previously – reflects on the ways in which the prosthetic experience may entail a complex and unsettling contestation of any sense of the subjective self. She writes of how the lived experience of her body simultaneously encompasses: (1) the ongoing sense of her originary 'whole' corporeality as it was before amputation; (2) the absent presence of her 'phantom' limb – itself a *psychic* prosthesis[4]; (3) the materiality of her 'real' manufactured prosthesis which can be forgotten, but may erupt into consciousness. As she remarks: 'to some degree I am always aware of the different choreographies, bodily rhythms, and spaces that attach to and attend my use (or non-use) of my crutches or my prosthetic leg' (2005: 57). The various elements sit uneasily and ambivalently together, resisting any fixed meaning and significance. Sobchack is acutely aware of the way in which both the phantom affects, which characteristically follow amputation, and the biomedical prosthesis itself profoundly unsettle the clean and proper body of the psycho-social imaginary. As she acknowledges, 'the material causes and processes of these sensations are not equivalent to their *experiential* effects' (2010: 52). The binaries of real/artificial, objective/subjective and material/imaginary are all made undecidable and inadequate to capture what she understands of her own embodied experience. Despite some differences in their prominence in her lived experience, she reflects: '"Phantom" limbs, "prosthetic" limbs, "real" limbs: their difference is one of degree, not of kind – and less in function than in material substance' (2010: 63). It is not that Sobchack wilfully evades fixity – indeed, she speaks of still striving for a sense of a *whole* body – but that it is constantly undone, not by the lack associated with amputation, but by the strangely expanded boundaries of her embodiment. What is at stake is wonderfully captured in artist Alexa Wright's digitally manipulated image of a man experiencing a phantom limb effect (Figure1.1). Where the complexity and slipperiness of incorporation looms large in Sobchack's phenomenological account, in the next chapter I shall show how that sense of incorporation is taken to another level in the context of the transplantation of living organs and tissue from one body to another.

What can be taken from the imbrication of material examples and a developing theoretical framework is that an unproblematised account of prosthetic technologies as replacements or stand-ins for missing parts of less than complete bodies cannot hold. In everyday terms, such interventions do often have a reparative value, but there is some further and existentially significant aspect of supplementation technologies that

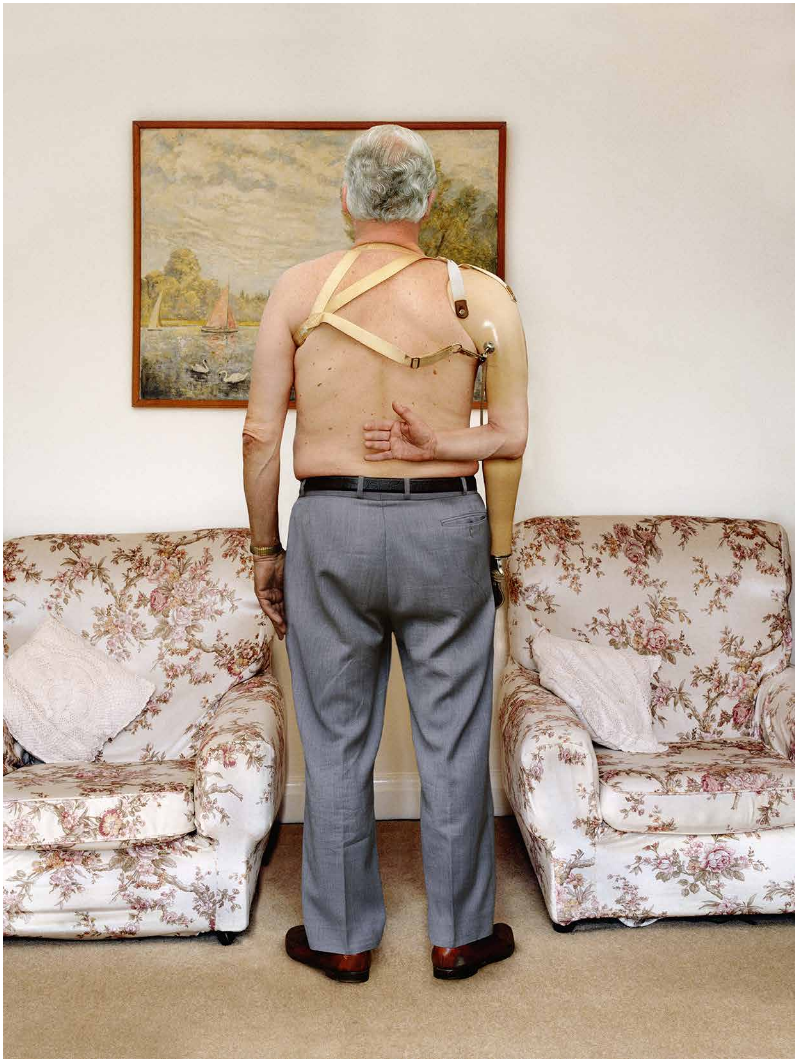

**FIGURE 1.1** *After Image LN2 © Alexa Wright. Courtesy of the artist.*

undermines the stability of human and biological being. Usually such a thought has devolved on an age-old suspicion of the non-natural, but my own take turns instead to Derrida for whom technology figures a deconstructive moment. In his 'logic of the supplement' (1973, 1974), Derrida signals the impossibility of fixing definitions or limits and stresses instead the impossibility of completion, an irreducible ambiguity and a thoroughgoing undecidability. Against the convention that prostheses are supplementary to an *originary* body, Derrida insists that only something which is already *inherently* incomplete can be augmented. In other words, that which is supplemented is less than self-sufficient from the beginning, and technology constructs that which it purports to enhance: 'The strange structure of the supplement appears here: by delayed reaction, a possibility produces that to which it is said to be added on' (Derrida 1973: 89). His approach presents an especially pertinent challenge to the framing of the body–prosthesis interface as though it were merely instrumental. And with prosthetic usage still in mind, there is a further twist. Given that Derrida insists that supplementarity is always a paradox, implying a movement to both augment – even make whole – an existing object, and at the same time to substitute for or replace that object, then a prosthesis may both extend functional agency *and* radically destabilise specifically human agency as such. Peggy Kamuf's commentary explains that a supplement is 'at once something secondary, external, and compensatory, and something that substitutes, violates and usurps' (1991: 139, n.9). As such, the desire for harmonious restoration – the making 'whole' of the disabled person, or the re-establishment of normative life – cannot be fulfilled. However they are thought, prostheses contest the unity and integrity of the supposedly originary body, fatally blur the boundaries of embodiment and at very least suggest a hybrid intercorporeality.

## Disability assemblages

In the light of the ambiguous experience of prostheses in the lives of disabled people which raises questions about the integrity of the embodied self, I want to make a theoretical shift and rethink the whole nexus in terms of neither self/other nor intercorporeality, but rather of assemblages. The problematic becomes even clearer in the overtly visceral context of donated organs, or microchimerism and the microbiome, and I shall say more about the turn away from Derrida and towards Deleuze in subsequent chapters. Although an understanding of the mode of supplementarity pushes the problematic of reimaging corproreal boundaries to a fruitful register, the Deleuzian notion of assemblage provides new opportunities to further explore our ongoing fascination with the nature of corporeality. Since the new materialist turn, feminist work in particular has emphasised the immersion of the human – and more importantly the singular 'I' – in its environmental context of multiple complex relations, particularly with other species (Rossini 2006; Haraway 2008; Wolfe 2010), but we should not overlook the account of inorganic technologies as equally constitutive of life. And it is here that a turn to Deleuze might more adequately reconfigure the terrain.

In the work of Deleuze and Guattari (1984, 1987) the embodied self – rather than being singular and possessing intentionality – becomes a network of flows, energies and capacities that produce never-ending transformations. In place of the usual focus on the opposition between subject and object, they rewrite embodiment as productive, excessive to the singular self, and unfixed. Their model is about fluidity, not containment. Instead of figuring a valorisation of autonomous and rational action, separation and distinction – the key attributes of the modernist self – Deleuzian embodiment relies on the capacity to make connections across nature/culture, between organic and inorganic, and to enter into new assemblages, which, being provisional, are in turn disassembled. In place of the normative organisation of the body, Deleuze and Guattari propose ‘a body populated by multiplicities’ (1987: 30). They promote, in effect, a deconstruction, a queering, of *all* bodies to the extent that putative boundaries no longer function as limits. Where other models are engaged with the contested boundaries of the embodied self, Deleuze and Guattari propose an extensiveness that goes beyond conventional distinctions between whole and ‘broken’ bodies, between rational organisation and inconsistency and between the organic and non-organic. In consequence neither the disabled body in general – whether the marked term is physical or cognitive – nor the prostheticised body is excluded from discourses of desire. On the contrary, the disabled body may be paradigmatic, not of the autonomous subject central to modernist discourse, but of the profound interconnectivity of embodied social relations. In Deleuzian terms, we are all interdependent, and come together and break apart in unpredictable energies and flows of desire. Such connections figure not self-complete and independent subjects, but multiple and fluid assemblages. In an everyday setting, to rely on a wheelchair for mobility, a prosthetic limb for balance, or a human assistant for daily tasks, is to be engaged in assemblages that always exceed the individual and her capacities. Rather than focusing on limitations, DeleuzoGuattarian thought emphasises the innate disposition of bodies towards activity and experimentation, creativity and above all the desire for expansiveness (Deleuze 1990: 218; Buchanan 1997: 83).

To speak of the disabled body in that context is not to imply that it is deficient, but simply to name one difference among many possible forms. On the contrary, it is a substantive site of adventure and potential where de-formations, misplaced parts and prostheses enable innovative means of production that are unconstrained by normative organisation. Surely this is what is meant by the body-without-organs (Deleuze and Guattari 1984: 9). In short, it is anomaly itself that offers possibilities of embracing the strange and opening up to new enmeshments and provisional corporealities. These are the connections that signal the leakiness and ultimate blurring of the boundaries between the human and animal, between organic and inorganic or between an originary body and a prosthesis.[5] The maintenance of a coherent sense of fleshy normativity that relies on the occlusion of all the disarray and disorder that embodiment entails is intrinsically shaken by the accelerating development of increasingly sophisticated technologies that can aid individuals with disabilities through high-tech prostheses, brain implants, exo-skeletons and transplantation surgeries, among others. Like every human being in varying ways, though perhaps more obviously, people with disabilities come into being through such provisional assemblages: there are human–machine assemblages enmeshing flesh and blood with prosthetic limbs, ventilators, wheelchairs; human–human assemblages with family or assistants; intra-human assemblages such as targeted muscle reinnervation (TMR) – a newly developing technique that uses the disabled person's own existing nerve impulses to control the movement of prosthetic limbs; and human–animal assemblages that rely on service animals such as helper dogs and monkeys, or therapeutic encounters with cats and horses.[6] All of these are forms of prostheses, far exceeding superficial functionality, engaging with the production of new forms of embodiment and mobilising a particular performativity of the embodied self.

This can be further illustrated with reference to certain disability art practices which can encompass the adventurous interface – even assemblage – between people and prostheses. As an intervention that explores, disrupts, disturbs and reconceives bio-imaginaries, art in its many forms already stages contestation. Because it can mobilise the production of knowledge along new pathways, facilitate ways of looking and encourage reflective expression, disability art is not simply something done by those who identify as disabled but can be a prime site of creative enterprise for every one of us.[7] It forces us all – as disabled and non-disabled alike – to consider how we relate to the changing world around us, to the transformation of bodies, and how we navigate the web of asymmetrical relationships in which we are all entangled. Art is not the site of individual meaning alone or the property of specific categories of people but an ongoing performance of the world of multiple becomings that weaves its way between intelligibility and unintelligibility, articulation and silence, estrangement and belonging. Its questions are posed across the board, regardless of how each individual might be embodied. The critic Charles Garoian (2013) broadens our understanding of prostheses to include the practices of art itself, insofar as its effects are a vehicle for extending us into and connecting us with other elements of life, while simultaneously creating new dimensions. Such production is both contingent and unpredictable – similar to the conceptual disturbances that can mark prostheses – and it facilitates a multiplicity of new linkages that resist normalisation. Garoian explains his approach to prostheses as a way of exploring metaphors of embodiment in art-based research, and as a challenge to the modernist myth of wholeness and normality that dominates in both art and mainstream notions of the human body. It is not that prostheses are necessarily all positive, but that our extensions into the world are unavoidable. As Garoian sees it, the desired mode of prosthetic epistemology and prosthetic ontology – embodied knowing and being in the world – occurs 'where disparate, disjunctive images and ideas extend one to and through the other and in doing so suggest and inspire new and renewed possibilities for interpretation and understanding social space' (2013: 9). The task is to resist totalisation and find a sustainable immersion in assemblages that lead our irreducibly estranged bodies into more extensive modes of experiencing and validating difference.

This is most apparent in the flourishing field of disability performance arts, which both now and in its precursor in the freak shows of the nineteenth and twentieth centuries[8] have provided opportunities to those not afraid to display their differences. The aim is not to use assistive technologies to overcome disabilities but to create innovative work that relies on a non-normative body. Aside from providing an accessible event, *Graeae* theatre company's 2017 production of *The House of Bernarda Alba*, for example, seamlessly interwove deaf and hearing actors with sign language, surtitles and speech to bring extra power to the themes of secrecy, repressed passions and the challenge to stifling conventions. In a different mode, the dancer and choreographer Claire Cunningham performs on crutches, the Canadian aerialist Erin Ball works both with and without her prosthetic lower limbs (Lavers and Burtt 2020), as does the UK group *DV8 Physical Theatre* who are well-known for defying stereotypes around embodiment and sexuality. The narrative of their 2004 production, *The Cost of Living*, forcefully deconstructs the trope of perfection and shows one of the company's members David Toole – who has just two limbs, his arms – dancing with a non-disabled female colleague. What is surprising is not that Toole can move his body with as much grace and control as the other dancers, but that he is fully integrated – without explanation or apology – into their display. *DV8* are no utopian idealists, however, and the performance also reminds us that the disabled man in his wheelchair is initially very much on the outside of artistic endeavour. Against a legacy of the knowledge constructed and authorised by medical discourses over decades that focuses on what disabled bodies cannot do – on the limitations of physical or cognitive impairment – performance artists can offer alternatives to normative expectations and celebrate possibility.

One such American performer is Lisa Bufano who underwent a bilateral below-the-knee and total finger-thumb amputation at twenty-one (figure 1.2). In her dance work – though that is surely too constraining a term – Bufano deliberately plays with transgressing notions of femininity and is upfront about her attraction to deformity and the way in which performativity enables her to embody herself as animal. She writes: 'My eye has always been drawn to abnormal forms … It's just that now my tool is my body. … being a performer with a deformity' (cited in Davis Brown 2016). In her short career Bufano consistently challenged her audiences to confront their own prejudices about the public display of anomalous embodiment and non-normativity. She was not afraid of failure; as her brother put it after her death, 'Lisa was easily engaged by seemingly futile efforts. She saw something beautiful in futility' (Bufano, P. 2013). Of the many videos of her work,[9] one stands out in particular: a short piece called *Mentally Fine* (2010). In it, Bufano is showcased through the sheet window of an empty store-front in Boise, Idaho, performing on her elongated prosthetic

**FIGURE 1.2** *Lisa Bufano performing. Photo © Gerhard Aba (Courtesy of the photographer).*

giraffe-like legs, which are shaped like those of Queen Anne chairs. Two women passers-by are filmed as they stop to comment on the unexpected spectacle, trying to come to terms with the visual assault on, and disorientation of, their normative expectations. One woman, faced with the physical difference of Bufano's body and her startling use of prostheses, struggles to express not simply her confusion but also in a strange way her support. Having established, in conversation with the filmmaker, Bufano's agency as an artist, she exclaims in relief 'mentally fine then?', implicitly making a conventional distinction and related assertion that cognitive disability is less acceptable than a physical impairment. Good liberal viewers of the video will no doubt laugh, but the passer-by then goes on to mention that she was once faced with an amputation herself, indicating that perhaps her reduction of the performance to normative epistemologies masks a moment of communality. Bufano herself well understood the mixed reaction, commenting elsewhere: 'I find that there's a gut response in audiences, an attraction/repulsion aspect to it that can be compelling' (Davis Brown 2016). What her dance work exemplifies, and what the passer-by does not overtly reject – even given the clash of imaginaries – are Bufano's crossings between human, animal and machine, which figure not as limitations but transformative possibilities of becoming other along multiple lines of flight. Crucially, her entangled form of prosthetic embodiment refuses self-sovereignty to enter instead into a Deleuzian assemblage in which the being of the individual is superseded by a state of becoming.

For some with disabilities, engagement with artistic practice as a producer is a conscious decision, but I want to suggest that to shift the focus to creativity opens up a much wider field of imaginative output. Alongside those choosing art in its more conventional meaning, we can begin to include all those whose use of prostheses draws them into the domain of innovative production. The advent of high-tech, essentially prosthetic, interventions into the body has already rapidly changed the terrain on which to understand the capacities of disability, and it goes well beyond the conventional model of 'failing' forms of embodiment. A prosthesis is no longer a simple utility designed to replace something that is missing or to correct an anomaly in the way that artificial limbs, transplanted hearts or pharmaceuticals were supposed to function in the past; they are at least also supplements that recreate embodiment itself, with all the complex Derridean connotations of that term. To recap: the very possibility of prosthetic enhancement indicates not a specific loss or failing of an *originary* body, but the impossibility of there being any whole and complete form of embodiment in the first place. A prosthesis may indicate that an intervention has been made to replace, realign or restore that which is missing or damaged, but it is also the event of innovation and re-invention, a tool of artistic creativity. That notion applies to many different forms of healthcare intervention, but it may be particularly apposite in the context of disability. As Susan Finley notes, 'prosthetic spaces are the imagination's playground to eliminate or over-ride, re-engineer, and re-conceptualize the physical and social barriers that conscribe the status of "other", particularly those who are physically marked by their difference, to their outsider and handicapping status' (2015: 506). I am not implying that there is no straightforward deployment of prostheses but that whatever the motivation and perceived benefits, the outcome goes beyond – conceptually and practically – simply restorative use.

Again there is no sense in which prostheses are peculiar to those experiencing disability, or that in the end there is any qualitative difference in the performativity they stage. Disability theorists Mitchell and Snyder join many other philosophers, like Stiegler and Ihde, in pointing out: ‘the prostheticized body is the rule, not the exception’ (2000: 7). Is there any substantial difference between the high-tech sprint shoes of a non-disabled athlete and the racing wheelchair of a disabled counterpart – except, of course, that the mode of propulsion of the latter is superior in efficiency?[10] Nonetheless, disability *is* still taken to speak to an originary *lack*, so disabled people may be more conscious of the extension, substitution or supplementation of their bodies in those terms. Where, for example, the development of supernumerary wearable, robotic arms – whether for artistic, industrial or military purposes – is hailed as an amplification of bodily possibilities and a transcendence of biological limitations, similar prosthetic devices used post-amputation are understood to be countering a functional failure of embodiment. Either register may be technologically sophisticated and it is difficult to pin down any substantive difference. Moreover, although prosthetic devices for disabled people are intended to replicate or enhance normative function and appearance, figuring a Foucauldian sense of the technological disciplining and regulation of the body,[11] they too are already excessive to the normative body. The danger, nonetheless, is that rather than highlighting communalities insofar as all bodies can be enhanced, those who are already classed as disabled would be left behind. The range of enhancement strategies that cover developing nanotechnologies, surgeries like brain implants to control cognitive as well as physical abilities and pharmaceuticals to alter behavioural capacities go far beyond the assistive technologies that are most commonly associated with people with disabilities. Given the transhumanist focus on individual self-fulfilment, it is hard to escape the conclusion that the drive to surpass the boundaries of current human achievement will remain the territory of a privileged few. As Gregor Wolbring warns, ‘the introduction of every new technology has led to a new group of marginalised people and to new inequalities’ (2009: 152). In that respect, the future is ambivalent at least, but none of us can simply opt out. In any case, my contention is not that visceral prostheses are tools to deliver social justice, but rather to enable a new imaginary of embodied forms. As such, the development of a thoroughgoing posthuman bioethics could render obsolete the binary foundations of present-day discriminations.

## Prosthetic creativity

My argument, then, is that the transcorporeality of the organic and inorganic, the assembly and disassembly of surprising connections, the capacity to innovate, and the troubling of intentionality may all be experienced productively – and creatively – by disabled people, insofar as there is a willingness to explore the uncharted potential of bodily extension and supplementation. As Lisa Bufano's artistry illustrates in its embrace of minoritarian thought and practices, to exceed the expected limits of the resources to hand can both intensify the decomposition of the operative binaries – natural/artificial embodiment; active/passive; biology/technology – and engage with multiple non-repressive forms of desire in place of what may conventionally be perceived as a lack. Following Deleuze and Guattari (1984), desire here is not primarily sexual; it is not possessed by a singular subject; and nor does it flow directly from one individual to another. Instead, it is an element of what they call desiring machines, and as Guattari explains, '(Desiring) machines arrange and connect flows. They do not recognize distinctions between persons, organs, material flows, and semiotic flows' (1996: 46). A desiring machine expresses, then, no necessary continuity, nor seeks a return to the illusion of an originary wholeness. What mobilises desire are the surface energies and intensities that move in and out of multiple conjunctions that belie categorical distinctions or organisation; it is not the ontological status of embodiment that matters, but what a body can do. This is what provides the grounds for a move away from what the disabled body putatively lacks to focus on its prosthetic potentials. In Deleuzian terms, it is clear that the experience of a dis-unified or prosthetic body demands a degree of inventiveness that most people rarely experience. In place of prohibition, repression and disavowal, Deleuzian embodiment is expansive, fluid and connective. It constitutes a new erotics of corporeal connectedness with creativity at its heart. And because the emphasis shifts from the integrity of the whole organism to focus instead on the provisional coming together of disparate parts, there is no need to think of bodies as either whole or broken, able-bodied or disabled, but simply in a process of becoming through the circulation of desire. Connectivity is the necessary but not sufficient condition of flourishing: what mobilises or stalls the rhizomatic proliferations of embodiment is the extent to which the connective nodules escape organised patterns of operation. The excessive and atemporal nature of modes of becoming represents a way of queering or cripping prostheticised disability.

In terms of assemblage, creativity is not a privileged characteristic that is given to some and intrinsically denied to certain others, but a process in which all can engage, whereby differential bodies, diverse materialities and disparate ideas interweave and enter into endless relations of mutual affectivity. Creativity can no longer be thought as a quality of a singular body, but as the energy and affect that flows between multiple bodies, locations, resources and ideas. In the Deleuzian sense, creative production – which would include all the art practices I have referenced so far – occurs within, and as a result of, extensive and inclusive networks of interrelations between creators, constructions and their audiences. That list is not exhaustive of course and we might just as well include all those who largely remain behind the scenes – like curators, manufacturers of materials or tools, administrators and service providers. In the case of those with disabilities, both physical and cognitive, the network is likely to be overdetermined by the input of healthcare professionals; modes of education; the designers of prostheses; the specific national benefits system that impedes or supports embodied difference; the paid assistants who facilitate personal care; the existing bio-imaginaries of the recipients of the art work; and many more. There are evident limitations but there is no absolute closure or completion. At the heart of it all – the multiple relations, the entanglements that energise action – creativity is the mark of a body capacitated to generate new outcomes and connections that channel affect and desire. I am not arguing that all disabled people have a postmodernist view of embodiment in which the possibilities of performativity and transformation are enthusiastically welcomed. It remains a choice whether to aim for realistic augmentation that supposedly completes the body or restores it to normativity, or to pursue previously unexplored prosthetic imaginaries. Most users are probably fairly conservative, but the more adventurous – and, to be pragmatic, the more privileged – have the option of creating new worlds for themselves that use their initial estrangement as a jumping-off point.

For Deleuze and Guattari, such nomadic flows of energy extend embodiment way beyond the merely human. It is not that there is no distinction to be made between one corporeal element and the next, or indeed between human and machine. It is rather that becoming entails an inherent transgression of borders that turns the agentic potential of the embodied person away from privileged notions of autonomy and rational thought that are the conventional markers of the human. The model speaks to bodies whose fluidity and energies are open to and engaged in mutual transformations. Where the stress is on the multiple possibilities of connection, then anomalous bodies need no longer be a source of anxiety, but hold out the promise of productive new becomings.[12] The Deleuzian take-up of this positive notion of productive desire is limited neither to those who already fulfil certain corporeal criteria, nor to the modernist form of autonomous agency. For everyone, regardless of their form of embodiment, it represents an adventurous move from the fixity of being to the inventiveness of becoming, but how might this operate in the lived experience not of unapologetic performance artists such as Bufano, but of everyday disabled people who – precisely *because of* their use of prosthetic devices – are usually characterised as dependent and lacking? I have already mentioned some decidedly low-key assemblages – like the relation between a blind person and an assistance dog – and will now look briefly at some of Barbara Gibson's work which theorises the practical day-to-day functioning of some severely disabled adults and children.

In an early study, about which I have already written (Shildrick 2009), Gibson listens closely to some young long-term users of ventilators and concludes that the dominant therapeutic drive to maximise 'independence' bears little relation to the men's daily experience. Searching for an alternative goal, she turns to Deleuze and Guattari's rejection of the autonomous subject, and reflects on their promotion of an active *becoming* that breaks through the bounded limits of the singular biological self. The point, as she understands it, is that the young men are 'both confined to individual bodies and simultaneously connected, overlapping with other bodies, nature and machines' (2006: 189) and generative of energy transfers. Speaking of one disabled man enmeshed with multiple life-supporting prostheses, Gibson writes, he is, 'a fluid body … a conglomeration of energies. He has replaceable parts. … His organs are here, there, and everywhere' (2006: 191–2). Going further, she marks not dependency but an 'electrified body flowing through power lines connected to the hydroelectric dam, receiving power (desire) from the river, from gravity that motivates the river'.[13] The human–machine interchange outlined here is supplemented in a more recent study of a severely disabled twelve-year-old girl that demonstrates how Mimi and her mother are not only interdependent, but, more profoundly, 'their selves connect and merge into assemblages and later disconnect and reconnect with others to form different assemblages. Within these assemblages there are no clear distinction between persons or between persons and technologies' (Gibson, Carnevale and King 2012: 1895). It suggests that the bodily transgressions associated with disability are a powerful step towards opening up the dynamic and always unfinished processes of assemblage that in turn point to the unlimited potential of becoming. While the accounts here are specific to particular embodiments, the Deleuzian thought that Gibson utilises figures both an individual moment of dis/abled becoming – and I use the slash to indicate the inadequacy of the usual term – and a modality of existence open to all. Far from signalling anxiety and restriction, the supposedly isolated vulnerability of *all* forms of embodiment might suggest the possibility of entering into intense and productive forms of connectivity. The embrace of concorporeality – and I deliberately leave the verb both active and passive – is open to all those who abandon the privilege of normative embodiment and embrace prosthetic linkages.

In a somewhat utopian sense, assemblages speak to multiple combinations, organic and inorganic alike, that are as hospitable to disabled people as to any others, but I do not want to suggest that the prosthetic performativity of disability is always able to operate as an unchallenged positivity. There are many pragmatic constraints – particular morphological differences and states of mind – or enforced patterns of living that continue to impede the flow of energies and frustrate intentionality. We need to be acutely aware too that the options available to most disabled people in the global North, or at least those countries with adequate welfare systems, are, in many other locations, severely limited and simply not accessible, except to the well-off. Nirmala Erevelles, among others, raises a cogent question: 'What does it mean to come to terms with the transgressive vagaries of … assemblage – precarious/partial/body-without-organs/liminal/ affective/ molecular – within political economic contexts imbricated in colonial/neocolonial practices of unrelenting social, economic, and militarized violence' (Erevelles

2014: np)? Rural populations throughout the developing world are unlikely to benefit from technology in the same degree as Westerners, and the mode of rehabilitation to normativity, which I have consistently critiqued, would in any case appear as an unobtainable dream. Even a country as neoliberal and economically ambitious as India has little in the way of aid for disabled people and relies more on intermittent charity than State organised policy. The category of disability – largely because of the widespread belief in *karma*[14] – invokes shame in those so-labelled and avoidance or contempt in the able-bodied public, a situation that is exacerbated by all the usual forms of discrimination – gender, class, ethnicity, religion, poverty – with the damaging addition of caste. In such a situation it might be necessary to rethink the purpose of rehabilitation but not to give up critiquing it. In any case, the prosthetic technologies employed may be very low-tech yet have as a great an effect as any sophisticated wheelchair, or the Bionic Arm. The Jaipur Foot (or Leg), for example, was invented in 1968 as a cheaply produced mobility device and was intended to be available to amputee Indians as an alternative to costly Western prostheses. It proved to be superior in flexibility and durability to the more sophisticated models and had the local advantage of allowing users to walk barefoot if that was their practice. It is still in widespread use and costs under $35. As a rehabilitation technology, it undoubtedly aids the push for independence and personal autonomy, but those attributes are not the primary goals in Indian society. Even under neoliberalism, family and communality have a higher value, and that form of inclusion is what the Jaipur Foot enables.

Given the limited nature of the dominant sources currently in play, academic thought about disability and bioprecarity must seek to counter the centrality of the discourses of the global North, and respond to the limitations of a privileged perspective that may not – and often cannot – speak to local conditions. On the historically entrenched scale of the 'soft power' of Western coloniality, those of us living or educated in the global North are becoming increasingly aware of the necessity for decolonial approaches. In the Indian context, Nandini Ghosh and Supurna Banerjee (2017), for example, critique Western notions of the transformative potential of cripping care through big social changes, but add that transformation can happen through everyday acts of survival within the communality of family life. Ethnic identification too is not without its own failures of perception: the inhabitants of modern cities like Chennai or Hyderabad, for example, may struggle to fully appreciate the lives of the 65 per cent of Indian citizens classed as rural. There is no easy course to follow, and, I would argue, a real danger exists of evacuating the responsibility to engage with what is too little known, a self-serving position of giving ourselves an alibi to do nothing. It would, moreover, be deeply patronising to assume that scholars embedded in the global South should not be equally involved in exploring all the resources that contest the status quo. Postmodernism and posthumanism may be Western constructs initially but the different stagings of the same problematic need not be seen as contradictory. Bioprecarity in general and disability in particular work across many different registers and we should reflect on how the interface between apparently conflicting methodologies might be fruitfully negotiated. In the Indian context, for example, Arun Kumar reminds us that while many other grassroots movements are campaigning against the fallouts of neoliberalism, disability activists are fighting for inclusion within the very agenda that causes poverty and disables people (Kumar, Sonpal and Hiranandani 2012: np). His pointed critique is one shared by progressive scholars in many other very different geopolitical locations.

A decolonial approach is about unlearning one's privileges and adopting an ethical openness towards otherness which means fully acknowledging the difference. Gayatri Spivak's work, which predates the institutionalisation of decoloniality, acknowledges the difficulties for northern-based scholars and recognises that the push for things like disability rights – and this would apply particularly under State conditions of neoliberalism – entails a necessary ambivalence. She calls for a 'persistent critique of what one cannot not want' (1993: 42). Insofar as rights *can* bestow social value and help pull oppressed people everywhere out of dehumanising situations, they should be supported as well as contested. What is required is a keen awareness of the different – but not exclusive – registers of contestation. The postmodernist-inflected model I have proposed here is not about conventional models of social justice, modernist notions of unrestricted choice or a freedom to enjoy every possibility, but nor does it deny that technologies can enhance the conditions of living. What it does intend is a break with the putative emergence of a coherent subject with fixed and organised desires, offering instead a turn to the energetic intensities which play across the points of connection between disparate entities. In that light, the postmodernism of the global North has more work to do in countering an entrenched individualism than do many other forms of sociality that already accept the positivity of interconnectedness. However it might be expressed, what matters is the transformative potential of the process of becoming with others. It points to an understanding of the body as always already supplemented that goes beyond the focus on individual agency and explores instead the *emergence* of a (provisional) self through an erotics of connection that could reconfigure our estimation not only of disability but of all embodiment.

As I have indicated throughout, the corporeality of disability – in its specific differences – is in many senses already queer in its contestation of the prevailing psychosocial imaginary.[15] Disability is not a unique case; rather, its forms of embodiment, and its overt embrace of prostheses, exemplify the fragility and instability of corporeality in general. The postmodernist acknowledgement that all bodies – normative and non-normative alike – are in a constant process of transformation means that all are potentially hybrid, nomadic, prosthetic assemblages. When Deleuze and Guattari refer to becoming minoritarian, they are not privileging any given category, but referring to processes – open to all – that operate through the assemblages provisionally brought about by what are in effect radically disparate prosthetic connections. To evacuate the stability of fixed being and identification is not without risks, but given that many existing bodies, especially disabled ones, are already figured by the repressive organisation of the modernist template as not mattering, it may be a necessary way forward. The overriding point, however, is that flux and instability are not peculiar to the anomalous body but are the conditions of all corporeality insofar as the wholeness and integrity of the normative subject is a phantasmatic structure. As such, the dis/abled body is no aberration, but a variable mode of becoming. Once it is acknowledged that corporeality – as an impermanent mode of embodiment – does not end at the skin, and that material technologies and both animal and mechanical prostheses constantly disorder our boundaries, it is difficult to maintain that those whose bodies fail to conform to normative standards are in any way inferior. Modernist anxieties around non-normative embodiment are exposed as a nostalgic throwback to a constancy only operating in the imaginary. In their entanglement with technologies at all levels, including human and animal others, people with disabilities who currently live at the margins – whether in the global North or South – may already embody the posthuman condition that awaits us all.

Although many of the prostheses I have referred to remain ostensibly external and mechanical – unlike the issues of organ and tissue transplantation that I move on to in the next chapter – their somatechnical take-up is nonetheless visceral. The phenomenological incorporation of so simple an object as a walking cane, the Derridian analysis of supplementation as *constituting* a sense of an embodied self and finally the Deleuzian extensiveness of assemblages all speak to the way in which prostheses are always already intimately intertwined with human being. Prostheses never remain as discrete objects to be laid aside at will but demonstrate a sticky viscerality. In that sense we are already more than human, attached to the materiality of our fleshy bodies but not defined by its limits. What is at stake in the radical conjunction of prosthetic technologies and disability is not just the decline of the priority given to some forms of embodiment over others, but the contestation of human exceptionalism as such. As we enter the era of post-anthropocentrism, can we finally dismantle the operative binaries of the modernist mind-set and begin to replace the tired old discourses of the limited singular self to celebrate an erotics of connection and open up a new prosthetic imaginary?

# CHAPTER TWO

# The phenomenology of organ and tissue transplantation

The argument throughout my text is that prosthetic technologies in general effect an intimate disturbance to the stability of an enduring corporeal self and induce a sense of inherent hybridity. To think specifically of visceral prostheses, however, will for many people conjure up certain surgical procedures that directly implant non-self material into the body. There are many inorganic supplements such as pacemakers or hip replacements, but of all the possible technological interventions into human corporeality, organ and tissue transplantation – kidneys, hands, corneas, skin and particularly hearts – has consistently excited a depth of interest and range of emotions that far exceeds mere engagement with the practical demands of the operation. In the twenty-first century heart transplantation has become so well-established as a biomedical practice in the global North[1] that it scarcely raises any scientific concerns unless the procedure is entering into new territory such as that opened up by face transplants. With a high survival rate for recipients, transplantation is a decidedly successful treatment for end-stage heart failure,[2] and yet this unexceptional procedure nevertheless provokes a complex response of widespread socio-cultural and individual psychic anxiety. I shall suggest that it is not the *biomedical* risk of heart transplantation that causes concern, but the manner in which the procedure deeply disrupts the cultural imaginary and poses irresolvable difficulties to the question of personal identity and the vexed relation between self and other.

Organ transplantation, like many other biomedical procedures, has long relied on the Cartesian machine model of the body to justify radical intrusion into the corpus as the properly reasoned and informed actions and choices of essentially disembodied sovereign subjects. The body is reduced to the status of personal property, inalienable in principle, although one may enter into a contract whereby body parts – organs, tissue, ova, blood and so on – can be commodified in an exchange economy; cut up; or supplemented by prostheses, including having discrete parts replaced by organic material from other bodies. Both the surgical subject and the surgical team are widely viewed as engaged in a form of heroic, albeit supremely functional, medicine in which questions of self, embodiment and intercorporeality are put to one side. This is especially evident in the field of heart transplantation which, of the more common procedures, is nevertheless the one most likely to provoke uncertainties with regard to the nature of the embodied self. Of all the non-visible parts of the body, it is the heart, along with the brain, that has been most clearly at the centre of imagination in Western culture,[3] although many other cultures privilege different organs such as the liver.[4] What is striking is the degree to which the heart is represented not as a discrete and merely functional part of the body that might be exchanged, but as an organ of immense *personal* significance that speaks to the age-old question 'Who am I'? In the socio-cultural terms of Western thought the heart stands in for a range of inherently human attributes such as love, empathy, fear and guilt. In short, it is perceived to be at the core of human selfhood.

With few exceptions, the standard way in which the field of organ transplantation is reported both within the biomedical sciences and in lay media heavily emphasises the notion of spare part surgery in which the graft is simply a utility, exchangeable between bodies but having no existential status of its own.[5] As biomedical illustrations demonstrate, the internal organs are neatly contained within the 'clean and proper body' (Kristeva 1980) that speaks to a cultural imaginary in which everything is in its place and accessible to biomedical control and intervention. Like other similar procedures, heart transplantation is deemed to have few implications for the phenomenological sense of the being-in-the-body of the recipient, but is judged as a success or failure solely on the evidence of immunological acceptance and subsequent functionality. All complex surgery remains something of a mystery to the lay public but we are generally content to accept the illusion of heroic medicine in which our fragile, disorganised and possibly diseased bodies are restored to an originary wholeness by the intervention of highly skilled experts in the field. The task of the imaginary is to maintain a coherent and integrated sense of bodily normativity that is made possible only by occluding all the instances of disarray and disorder that embodiment actually entails. Nonetheless many operations judged fully successful in biomedical terms,[6] in which the signs of ongoing clinical recovery are strong, result for the transplant recipients in significant degrees of psychic disturbance to their sense of self which range from feelings of unease and uncertainty through to complete breakdown.

Even where the prosthetic modification of bodies is scarcely discernible at a visual level, then, it can have profound implications for the supposed continuity of the embodied self, raising the questions: What are the theoretical implications of stitching together previously separate body parts;

and what does it mean for a recipient to assent to a procedure that at the most fundamental and symbolic level disrupts the integrity of the 'I'? To say that the embodied self is cleaved plays on the double meaning of 'divided by force' and 'closely united' and gives a rich indication of Derridean *différance*, for it is undoubtedly a sense of hybridity, of in-betweenness that is at stake. The ability of recipients to sustain and incorporate mechanical or donated organs over time is at least correlative with their negotiation of questions of self-identity, bodily integrity and corporeal hybridity. In this chapter, I take heart transplantation as my specific focus in order to problematise and explore the issues – both substantive and immaterial – through a number of different but mutually supportive conceptual models of which the major strands are corporeal phenomenology, Derridean poststructuralism and Deleuzian assemblage theory, all somewhat refashioned by a feminist and queer reading. Before offering that theoretical overview, let me first briefly set out the material dimensions of a specific heart transplantation project with which I was deeply involved for well over a decade.

## The *PITH* project and Merleau-Ponty's phenomenology

The substantive research that underpins my argument here is based in an international multidisciplinary project – the *Process of Incorporating a Transplanted Heart* (*PITH*) that explicitly set out to use a phenomenological perspective to gain insight into the non-medical aspects of transplantation, although that approach was eventually superseded by a more committed postmodernist analytic.[7] Where the original program was focused on recipients, a new follow-on project *Gift of Life Analysis* (*GOLA*) undertaken by the same team explored the meaning of transplantation to donor proxies.[8] Instead of reading off the biomedical markers of recovering patients to ascertain the levels to which they are supposedly restored to health, the *PITH* project – on which I will mainly focus – sought to engage with heart recipients in terms of their lived experience, asking them how they *felt* about their new forms of embodiment. In the initial stage, a cohort of twenty-five recipients of mixed age, gender and ethnicity, all of whom were between one and nine years post-transplant, were identified and interviewed.[9] Most importantly, all interviewees were regarded as medically and psychologically stable. This is particularly significant, because although the *PITH* team picked up high levels of distress and dysphoria, it would not have shown up in standard tests.[10] Of the twenty-five interviews, seventeen recipients expressed themselves with reference to a machine model of the heart, but more importantly, twenty recipients verbally expressed or visually displayed some distress or dysphoria either in relation to the donor, to their own identities or to both. In other words, although the recipient is expected to incorporate the alien material into her own embodied experience as an integrated element of her own identity (Shildrick 2008), our research shows that the majority of recipients struggle to do so, experiencing rather a range of affects that indicate an acute awareness of the continuing otherness of the donated organ.

The results show a startling degree of self-uncertainty and distress that is exhibited both through verbal interchanges and through bodily comportment. The question 'Who am I?' takes on new meaning that can only be understood – as phenomenological theory would intend – through the body. What has emerged from the research indicates very high levels of identity disruption and dysmorphia across the sexes. Where such reported experiences might conventionally be seen as evidence of an individual failure to deal with the traumatic intervention into the body that transplantation entails at the clinical level, there are other less medically based explanations in play. Even at the material level, recipients are faced with at least two contradictory narratives – that of 'spare part surgery' and of the 'gift of life' – which I shall explore later in the chapter. The profound disturbances that recipients spoke of or displayed were, then, predictable and meaningful outcomes of the embodied experience itself, and building on the development in Chapter 1, I shall show how a phenomenological perspective provides insight in interrelated ways. First, the approach undercuts any putative split between the psychic and the somatic, and second, it lays the ground for an understanding of organ replacement as a procedure that usually involves the intimate interaction and connection between at least two embodied selves.[11] In recognising the fleshy materiality of the graft as a visceral component of the living self, questions concerning the significance of the transfer to the recipient can be addressed in new ways.

The corporeal phenomenology of Merleau-Ponty fundamentally challenges the Cartesian split between mind and body – the very thing that authorises technological interventions into the body. The significance of this for biomedicine is profound and suggests that a phenomenological approach that focuses on the lived body might be a more adequate model from which to understand the actual experiences of the recipients of healthcare in all its manifestations. The contestation of the mind/body distinction is, however, just one of a series of moves made by Merleau-Ponty that interrogate the binary structure of the modernist logos. A further highly significant point arising from his work, and one that has been particularly developed in feminist thinking (Grosz 1994; Weiss 1999; Diprose 2002), concerns the intercorporeal possibilities suggested by the phenomenological notion of reversibility. For Merleau-Ponty (1968), reversibility signals a series of correspondences in which sight and touch always intend 'being seen' and 'being touched', a mutuality of perception and affect that troubles the distinction between self and other. The theme of an ambiguous intersubjectivity is apparent in the earlier work (Merleau-Ponty 1962), but it is in his posthumously published text *The Visible and* *the Invisible* (1968) that Merleau-Ponty lays the ground for a crossing of the boundaries not only between an embodied subject and embodied object, but between exterior and interior. While the thematic of intercorporeality – although never mentioned as such – is strongly implied in the chiasmatic relation between bodies, the further step of concorporeality, the coming together of bodies, is there to be developed. At very least, bodies cannot be seen in terms of the absolute separation and distinction demanded of the sovereign subject of modernity. In engaging with Merleau-Ponty, feminist scholars (Rothfield 2005; Zeiler 2014; Käll 2017) see such ideas as speaking to a pre-existing feminist ethics grounded on connection and relationality, although I will posit a more appropriate postmodernist ethics later in the chapter. For phenomenologists bodies are always in communication and co-construction, even where distance is maintained as in Merleau-Ponty's reimagining of the chiasmatic relation between the seer and the seen in *The Visible and the Invisible*. More specifically, I suggest that the late work might provide significant new insights into the operations of what, in the context of organ transplantation, is essentially the construction of a hybrid body.

Aside from the mutuality of embodiment, a further important theme taken from Merleau-Ponty concerns his concept of flesh ontology. What he appears to imply in this notion is that beyond the human to human interconnection that channels the co-construction of embodiment, we are all immersed within, profoundly touched and constituted by the elemental medium of the 'flesh of the world', the undecidable environment in which the encounter between self and other takes place. Indeed, the use of the terms self and other cannot be taken to refer to the binary distinction of the modernist logos for that is precisely what is thrown open to question. Rather we experience distance through proximity, a folding over of flesh that creates the possibility of difference within a unified but undifferentiated medium. As Sue Cataldi (1993: 28) puts it, 'things simultaneously envelop or *copresently* implicate each other'. In relation to the *PITH* project, the concept of flesh enabled us to 'think through embodiment beneath subject-object dualism by developing a radically unified ontology' (Cataldi 1993: 58). What Merleau-Ponty is attempting to do is to express a fundamental unity of existence without being centred on a knowing and sovereign subject. In insisting that we are all part of the same flesh where 'the world of each opens upon that of the other', he seeks to instantiate 'other landscapes besides my own' (Merleau-Ponty 1968: 141) that are nonetheless interwoven with mine through the reversibility of seer and seen, subject and object. As Merleau-Ponty uses it, the central notion of reversibility developed in his later work does not imply any merging of subjectivities, but rather a coming together in difference, a point of both convergence and divergence. This will become important in my account of heart transplant recipients, who I will argue are both self and other, constituted as hybrid but never comfortably merged into a new unified whole.[12]

Taking corporeal phenomenology as its starting point, then, the *PITH* research project sought to establish how heart transplant recipients perceive their hearts both pre- and post-transplant, whether they experience disruptions to bodily integrity or personal identity, and how they imagine and speak about the relation to their donors. For many scholars of the humanities, it might seem obvious that such issues need to be addressed if more ethically adequate biomedical procedures are to be put in place, but the biomedical professionals allied to transplantation are strangely reluctant to countenance the relevance of those questions. With regard to the goals of organ transfer, the discourse of biomedicine remains firmly within the realm of heroic interventions that result in the promise of prolonged life, with enhanced functionality, and the expectation that the recipient will be restored to her original self. The replacement of the diseased heart with a healthier model is accomplished without pause for thought as to the socio-cultural or psychic significance of intercorporeality, in large part because the operative mode of discourse reproduces the modernist mind–body split that occludes the significance of felt experience. As Drew Leder remarks, 'at the core of modern medical practice is the Cartesian revelation: the living body can be treated as essentially no different from a machine' (1992: 23). Even though the lay terminology of spare part surgery succinctly sums up what is perceived to be at stake, and the machine model of the body is widely cited by recipients themselves – 'it's just a broken part that got fixed' – it does little to allay an underlying and widespread socio-cultural anxiety as to the real meaning of suturing body parts together. As Margaret Lock puts it, 'it is abundantly clear that donated organs very often represent much more than mere biological body parts; the life with which they are animated is experienced by recipients as personified, an agency that manifests itself in some surprising ways, and profoundly influences subjectivity' (2002: 1410). Nonetheless, the authorised narrative of clinic gives no credence to recipient doubts and fears, other than as manifestations of psychological disturbance. For most patients attending clinic sessions, the only appropriate – the only allowable – response to the question 'how are you?' is to respond with reference to measures of diet, energy levels, respiration, pulse rate and so on, all the expected biomedical markers of recovery. What is scarcely mentioned in such settings is any sense of the lived body and its affects. Arthur Frank begins to catch some aspects of the problematic when he remarks, 'The medical model, so potent against what can be located, identified, and acted upon, is equally impotent against suffering that resists location, identification, and action' (2001: 355).

The question of what other considerations should be attended to has been raised repeatedly by philosophers (Varela 2001; Nancy 2002; Svenaeus 2010; Zeiler 2014), social anthropologists (Lock 2002b; Sharp 2006), critical sociologists (Fox and Swazey 1992: Waldby 2002: Haddow 2005) and cultural theorists (McCormack 2012, 2021; Wasson 2015, 2020) but very rarely from within biomedicine, and then usually only by those in 'supporting' therapeutic roles (Forsberg *et al* 2000; Sadala and Stolf 2008). Issues include not only those concerning disruptions to the embodied self, but wider concerns about the commodification of organs (Joralemon 1995; Scheper-Hughes 2003), the nature of consent (Koenig and Hogle 1995) and the socio-economic costs in the context of scarce resources (Mitchell *et al* 1993; Dewar 1998). All are important issues but my focus remains on the relatively under-researched area of the experience of both recipients and donor proxies in response to the phenomenological viscerality of transplantation. One of the most disturbing aspects of the lifelong experience of being an organ recipient is that the authorised narrative of the clinic encompasses on the one hand the supposedly neutral technological aspects of spare part surgery and on the other an overt reference to the highly emotive concept of the gift of life as the donor organ is habitually called. Even the least-troubled respondents acknowledged the basic conundrum: 'Somebody dies to make someone live, you know … You think about it all the time.' As the analysis of the *PITH* data confirms, heart recipients experience a range of deeply embodied affects and emotions – distress, loss, guilt, dysmorphia, joy, gratitude – that are not simply mental states, but experiential modes of being that engage precisely with transformations within. It is not so much the exteriority of experience that concerns me, then, as the frequently unexpressed and often inexpressible meaning of a body effectively rendered hybrid.

What is called for is a visceral phenomenology that understands changes to the interiority of the body as having as much import to being-in-the-world as our external interactions. As Drew Leder puts it, 'beneath the surface flesh, visible and tangible, lies a hidden vitality that courses within me. "Blood" is the metaphor for this viscerality' (1999: 204). My intertwining with the other is a relation of flesh *and blood* and must therefore take account of the interior organs and tissues. The flesh of the world does not stop at the skin, and from that perspective, organ transplantation could never be simply spare part surgery, a matter of technical proficiency stripped of any implications for the embodied self. Leder (1999: 206) explicitly sites the maternal/foetal bond as an example of Merleau-Ponty's chiasmatic identity-in-difference – 'the two bodies are enfolded together, sharing one pulsing bloodstream' – and for feminist scholars, pregnancy has become a powerful trope for the body that is not one (Young 1984; Irigaray 1985; Diprose 1994). The extension to encompass transplantation is a further step; yet, what I am calling visceral phenomenology is less recognised in the context of the transfer of internal organs than in the more recently emergent procedures of hand and face transplants. To take one example, a brief article in *The Lancet* – a leading biomedical journal – does make a strong, quasi-phenomenological claim that 'the identity of an individual extends beyond him or herself' (Carosella and Pradeu 2006: 183), before reassuring readers that because *organ* transplants are internal and non-visible, 'the self-identity of the organ recipient was not in question' (*ibid.*). In contrast, the authors assert, hand or face transplants are more ethically complex, because they imply ‘accepting the constant presence of another person, and even a modified expression of the recipient’s personality […] a deep identity split occurs’ (*ibid.*). One cannot doubt that the visibility of the graft does entail distinct problems, but what is remarkable is that Carosella and Pradeu’s account could just as easily have been describing the experiences of many *PITH* respondents. For them the interiority of the graft – as with pregnant women – did not circumvent the question of an otherness within.

Before further exploring the theorisation of visceral phenomenology and hybridity in the context of transplantation, I want to briefly note that the *methodology* of the *PITH* and *GOLA* projects was conducted with phenomenological principles in mind. Although the broad basis of gathering qualitative data operated through the familiar vehicle of semi-structured interviews, each encounter between the potential or actual heart transplant recipient and researcher was not only audio-taped but also video-recorded to capture the bodies of *both* the participants and something of the environment in which the interview took place.[13] Recipients were given the choice of where to set the interview, with most preferring their everyday domestic setting, the usual alternative being a comfortable ‘sitting’ room within the hospital that was deliberately distanced from the clinic itself. In most interviews, then, the recording captures speech, posture and dress, bodily gestures, environmental artefacts and the embodied interaction between interviewer and interviewee. In a phenomenological sense, all of these are aspects of communication, much of which takes place in the pre-linguistic mode. Human beings habitually engage in a complex body language of gestures, facial expression, movement and tone of voice which precedes and supports speech itself. Language in its pre-linguistic form ‘creates itself in its expressive acts, which sweeps me on from the signs toward meaning’ (Merleau-Ponty 1973: 10). In the context of contemporary healthcare, Christian Heath offers a rationale for visual methodologies noting that ‘(t)hrough gesture, bodily comportment and talk, (respondents) render visible what would otherwise remain hidden and unavailable for inspection’ (2002: 615). Heath does not offer an explicitly phenomenological analysis, but in the context of the ‘flesh of the world’, we should expect that the environmental aspects of the interviews would not be without their own contribution to meaning.

The respondents’ body language, then, gives an extra dimension – a visual prosthesis – to the analysis of what they actually have to say, but what is striking is the extent to which such expressiveness goes beyond or even contradicts the spoken word. The respondents’ narratives, whether verbal or otherwise, engage with all the ambiguity surrounding what Merleau-Ponty (1962) calls being-in-the-world,[14] and what I refer to as becoming-in-the-world, a never-ending process of construction that belies any reference to a core self. Although our grammatical structures presuppose a stable speaking subject transparent to herself, video-recording powerfully illustrates the difficulty that post-transplant recipients may experience in verbally articulating the undecidable nature of the disruptions to a sense of self. It appeared that there is no single truth to be told, and a strongly recurring feature of the video material was the incidence of clear incongruities between spoken words and embodied expressions and gestures, which was observed in nineteen of the twenty-five records.[15] Artefacts also played a significant part in complicating the narrative structure, as for example in the case of a woman, three years post-transplant, who chose to be interviewed under a prominent wall sign spelling out the word 'Hope'. The encounter vividly showed her inner tensions, even despair, not only by speaking in a slow pained monotone, but by constantly banging a water bottle on her own lap, albeit the message she was attempting to convey to the interviewer was one of survival and hope. Another recipient, who was highly successful in deflecting the interviewer's questions away from any in-depth appraisal of how he felt about himself post-transplant, used the medium of taking apart a heart-sized and shaped Inuit puzzle sculpture to visually signal his fear that his own 'broken heart' could not be put together again.

Despite the general acceptance in biomedical literature of a mechanistic Cartesian model of the body that would appear devoid of phenomenological or non-normative dimensions, a paper by the psychiatric team, Inspector, Kutz and David (2004), on the role of magical thinking reveals that notwithstanding a sophisticated knowledge of anatomy and physiology just under half of their sample of heart recipients had an overt or covert notion that they have acquired elements of the donor's personality along with the organ. This was exemplified in many of the PITH respondents: 'there must be some, maybe a memory chip, in that heart that came from that person and came to me … it doesn't really match mine'; or the male recipient who reported that he had acquired a preference for pink clothing and felt therefore that his donor must be a gay man. There is some academic recognition, however, that post-transplant recipients have strategies to negotiate anxieties that are implicitly discouraged and remain unspoken. In a discussion of defence mechanisms in heart transplant recipients which concentrates on attitudes towards the donor, Bunzel *et al* (1992), for example, claim that almost 73 per cent are in either complete or partial denial with respect to their relationship with the donor. The assumption of much previous research that the post-transplant recipients were alone in their resort to defence mechanisms is surely undermined by Margareta Sanner's observation that '(a)voidance, suppression and denial were the most common defence mechanisms, *all of which seemed to be supported by the medical context*' (2003: 391, *my emphasis*). Such studies do uncover the disparity between a rationalist and 'fantasy' approach that may both be present in an individual recipient or donor proxy, but they fail to notice that authorised narrative of the clinic is far from neutral, and may work not only to silence anxieties but to promote seemingly contradictory epistemological frameworks (Shildrick 2008; Shildrick *et al* 2009).

As with recipients' speculations about the provenance of the graft, donor families are deeply invested in constructing an account about the therapeutic outcomes of the transplant organ that may allay their negative memories of the death of their loved ones. The most recurrent narrative imagines a sense in which the donor will in some sense live on in a properly deserving recipient.[16] The *PITH* team were not concerned with the truth value of respondents' beliefs about their respective donors or recipients,[17] but with the phenomenological experience that produces such accounts. Accordingly, and in line with recent postconventional and feminist thought, the team did not seek to impartially engage with the data set as though there could be a wholly objective truth of the matter to uncover, and we were less interested in the descriptive question 'how?' than to ask the question 'why?'. Our goal as a group of multi-disciplinary researchers was to be critically self-reflective, rather than unbiased, and viewing the depth of dysphoria and distress evidenced in the often highly disturbing videos forced us to acknowledge our own embodied emotional and affective engagement in such an enterprise (Shildrick *et al* 2018).[18]

At the heart of the matter – and it is instructive how ubiquitous such metaphors are in Western languages – lies a concern with the integrity of embodiment, an integrity that for most, if not all, organ recipients will have been severely tested by the onset of life-threatening illness and disease. Although few of us may actually explain ourselves in terms of a Cartesian duality whereby a controlling self simply exercises the machinery of the body, there is a taken-for-granted sense in which the body is assumed to be simply a responsive, but largely unthought, material medium through which our agency is expressed. That sense constitutes what Leder (1990) calls the absent body, a state of everyday unawareness of our own material processes, but it is one that cannot prevail in the face of corporeal transformations: in situations of material disruption, the vulnerability, unpredictability and interconnectedness of corporeality explicitly claim our attention. The body itself may become an alien other, disengaged from the self and threatening to the integrity of the embodied subject. As Leder puts it, 'the body is no longer alien as forgotten, but precisely as re-membered, a sharp searing presence threatening the self' (1990: 91). For many phenomenologically inclined sociologists, like Arthur Kleinman (1988), the goal of healthcare is the recovery of the unified self and the restoration of forgetfulness, as though the normative body were not already vulnerable, unstable and open to its others. Patient narratives frequently provide support for the idea of getting back to one's old self, where the integrity of embodiment is once again taken for granted.[19] Alongside what he calls the restitution model, Arthur Frank (1997), however, identifies two further alternatives: first, the chaos narrative in which the patient expects no respite from the alienation of illness, and second, the quest narrative in which the experience of bodily breakdown is seen as a transformatory one that enables the sick person to become someone new. In bioethical terms, it is the latter that best expresses an optimistic scenario for organ recipients. Despite an insistent authorised narrative of transplantation that promises personal recovery, the recorded experiences of heart recipients speak to a complex and disturbing alienation in the embodied self that might be most effectively addressed by the bioethical goal of facilitating an acceptance of transformation. And that entails not just letting go of restitution to the self, but abandoning the belief in the rigid separation and distinction between one body and another.

## The gift of life and concorporeality

How does this fit with the wider discourse of transplantation, in which the rhetoric of the gift of life is deeply entrenched and is routinely used as the privileged metaphor for the donor organ and the act of donation in Anglo-American contexts?[20] In the hospital where the *PITH* research was centred, all prospective recipients were given the *Heart Transplant Manual* in which the Introduction sets the tone: 'We believe our work is only possible through the generous act of organ donation and our efforts must honour these remarkable gifts from organ donors and their families' (2000: 7). What the relentless message stresses is a fundamental *connection* in which the donor has given some part of his or her *living* body to sustain the life of another. In deceased donor procedures, the donor body is technologically maintained on respirators until the removal of the organs, which runs the risk of the transplant operation being read as a form of cannibalisation. The stress on the putative altruism of the gift may relieve that tension, but in signalling a phenomenological connection between individuals, it opens up the very personalised question of hybrid embodiment. The celebration of donor altruism, both within the clinic and in the public sphere, makes it difficult for the recipient to forget that the transplant organ is not simply a circulating spare part, and that by incorporating what had been a vital element of an other, she is effectively indebted.[21] For many recipients writing a thank you letter was deeply painful. As one explained: 'I don't know how to say thank you … it's not … not enough, it's not enough … I really owe them something'. Whatever the intentions, the gift of life discourse also highlights other paradoxes: the acquisition of the organ that will most likely prolong the recipient's life relies on the death and evisceration of another; the provenance of the gift is another human being to whom the recipient should feel grateful and yet the relationship is shrouded in officially enforced anonymity.[22]

In any case, as anthropologists and philosophers alike have made clear, the complex concept of the gift – a term deployed so lightly in the emotionally and ethically charged context of the life and death of heart recipients and donors – demands a high degree of theoretical reflection. In Marcel Mauss' pioneering anthropological analysis the classical gift relation sets in motion an endless system of indebtedness and obligatory exchange which structures the relation between self and other to the extent that the gift may impose some form of burden.[23] In the event of deceased donation, the initial return is to a proxy – usually a family member of the donor – with whom the recipient may either seek, or find imposed, intimations of kinship (Shildrick 2013a). Even more significant, however, to the experience of otherness felt by organ recipients is Mauss' observation that 'to accept something from somebody is to accept some part of his spiritual essence, of his soul' (1990: 12). As he understands it, any donation exceeds its immanent materiality such that the gift is not just an object, but figures something intrinsic to the giver herself. He writes: 'The objects are never completely separated from the men who exchange them' (1990: 31). In relation to organ transplantation that surely implies that the heart can never simply be a neutral spare part; and nor can I claim a transplant as wholly my own. If moreover, in a gift economy, the self-identity of the giver is invested in the gift, then the transferred donation not only fails to make the break between one body and the other, but on the contrary enacts an intermeshing of corporeality that speaks to a continuing bond.

As the *PITH* and *GOLA* research shows, heart transplant recipients do habitually claim to have incorporated the imagined characteristics of their donors in terms of personality, affect, and even new attitudes and values, while donor proxies seek confirmation that their loved one lives on. From either position, there may be a determined quest to claim kinship relations that spills over into a desire to meet that may be unwelcome on the other side.[24] Heart transplantation must therefore lead inevitably to a mutuality between donor and recipient as embodied subjects that might begin to explain some aspects of recipients' ontological unease. Where direct return – as a response to the perceived burden of being in debt to another – is clearly impossible, the receiver of the gift of life may feel constrained to reproduce tangible signs of the absent presence of the original life. The transplanted organ represents in the clearest possible way the co-existence of two living beings, not as a newly integrated and autonomous singularity, but as the other within the same. And while that contention speaks to a philosophical abstraction, it has a biomaterial counterpart in that the DNA of a transplanted organ is never assimilated to the host body but remains alien for life, and subject to repeated efforts to eject it. In the following chapter, I shall explore in depth the complications occasioned by such microchimerism, but for now will leave it aside as do the majority of transplant clinicians.

In the contemporary climate of decolonial thought, it might be argued that Mauss – who first published *The Gift* in 1925 – relies too heavily on the preconceived attitudes and values of the global North that appear in the anthropological field reports of his predecessors. Scholarship from these early decades of the twentieth century can be highly contentious, but Mauss, nonetheless, intended to rethink the accepted Western notion of exchange and suggest one that has far-reaching consequences for both the gifter and the receiver. In that light and given an undisturbed assumption that self and other *are* fundamentally separate entities, it is easy to see how in the present-day clinic a transplanted organ may play into the recipient's sense of an internal, yet demanding, alien other. The embodied prosthesis may be characterised as a gift but it appears to have an agency of its own. Where Mauss (1990) sees gifting as, in effect, the occasion of continuing obligation in the structural relation between self and other, others like Derrida (1992) and Diprose (2002) have attempted to reconfigure its significance. Both reject the notion of the sovereign self whose singular identity and integrity is compromised by acceptance of the gift – and especially when it cannot be remitted by reciprocity – and set out an openness to the other that is not reliant on exchange, on denial, nor on assimilation. For feminist bioethics in particular, the appeal to reciprocity is highly privileged and is seen as an important corrective to the potential one-sidedness of the ethics of care. For Diprose, however, the gift is not a commodity that entails an obligation: it is a matter both for recipient and donor, brought together by what Diprose calls corporeal generosity.

In a productive reworking of the normative rhetoric, Diprose takes up the Derridean elaboration of the gift without return (Derrida 1992). Where Diprose's approach is particularly relevant to transplantation ethics is in the understanding of corporeal generosity as figuring what literally happens between bodies, and yet is intrinsically excessive to the notion of the bounded body. The gift, as she sees it, 'exceeds […] contractual relations between individuals', and she goes on to name affect as 'the basis of the production and *transformation* of the corporeal self through others' (2002: 75, *my emphasis*). Her model challenges the viability of the legitimated biomedical narrative of an unchanged self. As the *PITH* and *GOLA* projects have shown, for recipients and donor proxies alike, the grafted heart is always more than an object of exchange, but rather the locus of a heightened experience of the lived body reliant on the coming together, but never merging, of the giver and receiver. Corporeal generosity itself, in Diprose's terms, comes into play precisely in the event of difference, which must be both preserved and responded to. As she writes, 'intercorporeal generosity maintains alterity and ambiguity in the possibilities it opens […] generosity is only possible if neither sameness nor unity is assumed as either the basis or the goal of an encounter with another' (2002: 90–1). In the mode of transplantation, what this suggests is that the heart recipient's intuitive grasping of an otherness within should not be denied – the organ is *not* mine to assimilate; the irreducibility of difference must be responded to rather than covered over, or even celebrated as an instance in which giving acts as a non-personal life force (Shildrick 2008). Diprose is not proposing a rerun of early second wave feminist touchy-feely notions of mutuality; she recognises that the gift may be disturbing and disruptive, and that the opening to the other is always ambiguous. It is not, then, that corporeal generosity has a predictable and always welcome outcome – it may be intolerable to the donor proxy or recipient that identifying details are withheld, for example – but that it lifts both the burden of the traditional gift and of the unchanged self as the only fully legitimated narrative.

What I want to take from Diprose is the possibility of an ethics that includes the ‘affective material offering of our body to the other’ (2002, 191) and to that I would add the acceptance by the receiver of such an offering. The generosity of which Diprose speaks has nothing to do with the altruism that in the popular imagination drives organ donation or with a relationality that leaves the participants unchanged. Mainstream feminist bioethics has long had a commitment to relationality, but that has not readily challenged the propriety – the completion and closure – of individual bodies. The model I am proposing here goes further than either the standard feminist recognition of embodied mutuality or Diprose’s notion of intercorporeal becoming; rather it addresses a mode of *concorporeality* that would include the hybridity of the heart transplant recipient and donor organ. If nothing else, a phenomenological enquiry into the acquisition of a donor organ should make us aware that to have a sense of self at all is to accept oneself as both in a process of co-construction and as open to more radical transformations. The putative incorporation of the heart of another is not a once and for all event, but a lifelong disturbance to the self that continues to pose ontological questions. The task, then, is find ways to accommodate the hybrid self without a complete loss of personal identity. It is difficult to see how organ recipients and, indeed, the transplant professionals themselves can flourish unless the intimations of otherness within, like those experienced by the *PITH* respondents, are openly accepted and integrated into a model of embodiment. One recipient expressed the commonly experienced tensions in that ‘the transplant program really tries hard to get us to objectify the organ. And treat it just as though, just as an organ’, but at the same time ‘this girl whose heart I have, um, she’s here in me’. It is not only the mutual construction and dependency of self and other that is at stake – as phenomenology has always stressed – but the viscerality of truly concorporeal life. The risky uncertainty of conjunction will remain, but the (bio)ethics of encounter cannot be otherwise. And it is precisely here that the intervention of Derrida – the ethical thinker who engages tirelessly with the conundrums of the contemporary world – proves the most useful.

For Derrida, as for Diprose, the ambiguous opening to the other engages both recipient and donor, but in seeking to understand the significance of what he calls the impossible gift – for the gift, and particularly an organic prosthesis, fits no conventional criteria – he gives heightened significance for the one who receives. In implicitly repudiating of the Maussian model, Derrida’s theorisation of the gift goes beyond the parameters of putative exchange – what he calls ‘the whole sacrificial bidding war’ (1992: 24) – and allows for a significant reconfiguration of one major aspect of the *PITH* data: recipients’ experiences of internal alienation. Unlike Mauss, whose exploration is firmly situated within the modernist paradigm of a fundamental split between self and other that may be negotiated by limitless reciprocity, Derrida is adamant that ‘(f)or there to be a gift, there must be no reciprocity, return, exchange, counter-gift or debt' (1992: 12). Instead, the gift figures an encounter, a fluid and ambiguous opening of the self to the other, an opening that is above all without calculation on either side. Notions such as altruism or indebtedness have no place here, and although a Derridean ethics never loses sight of responsibility, it is in the nature of what constitutes a response to, and protection of 'the other's otherness', rather than an accounting of the right course of action. His approach inevitability raises the question of what it might mean to quite literally open one's embodied self to the living, yet intrinsically alien, organ of an other. And it is this attentiveness to the receiver that is complemented in Derrida's later work (1999, 2000) by his focus on the host and hospitality.

Once more the analogies with organ transplantation are plain to see. The recipient is indeed host to the graft – itself an intriguingly ambiguous word that opens up the question of the directionality of support.[25] Derrida has already theorised such an undecidability – '(t)he host thus becomes a retained hostage … responsible for and victim of the gift' (2000: 107) and 'the guest becomes the host's host' (2000: 125) – remarks which entail just that same risk and uncertainty that surround the gift. Moreover, as Derrida understands the ethical dimension of absolute hospitality, the host must not set limitations on what crosses the threshold of the body (in this case the living organ of another), but must offer an unconditional welcome to the other, which devolves not on the expectation of integration and possession, but on an openness to difference that will never be an object of knowledge. That other – whether as a person or as a discrete organ – is always excessive to normative expectations. What is crucial for Derrida is that hospitality is something given *before* any identification – in material terms, the provenance of the heart does indeed remain unknown – such that undecidability persists in the irreducibility of the other to the same. The very crossing of the threshold by the other effects not only a displacement of the boundaries of the body – the confusion of self-material and other – but the host's own prior identity is irrevocably changed. As Derrida notes, the arrival of otherness is 'enough to call into question, to the point of annihilating or rendering indeterminate, all the distinctive signs of a prior identity' (1993: 34). The encounter cannot resolve in assimilation, for the other is both constitutive of the self and remains excessive: in material terms, the alien DNA persists. Nonetheless, the relation is transformative. In opening up to and incorporating the irreducibly different, the rigidity of bounded being gives way to the becoming of a concorporeal self.

When we consider not simply recipient anxiety in the face of the unknown, but a more specific ontological disturbance, Derrida's refiguration of hospitality again offers crucial resources that both insist on the difference between self and other, and problematise the assumption of an interval in the encounter. Rather, the distinction between inside and outside is lost, and the corporeal boundary between self and other is blurred. It is a form of hospitality that owes nothing to the comfort of homogeneity or stability, or even certain benefit, and is prepared to expose the individual self to the risk of the unknown and unforeseeable. Nothing can be taken for granted. The gift and hospitality, then, are two sides of the same coin, and together they signal the promise, not of an ultimately self-centred altruism and benefit, but of a corporeal ethics of response and responsibility. But there is a further twist which will be marked in the post-transplant memoir of Jean-Luc Nancy (2002): within postmodernist thought the threshold of the self has *always already* been crossed by the other who resides at the core – the heart – of the self.

As always the ethical task set by Derrida is to dismantle the oppositional relationship between self and other, and to disrupt the putative self-sufficiency of either. His approach – and its materialisation in the graft – is a profound reminder of the vulnerability of the embodied self. Feminist bioethics, with its own commitments to reconfiguring the distinctive sovereign subject of moral principles, already fruitfully engages with the Derridean project – among others – to develop strategies of encompassing rather than circumventing the intrinsic uncertainties, both ontological and epistemological, of the postmodern era. And for all the high theory, Derrida himself clearly understands the acute links between an ethics of the undecidable and the 'matters of urgency' that assail us: 'It is often techno-political-scientific mutation that obliges us to deconstruct; really, such mutation itself deconstructs what are claimed as … naturally obvious things or … untouchable axioms' (2000: 45). We should not hesitate to take on uncertainty, however risky it appears, for in dispensing with the comfort of principles and precedents, ethics necessarily becomes a matter of high and specific responsibility.

The pragmatic difficulty for transplant recipients, as I understand it, lies in the disturbing reality of hybridity, for a despite an everyday acknowledgement of our external communication and connection with others, the psycho-social imaginary maintains the illusion that each embodied subject is self-complete and occupies a clearly demarcated territory sealed by the boundary of the skin. The inherent queerness in the juxtaposition of celebrating singular selfhood and the willingness to accept organ transplantation as a social and personal good would seem fraught with risk. The *PITH* team did, however, uncover some unanticipated welcome for hybridity in relation to a cohort of respondents who were currently maintained by left ventricular assist devices. These wholly non-organic prosthetic systems work together with the recipient's own heart to enhance its functionality by providing an electrical boost delivered by a driveline from an external control system to a surgically implanted device that acts as a supplementary pump. LVADs are occasionally used as a bridge to receiving a donor organ, or more rarely as an end-stage therapy when transplantation is inadvisable, although as the technological aspects become better designed and effectively miniaturised, they are likely to be marketed for more permanent use. Against expectation, the users who were interviewed were largely unfazed by their hybrid embodiment, and in some cases jokingly saw it as conferring superpower status. The users still felt self-complete and the somatechnics of LVADs were not a source of ontological anxiety. As one woman user enthusiastically put it, ‘I’m going to have withdrawals when I do get the heart … it’s my little friend, it’s keeping me alive. … I think of it as a machine, but it’s part of me’, while another, anticipating an organic transplant to replace her LVAD said – referring to her ‘superwoman’ status – ‘I’ll have to give back the cape!’

**FIGURE 2.1** *Diagram of the* HeartMate II™ *left ventricular assist system showing the external battery pack and controller with a drive line to the implanted LVAD. Reproduced with permission of Abbott, © 2021.*

In contrast to both that positive and self-contained acceptance of hybridity in the face of a technological prosthesis and the deeper anxieties occasioned by organic transplants, Donna Haraway's challenging assertion – 'even the most reliable western individuated bodies […] neither stop nor start at the skin' (1989b, 18) – offers an alternative understanding. Her notion of the cyborg has something in common with the hybrid bodies I describe here, particularly in the LVAD interface between the human and technological, but with the crucial difference that her conception the cyborg is lived as *posthuman*, whereas transplant and implant recipients are unsupported in the context of an imaginary that can recognise only the human. In general, the body that is less than bordered, distinct and wholly itself is the matter of deep disturbance, literally the stuff of nightmares or horror movies where alien elements may breach the boundaries of the skin to effect a mode of concorporeality that subverts the embodied subject from within. The highly negative notion of being personally invaded and taken over by an alien other has a long history in Western literature and film, as well as being a recurrent feature of many other cultures, and it reappears strongly in the context of heart transplantation where a quite literal and substantive exchange has taken place.[26] Despite encouragement to see their 'new' organs as fully integrated parts of their own bodies, a high proportion of recipients are fully aware of the phenomenon of transferred identity that haunts popular discourse on heart transplantation. Although sensationalist media hype is widely derided, what spoke to respondents were not the dry scientific data, but films like *21 Grams*, *Heart of a Stranger*, *Blood Work* or *Return to Me*, the memoir written by an organ recipient who describes her identity crisis after receiving the heart of an eighteen-year-old male, whose characteristics she appears to take on (Sylvia and Novak 1998), or the novel *Change of Heart* (Picoult 2008), all of which voice cultural anxieties about organ transplantation. In seeking to understand why recipients report large and small phenomenological changes and attribute them to the graft, the socio-cultural context cannot be ignored.

In the context of heart transplantation, relatively few of the *PITH* respondents reported feeling a sense of renewed wholeness, but rather were acutely aware that their sutured bodies spoke to a different mode of being-in-the-world. As Waldby and Mitchell point out, the 'organ recipient is involved in the most direct and literal form of intercorporeality' (2002: 249), an experience I have renamed as concorporeality. The post-operative patient knows that something fundamental has changed and in order to live well must find ways to accommodate the reality of a corporeal transformation that instantiates the hybrid body, whether that devolves on the incorporation of human or mechanical organs. Although heart recipients are encouraged to see the transplanted organ as their own, the difficulty of sustaining that ownership is evident in the uncomfortable and inconsistent shifts between 'my heart' and 'his/her heart' that most respondents verbalise. Others were more explicit: 'The heart belongs to that person, so I'm not alive, he's alive, he's alive in the shape of me.' That difficulty, moreover, is heightened insofar as the recipient body now hosts alien DNA that will never lose the specificity of its otherness and will continue to provoke an unremitting immunological response that left unchecked would reject the transplant organ. In consequence all recipients are obliged to take a cocktail of immunosuppressant and counteractive drugs for the remainder of their lives, without, however, being given adequate information as to precisely the hybrid nature of their embodiment either in the material terms of non-self DNA nor in recognition of psychic alterity. In effect – and despite any expectations of recovering oneself – the other is both incorporated within and irreducibly alien to that self. The embodied self is, then, inevitably transformed, the body that is no longer one. As Luce Irigaray (1985: 28) puts it, the body is 'always at least double [...] it is plural, more diversified, more multiple in its differences, more complex, more subtle than is commonly imagined – in an imaginary rather too narrowly focused on sameness'.

Once again I take up the work of Derrida for whom the technology of transplantation would invoke his logic of the supplement (1973, 1974), a term which operates as a synonym of *différance*. As I outlined in relation to disability, supplementarity marks the fallaciousness of fixed boundaries and emphasises instead deferral, incompletion and undecidability. In the traditional view, set out by Kant in *Critique of Judgement* (2008), a supplement – in the text, *parergon* – is an inessential and external augmentation of an already-complete object. In contrast, Derrida (1987) argues that the very possibility of augmentation shows that the object must have been less than pure/complete/self-sufficient from the beginning; in short, there is an *originary* lack that the supplement supplements. In effect, supplementarity is essential in constituting the object as such. As I understand it, Derrida's insight is highly relevant to the question of biomedical interventions into corporeality such as that effected by organ and tissue transplantation. In his own terms, Derrida even suggests that what he calls 'technological supplementarity' may be the general logic of such discourses as those of drugs, surrogacy, AIDS, sex changes and organ transplants. As he puts it, 'technology has not simply added itself, from the outside or after the fact, as a foreign body ... this foreign or dangerous supplement is "originarily" at work and in place in the supposedly ideal interiority of the "body and soul". It is indeed at the heart of the heart' (1995: 244). Moreover, the complicating double logic of the supplement as both augmenting an existing object and substituting for or even violating that object speaks clearly to the dual experience of transplant recipients for whom life is supported and prolonged *and yet* deeply disturbed for intimations of alien otherness. The prosthetic intervention which seems to promise restitution to a pre-existing and singular selfhood instead opens up to an indeterminate state of hybridity that contests the notion of individually embodied identity.

Derrida's insistence on the instability of an originary self is reflected in one of the most sustained deliberations on the significance of having a heart transplant written by the philosopher Jean-Luc Nancy, who underwent the procedure in the early ’90s. In *L’Intrus* (the intruder), Nancy makes explicit what other recipients leave implicit – that his account cannot ‘disentangle the organic, the symbolic, and the imaginary’ (2002: 3). Unlike many others, however, Nancy is indifferent to the identity of his donor and refuses to sentimentalise the experience of otherness within. As he writes, ‘the whole dubious symbolism of the gift of the other – a secret, ghostly complicity or intimacy between the other and me – wears out very quickly’ (2008: 166). Where I have been arguing that phenomenology might see the hybridity of the transplanted body as a point of felt connection that escapes the binary of self and other, Nancy focuses instead what is unassimilable. In a gesture more akin to Derrida’s reflections on hospitality than to Merleau-Ponty’s flesh of the world, *L’Intrus* opens with a deliberation on the in-coming of the stranger, which to our surprise is not a metaphor for the grafted heart, but Nancy’s *own* failing heart as it had become an element threatening the previously assumed integrity of his embodiment. As corporeal breakdown has forced itself on his attention, the absent presence of the healthy body has been superseded by the ‘dysappearance’ – to use another of Leder’s terms (1990) – of his heart which is now, he says, ‘an elsewhere “in” me’ (2002: 6), that marks the self/other relation as an originary internal estrangement.

After transplantation, as his immune system attempts to reject the substitute organ, Nancy refuses the metaphor of either ownership or connection, reflecting instead on a self-alienation in which the meaning of *l’intrus* comes to figure equally the original heart, the graft, the multiple viruses and bacteria that inhabit any body, the effects of the immune system and the drugs that suppress it, the onset of a cancerous tumour, and above all death itself. As he puts it:

> I am the cancerous cell and the grafted organ, I am the immuno-depressive agents and their palliatives, I am the bits of wire that hold together my sternum, and I am this injection site permanently stitched in below my clavicle, just as I was already these screws in my hip and this plate in my groin. … We are … the beginnings of a mutation: man recommences going infinitely beyond man.
>
> (2002: 13)

All of these are states of self-estrangement, or more properly they expose the visceral disturbance effected on the body by internal and external forces alike. There is no possible restoration of the self, but only the recognition of hybridity as the condition of all forms of embodiment. As Nancy concludes, ‘the *intrus* is none other than me, my self’ (2002: 13), a transformed self exposed as multiple, excessive and always in a state of becoming. Where other recipients attribute their feelings of alienation to the troubling incorporation of the donor heart, Nancy – mirroring Derrida – uses the experience of transplantation to reflect that embodied selfhood is never unified, but rather inherently fissured. Very few people will undergo anything so profound as a heart graft, but perhaps Nancy's sustained and often brutal meditation on his personal experience of intracorporeal embodiment marks precisely the point of reimagining what is at stake in such transformations.

As a phenomenological insight into what it means to be embodied, Nancy's account speaks clearly to an almost-abject individual experience of disintegration and hybridity, but does that mode of thinking overshadow the intimation of connection that Merleau-Ponty seemed to suggest? One answer might be to posit a critical feminist use of phenomenology that would endorse the trope of the dis-organisation of personal embodiment but see that precisely as the condition of possibility for connection with others. If the self-contained and impermeable subject of modernity is an illusion, operative only in the socio-cultural imaginary, then an inherent openness to otherness is the starting point. In the face of the contingency and vulnerability of embodiment where becoming-in-the-world is always mediated by others (Shildrick 2002), self and other are always concorporeal, intertwined but not encompassed by sameness, and what postconventional feminist theory has always stressed has been the fluidity between bodies that does not stop at the skin (Irigaray 1985; Grosz 1994; Weiss 1999). It mobilises, as Irigaray puts it, '(n)earness so pronounced that it makes all discrimination of identity, and thus all forms of property, impossible […] This puts into question all prevailing economies' (1985: 31). Although Irigaray refers here to what she sees as elements of an unrealised notion of the feminine, her words are suggestive of the encounter between self and other in the context of transplantation, where questions of self-identity and the ownership of body parts become equally meaningless. And like the feminine they require another mode of thinking. Unlike Merleau-Ponty – to whom she gives serious if critical consideration (see Irigaray 1993) – Irigaray is fully engaged with a visceral phenomenology that does not depend on perception alone. Her project is always a deeply ethical one which should remind us of the urgent need to mobilise a bioethics of transplantation that does not rely on issues of rational consent, property in the body, contract or the proper determination of donor death.

## Deleuzian somatechnics

The use of phenomenology and the insights of Derrida and others concerning prostheses in the mode of supplementarity remain important steps in reimaging corporeal boundaries, but again the Deleuzian notion of assemblage, which I outlined in Chapter 1, offers alternative possibilities of a somatechnical understanding of what is at stake in hybrid embodiment. To briefly recap, for Deleuze and Guattari (1984, 1987) the embodied self is never atomistic nor complete, but consists in a nexus of ever-changing of flows, energies and capacities that figure what they name as desire, a positive force that is excessive to the embodied self and unfixed in its scope. As Guattari explains, ‘it’s everything that overflows from us’ (1996: 46). What mobilises desire are the surface energies and intensities that move in and out of multiple conjunctions that disrupt categorical distinctions or organisation. These ‘desiring machines’ or assemblages (1984) exist only through their constantly varying organic and inorganic interconnections and what they show above all is that what are taken to be the necessary boundaries of the body are open to radical transformations.

To think specifically of visceral prostheses in a Deleuzian mode makes clear that they are by no means exceptional, nor a response to corporeal incompletion. Rather they are potential enablers of inventive channels of desiring production that escape the limits of normative expectations and action. In short, supplementarity uncovers an immanent desire that signals an embrace of unfamiliar linkages and novel incorporations. As in the context of disability, such connectors eschew distinctions between all manner of categories including the transplant recipient’s putatively originary body and their prosthesis, whether or not it is organic. In that light, recipients figure not as auto-complete and independent subjects secure in the illusion of identity to the self, but as multiple and fluid assemblages. None of us are beyond such configurations, although they may manifest more overtly around those – disabled people or transplant patients – who may be intimately engaged with assemblages on a pragmatic level. Transplant recipients variously experience inorganic LVADS; human-derived donor organs; and the incorporation into the body of animal-derived pharmaceuticals or organic parts like pig’s valves. Xenotransplanation – the widespread use of animal tissue or organs – is explicitly banned in most jurisdictions for reasons of both public revulsion and biomedical risk,[27] but it is possible in principle. All these modes of supplementation move beyond the goal of restored functionality and speak to an embodied self which is always in transition and can never be said to be pure.

As before, my claim is that the transcorporeality and interconnectivity of assemblages which contest individuality in the abstract are already inherent in supplementarity and its manifestation in prostheses. The breaking through of the normative limits of individual embodiment can both underline the instability of binaries – particularly those of biology/technology; self/other – and multiply forms of desire. It is, above all, a dis-organisation that opens up to new forms of vitality and becoming. In shifting the emphasis away from the putative incompletion of particular bodies, Deleuze and Guattari reconfigure the experience of a dis-organised body – a state that may be thought characteristic of disabled people and transplanted patients alike – as a nexus of potentially flourishing and productive assemblages. In Deleuzean terms, corporeal connectedness lies at the heart of flourishing, and what is effectively celebrated – albeit with caution as the movement between the poles of liberation and repression is constantly shifting – is what I have called a new erotics of connection. It is not the case that the Deleuzian approach entirely gives up on the notion of the subject. The interaction of bodies in time and space continues to produce subject effects – as they put it, 'you have to keep small rations of subjectivity … to enable you to respond to the dominant reality' (1987: 160) – but it is only when those effects begin to coalesce and settle that the familiar sovereign individual of the postEnlightenment could be said to appear. Their point is that such effects are unsustainable in fixed form, beyond the temporary or provisional, so although the molar politics of identity and subjectivity are never entirely dismissed, they are constantly confronted and displaced by the molecular politics of flows and intensities.

The model speaks, then, not to individuals or identity but to transcorporeal embodiments and assemblages whose fluidity and energies are engaged in mutual transformations. At times these may invoke the negative, but the effects are always provisional and were the stress to be changed from accomplishing a secure sense of self to embracing the multiple possibilities of connection, then the uncertainty of outcomes could be recast as risky but always productive. Hybridity is no longer a special source of ontological anxiety, but the promise of new forms of life expressed not as being but as becoming. The corporeal extensiveness proposed by Deleuze seems highly appropriate to, but by no means theoretically generated by, the bioscientific and technological possibilities of the present era, such as organ transplantation, where the deceased donor body provides on average seven useable organs and tissues. Although such medical knowledge should never be taken for granted or treated as stable, at the cutting edge, bioscience can provide a wealth of insight to inform and illustrate our wider understanding of supplementarity as intrinsic to embodiment. If the supplement is always already 'at the heart of the heart' as Derrida puts it, then the body is always other than itself, dis-organised and incapable of restoration to an originary model. The conventional trust in the givenness and fixity of corporeal boundaries has long since been overtaken in both theory and practice, and to think the body now surely problematises not only individuality and identity to the self, but the very intelligibility of human being as such. The operation of transplantation as a widely accepted practice undercuts the whole notion of singularity and points towards a different imaginary that queers conventional notions of embodiment.

Nothing less than a profound rethinking of the practices of organ transplantation is required if the endeavour is to escape bioethical paralysis. Faced with the evidence of the *PITH* and *GOLA* projects that both recipients and donor proxies are deeply disordered by their experiences, I have long felt highly sceptical towards claims that transplantation is an irreproachable moral good. While the prevailing cultural imaginary speaks to the embodied subject as autonomous and distinct from her others, and contained by the boundaries of the body, the lived experience of incorporating or giving a donor heart signals corporeal fluidity. There is no post-operative renewal of a previous self, but rather a mode of intercorporeality – or more properly concorporeality – hitherto unthought. If there is no pre-existing pure form of embodiment to restore – in phenomenological terms, we are already hybrid, already more than one, already more than human – then we can begin to trace other ways forward. At any discrete moment there may be a claim on autonomous subjectivity, not as a solid foundation, but only as an element of a sense of self that is always open to disruption and resignification. The term intercorporeality moves in a posthumanist direction, but it nevertheless preserves an unhelpful sense of self and other. If we thought through the meaning of embodiment more clearly, and re-examined the epistemologies that dominate bioscience, then we could begin to see that it is precisely the notion of fixed boundaries – even in the residue of self and other that intercorporeality implies – that is the problem. What transplants show is that in destabilising bodies, we also destabilise the epistemologies and ontologies that constitute the normative markers of embodiment. As the body becomes increasingly posthuman, or at least no longer organised according to humanist principles, as it makes novel connections and is exposed as already participating in machinic assemblages, can we reimagine the components of human identity and its supporting ideologies? In place of the ontological separation of self and other, and even beyond intercorporeality, there is a need to think through the radical possibilities of assemblage where many different elements conjoin – and split apart – in never settled flows of energy.

The bioethical problematic posed – but not uniquely produced – by transplantation is to move beyond a notion of the self comfortably at home within normative boundaries to the recognition that it is inherently displaced. A liberal humanist politics of norms and identity gives way to a politics of hybridity where the categories of embodiment are no longer clear-cut. The task is to find a way of occupying that impossible point poised between the poles of assimilation and rejection, both of which signal the ethical bankruptcy of failing to value difference. In place of the desire for assimilation that reduces otherness to the selfsame, the arrival of the stranger/organ, whose difference exposes the gaps in the autonomy of the host, could be a welcome reminder of an inherent vulnerability. It opens up the productive possibilities of, and multiple differences in, the relation between a provisional self and other. And if we resist the desire to domesticate the undecidable, then the encounter with the strange(r) can be the occasion of a radical rethinking both of our own self-sufficiency and of our responsibility to the other. The burden is to remain open to the radically, but not absolutely, unknowable other, in an encounter that is mutually risky and productive. It would be a response that as much affects my own being, or more properly my own becoming, as the coming of the other. Rather than imposing the one 'true' story of restitution and recovery on the transplantation narrative, there is an urgent need for strategies that acknowledge and start from the experience of disturbance. The issues uncovered by recipients' and donor proxies' accounts mobilise the need to radically engage with, and represent, the experience of concorporeality. At the limit, it is an ambitious call for a new cultural imaginary invested in Deleuzian notions of assemblage.

The deployment of such insights in the context of heart transplantation, and its diversionary rhetoric of the gift of life, may have substantive implications for the well-Being of heart transplant recipients and donor families. Instead of seeing the outcome as figuring on the one side an unsupported loss of ontological security, while on the other the division between life and death is taken as absolute and self-evident, could we rethink organ transplantation as an *ongoing* project, not only for the recipient but for the donor too? In the next chapter I shall turn to some further and highly challenging biologically based complications, while in Chapter 7 the question of life and death is addressed in more detail. As always, the point to reiterate here is that far from being a unique and disturbing phenomenon peculiar to transplantation, the visceral encounter with otherness within is the very condition of every subject. The contemporary problematic of heart transplantation already crosses the biological, medical and technological aspects of prostheses alike, and will become even more complex in the light of the micro-biology that I introduce next. Above all my focus signals a material practice that at the horizon of aspiration points the way to the quest for a possible and future posthuman bioethics.

# CHAPTER THREE

# Micro-biologies

The focus on the nexus surrounding heart transplantation in the previous chapter begins to indicate that the discursive moves of postmodernism and posthumanism are not modes that displace or compete with the material concerns of contemporary bioscience, but complementary approaches that explore the profound yet generative indeterminacies of all forms of life. Deleuzian assemblage theory already works to cut across the disciplinary silos that can hamper innovative thought, and instead draws together the humanities, social sciences and biosciences to create its own transdisciplinary assemblage. The new materialist focus on reclaiming substance against the elevation of disembodied epistemologies and ontologies of many accounts of postmodernism has successfully stressed the entanglement of the human with multiple other species. As Rosi Braidotti (2002) insists in her exposition of a nomadic ontology, the human self is fully immersed and immanent in a network of non-human (animal, vegetable, viral) relations, and in her text *Transpositions* (2006), she posits inorganic technologies as vital elements of our life processes. To all of that, I would want to explicitly add in the context of what I am calling micro-biology in both human and non-human registers. Microbes, like machines, are not simply the environment of the human, but an intrinsic part of the texture of all forms of embodiment. It is here that a further turn to Deleuze might more adequately encompass all that a materialist analysis would wish. That our bodies are already recognised as organic assemblages at the level of biomedical interventions like transplantation or assisted reproductive technologies, not to mention our daily ingestion and processing of countless organic others, must surely contest the purity of human being without necessarily invoking the posthuman. In this chapter I shall drop down in scale to consider how the microbiome and the lesser-known operation of microchimerism are a massive insult to the narrative of human exceptionalism. Together they constitute the most visceral of prostheses and establish posthuman embodiment as a ubiquitous biological condition.

In its claim to be the master discourse, modernist philosophy has long appeared to float above the messy matters of bioscience, which constitute, nonetheless, one of the major authoritative discourses that sustain the Western obsession with the distinction between self and other, between one body and the other. Feminist scholars too – with some notable exceptions – have been reluctant to engage with biology, not perhaps realising the potential of disruption to patriarchal and modernist thought that the field can provide. As Elizabeth Grosz notes, 'feminist theory has protected and insulated itself from any incursions into biology through the fear, indeed paranoia, surrounding the question of essentialism, though biology is one of the few disciplines able to adequately contest essentialism' (2010: 50). Given that feminist theory is committed to contesting the seemingly rigid hierarchies and oppositions of the Western logos, and anticipates that things could be otherwise, then an excursion into the biosciences may prove invaluable in grounding a range of philosophical, political and socio-cultural speculations and actions. I am not suggesting that biology trumps other concerns: it is no less a political discourse than any other and – despite the illusions of many practitioners – is generative of partial truths at best, not an objective finality (Haraway 1991, Wilson 2015). The rethinking of biological orthodoxies, particularly with regard to the existence of a singular genetic profile of what counts as human, co-articulates with the contemporaneous recognition of biopolitical and bioethical entanglements to underpin a concern for the very notion of species boundaries. In the biosciences, the relatively recent emergence of bioscientific work on the human microbiome and on microchimerism, together with a concomitant upsurge of interest in the concept of immunity across political, philosophical and cultural spectrums, opens up a radical contestation of the dimensions and significance of human being.

This chapter examines the complex interfaces and conjunctions of the microbiome and microchimerism – both of which figure an intrinsic visceral hybridity – to better understand how embodiment is being transformed in the age of advanced biotechnologies and new biomedical understandings. It is not simply that interconnections and mutual dependencies are a common feature of most, and perhaps all, organisms, but that they operate at the most fundamental level of cellular life. Where biology has often been taken to validate personal individuality and species exceptionalism, there is considerable ongoing research that suggests quite the opposite. The major planks of what is seen to constitute the distinctive nature of the human devolve on several areas of interest including the immune system; the functioning of the brain; and the genetic constitution of the body.[1] A substantial challenge to orthodoxies is mobilised by the effects of both the microbiome and microchimerism around the issue of immunity and its relation to questions of self and other. As I demonstrate, it is where biology and philosophy come together most strongly to unsettle boundaries both within the human and across species. It is as yet unknown what microchimerism in the brain might entail, but it is already established that the gut–brain axis enables the microbiota of the gut to affect neurodevelopment and a range of higher brain functions such as emotions, cognition and behavioural attributes. As for the putatively unique and enduringly stable genetic signature of each human cell that collectively comprises the genome, that too can no longer be taken for granted. It has long been known that all human bodies swarm with a multitude of putatively alien others, the majority of which carry their own DNA – such as the countless bacteria that inhabit our gut (Waldby and Mitchell 2006) or the microchimeric cells present throughout our bodies – but that insight has rarely been developed in any depth in the humanities. In broad terms, human beings do have a high degree of similarity in their genetic makeup; yet, small differences in individual DNA generate extraordinary phenotypic diversity across the whole category. We should not be surprised, then, that all the other non-self genetic material that we embody – and particularly the enormous variability of organisms of the microbiome – should be of high significance to the issue of defining specifically human being. It throws up the radical question: should the multitude of non-self cells that flourish in the human body be thought of as mere supplements to the self or as constitutive of the self?

Before moving on to outline some of the significant discoveries associated with the microbiome and microchimerism, I want to flag my concerns about the very nature of the underlying bioscientific practice. My overriding purpose in *Visceral Prostheses* is to trace the entanglements of the human with countless other living organisms at cellular levels, and to point out that we are already posthuman. The difficulty that arises in backing up that claim is that the apposite bioscience involves, as it does more generally, extensive research conducted not on human beings but on other living entities at both macro- and microscopic levels. I wonder if there is not an irresolvable contradiction in promoting the commensality of such life forms in a way that goes far beyond the simple biological data while at the same time referencing laboratory procedures that habitually use animal models. I do not want to rehearse here the well-known practical arguments that there can be no obvious or reliable scale-up from such trials for that simply implies no more than an unfortunate obstacle to knowledge production about the human body; rather I am concerned with the bioethics of what many would see as the exploitation of other species. In the area of microbiome research for instance, the use of murine models is very common, partly because it is straightforward to raise what are called germ-free mice which can then be compared in their development and behaviours – in often manufactured stress situations – with those carrying a 'normal' microbial load. Although I shall not look in any detail at the research methodologies, I do cite the results of basic – that is speculative, curiosity-driven – research that nonetheless often has extensive implications for what we know of human biology.

In bioethical terms, what are taken to be the morally relevant features of prospective laboratory animals are sentience, higher cognitive capacities, capability for flourishing and sociability (Nuffield 2005), but that would seem to limit ethical consideration to vertebrates – with the exception of the octopus family[2] – which are afforded at least limited protection against research-based harm. It is not that I believe any life has an absolute value, but that the justification of *forced consequentialist sacrifice* – a position that Donna Haraway (2008) has implicitly engaged with – is unacceptable (Nuffield 2005: xxiv). We need to think beyond consequentialist trade-offs that rely on an intrinsic belief in human exceptionalism and that ground the partial permissibility of using animal models and face instead the deeper ethical question of whether it is ever acceptable to subject non-human others to bioscientific research that is not intended to bring them any benefit. As the basics of biology have reached the molecular level, it is possible to propose alternative methods of research that do not require any animal-derived biological material. Alongside mathematical and computer models of biological processes, the physical and biochemical properties of molecules can be explored to make effective predictions, or research may be conducted on human volunteers or on human cells and tissues cultured for that particular purpose.[3] There is nothing unusual in this but in reality most material of this nature is still obtained from living or humanely killed animals. The overall burden of harm to others in whole body experimentation is slowly reducing, but without that being a primary aim.

Although an ideal research scenario would replace all non-human animal matter with alternatives, I am not – given my own rejection of binary solutions – a fully committed abolitionist but hold what the Nuffield Council Report (2005) calls the 'moral dilemma view'. It is not an ethically comfortable position, but it may be that in uncovering the *necessary* ubiquity of myriad life forms including ourselves, the case for respecting non-human others – and that encompasses primitive organisms – will be greatly strengthened. I am not suggesting that experimental science alone has a case to answer – we are all complicit – but such a view does make a demand on biomedicine to respond to postmodernist philosophy, feminist and environmental studies, not simply as differing theoretical perspectives but as a trigger for changing practice. It would require a fundamental re-evaluation of the normative hierarchies that determine which forms of lives matter and should be protected and which are dispensable. What I am suggesting is effectively the horizon of a new imaginary – a distant dream perhaps, but one that will encourage us all to reflect on what is at stake, here and now, in bioscientific knowledge production. In continuing to promote disciplinary assemblages, we must keep all eyes on that horizon and ensure that practical methodologies evolve along with the theory.

## 1 *The microbiome*

The human microbiome refers to the total DNA content of microbes inhabiting our bodies across a range of corporeal environments – the gut is only the most prolific site – that together with the host's existing genetic material constitute what is often termed a hologenome (Rosenberg and Zilber-Rosenberg 2014). In addition to the gastro-intestinal tract, microbes thrive in the context of mucous membranes and inhabit the mouth, the skin, urogenital areas, the eyes and to some extent the lungs (Lloyd-Price, Abu-Ali and Huttenhower 2016). The list is not exhaustive, and there are now some very preliminary suggestions that even the brain – which until recently was thought to be impermeable to 'foreign' substances – may be another site of microbial flourishing (Roberts, Farmer and Walker 2018). The component parts of the microbiome range across innumerable and highly diverse conjunctions of viruses, bacteria and eukaryotes, with a smaller number of archaea. Although microbes are commonly thought of as pathogens in everyday parlance, many are not and even those identified as pathogenic – such as some strains of fungi – may play an important role in maintaining healthy populations and even promoting inter- and intraspecies sociality through their effects on cognitive behaviour (Stilling *el al* 2014a). It is widely accepted that most microbia are commensal and may be engaged in mutualism with even some parasites playing a productive part.[4] As Stilling *et al* remark, 'symbiosis in general and microbial endosymbiosis in particular can be viewed as the essential complement of *the missing activity of an organism's core genome*' (2014a: 3, *my emphasis*). Read as intended the words indicate that working together in symbiotic communities, microbiota sustain multiple ecological functions necessary to the maintenance of the host organism, but they make clear too how even adventurous bioscience finds it difficult to escape metaphors of origin and completion. Towards the end of the article the authors do pose the question: 'Who is the puppet, who the puppeteer?' – but it maintains the distinction rather than questioning the whole notion of supplementation (in the Derridean mode) and the entanglement of host and guest. I want those tensions to bubble through any bioscientific certainty.

A similar binary understanding of medically dominant issues such as the effect of the microbiome on immunity, or the deployment of the normative understandings of healthcare paradigms, both based in the experiences of the global North, informs how the related research and practice is formulated. The impact of geographical and cultural differences with regard to what constitutes good health and diet shows in the largely Western-based recourse to excessive antibiotic treatments and the intentional elimination of some multicellular eukaryotes such as helminths – parasitic worms like flukes and tapeworms – that have been a ubiquitous element of the gut microbiome throughout recent evolutionary history. As Martin Blaser warns, 'in present-day traditional societies in which these aspects of modernization are not present, the microbiota is substantially richer, consistent with the hypothesis that in industrial societies, we already have lost more than half of our microbial diversity' (2018: 1173). The imposition of strict regimes of hygiene control, particularly in the area of waste management, and incautious eradication of disease vectors may speak now to our failure to comprehend the extent and importance of human/non-human entanglement, but those same practices have historically marked racist and colonial practices. A horror of dirt, infection and animality expressed in the self-satisfied phrase ‘cleanliness is next to godliness’ relies on a notion of ideal purity that belies the ‘contaminated’ reality of all human life. Although there are many pathogens that we would wish to avoid,[5] it is not the case that they all express negatively in the same way or cause certain harm in very different times and locations. In the light of new discoveries, there is now a fast-developing interest in, and acceptance of, faecal microbiota transplantation in the service of installing a different and more varied microbial environment in the gut that would boost immunitary protections (Allegretti *et al* 2019).[6] In a similar way, many worm species previously seen as harmfully parasitic are being deliberately introduced into the human body as welcome symbionts for those with intestinal problems (Loke and Lim 2015; Lorimer 2016).[7] In both instances, there are flourishing communities of biohackers at work, as well as the inevitable commercial and strictly medical interest. The call for regulation of such commodification is based on the realisation that very little is known about the complex interactions of differential microbiota, and it raises the question of what damage might have been done by colonial regimes to communities worldwide where living with such ‘contaminatory’ agents was unexceptional. The widespread loss of many associated immunomodulatory capacities and of commensal interactions with other microbial inhabitants of the gut – what Velasquez-Manoff (2012) calls ‘epidemics of absence’ – highlights that what is considered healthy is always a matter of geo-biopolitics.

The volume of research into the microbial communities that cohabit in and on our bodies has grown exponentially in recent years, plotting the trillions of genes that make up the microbiome (Stilling, Dinan and Cryan 2014a; Gilbert *et al* 2018). The bioscience involved is now far from speculative, and the microbiome has been the focus of state-sponsored research on a massive scale in the United States where the *Human Microbiome Project (HMP)* received substantial funding between 2008 and 2016 from the National Institutes of Health. The big difference with the similarly well-funded *Human Genome Project* is that where the earlier research revealed countless surprises in the terms of the genetic overlap between human beings and other animals – and not just the anticipated ones with primates – it nevertheless did not seriously question the attribution of human. In contrast, the *HMP* research throws into doubt the very idea that there is some uniform set of markers that ensures our singularity as a species or that the difference between one human being and another depends primarily on broadly inheritable DNA. The benign public aims of the *HMP* may be all about understanding how changes in the microbiome affect health and disease – and one can only speculate with foreboding the military uses that the research may support – but as always there are some highly radical and largely unspoken implications that could paradoxically disrupt both monolithic power structures and the very sovereignty of human beings that generate the parameters of the research in the first place. The clinical goal remains the search for innovative ways of treating bodily disorders by manipulating the microbiome to favour desired characteristics in the host, but that intensive empirical and utilitarian work aside, the task of identifying the genetic entanglements of the specific biomass lends itself to profound speculation on the nature of the human.

What has been rapidly established is that the human body, far from having one exceptional genome that marks it as superior to other organisms, is a complex admixture of bacterial, fungal, parasitical and viral components on a cellular level in which the strictly human cell (or rather the human as previously understood) is greatly outnumbered. The ratio of human to non-human genetic material may be very low, and there are estimated to be around 10,000 microbial species living in the body, with the biggest proportion in the gut (National Human Genome Research Institute 2012). Early claims that microbes, measured by cell number, constitute approximately 90 per cent of human bodies (Gilbert, Sapp and Tauber 2012) are now considered unconvincing, and more recent estimates – based solely on bacterial presence – suggest a ratio of 1:1 for human to non-human cells (Gilbert *et al* 2018), or at most around 1:3 if all microbial elements are taken into account. The revision is substantial but it makes little difference to the basic argument: that we are not singular or bounded entities, but are materialised as genetically multiple.[8] There is no steady state and each individual has a unique microbial makeup that interacts epigenetically both with the external environment and within the host body between different microbial communities. Such communities create, then, complex and highly specific adaptive ecosystems that are finely and continuously in tune with the ever-changing physiology of the host. Although in adult species there may be a provisional homeostasis that promotes optimal functioning for the organism, any balance is subject to dynamic change and new development in response to multiple internal and external factors. In an ecosystem, there are no absolute exclusions and any component may find a place at variable times.

It is thought that the specificity of individual human genetics predisposes the acquisition of particular microbial organisms, but the microbiome as such is not predetermined but develops over time, initially as the infant passes through the mother's birth canal. Lactation is a further important vector of microbiota transmission both directly to the breast-fed neonate but also in the production of complex sugars that do not contribute to infant nutrition but instead feed those microbial communities in the gut that contribute to establishing and developing the neonate's immune system (van den Elsen *et al* 2019). Offspring do, of course, inherit many aspects of their parental makeup, but the fixed teleology of successive generations passing down definitive genes is disrupted. In place of a neat heredity mix of male and female chromosomes that underpin the genetic makeup of the next generation, there is genomic fluidity that continues throughout life, with older people having somewhat different genomes to their younger selves. I am not who I was. Most of us, nonetheless, are unable to verify such claims for ourselves and they may seem to have minimal effect on our lives, so does it really matter whether we are able to identify a singular genome? There are of course immediate implications for health and disease, which range from the emerging field of faecal transplants, which finds its rationale in the microbiome, to ongoing research around organ transplantation which suggests that its success may turn out to be positively affected by helminth therapy (Lorimer 2016). Research into the microbiome is still in its relative infancy, and already there is almost no area of human health that is left untouched by its practical possibilities. Beyond biomedical speculation are some profound questions that speak directly to the posthuman, as we begin to discern something of the same inter- and concorporeality that such modes raise about the supplementarity of prostheses, in terms of the material considered in previous chapters.

Meantime, it is important to mark that while the notion of co-existing communities sounds benign, there remain many pathogens that can be deeply harmful to human life, although there is often ambiguity around what constitutes a pathogen. Many are bacteria, such as *Helicobacter pylori* (*H. pylori*) which flourishes in the mucosal lining of the stomach and is known as a cause of gastric ulcers. *H. pylori* have a long co-evolutionary history with human beings (Blaser 2006) and are currently resident in around 50 per cent of the world's population, usually from childhood, and yet as few as one in ten people experience any ill-health as a result (Khoder *et al* 2019).[9] It is not only a leap of faith to name *H. pylori* as the causative factor of gastric disorder, but indicative of a failure to consider what other changes have occurred to convert a hitherto harmless bacteria into something destructive.[10] What may certainly cause harm, however, is the unproblematised medical response to the unsurprising detection of *H. pylori* in anyone presenting with gastric problems. Only a few decades ago, gastric ulcers could not be treated short of life-threatening surgery, so the development of what seem to be effective pharmacological therapies has been widely welcomed. The problem is that patient may be subjected to an onslaught of extensive protein pump inhibitor (PPI) drugs and antibiotic treatments, including the alarmingly named eradication therapy, which eliminate not only the assumed pathogen but countless other organisms of the microbiome. At present there is growing concern about the effects of excessive use of antibiotics but it is primarily couched in terms of the emergence of resistant strains of bacteria. What is equally important is that the use of antibiotics, psychobiotics (Burokas *et al* 2015), even probiotics, anti-fungal agents and all the other pharmacological solutions that radically disrupt the mutualistic functioning of macro- and micro-organisms should be treated with great caution. So little is known about the detailed composition and interactivity of the microbiome – our most abundant source of visceral prostheses – that many present-day medical therapies, which now include faecal transplants, risk, as they have always done, exacerbating corporeal damage. Given the extreme specificity of each person's microbiome which responds to a host of non-interior and non-organic catalysts, it would be a mistake to rely on biology alone to generate adequate understanding of the processes at work.

Part of the problem is that the language in which the microbiome enters into socio-cultural awareness is still biased towards militaristic metaphors, such as 'competing armies', even though the science reveals a high degree of cooperation and mutual benefit. In fact many microbes are unable to survive outside the body, just as the human being herself could not survive and develop without maintaining an active microbial viscera. As Lloyd-Price *et al* maintain, the functions of the microbiome 'may include processes that are not carried out by human cells and thus represent a potential basis for symbiotic host–microbial relationships' (2016: 3). The known influence of the microbiome is already very wide and is particularly strong in the area of neural development, as it affects cognition, mental stability, social behaviours, the endocrine system and above all the establishment of a robust immune system. The gut microbiota is the most studied aspect of the microbiome and is the crucial driver of ongoing research. The importance of the gut–brain axis (GBA) has long been recognised in biomedicine with the concept traceable as far back as Hippocratic thought which taught that the mental state of melancholy was connected with the accumulation of black bile (*melaina chole*) in the gut. In recent times GBA refers to the bidirectional communication between the central and the enteric nervous systems, whereby the emotional and cognitive centres of the brain are linked with peripheral intestinal functions. In exploring that connection in *Gut Feminism* (2015), Liz Wilson makes a strong case for a productive relationship between biology and feminist theory, though surprisingly she has nothing to say about recent advances in microbiome research. In that arena the emphasis has been on describing the specific importance of gut microbiota in influencing many cognitive states such as depression, autism spectrum disorder,[11] schizophrenia and Alzheimer's disease (Mangiola *et al* 2016) – and here we may begin to discern its importance to disability – as well as developing the immune system of the embodied self.

Various pathways, including those of the endocrine and immune systems, are implicated in GBA functionality with the vagus nerve – which extends from the brainstem through the neck and the thorax down to the abdomen and gastro-intestinal tissues – being a major contributor. The vagus nerve is already known for its role in transmitting feelings of hunger and stress and for regulating inflammation, and it is thought that vagal neurons carry feedback from the GI tract to the brainstem which in turn engages the hypothalamus and limbic system which regulate emotions. The traffic is two way with stimuli from the limbic system influencing the activity of the

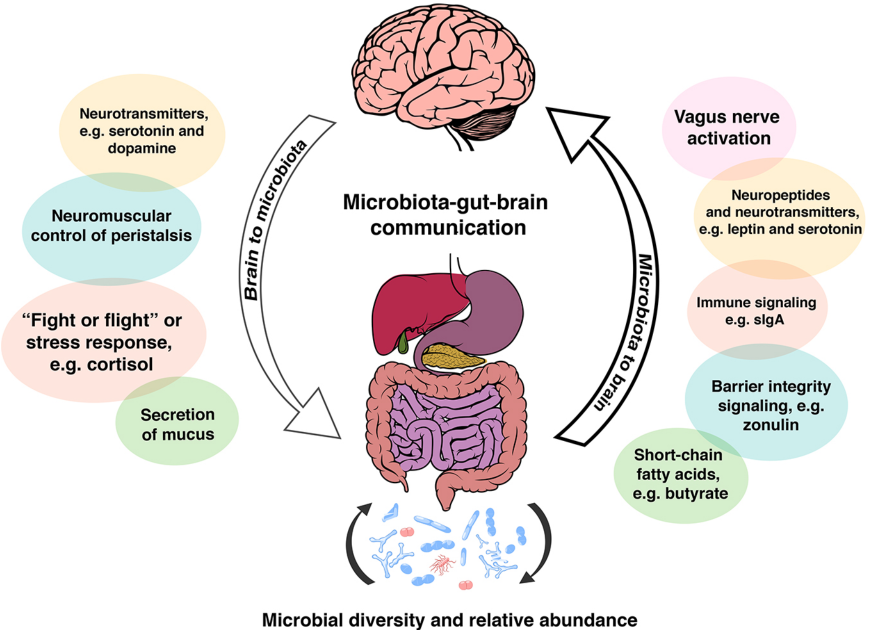

FIGURE 3.1 *The gut–brain axis and bidirectional communication (image by Miguel Toribio-Mateas 2018. Used with permission).*

gut; yet in keeping with the characteristic language of bioscience, Fülling *et al* – in an otherwise nuanced and innovative paper – suggest that 'the most direct way for the microbiota to influence the brain is by *hijacking* vagus nerve signalling' (2019: 1000). The authors note that when the vagus is ablated either accidently or by intention in human subjects, there is an increase in psychiatric-related disorders such as anxiety. What is surprising then is why there appears to be nothing published on the effects of cutting the vagus nerve as an inevitable by-product of heart transplantation. As that has been my own major area of research, I have asked many research scientists and clinicians for insights into the question, but without success. In primarily seeking right and wrong data-based answers, bioscientists remain frustratingly resistant to a speculative follow-through on even the wider medical implications of their own work. Unrestrained by such conventions I wonder if damage to the vagus offers a partial explanation of the deep distress experienced post-transplant by the majority of the *PITH* respondents. If the many positive influences of the gut microbiota are unable to interact directly with the brain, and at the same time the microbiome in general is being subjected to heavy doses of unfamiliar antibiotics and immunosuppressants, then the visceral accommodation of human and non-human organisms on which good health depends is clearly disrupted. I say that explanation is ‘partial’ advisedly as it would be misleading to suggest that experience can be measured by empirical data alone. As I have outlined in the previous chapter, the issue for transplant recipients remains as much ontological – and indeed socio-cultural – as medical and it warrants an integrated multidisciplinary exploration.

## Immunity and the self

It is now accepted that the gut microbiota engages in neuro-active processes that regulate cognition, mood, pain, obesity and a range of neuropsychiatric diseases, and generates new insights into individual variations in personality and behaviours. Perhaps the most important discovery, however, is of the close link between the microbiome and the immune system, especially in terms of supporting immuno-tolerance. Since the middle of the twentieth century, the biomedicine of the global North has been largely characterised by the growing discipline of immunology which studies the tissues, cells and molecules involved in the protective mechanisms of any living body. The failure of that protection is not limited to the control of exogenous agents, but extends to the many common ailments like irritable bowel syndrome and Parkinson’s disease which are cited as examples of GBA activity and are also identified as autoimmune disorders which arise when the body launches a hostile response to its own cellular material. The immune system comprises very many different cell types, all communicating via complex molecules, and is affected by a range of external factors including gender, age, diet, climate and so on; in other words, it is not dissimilar to the microbiome itself. Where the two come together, the relation is portrayed as supposedly resting on the opposing modes of either elimination or tolerance of non-self cells depending on whether they are classed as harmful or beneficial. What recent research has increasingly stressed, however, is that the two systems have not only co-evolved, but in the course of healthy life are usually highly cooperative. Competition does occur when the speedy arrival of unfamiliar organisms throws out the balance and activates a hostile immune response, but more usually constant small changes in the microbiota do not trigger protective activity. Most interactions are consistent with corporeal health and what could be classed as pathological is the *absence* of micro-organisms (Chiu and Eberl 2016).

Conventionally the immune system in humans is thought of as an essential defence against any bacterial or viral invaders – and I will more fully trace the emergence of that notion in relation to microchimerism – though it can also recognise and overcome potentially cancerous cells, maintain health and control inflammation.[12] Originally immunity was understood in terms of the response to infective agents, but following the mid-century research of Peter Medawar and Macfarlane Burnet, it became almost universally accepted that, at the basic level, the operation of the system relies on the distinction between self and non-self, at least in the higher vertebrates that were studied. While several of the contemporary observations on immunology have been subsequently superseded, the apparently natural antagonism of the self/non-self cellular relation has largely endured. Polly Matzinger's article 'Tolerance, Danger and the Extended Family' (1994) was a notable challenger which set out a novel approach to account for anomalies in the self/non-self model, but failed to effect a lasting paradigm shift. Her danger model, which initially emerged from a period before the influence of microbiomic activity was widely recognised, claims that the primary driving force of the immune system is the need to protect against any cellular damage that generates alarm signals. According to Matzinger, both positive and negative messages are constantly relayed from an extended network of bodily tissues with cells under threat of injury sending specific danger signals. In other words, the emphasis is shifted from the trope of invasion to one of interruption in the smooth flow of internal communication, an approach that fits far more comfortably with what we now know of the host–microbiome assemblage.

Something similar is also suggested by biophilosopher Thomas Pradeu's continuity model (2012) which – although he considers but ultimately dismisses Matzinger's theory – posits an immune system that constantly monitors all elements of the organism and relies on the largely benign stimulation of endogenous antigens to function efficiently. In Pradeu's view, simple autoreactivity and the more risky autoimmunity are necessary parts of an organism's homeostasis, and it is only in the event of dysfunction that autoimmune diseases can develop (96). The crux of the continuity model – which decisively contests the self/non-self explanation of standard immunology – is that the triggering of a significant immune response is due to 'the sudden appearance in the organism of antigenic patterns strongly different from those with which the immune system continuously (i.e., regularly) interacts' (137). It is not the foreignness of an antigen that invokes a response but the discontinuity in forms of expression. As with the danger model, the continuity model posits an intracorporeal communality of diverse cellular life rather than an oppositional state ready to repel otherness. Immune tolerance, which Medawar and others had seen only as a facet of foetal and early infant life before the immune system has developed and stabilised, is the default position. Pradeu has nothing direct to say of the microbiome but, nonetheless, shows a keen awareness of commensal micro-organisms and symbiosis, and he notes that even unicellular micro-organisms have an immune organisation, meaning that in the human body it is misleading to speak of a singular system. The overall objective of his theory is, as Pradeu puts it, 'to open up the immune system to its environment instead of viewing it as exclusively self-centred' (204).

However it is viewed, the immune system is highly complex, extensive and critical to the optimal functioning and survival of most organisms, and it offers new perspectives on the philosophical question of self-identity and individuality. It is important to note that biological identity is not the same thing as existential identity and though the latter may cite the former as offering some level of empirical backup, terms like self are equally slippery across the disciplines. Pradeu's own continuity theory in which there is immune tolerance of frequently encountered commensal organisms, other antigens and some tissue grafts shows how the immune system – by recognising and integrating innumerable heterogeneous components – might have a central role in defining a *physiological* individual. It is the very exposure to, and interaction with, an unending variety of non-self elements that grounds the establishment of stable associations that contribute to what might be called an enduring identity. Nonetheless the most widely accepted concept of the immune self remains rooted in historic self/other distinctions and Pradeu, like Matzinger (1994), has been deeply critical of it, albeit claiming some similar defining aspects for the human organism at the centre of his model.

Other biophilosophers accept the explanation of relatively stable immune interactions with microbiota but use the same observations to reject the notion that host organisms are individuals (Gilbert, Sapp and Tauber 2012). Once the ubiquitous symbiosis afforded by the microbiome is taken into account, the immune system's tolerance and management of microbial-host relations serve as a key mediator of the holobiont where such self/other distinctions might be thought redundant.[13] The assemblage of somatic and microbial cell populations does not, however, decisively answer the question of identity with some commentators reluctant to give up on the notion of individuality. As Chiu and Eberl ask, is the holobiont a multispecies organism or simply a 'collection of individuals engaged in a wide variety of ecological relations' (2016: 820I)? Although they acknowledge the importance of mutual strategies in the development of larger ecological units – largely through immune interactivity – they do not see micro-organisms as an integral part of the host. In common with other researchers Chiu and Eberl understand the contingency of microbiomic constitution, but take that to indicate that the holobiont cannot be seen as an organism in itself. By thinking of individuality conventionally as entailing the aspect of persistence, they see the ongoing changes to the composition of the holobiont as relegating the micro-organisms to the role of maintaining host individuality (831). In contrast, my own claim is that the dynamic nature of the interactions renders the determination of any boundaries of individuality impossible. The constant flux of assimilation or rejection that the immune system presents in response to different organisms suggests a state of fluid activity in which the transition from one response to another does not support the establishment of definitive frontiers between an organism and its environment. The ontological and epistemological distinctions between host and microbe, internal and external, lose their significance and become an undecidable blur. The processes of assemblage at work in such a scenario imply a sense of coming together, but it is also about the rhizomatic extensions that reach out into the wider ecological context. And it is not just identity and individuality that are at stake: if the human is a multispecies holobiont, what do we mean when we speak of the human?

In the light of research into the microbiome, what can be asserted is that from a biological perspective, we are at very least, *supraorganisms* that are deeply hybrid in nature and display few of the expected distinctions that mark out self from other.[14] The paradox is that as a supraorganism the human being is both denied conventional individuality, biologically based on a singular genetic code, and afforded an absolute distinctiveness by the complexity of the intra-active microbial communities. For Benezra, DeStefano and Gordon (2012), the outcome of this proliferation of non-human materiality is not a diminution of our humanness but a reinvigorated emphasis on '*our* uniqueness', as it becomes feasible, for example, to distinguish – as purely human genetics could not – between monozygotic twins. It *can* confidently be argued that the make-up of the body is significantly different in every case – it is thought for example that the microbial components are highly variable with less than 30 per cent being found consistently across all healthy bodies of the same species (Lloyd-Price *et al* 2016) – but that leaves open the question of what is meant by *our* uniqueness. To whom does 'our' refer? If 'our' bodies are not simply augmented but are potentially equalled if not outnumbered by highly dynamic microbial supplements, then it is not clear that we can usefully think in terms of any human singularity. It is difficult to make the case that animals, including human beings, are individuals in the anatomical sense of having separate and distinct bodies. In the next section I take a narrower focus on the dynamics of the human self and look at the phenomenon of microchimerism, and in particular its involvement in immunity, to show that singularity cannot be sustained.

## 2 *Microchimerism*

For modernist philosophy with its focus on ontology, epistemology and ethics, the empirical claims of bioscience may seem small beer, but they helpfully feed into the enduring assumption that there is a strictly bounded relationship between self and other. One powerful validation arises from appeal to the putatively unique and temporally stable genetic signature of each human cell, which in turn determines the precise make-up of the human leucocyte antigens (HLAs) that underpin our immunological systems.[15] It is extremely rare for two individuals to have the same gene encoded set of HLA molecules[16] – collectively called a tissue type – and as a result, we consider that the biological distinction between self and non-self is absolute and embodied. In lay terms, and indeed in many current student textbooks, immunology itself is described as the science of self/non-self-discrimination. In reality, the purity of that distinction is illusory and what constitutes the proper 'me' is already shot through with otherness as current research on the microbiome has consistently demonstrated.[17] And it is not only about the microbial communities that live in and on our bodies; the assemblage of others extends from surface cohabitation to the cellular level.

In drawing on my own research around the inherent hybridity of organ transplantation that already unsettles identity to the self and signals new ways of becoming other, I want to look more specifically at the event of chimerism as it contests the discourse of the self's immunity to the other. Classically, chimerism is understood as a combination of forms, either intraspecies or transspecies, with the word being derived from the Greek myth of the Chimera, a fabulous creature which combined elements of a lion, a goat and a serpent to create something new. In contemporary biomedicine, the term most frequently encountered is *micro*chimerism which refers to a small but significant presence of so-called non-self human cells co-existing with a dominant population of self cells in the same body. More extensive chimerism is said to occur when the host cells are outnumbered or even replaced within a solid organ for example. That the occurrence of chimerism within a supposedly single body presents a serious challenge to one of the fundamental doxa of Western medicine and specifically contests the definitive principle of the immune system might seem self-evident; yet in the face of a socio-cultural imaginary that insists on clear boundaries between self and other, the authorised discourse, of the clinic at least, remains largely unchanged, stressing the importance of securing immunity and assuring us all of our continuing essential singularity. Nonetheless, where the hybridism of solid organs stirs up ontological issues for transplant recipients and philosophers alike, but seems to present no non-clinical problems to practitioners, the question of cell microchimerism is the starting point for a series of reconfigurations. For conventionally trained bioscientists, the search is for a functional explanation as to why and how what is expected at most to be a transitory phenomenon – better yet it did not occur at all – may persist for decades, while for critical postmodern theorists, the adventure is to bring philosophical speculation to bear on the problematic in a way that opens up to the concept of assemblage in its Deleuzian sense as a better model for organic life, including human life.

Before picking up the thread of immunity again, it is important to set out what is known empirically of microchimerism which is far more ubiquitous than the chimerism of whole bodies. Unlike the latter, microchimerism occurs at the cellular level and has limited impact on visible morphology. In both cases genetic and – where they occur – morphological *distinctions* are retained within a single body. Unlike a hybrid, such as a mule, which is the genetically *assimilated* offspring of a horse and a donkey, a true chimera, such as a geep, maintains the unique signature of the distinct genetic components of the parent sheep and goat in a patchwork of cells. In other words, in a hybrid *each* cell consists in a combination of genes, while in a chimera each individual cell will contain genes from only one of the originating organisms. In short, the tissues of a chimera are populated by cells that are genetically distinct from each other. In consequence, a mule – whose

**FIGURE 3.2** *Chimera of Arezzo fourth/fifth century BCE (Saiko, cc-by-sa 3.0).*

interspecies chromosomes cannot form the necessary pairs – is unable to breed,[18] while a female geep can theoretically give birth to either a lamb or a kid depending on which genes predominate in the reproductive gametes. The two categories, hybrid and chimera, both contest the separation of self/non-self and disrupt the expectation of genetic singularity, but the chimera alone escapes the reproductive dead-end of the hybrid.

Present-day prevalence is unknown, but in conventional evolutionary terms, microchimerism is an ancient phenomenon widely detected in plants and invertebrates as well as many vertebrates and mammals including monkeys, cattle, dogs and humans. In human beings a range of both iatrogenic and natural chimeric states exist, with biomedical interventions such as organ or stem cell transplantations constituting the former, while the latter includes the fusion of dizygotic twins *in utero* into one body or the more common incidence of foetal cell engraftment into the maternal body, and vice versa. Whatever the provenance, such transformations challenge 'the traditional evolutionary dogma for the dominancy of genetically *homogenous* entities in nature' (Rinkevich 2011: 1). As with the microbiota, this has transformative implications for our conventional model of distinct biological objects, including ourselves as human beings, where each organism is coincident with a single genome. What is at stake, at very least, is the principle that DNA is sufficiently stable across individuals and over intergenerational time to provide a reliable guide to the genetic basis of human health, disease and difference. Strictly speaking, microchimerism indicates that no more than 1 in 1,000 cells is *genetically* distinct from the majority, but in some cases such cells may come to predominate in a particular organ or tissue as well as circulating in low numbers throughout the body. As a consequence, as Dupré remarks, '(c)himeras do not necessarily experience any unusual symptoms, so the prevalence of full chimerism, chimerism derived from multiple zygotes, is not really known, and may be much higher than suspected' (2010: 22).

Bioscientific explanations for the existence of microchimerism and the extent of its significance are widely disputed, but biomedical practice is slowly beginning to respond to experimental data, though not with the same enthusiasm that has greeted research into the microbiome. Given that organ and tissue transplantation has been central to radically rethinking the self/other distinction, it is no surprise to find that it is the testbed of microchimeric experimentation and speculation. On the wider spectrum, as Lappé and Landecker note, '(a)s genomic instability becomes an area of increasing focus for life scientists, it opens up a new landscape of genomic multiplicity and temporality in health and disease' (2015: 161), and anything that involves genetic testing as an absolute arbiter of biological 'truth' will require revision. This is well illustrated by a notorious case initially reported in an issue of *Psychology Today*, a magazine that pitches in the space called 'public understanding of science'. It tells the disturbing story of an American woman, Lydia Fairchild, whose maternity of her own 'natural' child could not be verified when she submitted a blood sample for genetic testing as part of a stringent welfare application. She was under suspicion of fraud, and even kidnapping, for some time before giving birth to a further child. Despite surveillance witness testimony that she had indeed birthed the baby and had not utilised any reproductive technologies that broke the genetic link between carrying mother and infant, the child's DNA 'proved' that Lydia Fairchild could not be the mother. The case was finally resolved when it emerged that she had profound chimerism to the extent that the DNA of her blood was quite different to the DNA of her reproductive organs. Her genetic profile, in other words, was at least dual and possibly multiple (Kean 2013).[19] The most likely explanation is that Fairchild was the result of a dizygotic twin conception that had disappeared when her embryonic self had absorbed the other twin *in utero*. The resulting singleton carried both her own original DNA and that of the non-identical twin, thus creating a chimera. Research in the area of uterine chimerism is still sketchy, but there are many suggestions that the phenomenon might explain intersex conditions, even the phenomenology of transgendered people (Hanley 2011), or at a different level, the observation that some people have eyes of different colours.

To stress how clearly microchimerism has the capacity to shake the biosciences, I want to revisit in more detail the new understanding of the immune system set out by Medawar and Macfarlane Burnet over sixty years ago. Up until their groundbreaking research, knowledge of the immune system was heavily focused on infection, but the new model spoke to the maintenance of the boundaries between the supposedly normal self and the alien other. Unless artificially suppressed, the immune response is supposedly activated whenever the body encounters 'foreign' antigens, and its task is to mobilise an array of biochemical agents that eliminate the putative threat of otherness. In formalising a theory of self/non-self antagonism, it was necessary to dismiss evidence of what is now called microchimerism. In the context of the time, largely unsuccessful experimentation with organ and tissue grafting was a major driver to change, and Medawar himself was motivated by the desire to unlock the puzzle of why the skin grafts offered to injured post-war military personnel were regularly rejected. He was able to identify the immune system as the effective destroyer of potentially palliative non-self tissue and his goal therefore was to find ways of securing *induced* immuno-tolerance.[20] Although he demonstrated and named the phenomenon of enduring chimerism as it could manifest in dizygotic twins in certain non-human mammals[21] and even very rarely in humans, and made the connection to *natural* immuno-tolerance, Medawar went no further than calling the occurrence a 'natural accident' and 'astonishing'. Those putative exceptions aside, what Medawar and his collaborators expected to find was a hostile relation between self/non-self cellular material and that became the dominant theme of the new science of immunology.

As I outlined in relation to the microbiome, the biomedical imaginary, for some decades, has characterised the immune system through a series of pugnacious metaphors expressing aggression, invasion, outright warfare and foreignness being met by a swath of self-defence mechanisms such as the forcefully named natural killer (NK) cells. The exploration of this characteristic language of biomedical knowledge production has been taken up for many feminist scholars such as Donna Haraway, for whom notions of the self indicate tellingly that 'individuality is a strategic defense problem' (1989b: 15), in terms of maintaining the boundaries between the normal self and the pathological other. Emily Martin (1990), Lisa Weasel (2001) and more recently Susan Kelly (2012) have all commented on the emergence of the specific discourse of immunology, and although the central analogies have long been undermined by research findings that clearly could not be fitted to the self-defence model, the very same metaphors still hold sway in popular discourse. The problem at any level is that while the body's immunological counter to the putative threat of otherness in the form of a bacterial infection, or even a carcinoma, might understandably evoke images of steadfast defence, its hostile reaction to many therapeutic interventions such as tissue and organ transplants, or bone marrow implants creates biomedical as well as metaphorical trouble.[22] In any case, the efficacy and binary closure of the self/non-self model takes no account of some notable and widely accepted anomalies. The most compelling of these include the phenomenon of autoimmunity where the body's *own* cells are seemingly misrecognised and responded to as other; the growing evidence of microchimerism following transplantation; the commensal microbial life in the gut; and the evidently *natural* tolerance between a pregnant woman and her foetus, despite their different HLA coding. The visceral transformations that chimerism implies indicate not simply intercorporeality, but the irreducibility of embodiment into singular and static forms. In the case of pregnancy, the aggressive language of immuno-warfare against foreign intrusion focuses, as Martin puts it, 'on the body that is all of one kind, all purely self … .hence the normal woman would destroy her foetus to return to a normal state of internal purity' (1990: 148).

Clearly this is not how the human reproductive process works, though in biology it has been conventionally inexplicable why – given the different HLA systems in place – the maternal body should not reject the foetal material or vice versa. The view persists that the two bodies operate as separate entities, immunologically opposed to one another rather than mutually supportive. But perhaps what is the more inexplicable is that the paradox surrounding such a ubiquitous and essential natural event as pregnancy has not resulted in any obvious rethinking of the mutually hostile self/other paradigm. Like every other authoritative discourse, bioscience invests in strategies of representation that finesse the empirical data to fit a particular discursive structure. I suggest that the rapidly growing evidence of those scenarios that do not fit the oppositional self/non-self paradigm, that throw into question not just the protective/defensive operations of the immune system, but the modernist normative context in which the inviolability of clear corporeal boundaries between self and other is taken as a given, presage perhaps a subtle shift across both biology and immuno-politics in the imaginary itself. While few bioscientists now doubt the existence of microchimerism – marked by very small proportions of mismatched HLA in the host body – many prefer to see it as always transient and insignificant. Nonetheless, the operative reproductive discourse shows a clear change from dominant metaphors of foetal intrusion – where the foetal cells are most certainly 'out of place' – to a new language of trafficking and migration (Martin, A. 2010) that catches the inevitability of the process, albeit with some negative implications. The whole issue of maternal–foetal microchimerism raises significant questions for the reproductive matrix, and in Chapter 6 I shall go on to further consider the effects, most particularly in the specific context of surrogacy.

Over the last couple of decades, the phenomenon of intercorporeal cellular motility has been mired in controversy, particularly in relation to maternal or foetal/infant ill-health. The notion that foetal stem cells can rebuild damaged tissue, bone or muscle is very familiar so there is an immediate sense of recognition that a positive claim for cellular chimerism might be made at least with regard to the mother's body. Nonetheless, microchimerism has been marked as both active in tissue repair and regeneration, and as a contributing cause of mysterious autoimmune diseases such as rheumatoid arthritis, MS, lupus – something alien is at work after all – and often in relation to the very same diseases (Nelson 1996; Bianchi 2007; see also Kelly 2012). What is perhaps confusing is that the evidence of disease progression presented on either side of the debate shows little disagreement with only the speculative interpretation making the difference in evaluation. The common ground is that non-self cells are frequently found in greater concentrations at the site of lesions than in peripheral blood, and in greater concentrations than in 'healthy' control groups. The association then suggests either a causal link in the disease process, or alternately that differential HLA – with its distinct immunological signature – gathers to offer additional protection and repair in the face of damage (Kallenbach and Bianchi 2011). For the most part, opinions seem fairly entrenched on either side, with few researchers looking for explanations of the paradoxical nature of the research findings. One exception is Lee Nelson who seems to have moved from an initial position of scepticism with regard to any beneficial effects (1996, 2002), which pitched her against the optimism of Diana Bianchi's lab, to a wide consideration of both the positive and negative implications, and, unusually for a research scientist, even an explicit rejection of the exclusionary self/non-self paradigm of human health. In general, the debate about the putatively destructive or preservative nature of transcorporeal cell mobility shows little sign of being resolved and most researchers have fallen back to saying that chimerism is sometimes beneficial, sometimes not, with many hopes of therapeutic implications shelved and research funding uncertain.

Turning to the field of solid organ transplants – livers, kidneys, hearts and so on – the relation between chimerism and tolerance is a central concern for improving graft acceptance rates. In the transplantation context, microchimerism matters specifically with regard to its input to the immunological status of the recipient. To forestall the rejection of donor organs which usually excite a massive immunological response that fully exemplifies the self-other paradigm, the holy grail has long been to induce tolerance. In conventional practice, as an immediate consequence of the transplant procedure, that tolerance has devolved on the strategy of engaging recipients in a usually life-long regimen of immunosuppressant drugs that allow the donor organ to continue functioning free of the host versus graft disease (or in some cases graft-versus-host disease) that would lead to rejection. Immunosuppressants have many toxic side effects, but in most cases must be deployed not just for short-term recovery, but for continuing survival. Without them the recipient's natural immune response to the unfamiliar donor DNA – which determines its own distinctive Human Leucocyte Antigen (HLA) profile – would be to overwhelm the putative intrusion and reject the organ, resulting in the recipient's own death. Grafts are rarely precise HLA matches, and although careful tissue matching between close relations, as in kidney transplantation, can eliminate some of the problem, where hearts are concerned that is not an option. Donor hearts are a scarce commodity and potential recipients may spend many months on the waiting list – with a third dying untreated – such that organs with a less than ideal degree of match must frequently be used. The resulting histo-incompatibility that would prevent a successful grafting can be controlled by suppressing the recipient's own antigens, but a further problem arises with a similar reaction originating with the donor organ. In what is called graft-versus-host disease, the functional immune cells of the new organ recognise the non-self markers of the recipient and attack the host who may have little defence if already immuno-compromised. The risk of heart transplantation surgery itself is not especially high with 90 per cent surviving for at least a year (Lund *et al* 2017): the danger lies in effectively managing the incompatible HLA systems.

Acceptance that microchimerism might be an issue in transplantation has been slow to emerge. The earliest serious consideration developed in relation to the surprisingly long-term survival of a few early kidney transplant recipients from the 1960s who were treated before effective immunosuppression became possible. In retrospective studies of those transplants carried out almost thirty years later, Thomas Starzl's traced the occurrence of cell migration from the grafts to the recipients' peripheral blood supplies (Starzl *et al* 1992). His research provided the first big challenge to the accepted belief that the alien cellular matter would stay *in situ*, and that the immune system operates on the principle of self/non-self discrimination such that donor and recipient antigens will always be in conflict. If donor HLA could be found not only *in situ* in the transplant organ but throughout the recipient body, could microchimerism be a factor in graft acceptance? In Starzl's understanding, chimerism might solve the problem of rejection by keeping in balance the immunogenetic effects of the two different populations of cells. His recommendation was that recipients of living donation should be given pre-treatment with hematopoietic (stem) cells derived from the donor bone marrow infused straight into the peripheral blood, which would obviate the need for highly toxic programs of immunosuppression.[23] Other researchers have indicated that cell mobility is bidirectional insofar as the transplant organ itself could show signs of coding for the recipient's existing HLA. By studying female to male donations, Quaini *et al* (2002) showed how a heart graft might be genetically transformed by the incorporation of the recipient's existing markers. Unlike the systemic chimerism studied by Starzl, the chimerism here (identified by the 'out of place' presence of Y chromosomes[24]) occurred within the heart itself. Contrary to existing doxa, it suggested that this unexpected chimerism 'could regenerate myocardium and sustain cardiac performance' (Quaini *et al* 2002: 5).

What Starzl's original finding suggests is that microchimerism can be an effective feature of transplantation, regardless of supplementary stem cell infusions. This is well-illustrated in the much-delayed publication of an Australian report of an emergency liver transplant carried out in a nine-year-old female child, whose whole immunological response realigned itself with that of the male deceased donor, with her blood group switching from O-negative to O-positive (Alexander *et al* 2008).[25] In the dry circumscribed style of bioscientific journals, the clinical paper reports that '(t)he patient remains well [five] years after transplantation. *She has not received any immunosuppressive therapy for [four] years*, and the results of her liver-function tests are normal' (Alexander *et al* 2008, 371, *my emphasis*). The authors offer various tentative explanations for the surprising absence of graft-versus-host disease, particularly as the transplant liver came, unusually, from a 'fully HLA-mismatched, sex-mismatched' emergency donation (Alexander *et al* 2008: 373). It is usually assumed that the long-term success of transplantation depends on careful, though never complete, tissue matching and the extent to which the recipient's immunological rejection of the donor organ, in which the antigens of the recipient body would produce antibodies to destroy the antigens of the graft, can be controlled by a life-long administration of immunosuppressant drugs. In the Australian case, however, the chance discovery at nine months post-Tx of extensive chimerism during investigation of a small bowel obstruction led to a decision to *withdraw* all immunosuppressant medication. This enabled the donor cells over the next few months to effect a full, and therapeutically beneficial, engraftment, which resulted in the patient's eventual full recovery.

There is now a growing and highly oppositional debate within immunology and transplant medicine with regard to the potential of beneficial or pathological outcomes in the presence of microchimerism, but practice is slow to change. That cancerous tissue, for example, which is a major risk in immunosuppression following transplantation, may show a heavy concentration of microchimeric cells fits pre-existing negative assumptions. Even in the light of the startling and provocative unfolding of the Alexander case, most subsequent studies have avoided upsetting orthodoxies by failing to pick up its radical implications that the self/non-self basis of immunology might be flawed. The charge has been that the data was in any case contaminated, and if not, then by the assertion, which Alexander concedes, that the process of microchimerism 'is common following liver transplantation … [and] usually disappears within the first 3 weeks' (Alexander *et al* 2008: 372). The Australian case, however, could scarcely be called one of *micro*chimerism, in which the percentage of 'non-self' cells is very low, but a full-scale transmutation in which an assay of 250 peripheral blood cells at post-transplantation day 492 showed 'all of these cells were male' (Alexander *et al* 2008: 371). Although the authors are highly cautious in offering any theoretical analysis or speculation concerning the case, perhaps understandably given the extent of their unsettling of biomedical givens, there is no doubt that their paper raises some urgent questions. Such a clear demonstration of genetic translocation, even in its rarity, suggests an intriguing new understanding of intracorporeal malleability, a recognition that borders are permeable, and that genetic origins may be far from secure. The dominant fantasy of a pure, unified and unchangeable identity to self established at conception and secure until death begins to dissolve. The systemic engraftment of donor cells still hints at oppositional relations, with the claim advocated by Thomas Pradeu (2012) – that immune systems might be cooperative – left unexplored. Nonetheless the case challenges not only biomedical science but the very understanding of what constitutes human being.

But is chimerism as ephemeral a phenomenon as many clinical papers suggest? It is implied by most standard research that it is characteristically short-term, and limited to the procedures of transplantation, or to the nexus of cellular exchanges that occur *during* pregnancy,[26] but some very different results indicate that it is universal and persistent. There is significant evidence that pregnancy-generated chimerism can be detected in women many decades later, and even in those who had never been pregnant (Bianchi *et al* 1996), which suggests that the prevalence of chimerism must have additional explanations. One that appears to satisfy the available cellular profiling is that chimerism 'handed down' as it were from mother to child could entail the translocation of HLA deriving from a *previous* pregnancy in which foetal markers (effectively traced as male ones) had entered the maternal body. I shall say more about this in Chapter 6, but for now the point is that if chimerism is potentially life-long in duration (Maloney 1999; Aractingi and Khosrotehrani 2005) then we can surmise an intergenerational scenario in which each one of us could carry non-self cells from a variety of genetically other relations. In principle, then, it is difficult to see why chimerism should not persist indefinitely.[27] It is telling that although there is a similar suggestion in Nelson's quasi-journalistic article 'Your Cells Are My Cells' for *Scientific American* (2008), there is not a hint of it in her reports of her extensive laboratory work. Biomedical science is clearly not yet ready for such a radical challenge to one of its central tenets. Yet chimerism is already known to relate to non-irradiated blood transfusions (Nelson 2002), bone marrow transplants, all types of tissue and organ transplant, pregnancy, generational genetic transfer and human dizygotic fusion.[28] And the list is surely incomplete. Although no-one has yet devised any way of testing the idea, it has also been suggested by both clinical research and the popular media that lactation (Molès *et al* 2017; Ninkina *et al* 2019) and, more contentiously, fluid sexual exchanges can also generate microchimerism (Yan *et al* 2005), which further raises the question of the implausibility of genetic inviolability. If each body in the normal course of health carries plural and durable populations of differentially active HLA, it is clearly not just our understanding of the immune system that needs to be revised. The very existence of chimerism and the probability that it is ubiquitous deeply disorders any notion of the bounded self or of individuality while at the same time *reinforcing* the trope of uniqueness by multiplying its specific markers.

## Autoimmunity and the immunitary paradigm

Having briefly marked out the entanglements of microchimerism and the immune system, I want now to explore how the many empirical observations could be further deconstructed by applying a theoretical critique to the sense of the bounded self protected against the incursions of others. If immunity stands for the self-defensive rejection of alien intrusion, and (micro)chimerism speaks to the co-existence of self and other, then it would seem that the latter portends a puzzling failure, or at least inaction, in the former. My question is whether it is possible then to think immunity and microchimerism in positive conjunction. At this point, it is worth remembering, as suggested by Ed Cohen (2009), that the notion of immunity as defence of the body only emerged in biomedicine in the late nineteenth century after many hundreds of years in which it was a purely juridical and political concept. I am not claiming, as Cohen wants to do, that the juridico-political concept of immunity has been inappropriately transplanted into an otherwise natural set of phenomena called biology. As a good Derridean, I would reject that split between culture and nature, and see the two as co-dependent with no pure origin on either side.[29] The point that Cohen makes, that the hypothesised late uptake of the concept of immunity by biology in relation to the human body naturalises the modernist subject as an independent entity necessarily engaged in self-defence, is nevertheless usefully provocative. It makes clear the intimate intertwining of our domains of knowledge production and raises the issue of how things could be otherwise.[30]

My own starting point is with an intriguing dissection of the word 'immunity' undertaken by the philosopher Roberto Esposito, who sees it as intertwined with what at first glance may seem to be an opposing concept, that of 'community'. Where the latter refers to something public or held in common, immunity signifies that which is private and particular to my self, but as Esposito (2008) points out, the two terms have a common root in the Latin *munus* which means an obligation or even a gift. *Munus* is all about obligations of responsiveness to the other; about reciprocity; it is what oils the wheels of community, and what is rejected by immunity. The one who is immune is exonerated from reciprocal gift giving and stands as an autonomous individual, free from the abnegation of self that community demands. In Esposito's terms, however, neither immunity nor community can be thought without the other, and what he calls the immunitary paradigm both protects and endangers the individual and socio-political collectives alike. The issue for political philosophy is that where the function of immunity is to protect life against external incursions, to ensure the continuity of selfhood and group identities, the risk lies in falling into an absolute refusal of difference which signals the decomposition of immunity into a highly damaging autoimmunity. In the attempt to preserve personal or communal identity (and remember the root word *idem* means 'the same') transformation is rejected and a kind of death-like stasis ensues.

As Esposito (2008) sees it, the individual may feel the necessity to immunise herself against the demands and obligations of community life, isolating herself from what would sustain her.

Now this is a highly familiar theme in my research around heart transplantation, where the acceptance of a donor organ, the so-called gift of life – which is currently reliant on the suppression of the recipient's immune system – inaugurates an enduring obligation within the recipient (Shildrick 2013b). Among the many troubling issues faced by heart recipients as they attempt to restore the texture of their prior lives is the new reality of their undeniably hybrid bodies giving rise to the ontological question of 'who am I now?', and the equally confusing sense, or imposition, of kinship with the donor family that follows transplant (Shildrick 2013a, 2013b). Commenting on Esposito's work, Timothy Campbell writes: 'Accepting the *munus* directly undermines the capacity of the individual to identify himself or herself as such and not part of the community' (Campbell 2006: 4). And that is precisely the issue with recipients, the majority of whom – prior to accepting the 'gift of life' – understand themselves within the normative paradigms of Western modernism as autonomous selves, sovereign individuals, with a very clear sense of the corporeal distinction between one self and the other. As Esposito notes, it is logically unthinkable for classical culture to tolerate the two-in-one or the one-that-is-made two. As a result, organ transplantation, in which the differential DNA and HLA – the ultimate visceral prostheses – of the donor material is never assimilated as such but remains fundamentally other, offers a somewhat paradoxical take on the preservation of the individual life.

Esposito's concern with bringing together the seemingly disparate arenas of political philosophy and the materiality of medical immunity should remind us of Haraway's dictum that immunology is at the heart of biopolitics (Haraway 1989b). In that conjunction, biology both emerges as a symptom of politico-cultural discourse (Cohen 2009) and is generative of it. In short, the embodied self is always a point of biopolitical production. As such, any cellular nomadism across the supposedly impermeable borders of distinct human organisms challenges immunity at all its levels. The underlying model for Esposito's biopolitics (2008, 2013) is of course biomedical, so when he says that to be immune 'is the "nonbeing" or the "not-having" anything in common' (2008: 51), he directly recalls the scientific definition based on self/non-self distinction. In both forms, immunity is both protective against the destruction of the individual through what Esposito calls 'excessive relations' and at risk of over-identifying otherness to the point of destroying precisely that which would be life-saving. The conventional understanding of the standard immune response of chronic rejection towards a donor organ or tissue, for example, that entails lifelong management by immunosuppression, is a case in point. Should immunosuppression – which itself always risks the deadly onset of other uncontrollable diseases – fail, then both the incoming material and the host body, which is wholly dependent on the prosthetic replacement, are expected to die. As Esposito notes, 'immunity, which is necessary for protecting our lives, if carried past a certain threshold, winds up negating it' (2013: 61).

There is no evidence that Esposito has ever considered microchimerism as such but his conclusions are precisely what the phenomenon effects. In his search for an affirmative biopolitics, he clearly understands that biomedical technologies – and indeed political practices – entail both the technological and ontological transmutation of the human body. While he mentions transplantation only in passing, Esposito does refer to pregnancy as a model for an immunity that does not end up destroying the life it seeks to preserve, that is not simply tolerant but hospitable to, and nourishing of, difference.[31] He references the maternal–foetal relationship as an affirmative mode of conceptualising immunity. As he writes:

> (it becomes) the figure of a cohabitation with difference, an emblem for a different means of thinking about community. This is most literally introduced with a reference to biologists who think of the immune system as an ecosystem or a social community – not just a defensive system, but a system of "self-alteration".
>
> (2011, 169)

This calls to mind the reciprocal and embodied ethics of corporeal generosity (Diprose 2002) – already introduced in relation to transplantation, but equally pertinent to maternal–foetal relations – which operates across alterity without effacing it. Such generosity evokes an unacknowledged form of community in which the self is not so much jeopardised by the risky contact with the common, as Esposito (2008) would put it, but grounds a mode of giving and receiving that is not dependent on the equity – the reduction to sameness – implied by exchange. The critical point of this strange form of *communitas* is that in overriding the immunological discourses of self and other, it does not transcend what Deleuze would call difference in itself. Esposito himself is always clear that the terms *communitas* and *immunitas* both presuppose what they appear to negate and that immunisation is 'the fold that in some way separates community from itself, sheltering it from an unbearable excess' (2008: 52). The ethical task is to ensure some liveable and coterminous existence.

What Esposito explicitly seeks is an affirmative biopolitics, but, as for many other European philosophers concerned with the concept of immunity, he understands the danger that it may fold into autoimmunity, which again marks the empirical site at which the interface between immunology and chimerism appears most exposed. Like Derrida (2003), Esposito sees autoimmunity as the characteristic mode of contemporary politics, the near inevitable outcome of that same process, where 'the negative protection of life, strengthened so much that it is reversed into its own opposite, will wind up destroying, along with the enemy outside, its own body' (2013: 64).

What is rejected in the overdetermined immunity against putative risk – in both politics and biology – is the possibility of (mutually) productive reconfigurations that go beyond the oppositional mode of self and other. Where Esposito does see hope in forestalling autoimmunity, for Derrida, in contrast, the trajectory is unavoidable. In biology, as he notes, the process of autoimmunisation 'consists for a living organism … of protecting itself against its self-protection by destroying its own immune system' (2003: 94) and he posits what he calls a 'general logic of autoimmunization' that extends to every community (Derrida 2003, 94). Derrida's work is extremely rich in its implications, and although the precise term *autoimmunity* is most associated with his response to the deadly event of 9/11 and its aftermath, it runs as a theme through his texts long before that date. The whole concept of the 'other within' which is fundamental to Derridean thought, and his understanding of the relation between the host and the guest in his analysis of hospitality, sets up a model in which the self is never finally secure. In *Spectres of Marx*, for example, Derrida writes: 'To protect its life … [the self] is necessarily led to welcome the other within … it must therefore take the immune defenses apparently meant for the non-ego, the enemy, the opposite, the adversary and direct them at once *for itself and against itself*' (1994: 177). It is as though autoimmunity is the spectre that never ceases to haunt the self, and it comes at the possible cost of instantiating the monstrous, of exposing the self to autodestruction.

Now this seems as though it would preclude any affirmative bioethics, that it would necessarily fracture life and posit death at the heart of all being. Derrida does indeed refer to our present ethics as thanato-ethics (*Aporias* 60), but it would be wrong to suppose that he sees autoimmunity as wholly negative with death as an implacable end. On the contrary the very spectrality that characterises his texts and disrupts identity to the self speaks to a very different take on temporality, not as teleology, but as irregular and unpredictable traces and recurrence. Autoimmunity, for Derrida, is unavoidable but at the same time it is what holds open not simply the question of alterity now, but the very possibility of futurity, the undecidable *a-venir* where we cannot know who or what will come. As he puts it, 'without autoimmunity … nothing would ever happen or arrive; we would no longer wait, await, or expect, no longer expect one another, or expect any event' (2003: 152). It is not, I think, that Derrida is any less desirous of the affirmative than Esposito, but that he refuses to prise apart what is positive and what negative. In this respect his work on hospitality, which is intimately related to the question of immunity, is highly apposite. For Derrida the ethical imperative is to offer an absolute hospitality with no ifs and buts, no limiting provisos as to whom or what our thresholds should be open. But that means welcoming not just those who conventionally appeal to our better community instincts, but also welcoming the monstrous *arrivant* – the refugee who may turn out to be a terrorist, the one who may murder us in our beds, or the transplant organ of unknown provenance. But the real point of course, as Derrida insists, is that absolute hospitality is both necessary and impossible. Because we cannot avoid immunising ourselves against others and falling into autoimmunity, our future horizons are undecidable, potentially destructive and monstrous *and* the point of positive aspiration. In an article comparing Esposito's and Derrida's understanding of autoimmunity, Penny Deutscher sums it up like this: 'It is because we are open to disaster that we are open to transformation. But the reverse also must hold. If we are open to transformation, we are open to disaster' (2013: 63). I whole heartedly agree but would want to reverse the emphasis of her equation.

I shall not pursue further any of the implications of these Derridean reflections on biopolitics, nor Esposito's warnings about contemporary thanatopolitics and medical technologies, except to note that although there is much in common, Esposito decisively opens up the field in a different direction with his gestures towards Deleuze. In marking the technological and ontological transmutation of the body, Esposito leaves behind the biomedical trope of tolerance – which in immunological terms refers to a lack of reaction to the other, a kind of passive co-existence – and posits a logic of dynamic multiplicity where variation is mutually affective. As he puts it, 'we need to find the mode, the forms, the conceptual language for converting the immunitary declension … into a singular and plural logic in which the differences become precisely what holds the world together' (2013: 65). Undoubtedly, Derrida's notion of hospitality (2000) has already done some of that work in establishing the fundamental interiority of otherness, but I am uncertain that it can convincingly offer up the '*affirmative* biopolitics' that Esposito is seeking. What the latter wants is a way of thinking afresh and constructing more adequate concepts about the events that involve and transform us, which, he points out, is precisely what Deleuze explicitly sees as the primary purpose of philosophy. In appealing to the *im*personal as the only vital and singular mode that goes beyond the conventional semantics that continues to function in relation to the individuality of the person, Deleuze gives recognition to the one in the other, and to the unbounded potentiality of life's becoming. As Esposito notes, 'that anything that lives needs to be thought in the unity of life … means that no part of it can be destroyed in favor of another: every life is a form of life and every form refers to life' (2008: 194).

Building on the exposition in previous chapters, I want to end this chapter, then, by sketching out some speculations on where a Deleuzian approach that seeks to explode the mythology of self-other distinctions might take us in engaging with the microbiome and the phenomena of microchimerism. Where empirical research has shaken some central tenets of bioscience, it is equally deconstructive of some fundamental structures of the dominant philosophical tenets of the global North, which feminist and decolonial thinking has already delighted in undermining. The contestation of the Western logos, in which undivided masculinist individuality reigns supreme, has long been underway from what I would cautiously call a feminist standpoint. But that critique has rarely escaped the bounds of humanism, nor has it engaged with more than a highly circumscribed mode of knowledge production. Now, the growing recognition of genomic variation can take us some further steps along the route to posthumanism, not as abstract speculation that might theoretically offer some better ways of becoming, but as the inevitable outcome of some very material and often highly pragmatic research. For feminist theorists, the task is push the 'so-what?' question to its limits,[32] and perhaps even contemplate that there are no limits.

This is precisely the point at which a turn to Deleuze is apposite. The radical break with modernist philosophy that he pursues not only contests the boundaries of embodiment *per se*, but makes sense of – and to a degree settles – many of the troubling aspects of the question 'Who am I?' which is so uncertain in both pregnancy and transplantation. The fundamental shift is from the conventional paradigm of 'self versus other' in the formulation that still dominates immunology, and thus biomedical science more generally, to a view of the normal 'self' as both irreducibly part of a holobiont and constitutively chimeric. At the heart of Deleuze's philosophy is a decisive break with the notion of an atomistic subject – the sovereign subject of modernity – that celebrates not static 'being', but a state of becoming in which any *individual* subject is always in a process of unravelling (Deleuze and Guattari 1987). Whatever our status or bodily form, all of us are enmeshed in multiple and dynamic webs of interconnections – assemblages – in which life itself is characterised as a non-personal vitalist force that is excessive to, and endures beyond, the unique experiences of each individual (see Braidotti 2006; Shildrick 2013b). Now this idea of assemblages is highly effective for understanding what is at stake in the microbiome and chimerism, which is never about an assimilation that wipes out the differences, but about a coming together of disparate elements that deform and reform each other yet go on functioning in some kind of new configuration.

In previous research, I have toyed with rethinking organ transplantation in terms of parasitism, but it is a term usually used negatively in relation to the micro-biology I explore, and one which inevitably preserves some features of self/other antagonism. The biomedical definition of symbiosis, for example, lists parasitism as one form but places it in opposition to mutualism or even commensalism as a mode that benefits the other organism at the *expense* of the host. In transplantation, the lifelong persistence of the difference of non-self DNA may effect a complete appropriation, as in the Alexander case, or alternatively prove fatal, for if the recipient body's rejection of the alien material succeeds, the host will surely not survive. As always, Derrida's take on hospitality has anticipated the former risk. Any incomer may be a welcome guest or an enemy, and he reminds us of 'the general problematic of relationships between parasitism and hospitality' (2000: 59). Nonetheless, the host must willingly accommodate the unknown other within. A Deleuzian mode, in contrast, stresses that life is marked by the *generative* power of connection and the unending processes of transformation and is immediately highly apposite to my own approach. In those terms, life is not a discrete essence, actualised in the individual body, but simply an element in the broader cycle of becoming that encompasses all manner of beings, organisms and machines. Each human life course *is* clearly marked by seemingly isolated episodes such as pregnancy or transplantation where things change or transform, but in another sense, events are also incorporeal and atemporal forces and intensities that are excessive to any given form of embodiment. In short, the strategic defence of the self that immunity – both biomedical and political – is supposed to mount gives way to what Esposito might even call community.

So how could this open up new ways of figuring the ways in which the microbiome and microchimerism so trouble the conventionally exclusionary function of the immune system? In Deleuzian terms, the possession of individual life gives way to the intensity of continued becoming in a process with neither beginning nor end – and that should call to mind the unfixed temporality of micro-organisms or my earlier speculation about intergenerational chimerism. In that sense, elements of others co-exist – just as they do for the recipients of organ transplants – in a new assemblage that contributes to the ongoing the flux and flow of life. The relation between a recipient and donor, for example, in such a model is not one of self and other as the science of immunology supposes, but an impersonal coming together in a new and unpredictable assemblage that reflects the cellular chimerism that is likely to occur. Alongside the anticipated changes that result from transplantation, many unexpected transmutations like the emergence of chimerism – that can be perceived as both positive and negative – disorder existing material boundaries and temporal limits and move always towards new possibilities of becoming other than the conventional self, and what is slowly emerging more widely is a shift, equally, from the notion of rigid and enduring corporeal boundaries, both external and internal, to permeable and leaky bodies.

As an authoritative discourse, biomedicine cannot be separated from the realm of the socio-political where the concept of immunity speaks to the modernist desire to protect the illusory purity of the defended self (Cohen 2009), and in Esposito's terms undermines the development of positive community. In accessing the basic science research on gestational chimerism and its many possible intergenerational offshoots, or on various aspects of organ and tissue transplantation, including the newly emerging stem cell transplants for neurological disorders, it is increasingly clear that they are all forms of biopolitical objects. In short, the *biological* ground of the mutually reinforcing bio-political trope of immunity as the underpinning of the distinct identities of self and other is far from certain. With the exposure of the inherent plasticity of human embodiment, not only in terms of visible body modifications, but at the cellular level, a more adequate mode of perception might be that of an intermingling of corporeal materials that, in maintaining the notion of irreducible difference, cannot be adequately expressed by the metaphor of hybridity. Building on the established recognition of microbiota, and our strengthening understanding that chimerism and microchimerism are the rule rather than the exception, inevitably undoes any unproblematised belief in the illusion of self/other separation and disjunction, and suggests new ways of thinking our existence, not in terms of self-defence, but through dynamic co-existence and the inherently communal form of assemblage. If once the standard expectation would have been that the incursion of other organisms could not be tolerated long term without pathological consequences, there are now at least some biomedical indicators of beneficial effect. We might wonder if we could think of such cellular translocations as offering a different model of becoming that extends far beyond the privileging of modernist forms of human being. Thought together, the microbiome, chimerism and an immuno-politics might resolve the inherent tensions of the self/other model and intensify the posthumanist insistence on the internal diversity, permeability and intersection of bodies across all macro- and micro-organisms.

## SECTION TWO

# Ecosystems in action

Where the previous section has set out the major areas in which my rethinking of prostheses was nurtured, the following three chapters illustrate how a somatechnical analysis can be extended into new areas of investigation. Dementia, stem cell therapy and surrogacy stage very different challenges across the broadly biotechnological/biomedical spectrum and have all generated diverse scholarly attention, but my intention here is to open up innovative lines of enquiry that engage with postmodernist and posthumanist exploration while maintaining a firm hold on the pragmatic issues at stake. The task is to rethink the organisation of theory and practice around each issue in terms not of discrete components but of dynamic ecosystems. Sectors of the biomedical field that are of high socio-cultural concern but in which development may be held back by normative assumptions could benefit greatly from new thinking around medico-prosthetic technologies and micro-biology. I want to stress the continuities and cross-cutting insights from the major themes of the first three chapters to show how some very familiar concepts and practices are being transformed by changes in the nature of such biotechnological applications.

The move from disability in a more general sense to the specifics of dementia treats that condition as exemplifying both the modernist notion of disability as lack or a failure of function and my preferred understanding of it as a condition of changed capabilities. This is, of course, by no means a novel approach but it has usually devolved on the issue of how the rights of people with dementia should be respected. In contrast I am less interested in the rights discourse than one in which the self – any and every self – is always already under erasure. At the same time, in the era of postmodernity, states of dementia lend themselves to a range of prosthetic interventions which are judged to improve the lived experience of those so categorised. Present-day technologies – particularly in the arena of robotics – hold out the promise of enriched avenues of communication, supported memory function and greater physical and mental activity. It is not that they necessarily fail to deliver on prosthetic enhancement, so much as they solidify characteristically modernist understandings of what makes life worthwhile. My question is what would the scenario look like if the criteria for evaluation changed to match the differential embodiment of people with dementia. And beyond the application of technological fixes, what is the significance of thinking about embodiment as always exceeding the singular as micro-biology suggests? Might there be other ways of flourishing that did not depend on maintaining the illusion of a singular self?

The arena of stem cell therapies is highly involved in contemporary bioethical debates, particularly with regard to the use of materials derived from embryos, and the experimental development of human stem cells in animal bodies, which inevitably raises the issue of chimeras.[1] In recent years, however, the emergence of induced pluripotent stem cells derived from autologous adult human tissue and the use of synthetic modelling has undercut moral anxieties. Rather than engage with the intricate bioscience of those increasingly acceptable processes, I focus instead on some well-established aspects of stem cell transplantation (SCT) which picks up on many of the issues already discussed in relation to solid organ and tissue grafts. As both the biotechnologies and the intricate understanding of the chemistry of the body improve, questions of affect are often left behind, just as they are for heart recipients and donor families. The emphasis is firmly on the efficacy of the biomedical procedure and its capacity to save lives that would otherwise be lost. My own approach again focuses on thinking about what it means to supplement the individual embodied self of the recipient with material – in this case in the form of bone marrow – from another body. Stem cell transplantation is particularly interesting in that it most usually involves close living kin such that the psycho-social effect on the donor must be taken into account. But that is only one part of the complex narrative around SCT which also concerns the biological aspects of visceral prostheses. Despite the scepticism which initially greeted the discovery of microchimerism in relation to solid organ transplants, the whole *modus operandi* of SCT depends on precisely the ability of the non-self cells of the donor – with their differential HLA – to circulate in the body of the recipient. Against the ongoing debate within transplant medicine more generally, it is the point of SCT that the translocation of cells will have a therapeutic effect. Microchimerism may not be named, but it is at the heart of the whole enterprise. It yet again raises the philosophical question of self-identity for both parties to the procedure.

My final vignette takes up the issue of genetic origins through a focus on the practice of surrogacy which gives a new twist to the whole question of visceral prostheses. Clearly the phenomenon of using a woman's body to gestate to term an embryo and then foetus that will at birth be given to another to nurture devolves on a prosthetic association. It raises issues about the nature of the relationship between the 'host' and 'guest', including the directionality of giving and receiving. Worldwide surrogacy is a contentious enterprise, particularly when it is commercialised in relations of inequality based on class, ethnicity or wealth. It is essential that such areas of potential and extant legal, social and cultural exploitation be addressed, but my own focus is on developing a range of other less overt issues. Early research into the microbiome and into microchimerism – where many of the initial insights into 'natural' microchimerism were most successfully aired and accepted in the biomedical community – already has much to say about pregnancy and reproduction. In taking up that discourse and locating it in relation to a very specific and controversial practice, I shall reiterate some of the main features and show how there are significant implications that disorder the normative questions around motherhood, genetic kinship, the bioethics of consent, and generational health and disease. There are several variations of surrogacy depending on the provenance and fertilisation of the gametes, but I focus primarily on full surrogacy where the abstract issues developed in previous chapters are at their most existentially and empirically acute. Overall, the problematic demonstrates that the existing ethical and legal apparatus is ill-prepared to address such newly emerging concerns.

In each of these discrete studies the ontological and epistemological dimensions of visceral prostheses are fully evident, but they are also the sites at which some of the most pressing conundrums in bioethics can be addressed. I cannot promise answers along the lines of better regulations and protocols – though those are certainly needed – but I maintain that asking questions in the face of uncertainty – and particularly uncertainty that may be irresolvable – is an essential step.

# CHAPTER FOUR

# Queer(y)ing dementia

The question of how to address the mentally and physically anomalous states of transformation that occur throughout any life course is one that has been increasingly embedded in disability theory and policy. Moving away from the medical model that sees only the treatment of a putative pathology as the central concern, contemporary thinking, as I illustrated in Chapter 1, has increasingly focused on the phenomenology and affect of differential forms of embodiment without resorting to hierarchies of value. When it comes to conditions that are usually associated with ageing, however, research that steps outside the strict biomedical approach is less well-established and reflects what is almost a social taboo in the global North in failing to acknowledge what is likely to happen as we get older. Nonetheless, elder care has become a pressing topic in feminist thought in particular and there are strong signs of a move to add a queer dimension to our understanding of what it means to grow older. To date, the majority of research papers that put queer upfront exclusively address the experiences of LGBTi individuals and communities. In contrast my own focus on dementia queers the field by disturbing its familiar narratives, definitions and concepts from a non-normative perspective that operates regardless of the specific sexual identities in play. The point is to explore how the category of supposedly failing health that is named as dementia and the practices that emerge in institutional care could be – and are already – queered by the intervention of technological and organic prostheses.

What is widely in play with regard to the 'failures' of ageing bodies is a deficit model that implies that those affected are especially vulnerable and have a shaky hold on what counts as fully human. As Braidotti notes, the humanist model is highly restrictive and marks non-normative others as 'disposable bodies' (2013: 15). For that reason work advancing the register of gender or sexuality into the field of dementia studies is already to queer the terrain,[1] just as it once did with conventional disability studies, and similarly some of the material ways of engaging with people with dementia, such as through music, movement and touch mark precisely the break with normative models that queer intends.[2] These are valuable perspectives that open up new ways of conceptualising the problematic and at very least introduce relationality into the scenario of dementia, but they fail to fundamentally challenge the meaning of the human. The point of engagement then becomes to restore human dignity and human rights (Cahill 2018; Shakespeare *et al* 2019). More promising approaches include collaborative art projects, such as those initiated by the Artful Dementia Research Lab (Lotherington 2019), which question the distinction between self and other, or theoretical approaches such as that of Bulow and Holm (2016) who recognise vulnerability as a condition of all human becoming that cannot be expunged by the ideology of 'successful ageing'. The recognition that preserving or reinvigorating a sense of selfhood in people with dementia is not the most coherent response – though the insistence on continuing citizenship (Bartlett and O'Connor 2010; Phinney *et al* 2016) is a vital principle for pragmatic reasons – opens a path to alternative understandings of embodiment itself. In this chapter, I want to think about dementia, not as an exceptional state marked by a loss of independence, but in terms of the prosthetic nature of all embodiment. The claim that our bodies are entangled with an array of external and internal prosthetic devices is widely accepted, but what makes that queer is when the technological aids on which we rely become irreducible, albeit often temporary, components of the assemblage that is identified as a person. Going further, what I am calling visceral prostheses – that is ostensibly non-self elements that are located within the body, particularly in the microbiome and through microchimerism – disrupt standard corporeal status even further. Before turning to the underacknowledged bio-processes at work, I will outline more closely the normative context of dementia.

In the conventional and entrenched terms of the global North, the putative declines associated with the embodiment of dementia and similar states has signalled a personal status of irreversible cognitive degeneration that results in an increasing inability to maintain the functions of everyday living, and that eventually ends in death. In the absence of significantly effective biomedical treatment, the most that can be hoped for are empathetic carers who might explore beyond verbal capacity to elicit a recognisable interaction through the use of music, touch, dance and so on. What is rarely questioned, nonetheless, is that dementia signals a breakdown in normative communicative competence that diminishes and finally renders beyond reach the subjectivity of the one affected. In recent years, however, there has been an upsurge in potential biotechnological interventions in the form of prostheses that claim to offer those with dementia some tools for maintaining contact with their previous sense of self. Some of these are purely mechanical aids such as robotic carers or quasi-animal companions, but I shall look too at some of the more organic interventions that I also class as prostheses in the sense that they augment an existing materiality.

The most recognised of the latter are animal-assisted interventions by means of which those with dementia, either in care homes (Yakimicki *et al* 2019) or sometimes in the community (Richie *et al* 2019), are afforded access to animal companions. Such living external prostheses are less queerly inflected than robotic carers – though the scope for that analysis remains – but they also raise troubling and rarely addressed ethical concerns that go beyond the issues I want to raise here.

There is a long history of exploring drug therapies in relation to dementia, and particularly in the context of Alzheimer's disease, but there has been little sign of success in slowing the development of the condition and none of halting it altogether. Every few years there is excitement at the prospect of a new type of intervention but it is rarely sustained. Currently there is some exploration of the potential of brain implants as visceral prostheses to support deep brain stimulation (DBS) which may counter the loss of memory. As so often, the initial research has been funded by DARPA (US Defence Advanced Research Projects Agency) for deployment with battlefield soldiers, with use in the field of dementia being a secondary spin-off. To date, results have been inconclusive though research is ongoing and hopes for a breakthrough are still hyped in the press, despite any positive outcomes being limited to those with mild Alzheimer's disease. My own alternative to such medico-technological fixes and as an addition to robotic scenarios is directed instead to the biological resources of the interior of the body. In the second part of this chapter, I will turn to more visceral mediations which could devolve on interventions offered by the potential manipulation of the microbiome. And on a more existential level I will suggest a radical appraisal of the state of dementia in the light of both the technologies of robotic care and the implications of micro-biology.

All this happens broadly speaking under the auspices of modernist biomedicine which as a subset of the socio-cultural imaginary is wedded to the idea of the singular self who is defined ideally by the qualities of autonomy and rationality, even in the face of the multiple breakdowns of those concepts in infancy, ill-health, disability and dementia. In 2020, the WHO estimated that around 50 million people have dementia, with figures rising rapidly year on year. The percentage of the general population aged sixty and over with dementia is between 5 and 8 per cent, with nearly 60 per cent living in low- and middle-income countries (who.int/news-room/fact-sheets/detail/dementia). The WHO takes up a characteristically Western perspective that dementia is a universal category, though it is clear that there is no consistent response in how the condition is evaluated. The experience of dementia is far from universal but is always socio-culturally inflected. In some ethnic communities where family relations, rather than the individuals, are given the greatest importance, as is the case in many traditional East Asian cultures, elderly people, so long as they are still seen as participating in family life, may not feel stigmatised or shamed by being dependent on others (Cipriani and Borin 2014). Dementia is typically seen as a normal part of ageing in contrast to Westernised societies where the high regard for self-sufficiency and independence, and fear of specifically cognitive decline, mark it as a condition of gross disruption in need of therapeutic interventions. In the global North, where the healthy adult life is marked by routine, self-management, predictability and a grasp of temporal affairs, well-being is already aided by an array of devices such as time-pieces, buses and cars, computers, spectacles, text messages and authorised protocols. As such, it might be said that the normative life course necessarily co-evolves with prosthetic practices. It is already clear that the use of external prostheses raises some questions regarding the nature of individual selfhood, but my suggestion is that internal organic prostheses more radically disrupt the modernist notion of the atomistic self who – in the case of dementia – has putatively slipped beyond communicative access. I shall look then at recent developments in both technology and biomedicine, and theorise the significance of those enhancements, in part by turning once again to the Deleuzian notion of assemblages.

## Robotic technologies

I want to start my enquiry with a mode of intervention that is becoming familiar. The use of quasi-animate digital/mechanical aids has been at the forefront of dementia care for many years and is expected to provide benefits not only to those with dementia – and that of course remains a contested category – but also to their families and professional carers. There are four categories of robots that can be deployed in dementia care: rehabilitation robots, service robots, telepresence robots and companion robots. The first two categories can assist, for example, with lifting and positioning non-ambulatory patients, with negotiating simple functions like activating machinery or picking up fallen objects, finding personal articles, by responding to simple verbal instructions, and may also engage in formalised greetings. Telepresence models are designed to have a monitoring and surveillance function that can transmit biomedical data about the status of the user with dementia to nearby carers or to distant clinicians, while the primary purpose of companion robots is to have a positive impact on the ability to sustain social relationships. All sorts of ethical and practical considerations abound: the Foucauldian overtones of robotic forms of constant scrutiny may give us pause for thought, and there is much concern about the possible dangers of replacing human with mechanised or digital care. For robotic engineers, however, care robots are widely seen as a friendly bonus, as a pragmatic technology that is intended to supplement not supersede the interhuman aspect of the caring situation (Khaksar *et al* 2016).

At root, much of the anxiety concerns the supposed insult to autonomous agency, but clearly for anyone with a neurocognitive condition, the question of autonomy as such already has diminished validity. What takes its place is the injunction to respect the dignity and intrinsic value of every human being whatever their physical or cognitive status (Bacaro, Mazzoleni and Virgili 2018). That approach has long driven much disability theory that is organised around the inalienable claim to human rights, and although it should provide a necessary layer of protection against discrimination and abuse, there are good reasons to underline its limitations. It is not just that the approach fails to secure the interests of those it seeks to protect – because that might be a simple category mistake rather than a flaw in the principle – but that it is grounded in an extremely limited liberal humanist understanding of what constitutes worthwhile life. The very concepts of rights, dignity, interests and so on are deeply normative and inherently reference a standard in which the human being is indeed autonomous, separate and distinct from its others, and capable of rational thought. The philosophical critique of that standard is now very long-standing, but has yet to filter through to the practicalities of dementia care. The issue for scholars in the field is that even when care is delivered conventionally through human to human interaction, the inevitable dependency of the one with dementia already problematises her agentic singularity and demands a degree of cooperation that is not necessarily dependent on mutual contract. If another intervenes in my everyday decisions and increasingly comes to organise my time, direct my movement and manage my affects, then that intervention is no longer an adjunct, but more of an enveloping presence that displaces my own subjecthood. Although these temporal developments are far from unusual in the duration of a life span – we were all dependent infants, we all get ill or disabled – they remain a matter of concern to conventional notions of the self. In contrast, feminist philosophy in particular has been insistent that relationality should trump autonomy and that we should recognise and celebrate mutual vulnerabilities (Shildrick 2002; Käll 2017).

The problem is that far too often advanced dementia may well evoke an unbalanced one-sided relationality, but that is the case only if we think that the condition transmits nothing of value. Wherever the balance of dependency lies, what frames the normative model is that the interaction is between two or more human beings. What the evolving technologies of the twenty-first century add to the ethical and ontological amalgam is a demand for a reappraisal not just of the somatechnical interface of the human self and other, but of the boundaries between human and non-human. It could be argued that any prosthetic device that augments or takes over functionality poses a challenge to the sovereign self of the Western logos, but all the more so when it appears to be a living entity in its own right. My focus here is on what are termed emotional care or empathy robots which are designed precisely to enter into not just practical but affective relationship with their users. Their agency – in the conventional rather than new materialist sense – may be an illusion, but their animacy does generate very real responses and effects, both emotional and somatic, and that alone unsettles and queers the confines of the human. There are many types in use, and most researchers are in agreement that having a human-like appearance enhances acceptance and efficacy. As Schmetkamp puts it, 'for our cooperative and collaborative interaction with robots – particularly in the medical or health care context – a strong human likeness might be crucial in these interactions succeeding' (2020: 882).[3] This seems to me to slot all too easily into an unquestioned assumption of anthropocentric superiority, and accordingly I will focus on both humanoid and non-humanoid examples of robotic technologies, each of which intends the fantasy of live interaction, albeit working in slightly different ways.

PARO is a small fur-covered robot resembling a baby harp seal that is about the size of a human infant, can squeak or coo with pleasure, cry with discomfort, flap its flippers, open and close its eyes, react to sound and touch, and appear to sleep (Figure 4.1). Its varied responses give a strong sense of a living, emotional being – albeit an infant one – capable of happiness, distress and surprise, largely in reaction to the touch and voice of the human user. The point of PARO in dementia care is to stimulate the cognitive attention of users and to create a sense of interaction that can counter problems of isolation, aggression and depression that affect many residents of care facilities (Wada *et al* 2008). The intimate encounter with PARO, which mostly seems to take the form of stroking or cuddling the robotic seal, is intended to be therapeutic, not just in calming and pleasing the user but in setting up a sense in which the seal itself appears as a vulnerable being in need of care, thus provoking a response and sense of agency in the person with dementia.[4] PARO is a technologically sophisticated and relatively expensive prosthesis that is in use in many countries worldwide and is, for example, currently estimated to be present in 80 per cent of Danish care institutions, despite its high cost of over $6000 for each unit.

Several small-scale studies have pointed to the benefits of PARO, not as an interaction between human and non-human that challenges affective boundaries, but as a utilitarian prop in which success is measured in terms of how far users improve their abilities to engage in social communications – whether physical, verbal or visual – with other human beings in care settings (Šabanović *et al* 2013). In an entirely and typically humanist understanding of what counts, Sherry Turkle (2011a, b), for example – who enthusiastically pioneered research into digital technologies many years previously – is one who now feels dismayed by the lack of authenticity in what she calls 'empathy machines', and she doubts whether PARO offers anything more than an illusion of connectedness. As she explains, 'we ask technology to perform what used to be "love's labor": taking care of each other' (2011b: 106–7) and goes on to speculate that sharing 'feelings' with animate robots accustoms the user to a reduced range of emotions tied to those that the machine can simulate. As becomes clear, Turkle, like many other commentators,[5] is unquestioning in privileging HHI (human–human interaction) over HRI (human–robot interaction), and at the heart of her ethically based distaste is the belief that although a symmetrical encounter

**FIGURE 4.1** *Seal-type Robot 'PARO'. Courtesy of AIST, Japan.*

may be implied, 'there is no such symmetry between human beings and even the most advanced robots' (2011b: 85). One could not disagree on Turkle's own terms, but I wonder about the implicit assumption that interactions should be symmetrical. In the course of any life that may be the exception rather than the rule, and in the specific case of people with moderate or advanced dementia – who constitute the greatest proportion of care home residents – it is difficult to see how any relationship could be symmetrical. Once, however, the encounter is thought in terms of mutuality, or perhaps more accurately commensality, that particular ethical problem disappears.

In the light of those supposed ethical issues, I want to consider a recent large-scale research project into the effects of using PARO which was conducted in several Australian care facilities, where, as the authors state, over 50 per cent of all residents with dementia are reported to have behaviours such as physical aggression, agitation, vocal disruption and chronic mood disturbance (Moyle *et al* 2017). Such negative symptoms inevitably lead to additional stress in care staff and reduced empathy with the causal condition, which in turn is reflected back in the frustration and agitation of residents which 'may lead to the additional regular use of antipsychotic medication' (Moyle *et al* 2015: 2). In some jurisdictions, though not including Australia, PARO is explicitly classed as a medical device, but in all operative settings, the hope is that it will counter disruptive affects and lessen the need for pharmaceutical interventions. The introduction of PARO into the lives of care home residents for a period of ten weeks was intended to test whether an animate robot was more sustainably therapeutic than either an equally cuddly but inanimate – and therefore more affordable – Plush Toy (actually PARO with all the functions disabled) or a program of usual therapeutic care.

The outcomes were, unsurprisingly, mixed although the members of the PARO group were shown to be considerably more engaged with the object on a visual level, somewhat more engaged on a verbal level, and overall experienced greater pleasure and exhibited less agitation. Clearly there was initially a strong novelty effect for individual users of both PARO and Plush Toy, but pleasure in particular remained significantly raised after five weeks for the PARO group. The supposedly counter-observation that PARO users also displayed increases in levels of anger was related to interruptions in activities, to other residents interfering with the robot toy, and finally the removal of PARO after the allocated 'play' period. In facilitating prolonged individual engagement with the robot, the research project had in any case set up a model not intended by the adopting care home for whom, as Tergesen and Inada put it, '(p)atients are meant to use [PARO] in a group setting to decrease social stress, not play with it in isolation or as a replacement of interacting with people and animals' (Tergesen and Inada 2010: np). That there were few sustainable effects discerned at a fifteen-week follow-up after the final withdrawal of the prostheses after ten weeks of hands-on contact is surely to have been expected, though Moyle and her colleagues make no comment. While they are clear that the intervention provided alternative models of communication to the usual care interactions, the hope seems to have been that the improvements would readily translate to human–human encounters. Had the human–machine sensory interactions been seen as valuable in their own right as exchanges that queered the limits of normative human behaviour, then the abrupt withdrawal of PARO would surely constitute a serious ethical misstep. The engagement and pleasure that PARO – and to a certain extent Plush Toy – evoked in residents were simply treated as a means to a definitively human-centred end, rather than as a demonstration of the constrictions of an anthropocentric outlook.

The question raised here extends to whether the companionship and comfort afforded by a 'real' animal are equally devalued. In the context of disability more generally, the non-technological status of assistance animals – which are usually dogs – is no less prosthetic in the sense that I use the term and has found great favour both as emotional support and as helping with everyday tasks. The well-known memoir by Rod Michalko (1999) about his relationship with his dog Smokie – who negotiated Michalko's sight impairment – takes a phenomenological perspective that gives full value to the mutual interface between human and animal. Several studies have outlined the benefit of deploying visiting dogs in care homes, but the problems of hygiene and effective management have precluded most programs for resident animals. Are, then, robotic animals – that require technical maintenance but no daily burden of grooming, exercise, feeding and disposal of excreta – the way forward? One study by Thodberg *et al*

(2016) set out to compare the effects on a sample of 124 Danish care home residents of interacting with a dog, a robot seal (PARO), and a soft toy cat, albeit affording access to the different 'animals' for the extremely limited period of twelve ten-minute visits. It is worth noting that unlike many similar introductions, the deployment in Danish care facilities was assessed by the research team not just for the impact on social communications and personal agitation, but for a more general uplift in residents' mood and improvement in sleep patterns (Calo *et al* 2011). In the Thodberg project it was established that the presence of any 'animal' in addition to a person is more stimulating than a person alone, and that robotic animals can be almost as effective as real animals. The finding that the dog and the robot seal triggered substantially more physical contact, verbal communication and eye contact compared to the toy cat 'suggests that the ability of the animal (or the object) to interact and give feedback affects the response, even though the interest for the robot seal decreased during the intervention period' (Thodberg *et al* 2016: 118).

A scoping review of fifteen similar studies conducted worldwide confirms the Danish experience and points to several positive outcomes for animal-assisted interventions using both real dogs and a plethora of robotic animals including PARO, Nao, NeCoRo and JustoCat (Aarskog, Hunskår and Bruvik 2019). In a majority of the research projects that were analysed, significant improvements in behavioural and psychological symptoms, depression and mood, quality of life and 'other' unspecified areas were recorded. Although the authors set out to establish 'which elements in animal-assisted interventions (e.g., physical touch), could be the potential causal pathways for long-term effects' (2019: 109), nothing more is said of the tactile dimensions of the encounter which leaves a possible crucial gap in the research. It is important to remember that residents with either moderate or severe dementia may become non-verbal, while touch – which is the very first perceptual sense to develop (Anzieu 1989) – remains relatively unimpaired. Given that there is wide acceptance that offering human to human tactile care to those with dementia or who are near to death is of great benefit, it is hard to understand why the haptic relation between those people and 'cuddlesome' aids should not be given more value. Nonetheless, sceptics of the digitalisation of dementia care continue to privilege the human (Jenkins 2017) above any evidence of the efficacy of robot interventions. Yet there are good reasons to rethink what touch might entail, and to speculate on which encounters promote the well-Being of people with dementia.

Bioscientifically, touch is thought of as multisensorial and is closely connected to bodily awareness. In other words, whenever we touch or are touched, we use our bodies in wider ways, the effect of which is registered beyond the immediate skin surface sensation. It could even be said to enhance a sense of agency insofar as 'touch seems to require active exploratory movements, and these movements are often guided and voluntary' (Fulkerson 2020). Phenomenologically, touch, unlike sight, is quintessentially an interactive sensation between sentient beings, in which the moment of touching is indivisible from being touched. Again unlike sight, touch crosses the boundaries of the proper rather than creating distance. It is precisely where the ontological separation of self and other; human and animal; animal and machine; living and non-living might be overcome. It is the site where people with dementia might ‘enact a posthuman “flat ontology” rather than a humanist hierarchical one’ (Quinn and Blandon 2020: 27). And as the Danish study notes, ‘the residents with severe cognitive impairment were more likely to touch [and talk to] the animal than those with a mild impairment level’ (Thodberg *et al* 2016: 117). In their ethically alert critique of animal-assisted interventions (AAIs), Nick Jenkins and colleagues point out that approaches to facilitating human–animal interactions within care environments position animals ostensibly ‘as sentient forms of prosthesis for disabled people’, which ‘highlight the roles that speciesism, human exceptionalism and bounded individualism have played in the subjugation of humans and nonhumans alike’ (Jenkins, Ritchie and Quinn 2020: 6–7). Their understanding of prostheses is a more conventional one than I propose, but I fully concur with the gist; yet, I wonder too how robotic animals might fit into the sentiment. Can we think touch as queering and pulling together what are usually irreducible and hierarchical categories to create a novel kind of non/living assemblage that reconfigures the meaning of human itself?

With that in mind, I turn to one well-known example of an animate humanoid robot. The NEC product PaPeRo is a small but fairly heavy and bulky baby-faced human-like robot which has been widely used in aged care facilities in an effort to improve the quality of life of the residents, including those with dementia. PaPeRo is decidedly not cuddly (Figure 4.2). It has many tactile sensors that enable it to converse, to respond appropriately to friendly or aggressive touching, move around, recognise individual users and engage in simple games. It can also – if one is prepared to stretch the imagination – sing and dance. Like PARO it is deployed to provide sensory stimulation, entertainment and encouragement to social engagement with carers, family members and peer groups. It is more than likely that PaPeRo does deliver therapeutic benefit to some of those with dementia, but as a ‘living’ model it is far less convincing than PARO even in the normative aim of enhancing strictly human interactions. Nonetheless, the authors of a major and recent study assert that the PaPeRo models they work with (sweetly named Sophie and Jack as gender balance requires) are superior to pet-like robots: although the latter ‘can provide entertainment and company similar to a pet for older people, the interaction of PwD with these robots is lacking’ (Chu *et al* 2017: 8). Once again we are alerted to the limits assigned to meaningful interaction. The affection and care displayed towards PARO and related prostheses like the much simpler and award-winning battery-operated Joy-for-All cat produced by Ageless Innovation, and the calming of agitation that several studies have shown, simply do not count. The priorities for PaPeRo are made clear as the authors continue: 'From the HRI [human-robot interaction] perspective, social engagement can occur between social robots and PwD and eventually facilitate HHI [human-human interaction] in aged care facilities' (Chu *et al* 2017: 9–10).

For all the hype, PaPeRo is rigid, very slow to move or respond, and – if intended to mimic human behaviour – entirely unconvincing. I am not used to my companions randomly breaking into song or dance, and would

**FIGURE 4.2** *PaPeRo robot at Nagoya Expo Centre 2006 (Photo: Jennifer. CC-BY-SA 2.0).*

be slightly alarmed should they do so. Either the conditions of dementia genuinely infantilise or that is the only way that those who provide care environments can make sense of the changed affects and capacities. That depressing resort to normative categories is fully exemplified in the study observation that everyone liked to play bingo with Jack, and 'Sophie is able to make people smile and laugh as well as causing them to be open to talk and interact with robots and/or people around them' (Chu *et al* 2017: 15). In being programmed for verbal interaction, what PaPeRo and competing robots like Pepper can do is to lead exercise routines or stimulate group activities like playing games, although there is also some scope for individual face-to-face sessions. Unlike animal models, their feedback consists in algorithmic articulations of encouragement, which in turn rely on the hearing and language capacities of residents rather than on the more universal response to touch. Some humanoid robots like Pepper have an inbuilt touchscreen interface but it is a purely mechanical element of the encounter that is unlikely to arouse positive affect in and of itself.[6] Once again it appears that the use of therapeutic robots revolves around a very Western and modernist understanding of what constitutes the self rather than considering the needs of the embodied self as, at very least, relationally constructed within the complex environment of humans, non-human others, inanimate materials, biomedical context and so on. There is in any case very little record – even accounting for the specific difficulties – of what those with dementia might prefer, and the stress is often on management within normative boundaries. Calo and colleagues, for example, are keenly aware of the limitations voiced by robot sceptics, but what they bemoan is the paucity of studies that 'investigate the process of how to use the robot effectively to meet *clinical* needs' (Calo *et al* 2011: 23, *my emphasis*).

Whether the robotic prostheses are animate or inanimate, humanoid or animal, issues of their cultural sensitivity and acceptability raise questions about the modernist assumptions behind their design and use.[7] Those familiar binary categories are in themselves questionable distinctions, with animacy in particular – the appearance of having sentience – being culturally troublesome. Traditional Japanese beliefs, for example, widely invest the quality in supposedly inanimate objects such that what counts might be the generation of affect rather than liveliness as such. A new multidisciplinary and international project is currently underway to address precisely that type of misunderstanding. CARESSES (Culture-Aware Robots and Environmental Sensor Systems for Elderly Support) has the goal of designing care robots that adapt the way they behave and speak to the culture of those with whom they interact. According to the dedicated website (http://caressesrobot.org/en/project/) the aim is to 'take into consideration the person's cultural values, beliefs and attitudes about health and illness as well as their self-care practices' and to 'be sensitive about the user's attributes like language, accent, interpersonal skills, communication skills, ability to trust others and to be compassionate to others'. This constitutes an important expansion of the terrain though how far it will address different expressions of affect remains to be seen. The dimensions of the problem are neatly outlined by Calo and colleagues' review of the deployment of PARO in different geocultural locations. As they note, 'in Asian countries, Japan and Korea, people accepted Paro as a pet, but not for therapy. In European countries, the UK, Sweden, and Italy, people accepted Paro for therapy, but not as a pet. In the US and Brunei, people accepted Paro as a pet and for therapy' (2011: 23). It is not simply that there may be different attitudes towards robots, but that the specific cultural relationship between humans and pets influences whether animal robots are experienced as therapeutic. The lower status of pets – popular though they are – in Asia mitigates against trusting in the robot as a therapeutic device. In addition we should be aware that not only may certain people have a fear animals, but that in many cultures and classes, dogs and cats (and probably seals) have little acceptance as pets and may be seen as unclean.

A further culture-based complication devolves on the limits of what constitutes an understanding of the self. Although Japan is seen as the heart of the robotics industry, the relationship between 'self' (the one with dementia) and 'other' (the robot) in that country does not mirror Western humanist concepts.[8] Unlike notions of the sovereign self whose disappearance drives fears of dementia from a Western perspective, it is not the loss of autonomy that disturbs the Japanese sense of well-Being. In the traditional Japanese discourse, the self is not a fixed and independent entity but emerges from a network of interdependent relationships, a view that reminds us of Merleau-Ponty's 'flesh of the world'. In that context, the progress of dementia – sometimes referred to by the concept *boke* – signals the danger that the person's responsibility to share obligations with others and not to become a burden is likely to break down. As Traphagan explains, *boke* is a 'fundamentally antisocial' debility that is stigmatised not for the cognitive and physical failure it may accompany but for the moral failure it signifies' (2000: 4). What is at stake, then, is the failure to maintain the self as an intersubjective and irreducibly connected entity. Dementia care in Japan has until recently been largely private and home-based, but with an increasingly ageing population, institutional care – with the increased likelihood of robotic interventions – is more common. It gives the opportunity to reconfigure *boke* as having value within a new relational context that draws together human, animal and machine as the environment in which selfhood continues to have meaning. And as Tanaka (2015) points out, selfhood may not be expressed in a verbal manner, but through embodied interactions, and nonverbal signals. In what is evocative of Deleuzian assemblage, each element emerges only in relation to the others rather than being given meaning by a central self. Effectively robots are as significant as any other constituent, including the human person. This is well-illustrated by Jong-min Jeong's reflections on a familiar therapeutic activity: 'Drawing, for example, consists of particular kinds of social and creative components in practice that include materials, organizational bodies, staff, tools, environment, music, a wheelchair, coffee, biscuits, individual moods and residents, to name just a few in care home settings' (2020: 364).

The problem, then, is not that PARO, Joy-for-All Cat, aibo, PaPeRo, Nao, Pepper and all the other therapeutic robot prostheses fail to deliver beneficial psychological, physiological and social effects, but they are being assessed against distinctly humanist and Western standards. Robotic technologies at any level disturb notions of human individual and demand more appropriate – and effectively queering – analytic tools. Above all, dementia itself signals changes to the sense of self that are ongoing and destabilising within normative conventions, so rather than focusing on efforts to revive the self, we might instead look for the opening up to the different and positive perspectives that such transformations provide. Could dementia, the state of being literally 'out of mind', signal more positive possibilities, as madness already does in critical disability theory. Floyd Skloot catches just that potential: 'Forced out of the mind, forced away from my customary cerebral mode of encounter, I find myself dwelling in wilder realms of sense and emotion' (2003: 21–2). The use of a plethora of robotic forms that at very least simulate life indicate that *human* interaction is not the limit of what might constitute living well. As Amelia DeFalco (2017) and Nick Jenkins (2014, 2017), among too few others, have recognised, robot care prostheses pose a fundamental challenge to human exceptionalism. If the technology that drives robots is itself an irreducible facet of our posthuman world, then we should surely ask how far that demands a posthumanist ontology, epistemology and ethics. As Jenkins comments, 'moving beyond humanist approaches to dementia will require more than technological innovation. It will require significant changes in the underlying ways in which we think about personhood and neurocognitive disease' (2017: 1494). Technology alone can never settle the problematic of dementia, but it does suggest that the continued focus on the modernist ideals of explicitly human personhood will stultify the amelioration by robotic prostheses of what is widely seen as an end to meaningful life.

At the simplest level, our faith in the stability of being gives way to the transmutations of becoming always in the context of multiple others; what we know and understand is slippery, impermanent and irreducible to single truths; and how we should act depends on our immersion in an expansive field of inter- and intraconnections that yield no universal ethical principles or protocols. Nonetheless, to go beyond the notion of human rights does not result in having no ethical position at all, but relies on thinking through our responsibility to the relationality and interdependency of all forms of matter. Critical scholarship around dementia has begun to turn increasingly to such posthumanist accounts that yield a keen awareness of assemblage theory (Andrews and Duff 2019; Quinn and Blandon 2020). The contestation of the category of human itself is firmly underway, and robotic forms are just one instance of the breakdown of normative boundaries. DeFalco seems to have mistaken PARO for a dog, but it matters little when she writes that animal robots 'raise the spectre of queer, destabilizing intimacies that cast doubt on the very condition of the human' (2016: 5). It is precisely with that insight in mind that I want to offer a theoretical expansion of the significance of our human entanglement with what I am classing as prosthetic others, first as external entities in the forms already referred to but also as the visceral presence of otherness within, not simply as a philosophical exposition, but as a biological, naturally occurring phenomenon. Where success in conventional dementia care appears to devolve on how far an originary self can be protected or recovered, the question I address is whether we can reconceptualise the body, and the embodied self, as part of a dynamic – but not necessarily organic – system of interdependency to the extent that it can never be thought as having a foundational or atomistic form. My next step involves a change of register to the now familiar ground of the micro-biology of visceral prostheses, and the claim that in theorising dementia we should not ignore developments in the bioscientific understanding of the multitudes of non-self cells that circulate in the human body.

## The impact of micro-biologies

The ongoing research on the human microbiome and on microchimerism which both entail the rethinking of biological orthodoxies – particularly those proposing a singular genetic signature of what counts as human – is of crucial relevance to my queering of dementia. As I have laid out in previous chapters, bioscience and biophilosophy can work together to contest both the thresholds of supposedly singular life and the very notion of species boundaries. The growing acceptance of the genetic diversity of each individual decisively challenges the distinction between self and non-self, but can what follows from that failure of distinction be relevant to the question of dementia? Nick Jenkins' assertion (2017 *quoted above*) that we need to rethink both personhood and neurocognitive disease hints at the move that challenges the disciplinary separation of philosophy and biology. At very least we are compelled to reassess the apparently simple linear temporality of birth, life, death, and to ask whether augmentation itself – manifest not only through robotic prostheses but in cellular life – already radically destabilises and disorders the humanist notion of an enduring and distinct self. The bioethics and the practical consequences of such a notion will require a profound reconfiguration of humanist values, but on an existential plane the move is one away from the pressing imminence of the supposed degeneration and death associated with dementia to a more affirmative mode that concerns itself with the persistent vitality figured by dynamic augmentation.

In recent years, as the dimensions of the human microbiome have become a familiar trope to the lay public, the intense bioscientific research that could radically disrupt the very sovereignty of human beings remains largely unspoken. Instead the major focus remains centred on how changes in the microbiome have widespread implications for human health and disease. Of the many conditions thought to be related to the status of the microbiome, dementia has been high on the list, and although the pragmatic enquiry has the potential to reorganise beneficial biomedical interventions, I also want to flag up the more philosophical implications of thinking micro-biologies in that same context of dementia. On the empirical level, it is too early to talk about established causal effects, but intensive research indicates a high degree of association. For several weeks in 2019, *Medscape* (Syrek 2019) listed gut bacteria and the brain as the top trend in biomedical searches.[9] To briefly recap, what research on the microbiome reveals is that the human body is no longer identified with a unique and singular genome that distinguishes it from other organisms, but consists, on a cellular level, in a complex and multifarious assemblage of bacterial, fungal, parasitical and viral elements, the majority of which carry their own DNA. There is no fixed template; each individual interacts constantly both with external environmental agents and within the body where different microbial communities are in a state of cohabitation. The naturally occurring assemblage of the normatively identified human host and the myriad other species living in or on it constitute a distinct ecological entity referred to as the holobiont (Simon *et al* 2019).

In good health, the mix of microbiota – predominantly gathered in the gut – is relatively stable and indicates a high degree cooperation and usually mutual benefit, but at the same time, imbalances are implicated in a range of conditions – diabetes, depression, lupus and a variable range of other physical and neuro-cognitive conditions that constitute dementia (Hill, Clement *et al* 2014; Alkasir, Rashad, Jing Li *et al* 2017).[10] It is now established that human beings rely on active microbial viscera for their own well-being, although there is no genetically predetermined microbiome but rather a life-long fluidity. As they grow into adulthood, and depending on their context and geolocation, most people will have developed a more varied and essentially protective array of microbial prostheses than their younger selves, but over the age of sixty microbial diversity begins to decline. The composition of the microbiome is always affected by dynamics such as diet, practices of hygiene, infections, medications – especially antibiotics – and even physical activity. As the body ages, exposure to several of these factors is likely to change, creating imbalances that may result in dysbiosis (Jeffery *et al* 2016). Dysbiosis refers to the state in which the gut microbiome can contribute to and perhaps cause chronic diseases, although it could be that the changes are a response to existing ill-health. What is clear is that significant alterations in the gut microbiome have been strongly linked to age-related diseases like dementia, and on a very simplistic level there is some evidence that probiotic supplements can improve cognitive function and memory in such scenarios. Several recent studies that investigate whether faecal microbiota transplants can alleviate and/or slow the progress of Alzheimer's disease are underway (Hazan 2020) with some promising results.

Dementia in all its forms is very common worldwide and increases greatly with advanced age, but what is known of the very elderly who remain in good health? A recent study showed that the microbiomic composition of centenarians is significantly different and more diverse than that of the average elderly population in having what are identified as more beneficial microbes (Biagi *et al* 2016). The emerging picture is not just about the biomedical prospects of managing the microbiome to effect continuing health or the amelioration of an existing condition but speaks to a radical acknowledgement that the human being is irreducibly entangled with countless non-self organisms that together constitute a holobiont. Where biology itself recognises the fundamental nature of an embodied and interlinked hybridity, we are encouraged to step beyond the empirical considerations alone to queer what is meant by the very concept of human being. In conventional terms, some specific conditions like dementia are feared precisely because they appear to undermine or destroy a supposedly stable state, but as a biophilosophical perspective makes clear, that the sense of self is always already insecure.

To further complicate and reinforce that understanding, I will turn again to another type of visceral prostheses – microchimerism – whose basic concepts amplify the sense in which we must think of ourselves as hybrids. Beyond the classical representation of chimerism as a synthesis of forms that nevertheless preserves visible morphological distinctions within a single body, microchimerism operates at the unseen but equally disconcerting cellular level. Microchimerism is most probably ubiquitous, and, as I outlined in Chapter 3, because bodily tissues may encompass cells that remain genetically distinct from one another, the state both maintains and contests the separation of self/non-self. In human beings, the incidence of microchimerism may be either naturally occurring or iatrogenically induced, but whatever the provenance, such transformations challenge the familiar dogma of genetically homogenous entities. In offering a radically new insight into *intra*corporeal diversity, microchimerism suggests that the conventional narrative of a relatively simple and fixed genetic identity established at conception and secure until death begins to disintegrate. The seemingly inexorable decline of the one affected by dementia may turn out to have far more complex connotations in both the biological and philosophical registers than the usual understanding of the human life span allows.

Both the microbiome and microchimerism signal modes that open up the terrain and speak directly to the inherent ambiguity of visceral prostheses and the absence of a singular genome. They indicate that there is no fixed standard of corporeality that simply declines in older age. The theoretical interest is clear in that eventually the impact of such knowledge must disorder the socio-cultural imaginary of the autonomous clearly defined individual that underpins modernist assumptions about our place in the world. The question asked of those with dementia – what has happened to their selfhood? – becomes of concern for us all. Such changes in self-perception will be slow, but in the meantime the microbiome has already entered the public understanding of science, and pressing practical issues of healthcare, including our response to dementia, may need to be rethought. The shift already underway is that if dementia can be shown to be related to a *microbiome* deficient in particular organisms, then potential treatments might include dietary manipulation, or the emerging field of faecal transplants, but it is equally possible that dementia and its related conditions are intertwined with the *microchimeric* nature of the body, particularly through cellular transmission initiated in pregnancy. At present, specific research is limited and there is no conclusive evidence to indicate that the microchimerism associated with pregnancy is related to cognitive diseases. It has been established, however, that foetally derived cells do pass through the blood–brain barrier to take up enduring residence in the maternal brain.[11] The unresolved puzzle is why Parkinson's disease appears to correlate with a higher than average incidence of brain microchimeras, while research into Alzheimer's disease shows the exact opposite that higher levels of foetal cells in the brain are found in those who do not have the disease (Chan *et al* 2012). Beyond the direct neurological effect, it is necessary to consider how microchimerism is interlinked with immunity which may suggest a new understanding of dementia.

To recap, the inclination to see the otherness of microchimeric cells as a threat that is properly countered by the body's immunological system fails to recognise evidence that microchimerism – like the microbiome – may have the beneficial effect of boosting immune responses. The high, and possibly ubiquitous, incidence of the enduring microchimeric co-existence of foetal and maternal material in any body, or the circulation of non-identical DNA after transplantation, for example, indicate not simply intercorporeality – still less simple augmentation – but the irreducibility of embodiment to singular and fixed modes. This may seem far from the issue of dementia, but those with the condition – and their carers – often have strong feelings that they are no longer singular selves (Kontos 2005). In biological terms, dementia may exemplify one outcome of the operation of the immune system in conjunction with what is most likely to be a maternal–foetal source of microchimerism (Kelly 2012). Clinical research suggests that pregnancy reduces the risk of Alzheimer's disease. As Molly Fox explains, 'evidence for pregnancy-induced long-term improvements in immunoregulation comes from studies of fetal microchimerism. Fetal cells are semi-allogeneic to the mother's genetic identity, and after a pregnancy, fetal cells remain in the mother' (Fox *et al* 2018: 523). It has long been known that pregnancy protects against many autoimmune disorders due to temporary hormonal changes, but with microchimerism – and this goes beyond Chan's research on the brain, referred to above – the result may be that later in life, the mother is protected against developing Alzheimer's disease, the most common form of dementia, and perhaps others.

On the conventional level the effect is unexpected: the immune response signals a self-defensive *rejection* of 'foreign' intrusion and is activated to eliminate the putative threat of otherness whenever the body encounters intrusive non-self antigens. But when microchimerism does not trigger such a response, it could signal either an unexplained failure in the immune system or an active concurrence that delivers beneficial effects. In recent years, microchimerism has been newly named as a potential explanation of many autoimmune diseases – which describes at least some forms of dementia – on the grounds that the body's immune system is not *mistakenly* attacking its own cells, but is responding to the non-self cells within. From that perspective, microchimerism exposes the self to the potential destruction of autoimmune diseases, but that reading ignores evidence of beneficial effects and simply reflects a wholly modernist way of understanding the biological constitution of the human body in which self and other are oppositional. As I explained in Chapter 3, the discovery of significant incidence of non-self DNA at the site of trauma or damage supports both the intimation that microchimerism can be pathological and the realisation that chimeric cells might gather where tissues are threatened with negative changes to multiply and boost existing protective immunological responses. Dementia, for example, is known to be strongly associated with inflammation, and in some cases with infections, and it may be that microchimerism enables a greatly enhanced response. It does not suggest any particular therapeutic interventions, but reminds us again that our entanglement with others at a cellular level may also be necessary to the body's homeostatic balance. I will not pursue the details of this argument further here, but return to the wider focus on the biophilosophy invoked by thinking microchimerism and the microbiome as an innovative modes of visceral prostheses.

## Biophilosophy and dementia

Once again, the thread of Deleuzian philosophy throws light on the problematic. To break with the notion of the sovereign subject of modernity who exercises freedom, choice, rationality and individual agency, that is everything that denied to those with dementia, is not to disown the inevitability of pain, suffering and dissolution. For Deleuze and Guattari, the process that they name as unravelling is a necessary element in the state of becoming (1984, 1987), in which the vulnerability of any subject position is clear to see. An unravelling of the self is precisely what is feared in dementia, but what if the process were neither good nor bad, but simply a continual transformation that marks the multiple and shifting webs of interconnections and entanglements characterised as assemblages? Whether organic and inorganic in nature – the micro-biology and robotic prostheses alike that operate in tandem with dementia – these are the relations that constitute life itself. As Guattari puts it, '(assemblages) do not recognize distinctions between persons, organs, material flows, and semiotic flows' (1996: 46). In taking account of multiple heterogeneous orders, Deleuzian thought is concerned with an irreducible hybridity of form and function and with the effects of mutual interactions. It is not that normative elements play no part, but that they no longer occupy a hierarchical position of dominance that figures autonomy and rationality as more valuable than the dependency and inarticulacy that characterise dementia. What is especially notable is that in an assemblage, it is the component parts, not a pre-given human subject, which determine the nature of possible connections. Where interfaces themselves generate meaning, we can begin to think in terms of distributed agency that supersedes the merely human.

DeleuzoGuattarian theory may appear abstract but it produces wholly material and political effects. It signals that when a body is produced as debilitated – as in dementia – it does not stand alone, and nor do the conditions of production remain static. The medical humanities have only recently begun to appreciate the Deleuzian perspective, but assemblages are highly significant in enabling us to think differently about embodiment in ways that reclaim devalued bodies that have been declared incapable (Shildrick 2009). For Deleuze, in any case, what is at stake is not functional efficacy or the expectation of a singular life prolonged. Dementia, remember, is a terminal condition, but a Deleuzian approach points beyond to an incorporeal impersonal vitalist force towards which my own experiences merely contribute. In contradistinction to the humanist ideals of modernist societies that try to regulate what is owed to and deemed appropriate to any given body, that alternative perspective advocates an embrace of uncertainty and radical change. What matters is to sustain becoming, however that plays out, even in the face of disability, dementia and impending death. Over a life course, the self-same 'I' is not insignificant; and my own sustainability matters, as it encompasses not simply pleasures, but also the endurance of breakdown, distress and suffering. Yet it is not the limit; flourishing does not only refer to the conditions of living but has a wider meaning in which the event of death enables life itself to recompose under new relations of sustainability.[12] Our possible futures can never be fully certain, but even in the face of apparent dissolution, an ethics of affirmation sees the positive potentials of transformation.

On the level of theory, the traditional philosophical goal of seeking to identify what life consists in has been redirected in the posthumanist context towards exploring how life might undergo a transmutation to something no longer determined by human exceptionality. Perhaps that is precisely the template to employ as we queer(y) dementia. Once the condition is reconceived as a network of relations that supersede the closed boundaries of the conventional life course, the deployment of prostheses – both mechanical and external and viscerally organic – could be reimagined as constituting an assemblage that offers an alternative to individual and normatively realised human selfhood. Specifically, a postconventional perspective on dementia that rethinks robotic technologies, and recognises the multiplicity of the microbiome and the genetic diversity of the microchimeric body, entails a radically different biophilosophical approach that actively seeks to ‘enter into modes of relation with multiple others’ (Braidotti 2015: 34). The biomedical context of dementia focuses on the human body, but the inexorable trajectory of posthumanism suggests a new ecology of life that fully embraces non-human others. By reimagining the illusory singularity of embodiment and the temporality of the life course, we are enabled to escape entrapment in the somatic status of dementia as a terminal condition. The possibilities of transformation, of continuous augmentation, through the medium of external and internal, mechanical and organic prostheses, represent not so much positive choices but rather the queer ecology of life, whether human or otherwise. The vulnerability of everyday living and the ruptures that mark a personal life span are inescapable, but the recognition of radical interdependence is not simply one option among many; it always already epitomises the chimerical ambiance in which we live. As we engage with posthumanism, the productive entanglements between corporeality and time within and across species switch attention from static being to ecosystems of becoming. And in opening up the parameters of the augmented self, dementia signals not an end to life, but a release from the rigidity of the sovereign self and an affirmation of continued becoming.

## CHAPTER FIVE

# Stem cell therapies and (bio) assemblages

It is widely expected in the popular imagination, and to a considerable extent within biomedical research itself, that in the near future biomedicine will be radically transformed by the utilisation of stem cell therapies. The discovery that pluripotent and multipotent stem cells can provide a potentially unlimited source of material from which most of the cell types of the body can be encouraged to develop opens up a horizon in which many common diseases and injuries like cancer, diabetes, rheumatoid arthritis or spinal cord injury could be treated with minimal intervention, while the organs most associated with transplantation – heart, lung, liver and kidney – could be restored to functionality rather than replaced. Certain 'hollow' organs such as the trachea or bladder have already been bioengineered *in vitro* on scaffolds seeded with stem cells, while the hope is that the damaged tissues of solid organs might be reactivated through the infusion of such cells.[1] Regenerative medicine seems to offer a future free of the violence of most transplantation procedures, but in reality there has been very little success outside disembodied laboratory conditions and in the human context extremely limited application (see Figure 5.1). Although the regenerative qualities of stem cells are increasingly hailed as a panacea for future medical therapies and may eventually yield substantive advances, I focus in this chapter on those interventions already in use to treat various blood-borne disorders. Even in the present context, stem cell transplantation (SCT) is not without social controversy. It can use either autologous (self-generated) adult stem cells, which can be obtained from fatty tissue, bone marrow, the peripheral blood supply and parts of the cardiovascular system, none of which raise bioethical concerns, or those derived from an allogenetic source, commonly a donor's bloodstream or bone marrow, or from placental cord blood, all of which – and particularly the latter – can be highly contentious.

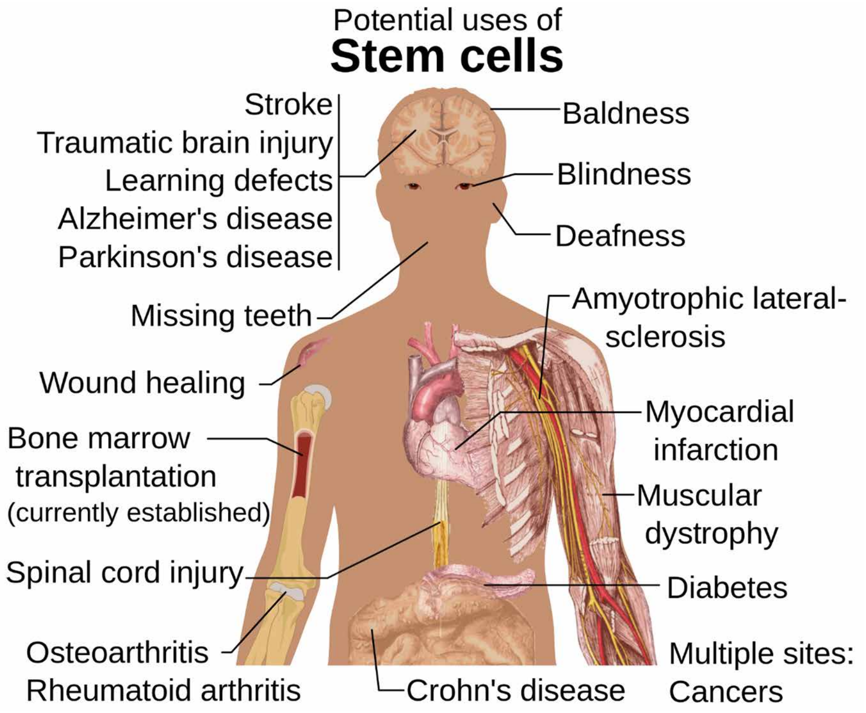

**FIGURE 5.1** *Image by Mikael Häggström (2014). Used with permission. Image also available on wikiversity.org: CC0 1.0 Universal (CC0 1.0) Public Domain Dedication.*

In the discussion of matters concerning SCT – also referred to as hematopoietic stem cell transplant (HSCT) – and especially in its status as a socially situated phenomenon, it is always necessary to abandon the singular biomedical perspective and its promises of restoration in favour of bringing empirical, biological and bioethical insights into conversation. In crossing the boundaries between those familiar forms of enquiry, I want to explore and reflect yet again on some recent issues in the realm of biophilosophy. My own approach to SCT is solidly related to my involvement in the long-term collaborative heart transplantation project that I wrote about in Chapter 2. Solid organ grafts are materially very different to stem cell transplants but there is considerable overlap in the phenomenological aspects of the procedure as it differentially affects recipients, donors and families alike. Questions of identity, of gifting and of mortality abound, and in kin SCT where the whole process happens within the complex relationships of a single family unit, the intertwined impact on lived experience is highly concentrated. Going wider, it is also apparent that the micro-biological issues relevant to the transplantation of solid organs shed new light on the philosophical and bioethical dimensions of SCT.

A great deal of empirical research is already to hand around the topic of transplantation either in strictly biomedical texts that have little place for speculation on the implications of the results or in the social sciences which are generally more open to providing a theoretical approach to research data. Both are essential, but beyond that, any systematic enquiry into reported lived experience requires I think a philosophical approach to complement the sociological and biomedical material. Rather than relying on an additive model to produce new knowledge, what is needed is mode of analysis that intends to interweave many areas of expertise – social, biomedical, legal, psychological – with diverse methodologies that reflect the complexity of the object of enquiry, which in this chapter focuses on SCT involving siblings. I will draw in particular on a recent German project based in Lübeck that explored both individual and family accounts of and reactions to kin-based SCT where all recipients and most donors were children at the time of the procedure.[2] The study is unusual – and phenomenologically laudable – in both engaging with all members of each family, sometimes together and sometimes alone, and interviewing the respondents up to twenty years after the transplant. In looking at everything involved in the understanding of SCT – the biomedical procedure, the individual and collective experiences of the family, the data collected, the expertise and expectations of the researchers and the varying analyses applied – what emerges, although the Lübeck team does not name it as such, is a knowledge assemblage.[3] That term reflects my own methodological approach throughout *Visceral Prostheses* and views the significance of transplantation itself through the framework of Deleuzian assemblage.

Like heart transplantation, the event of a bone marrow transplant – the main form of stem cell transplant under consideration here[4] – speaks to a radical encounter between self and other, and is the site where the conventional boundaries of what constitutes a singular self are deeply problematised. In the case of living kin donation, which is the most prevalent form of SCT in paediatric contexts, the collision of life and death is less prominent than it might be in other transplantation scenarios, but nevertheless provides the underlying motivation for action. The interview material generated by the Lübeck project specifically investigated the well-being of donor and recipient children in the context of familial donation. My own interest, however, is focused on the implications of viewing stem cell transplant as a visceral prosthesis that impacts the ontological as well as empirical relation between self and other. Like the other forms of prostheses already discussed, the experience of SCT undoes the normative binary and reflects an irreducible intertwining that produces a somewhat unstable sense of self for both recipient and donor. At very least, and whatever the empirical connection between the two, the procedure and its aftermath are shot through with some ontological uncertainty. For recipients of donor stem cells, the lived experience arouses complex emotions not only about the external relation between self and other, but also about the presence of the other within the self. In a powerful way it is a relationship of hybridity or even spectrality in the Derridean sense.[5]

## Biocultural dimensions

In strictly biomedical terms, bone marrow is the site in which red and white blood cells and platelets are manufactured, and a transplant may be the recommended treatment for children and adolescents with some types of cancer, particularly childhood leukaemia, lymphoma and other blood-based disorders, including, for example, sickle cell anaemia. In most cases the purpose of the SCT is replace the recipients' own diseased bone marrow stem cells with healthy cells, or to counter the destructive effects on the bone marrow of high doses of chemotherapy or radiation given to treat the underlying disease. Of course any exercise in life-saving procedure, which SCT may be, raises awareness of personal mortality, insofar as biotechnologies increasingly intervene into terminal conditions that once seemed natural and inevitable. As with other types of transplantation, success in averting death relies on many factors that cannot be easily controlled.[6] But biomedically the hope for better health and prolonged life is soundly based, albeit living on is not as unproblematic as might be expected. Both recipients and their sibling donors may be significantly disturbed by the procedure, but they are afforded little opportunity to explore and try to make sense of any negative emotions that they may experience. In any case, there is a striking lack of recognition for feelings that exceed the usual categories of disquiet. In a recent paper Amonoo *et al* (2020: 2) float a new approach: 'our understanding of psychological distress in HSCT patients must go beyond commonly studied symptoms that are typically measured quantitatively with self-assessment measures', but in the event their qualitative data offers few new insights and has nothing to say of the existential anxieties that emerged in the Lübeck project. As some of the Lübeck transcripts make clear, such urgent issues are particularly unaddressed in the context of intra-familial donation, where the well-being of the family as a unit may be privileged above individual disturbance.[7] Given, moreover, that the transaction is between siblings, the majority of whom were children at the time, the imposition of a unified narrative of hope might be even harder to resist. What is often occluded are some profound bioethical concerns.

Stem cell donation rightly generates extensive public debate around questions of consent, and the exploitation of those providing so-called spare parts, but aspects that are given far less time are the wider ethical and philosophical implications of incorporating another's genetic material. In normative terms, however, the ethical issue of utilising the biological material of young people below the age of independent consent – and in many cases too young to even understand what is involved – is the central concern. The irreducible moral problem is that the extraction of stem cells has the potential to harm the donor without offering any personal therapeutic benefit. The recipient on the other hand may face death if what is a relatively risk-free medical procedure for the donor is not carried out.[8] It is well established that siblings have the best chance of high HLA compatibility making them the preferred choice of families who both wish to keep the matter within their own sphere of influence and to avoid the additional prohibitive costs of external allogenetic transplants.[9] Like many other transplant procedures, SCT as a therapeutic intervention is only available to those individual families enjoying state subsidised medical services such as the UK National Health Service, or who are able to access and afford over time the pre-transplant work-up, the transplant itself, which may involve an extended stay in hospital for recipients, and the follow-up checks. Outside of kin donation, there are many national registries of potential bone marrow donors and both public and private placental cord banking facilities to satisfy international demand. What is in play – if we think back to Esposito (2011) – is a tension between the immunitary need for stem cells as the answer to an individually centred crisis and the communitary supply that crosses boundaries and borders between the self at home and the foreign other. The prosthetic material itself is a valuable commodity with economic, political, social and psychological dimensions.

In the Lübeck interviews the acknowledged tensions remained wholly domestic. Just one family mentioned the expense, but nearly all expressed a strong desire not to go outside the family even though it would have vitiated the ethical conundrum of subjecting a child of their own to a procedure that – besides carrying some known medical risks – has an unquantifiable potential for psychological disturbance. Deciding which sibling should be selected as a donor impacts the entire family dynamic, and may establish a new, and possibly fraught, relationship between the siblings, some of whom may feel excluded. And once the procedure is underway, the whole family is faced with a time of intense stress while two of its young members undergo a period of isolation and invasive medical interventions (Packman *et al* 2004; West *et al* 2020). For sibling donors, the powerful appeal to the obligations of kinship generates extra burdens, and they may – with good reason – see themselves as effectively a means to an end, rather than as individuals in their own right. Some jurisdictions mandate the use of donor advocates to represent young children, but the German families in the Lübeck study were not obliged to take external advice. With few exceptions, the families involved – not just the parents but donors and recipients themselves, and other siblings – voiced a belief that helping the ill member was a shared responsibility. The agreement to familial donation was taken for granted with little – in most cases, no – consideration of possible alternatives. The Zucker family mother is by no means unusual: ‘It was clear to me, without us having a massive discussion with Zorro, that Zorro WILL donate whether he wants to or not.' What is striking in relation to the interviews, however, is the number of donors who retrospectively – and perhaps concurrently – felt themselves to be exploited.

The question of exploitation emerges at several different levels, both within the family and in the wider context of the bioeconomies of visceral prostheses. I shall explore that more fully in the next chapter but for now I want to mark that it was not simply a one-off transfer of donor stem cells that was at stake, but an ongoing sense in which the donor as an individual could be considered a prosthetic resource. While the families involved could rationalise the specific, time-limited procedure of stem cell extraction as a necessary therapeutic intervention in which the transfer of cellular material would be quickly renewed in the donor's body, there was also an expectation that future donations might be needed and should be given. Although just three of the Lübeck donors had undergone more than one extraction procedure, some were anxious that they would be seen as a repository of 'spare parts' to be called on again at some point in the future. The Kunow father ruefully admits that he thought of his donor son as a 'spare parts depot', while the Wahl father refers to one child 'as a construction site for the other'. It is not that parents were unaware of the pressure that was put on donors but that the overriding desire was to come to the aid of the sick child even if that meant putting aside their scruples concerning donor siblings. The ethical and existential implications of both giving and incorporating another's genetic material had begun to emerge in the retrospective interviews but seemed to have little currency in the crisis situation itself.

My own participation in the multi-dimensional *PITH* research project in heart transplantation leads me to believe that those elements should be a site of specific attention and perhaps merit primary concern, particularly in the context of the emergent understanding of the phenomenon of microchimerism. There is little doubt that all organic transfer is symbolically complex, such that stem cell donation – like other forms – swiftly moves beyond the functional repair or spare parts metaphor and may seem to constitute the gift of life, though few of the respondents in the Lübeck SCT project explicitly referred to the transfer in those terms. Nonetheless, the seemingly laudable metaphor of the gift does frequently underlie family understanding of the process, but it raises its own problems and specifically amplifies the potential disturbance to the relation between self and other. Moreover, unlike the case of *deceased* organ donation in the heart transplantation procedure, where the spare parts discourse is positively encouraged as less disturbing, in scenarios where there are living familial donors – as in SCT – the reverse is true and the notion of spare parts is silenced as highly insensitive. But whatever the type under consideration, few of those intimately involved feel the transaction to be a simple replacement of faulty, even life-threatening, components for better-working ones. Far from being a neutral and depersonalised procedure, or even the expression of disinterested altruism, the organic material of a stem cell prosthesis takes on the sense of a real and symbolic gift that binds the giver and receiver together in an economy of exchange.

As with heart transplantation, respondents do not need to be familiar with Mauss' theory of the gift (1990) to recognise that the transplanted object carries with it intangible aspects of the other and expectations of reciprocity. The often burdensome, but usually inexpressible relation between the two parties centres on the discourse of having been given something precious, the acceptance of which generates certain supposed obligations to the donor. Where the donor is a living family member, the potential of that pressure is unavoidable. But what happens if the SCT fails to secure a healthy life for the recipient, and may even introduce new sicknesses such as graft-versus-host disease? Medical evidence indicates that GvHD is widely experienced in stem cell recipients and in the Lübeck study some cases had resulted in long-term illness. As a known risk, families would have been alerted to the possibility of GvHD but perhaps not to its specific manifestations such as liver failure, severe infections, dwarfism and sepsis, and its possible contribution to depression and behavioural problems. Two recipients out of sixteen died in the early years following transplantation which raises the question of what donors must then feel about the gift relation. Do they perceive their own translocated bodily material as simply inadequate or as causative of further complications? Do they feel a part of themselves has died? In heart transplantation, donor proxies are heavily invested in the survival of the recipients and may treat any death as a further loss of the donor. The Lübeck interviews shed some limited light on these particular questions and in line with other external research suggest some troubled responses. The scoping review conducted by Garcia *et al* (2013) indicates that in addition to the grief that might follow any family death, related donors commonly experience feelings of guilt, depression and inadequacy following recipient death. What is perhaps surprising is that unrelated donors often expressed even greater devastation and assumed a stronger burden of responsibility. It is understandable that family respondents might be reluctant to explore the existential as opposed to biomedical dimensions of intimate kin dying, but what the Lübeck interviews do reveal is a high degree of disturbance to the integrity of the self.

As many of the transcripts show, the post-procedure relation between recipient and donor is more or less existentially loaded in terms of personal identity. The Wahl family mother remarks of her recipient son (who refused a personal interview): 'it is something, something VERY existential and important for him, that it's also from his SISTER, because actually he is very attached to her and even more because of this', while the female Rohde donor reflects: 'now my sister is (*laughs*), yes, the same as me, how stupid, now I'm no longer unique or something'. In the field of heart transplantation, very few of the respondents gave extravagant accounts of felt changes to their sense of personhood, but many experienced themselves as no longer the people they had previously been, either in tastes, temperament or behaviour. The researcher team in the stem cell study suggests that it is having a close knowledge of the donor – it is after all a sibling relation – that generates such disturbing reflections, but research in the wider field of organ donation shows that complete anonymity is no bar to speculation about hybrid identities (Kaba *et al* 2005; Poole *et al* 2009). The ontological question ‘Who am I now?’ is a central concern in either case. Although the degree of palpable distress expressed by heart recipients in their newly embodied states was more strongly evident (Poole *et al* 2009), it is clear that many stem cell recipients too felt themselves now entangled with the donors beyond the level usually expected of siblings. Certainly there were deep feelings of obligation, or perhaps even guilt in that the prolongation of their own lives depended not just on generosity but the potential discomfort and anxiety endured by very specific familial others, but it is the intimation of shared attributes that is the most remarkable. In the Speidal family mother’s account, ‘it was like this, he [the recipient] gets his brother’s blood, so he BECOMES his brother’ (26), while the recipient himself confirms her view: ‘I mean, I dunno, it’s just a feeling, you’ve got your brother’s blood actually IN you. Like and, mh, yes, it’s FUNNY to describe. It’s as if you were linked even more closely than you would be anyway.’

The empirical findings from the SCT study interviews reiterate that the experience of bone marrow transplantation can indeed invoke an unfamiliar sense of hybridity.[10] The initial understanding of that disturbance relies on the phenomenological claim that as the self is always embodied, then any changes to the corporeality of an individual must unsettle any stable and fixed sense of self (Merleau-Ponty 1962). The coming together, then, of self and other in the material form of transplantation is no simple matter, but an enterprise of high affective significance. When the dominant psycho-social imaginary of the Western world rests on the boundedness and singularity of each individual, it is hardly surprising that the tangible experience of what is in effect a form of hybridity remains a largely alien and potentially disturbing perception. As with many life-saving biomedical procedures, the preparation period for the transfer of cellular material in SCT does not seem to include any recognition of the potential for psychic disturbance for either the donor and recipient.[11] Although there is broad agreement that the procedure is relatively low risk for donors in the physical sense, the few reviews that consider psychological effects in related donors rarely go further than noting raised rates of depression or anxiety that are especially evident should the recipient die (Billen, Madrigal and Shaw 2014). The neglect of donor experiences perversely suggests a one-way relationship that is at odds with my own understanding of a mutually constitutive prosthetic relationship. As the psychoanalyst Françoise Daune notes, the GvHD commonly experienced after stem cell transplantation raises the question of ‘who incorporates whom’ (2015: 105). Considerations of microchimerism at the cellular level introduce new dimensions to the issue of identity, in that the continuing circulation and operation of ‘alien’ genetic material in the bone marrow and peripheral blood supply inevitably raises questions regarding the singularity of the self.

Before coming to the specific implications of microchimerism for SCT procedures, I want to look more generally at some of the other elements of stem cell donation that are not readily apparent to those involved on either side. What the *PITH* project consistently showed, and we can reasonably speculate that similar forces are at work in stem cell transplants, is that the authorised discourse endlessly reiterated in the clinic and in the media acts to discredit or silence alternative narratives (Abbey *et al* 2009). Questions of hybridity, and the more so regarding chimerism, are clearly discouraged such that those involved may find little support or acknowledgement of the challenging concerns arising from their phenomenological experience after the procedure. As with organ transplantation, and prior to any clinical intervention, the focus for both those choosing to donate and those waiting to receive a stem cell donation, and for the wider families, is likely to be primarily on the prospective health benefits or risks. Yet at the same time, popular media representations of transplantation – though usually around more tangible elements such as heart, eyes or hands – abound with unsettling narratives that suggest an underlying fear that the personal characteristics of the donor might transfer to the recipient, or that s/he (the donor) might reappear as a spectral presence. It goes further than the phenomenological sense that corporeal changes – here the assimilation of donor material – may induce the emergence of a new embodied self, to speak instead of a self haunted as it were by traces of the other. As the *PITH* study revealed, for the majority of heart recipients, whose biomedical recovery and well-being were expected to be coincident with a restored sense of singular selfhood, the path to the ontological state of well-Being was often challenging and sometimes impossible. Jean-Luc Nancy (2002), who received a donor heart – and had a stem cell transplant some years later – speaks, for example, of becoming a stranger to himself, while Francisco Varela who had a liver transplant reflects: ‘We are left to invent a new way of being human where bodily parts go into each other’s bodies, redesigning the landscape of boundaries in the habit of what we are so definitively used to call distinct bodies’ (2001: 260). Neither the trope of the spare part nor the expectation of gratitude for the putative gift of life can account for such experiences, and although they provide no direct template for understanding the familial context of sibling donation, there are clearly some similar existential disturbances at stake. SCT is a far less dramatic procedure than solid organ transplantation and as such is rarely represented in film or literature; yet, that very lack of popular accounts may even exacerbate the feeling of both recipients and donors that the sense of hybridity they experience is peculiar to themselves and should not be voiced. Particularly in the family situation, the tyranny of positive thinking may override any opportunity to express the underlying anxieties.

The unproblematised expectation that SCT enhances health may be offset, nonetheless, by the intuition that there will be a change to the uncomplicated notion of an enduring sovereign self. Such a conception might well be experienced as intrinsically negative for those wedded to the Western logos, but it need not be so. As I outlined in Chapter 2, the work of postconventional theorists, such as Jacques Derrida, takes a very different view as it moves away from the trope of singular personhood and individual identity. The insistence of the Western logos on self and other as separate and distinct entities is for Derrida an illusion, and it is precisely the arrival of otherness that marks the creative possibility of going beyond the metaphysics of the modernist concept of the self. For Derrida the coming of the other – and we can see it as both abstract and concrete – cannot be forestalled and is always dependent on something elusive that cannot be grasped as such in the immediate moment; it always speaks to a hauntological relationship between self and other (Derrida 1994). What matters is that the trace of the unknown other should be openly welcomed (and here we might think of the recipient's embrace of donor material), not in the expectation of benefit – for that can never be certain – but as a way of securing a future. As with every form of augmentation or supplementation, the prosthetic nature of the stem cell transplant positions it as a vital element not of a pre-determined and settled being, but of a creative becoming. In letting go of the illusion that the recipient – or the donor for that matter – should be restored to the same self is to accept the embodied hybridity that transplantation entails in a more welcoming and expansive way. The relation between self and other is no longer binary and constrained by boundaries, but becomes entangled: remember Derrida 's dictum, 'the guest becomes the host's host' (2000: 125). In the *PITH* project at least – and we can speculate that the experience of SCT would be no different – the empirical material showed that those who comprehended the putative loss of corporeal singularity, who did not fetishise autonomy, were less unsettled by their unfamiliar experiences and affects. Whether it concerns solid organs or microscopic stem cells, the promise of recovery that transplantation offers, is misplaced. The existential unease mirrored in the uncertain reality of many recipients, donors and indeed the wider families is nevertheless the ground for a radical rethinking of the nature of embodiment and an opening to more liveable alternatives.

## The microchimeric and immunological context

It is with that aspiration of reconfiguring the temporal and spatial boundaries of embodiment in mind that the very material biological basis and intrinsically microchimeric nature of SCT come to the fore. As I have already outlined, the existence of microchimerism fundamentally undermines any belief that each individual organism is regulated by a single unvarying genome or displays genetic homogeneity across all cells of the body (Nelson 2012).

Rather, the putatively non-self cells of microchimerism are not assimilated to achieve new uniformity across the totality, but remain enduringly distinct. Among the many known iatrogenic causes arising from biomedical interventions into the body, transplantation of all types is prominent with stem cell transplants offering a particularly intriguing subset. Despite the low incidence of non-self cells, there are compelling reasons to believe that microchimerism is strongly enmeshed with the biomedical outcomes of many solid organ graft procedures, while for bone marrow transplants it is the – often unnamed – driving force to the extent that what might be more accurately called macrochimerism is the implicitly desired outcome. Despite the ongoing and highly oppositional debate within much immunological and transplant research in general with regard to the potential of beneficial or pathological outcomes in the presence of microchimerism, biomedicine has been successfully exploiting the phenomenon in bone marrow transplant for over fifty years. What is striking, then, is that unlike the situation with solid organ transplants, where the dominant *clinical* narrative still insists that the DNA of the graft will remain *in situ* and play no part in recovery and future life (even though that claim is increasingly shown to be an illusion), the biomedical point of stem cell transplants is exactly the opposite. The explicit aim is to import active components that will both substitute for the originary stem cells, damaged, for example, by diseases like leukaemia or by treatment regimens, and boost the recipient's immunological responses. Where existing bone marrow has been fully or semi-ablated, the primary intention is to stage a comprehensive replacement with non-self cells.

In the biomedical context of transplantation, the concerns around microchimerism are less to do with 'alien' DNA than with its input to and effect on the immunological status of the recipient. Left to itself, the recipient's natural immune response to the unfamiliar donor cells – which carry their own distinctive human leucocyte antigen (HLA) profile – would be an overwhelming onslaught on the putative intrusion, and rejection of the transplanted tissue, resulting in the recipient's further decline. Where it is possible, as in some kidney transplants and certainly in bone marrow transplantation, careful tissue matching between a closely related donor and recipient can eliminate some of the problem. In the case of sibling donation, as in the Lübeck study, the parents and children involved express a strong psycho-social desire to keep the whole experience within the family, but that in any case is the preferred medical approach. Nonetheless, there is rarely a complete correspondence of HLA, which is highly specific to each individual, so the resulting histo-incompatibility that would prevent a successful grafting must usually be controlled by suppressing the recipient's own antigens. At the same time, a parallel problem arises as the donor cells mobilise a similar rejection response against the recipient. In graft versus host disease, the functional immune markers of the transplant material recognise the non-self status of the recipient and attack the host who may have little defence, especially if already immuno-compromised. The biomedical procedure of stem cell transplant is not especially risky in itself: the danger, as in all transplantation interventions, lies in effectively managing the incompatible HLA systems. Although post-transplant care and drug regimens may change over time, the underlying doxa remains the same – that the immune system of all animals naturally operates on the principle of self/non-self discrimination such that donor and recipient antigens are in an antagonistic relation. The success of transplantation procedures, including SCT, is therefore thought to devolve on an effective containment of the otherwise inevitable consequences of histo-incompatibility. The peculiarity of bone marrow infusions is that the suppression of recipient antigens may enable a complete engraftment of donor cells – a form of *macro*chimerism – that directly counters certain existing conditions such as leukaemia. The graft versus leukaemia effect is a well-recognised benefit of SCT where the lesion is blood-borne, though it does not extend to subsequent cancers in other organs and tissues (Kolb 2008; Dickinson, Norden and Li 2017).

The historic legacy of the pioneers of immunology remains the conviction that the protection and maintenance of the boundaries between the supposedly normal self and the intrusive other are a natural function of the healthy body, and that in turn has been the dominant template for transplant medicine. The limited influence of several attempts to reconceptualise the nature and function of the immune system speaks to a strange silence about the fact that the very success of SCT must raise doubts about the bioscientific sustainability of the standard model. Even the most notable challengers to the orthodoxy – Donna Haraway (1989b), Polly Matzinger (2001) and Thomas Pradeu (2012) – offer no significant commentary as to the startling implications and ongoing viability of bone marrow transplants, which for all their drawbacks rely precisely on natural immuno-tolerance. The further issue is that beyond the developing bioscience, the socio-cultural imaginary, of which the biomedical imaginary is a subset, remains committed to just the same core belief in the intrinsic nature of self/non-self conflict, and that is the likely starting point for both recipients and donors. The notion of the self embedded in the Western logos speaks to an atomistic, already complete and defensively bounded entity. Any suggestion – regardless of the outcomes of material research – that the immune systems of the self and its other(s) might ever be cooperative not only is an insult to the basic principles of immunology, but queers the very understanding of what constitutes human being.

Once it is accepted that the immunological effects of transplantation extend throughout the body of the recipient, we are obliged to reconsider the relation between self and other. Given that the DNA and the associated HLA profile of the donor circulate in the peripheral blood supply at very least, the issue of hybridity takes on a more radical significance. Even when the finer points of DNA coding are scarcely addressed by either clinicians or their patients, the recipient can no longer claim to be 'all me', and the intuition of hydridity is frequently an element in the post-transplantation context. Whatever the clinical narrative around SCT, both sides of the transaction display a feeling that the bone marrow graft signals that some aspects of a donor are incorporated. In a few cases there is a stronger sense that the particular essence of the donor is evident in the recipient. Hybridity is not a term commonly used in the interviews by either the siblings or their wider families; still less were respondents or donors aware of how circulating donor DNA in effect constitutes a microchimeric environment in the recipient body; yet, there is surely a sense that the embodied self has changed. In biomedical terms, what may occur – and it is after all the intention of SCT – is that the donor cells may effect a complete engraftment of the bone marrow and peripheral blood supply, while co-existing with the recipient's own DNA still present in the epithelial cells for example. It seems unlikely from the Lübeck interview material that any of this was discussed with the families involved as being of particular relevance. As the father of family Rohde dismissively remarks, and his is the only direct reference, 'you know I find the concept so crazy, the doctors are talking about chimerism … it's from, comes from the Greek chimera' (Rohde, father, 106). For everyone concerned the cogent questions are largely focused on the material consequences of SCT in terms of future health and illness, but the philosophical implications of the coming together of self and other should not be ignored. It is not a case of hybridity as such, which technically indicates a form of assimilation, but precisely of chimerism where – at the cellular level – the incoming components remain genetically distinct.

The first successful SCT procedures occurred around the same period as solid organ transplantation, but the issue of chimerism was not recognised in the latter, and to a degree made explicit, until Thomas Starzl's retrospective studies of the outcome of kidney transplants, which demonstrated that donor HLA, could be detected in the peripheral blood supply (Starzl *et al* 1992). Up until that point, in what Starzl referred to as an 'epistemologic collapse', the solid organ graft had been understood 'as an island in a hostile sea in which the leukocytes were solely those of the recipient' (2007: 15), a quite different scenario to the donor leukocyte chimerism associated with bone marrow cell transplantation. Even there the full impact of microchimerism was obscured by the belief that success in SCT was most assured by the event of macrochimerism in which mutual tolerance played little part. When it was demonstrated in the early 1990s that 'a trace population of recipient leukocytes [remained] in essentially all such "perfect" bone marrow recipients' (2007: 15), the distinction between organ and bone marrow engraftment was reduced to a simple difference in the proportions of donor and recipient cells. In short, it was the first clear indication of extensive microchimerism. Starzl proposed that the problem of immunorejection might be countered by keeping a balance between the immunogenetic effects of the two different populations of cells by means of recipients being given pre-treatment infusions of hematopoietic (stem) cells derived from the bone marrow of living donors. His underlying aim was to find a way of minimising the need for highly toxic regimens of immunosuppressant drugs which can generate a plethora of new morbidities. Because such infusions did not prove reliably effective in solid organ procedures, Starzl's insights were widely discounted, even though the whole enterprise of SCT shows the potential of microchimerism in relation to immunotolerance.[12] The ongoing absence of discussion about microchimerism among SCT clinicians[13] and families is puzzling in the light of widely accessible online accounts indicating that the donor DNA and HLA takes over bone marrow function and circulates in the blood, although there is still little recognition that it may equally settle in solid organs and other tissues. One might ask whether the omission of explanatory information about issues that may affect both future health and existential well-Being raises the question – at least in its conventional sense – of what constitutes informed consent, especially where children are the recipients and donors for whom proxy decisions are being made.

The problematic of immuno(in)compatibility is not, however, limited to iatrogenic outcomes, and by exploring the wider context of cellular chimerism it becomes possible to trace its further significance. The incorporation of allogenetic material is one mode of inducing microchimerism but the phenomenon has many other grounds, many of them occurring naturally, as in pregnancy. The implication is that recipient and donor bodies may already be microchimeric with the translocated haemopoietic material simply adding to the incidence of non-self cells. Given that populations of distinct DNA and HLA are durable over time and most probably beyond the normal life-course, the potential ubiquity of such somatic multiplicity and intracorporeal malleability poses a fundamental challenge to the Western socio-cultural imaginary of singular selfhood that finds its biological justification in the individual uniqueness of DNA identity. The ubiquitous trope of gift giving, which underlies much transplantation discourse, nevertheless positions the transfer of donor material as an extraordinary act that sets in place an enduring obligation of gratitude. There is no doubt that within the familial context of SCT, recipients are acutely aware of a putative debt owed, which both donors and other family members often cannot resist pointing out, although that reminder may be presented as though it were in jest. Sometimes, however, the strain of receiving bone marrow as an apparently one-way act of altruism results in painful misunderstandings. As one female recipient (Kirstein family) reported, 'well [I was] also very depressed and then I tried to kill myself and um my brother could never approve of that like, because he said: I SAVED your life and now you just want to throw it away!' The sense of an enduring connection is very strong but the conventional framing of the donation makes no assumption that it is an exchange in the Maussian sense, still less the impossible gift of Derridean theory. On the contrary, the putative altruism of the gift blocks open relationality and the recipient referred to here laments that her brother was unconcerned with her reasons for attempting suicide.

Most donors were fully aware of giving something of great value and several in the Lübeck study spoke of feeling an onerous burden of responsibility. One male (Wahl family) referred to the experience leading up to SCT as akin to being pregnant and to the procedure itself as 'like a birth or like a (..), like a sort of transfer of now- now- as if life is somehow flowing in right now or something and that COMES from ME'. For many siblings a deepened sense of kinship was an expected outcome of the procedure (D'Auria *et al* 2015, Schües *et al* 2022),[14] but it is limited to neither paediatric nor family scenarios and extends to a sense of mutual kinship between *unrelated* recipients and donors. As one research project found, eleven of the twelve unrelated donors who were interviewed wondered if they shared characteristics other than HLA with their recipients and had become their 'genetic twins' following SCT (Wanner *et al* 2009). The experience of a shared identity mirrors what is felt by both recipients and donor proxies in the context of heart transplantation (Shildrick 2013a, 2013b), and the move from the field of solid organs to that of regenerative tissue in the case of SCT indicates that the boundaries between self and other are readily breached. The philosophical critique of the relation, where the supposed boundaries of the one secure it against the intrusions of others, is at its most cogent point of engagement in Roberto Esposito's deconstructive analysis.[15] As Esposito recognises, conventional culture cannot tolerate the insult of ontological dualism: the two-in-one or the one that becomes two. Few recipients will think explicitly in such terms but they express precisely what may be disturbing about the transaction: prior to accepting the 'gift of life' they have lived as atomistic selves within the normative paradigms of Western modernism, with an unthinking, and probably unexpressed, belief in the corporeal distinction between one self and an other; afterwards the closure of individual identity is no longer possible. Small wonder then that so many of the families involved in the SCT study treated such unsettling intuitions as a joke.[16]

## Biophilosophy and SCT

The biopolitics developed by Esposito draws throughout on the materiality of biomedical immunity. As I outlined in Chapter 3, his purpose in engaging with both the biological and ontological transformations of embodiment is to advance an *affirmative* biopolitics which goes beyond the neutral biomedical figure of tolerance and postulates a mode of positive relation between self and other. Where microchimeric outcomes stage a phenomenological assault on the notion of an individual life restored insofar as the differential DNA of the donor cells resist assimilation and remain fundamentally other, Esposito offers instead a model of flourishing multiplicity where dissimilarity itself is mutually productive. His evocation of the body as open relies, as Nik Brown glosses it, on 'the emergence of new kinds of immunitary sociality, interrelationships that defuse the destructiveness of over-protection and the illusions of total security' (2019: 91). The notion of a radical hospitality proposed by Derrida (2000) that confirms the always/already interiority of otherness has previously intimated something similar, but it is less directed towards an explicitly transformative and creative end. Esposito more clearly takes his lead from Deleuze in enabling new modes of thinking that will facilitate more adequate ways of conceptualising the processes and affects that transform life. Deleuze has little interest – even in a deconstructive mode – in modernist semantics that focus on individual and autonomous selfhood; rather he recognises not simply the one in the other, but the modality of an *im*personal vitalism that eschews the limitations of *being* and privileges instead the excessive potentiality of life's becoming. In conclusion, then, I offer some brief speculations on how the significance of SCT chimerism might be read through a Deleuzian approach that takes for granted the illusory nature of self–other distinctions.

As with Derrida, Deleuze (both alone and in collaboration with Guattari) decisively breaks away from modernist thought not only in contesting singular embodiment *per se*, but in opening up the disturbing ontological question 'Who am I?' that so clearly underlies the unease generated by any transplant exchange. It marks a deep-seated challenge to the orthodox standard of self versus other that still – despite recent research discoveries around microchimerism – underlies the bioscientific discourse of immunology and the socio-cultural imaginary more widely. In its place, the emerging theoretical shift is to an understanding of all embodiment as constitutively chimeric. For Deleuze, the notion of the atomistic and unchanging subject of Western modernity gives way – at most – to a provisional self who is always within a positive process of falling apart to reconfigure in manifold new ways. In place of static being, the emphasis is on a condition of becoming (Deleuze and Guattari 1987). The unique experiences and putatively contained embodiment of each person are enmeshed in assemblages, those multifarious and impermanent webs of interconnections that generate dynamic fields of energy, and life itself is an unlimited vitalist force that exceeds the individual life-span from birth to death (Braidotti 2006; Shildrick 2013b).[17] The concept of assemblages provides a convincing alternative to the logic of unity and wholeness, and a valuable perspective from which to understand what is at stake in the chimeric dimensions of SCT. To reiterate, chimerism – whether of whole parts or of cellular material – denotes not a simple assimilation that overrides the coming together of original differences, but a conjunction of disparate elements that both deform and reorganise each other, yet are still functional within a newly configured relationship. It is a way of thinking about human life as always and inextricably entangled not only with other organisms but with an assembly of technologies and processes, and that is precisely what is exemplified in all forms of somatechnics in which the empirics of transplantation – whether of solid organs or stem cells – play a significant part.

At a less rarefied level we might also think about the family itself as an assemblage – a coming together of individuals who in certain circumstances function as a composite entity rather than as a group of autonomous beings. Certainly the familial bodies at the focus of the Lübeck SCT research project seem to take that view, and although they may be open to the changes wrought by events and processes and do not cleave to a static essence, there is still a strong commitment to an organised and organising intra-related entity. As the Bahr family mother commented, 'something very special connects us, what we experienced together, what we endured and survived. That continues to connect us, you know'. And for the Kötter family father, 'a family is something … something priceless (…) because actually they're all part of oneself'. Given the well-documented psychological stress that sibling SCT places on both the recipient and donor (Packman *et al* 2004), it might be supposed that retrospective accounts are somewhat idealised, but it clearly matters to the members that they are seen as a family, and that the fluid circumstances in which they find themselves can be managed within the unit without resort to external donors. In that sense they satisfy the English language definition of assemblage as the fitting together of disparate parts to form a unified whole, but not the full Deleuzian sense in which the original word *agencement* indicates a loosely linked array of heterogeneous elements (Nail 2017).[18] The philosophical paradox is that the implicit rejection of radical difference in the desire for kin stem cells at one level defines an immunitary unit at odds with the communitarian sharing that SCT implies.

Nonetheless, even though constrained, the constructive power of interconnection – the family as some kind of assemblage – and the ceaseless processes of ontological transformation generated in the nexus of chimerism – which the family are tacitly obliged to accept – are still undeniable. The concepts of both assemblage and microchimerism may help us to rethink SCT, not as a one-off event in the life of a sick individual which results ideally in restoration of normative familial and social relations, but as an enduring transmutation for both the recipient and the donor, and for all those with whom they interact. For Deleuze, as I have already indicated, human life is not limited to the temporally sequential frame marked out by the conventional life-span of any individual, but rather persists as just one variable element of the enveloping process of becoming that constitutes all types of living (and dead) organisms. That is not to deny that for all of us, personal life years are punctuated by distinct episodes such as the illnesses that necessitate SCT, where there are evident disruptions to patterns of development; yet in another dimension, events are atemporal and intangible energies and potentialities that supersede singular or fixed modes of embodiment. The science and politics of immunity that operate in terms of protection of singularity and the management of boundaries between self and other are superseded by the assemblage of co-relational becoming.

In the immediate and conventional context of SCT procedures – in which the individuality of each person is taken for granted – the point is to restore the prospective recipient to the self who preceded illness and the specific biomedical procedure. In contrast, Deleuzian philosophy contests any notion of the individual 'occupation' of embodied life and promotes instead an appreciation that we are all inserted in a vitalist process without beginning or end (Braidotti 2006). In any case, what matters from the Deleuzian perspective is not whether the recipient re-establishes normative function over extended life years, or even secures ontological Well-being, but to what extent the process of living speaks to what Rosi Braidotti calls 'sustainability': 'The sustainability of these futures consists in their being able to mobilize, actualize and deploy cognitive, affective and collective forces which had not so far been activated … These forces concretize in actual, material relations and can thus constitute a network, web or rhizome of interconnection with others' (Braidotti 2010a: 413). The science and politics of immunity that operate in terms of the protection of singularity and the management of boundaries between self and other are superseded by the assemblage of rhizomatic becoming. The recipient and donor in such an assemblage are no longer positioned as self and other; both are components of an apersonal correlation of elements that reflects the materiality of the unseen and largely unacknowledged cellular chimerism that the biomedical procedures have intentionally mobilised. In addition to the predictable and desired changes that result from SCT, like the recovery of health, the overlooked transmutations effected by microchimerism must inevitably disorder existing corporeal boundaries. The authoritative discourse of conventional biomedicine that mirrors the modernist socio-political objective of maintaining the illusory singularity and integrity of the bounded self – a model that would thwart any move towards positive community – is contested by the very success of the intervention. The transfer of bone marrow between siblings is at very least a step towards realising new potentials of becoming other than as separate and distinct selves.

Research into the nature of microchimerism in organ and tissue transplantation – including bone marrow transplants and the projected use of stem cell therapy for neurological disorders – is driven by bioscience alone, but such procedures also constitute highly significant biopolitical objects. In effect, the *biological* ground that has reflected and sustained the biopolitical rhetoric of immunity, with its insistence on the distinct identities of self and other, is no longer viable. As both the postconventional humanities and bioscientific discourse increasingly acknowledge the plasticity of human embodiment, not simply in the context of established and future modifications of tissues or organs, but at the unseen cellular level, a new understanding of the inherent entanglement of corporeal materials is emerging. Multidisciplinary enquiry into transplantation suggests that rethinking the interweaving of microchimerism and an immuno-politics could mobilise an ethical challenge to the damaging rigidities of the self/other model of modernity and insist instead on the fundamental diversity, mutability and connectivity of all corporeality. As it becomes increasingly clear that the incidence of chimerism and microchimerism is a ubiquitous facet of embodiment rather than a strange exception,[19] we should seek to find new models of thinking human life, not as a collection of time-bound individuals each defending the autonomous self, but as a fluid, interactive and communal assemblage, operating in the wider context of dynamics ecosystems.

# CHAPTER SIX

# Genetic origins and surrogacy

This chapter explores the implications of micro-biology in some further socio-cultural and ethico-legal contexts, particularly as they relate to the destabilisation of genetic origins in the postgenomic era. As I have already shown, the claim that the genetic coding of each cell in the human body is both consistent across all cells and unique to one individual alone is decisively undermined first by the existence of the microbiome and then by the phenomenon of microchimerism. Both occurrences mark the presence of parallel but unassimilated genetic material – perhaps mere traces in the case of microchimerism – that is derived from genetically distinct organisms, either human or non-human. The undeniable outcome is that a significant number of cells in the same body code differently to the supposedly exclusive dominant DNA. Given that DNA is conventionally identified as the marker of a unique self, the phenomenon throws up all sorts of hitherto unaddressed questions about personal identity and the boundaries between human beings and other forms of life.

One primary focus in what follows is an investigation of the event of specifically maternal–foetal microchimerism with particular regard to surrogacy, and the question of whether our existing ethical and legal apparatus can adequately address the newly emerging concerns around the disruption of identity. The bioscience of maternal–foetal microchimerism has long been recognised, especially in regard to its possibly beneficial effects in terms of enhancing the body's range of immunological responses or to any potential harm in provoking autoimmune diseases, but little consideration has been given to its non-medical implications. However that controversy develops, I want once again to extend understanding by insisting on a multidisciplinary approach that refuses to privilege any one perspective. In short, it is important to consider the developing micro-biologistic dimensions of embodiment in general, and gestation in particular, without separating them from socio-cultural and ethico-legal effects. Once the diversity of

DNA coding in a singular body has been established, the boundaries of self and other, health and illness, and even life and death, are displaced. In the ethico-legal sphere, doubts about the singularity of DNA-determined identity impact the operation of criminal or immigration cases, transgender attribution, the operation of surrogacy laws, and the identification of legal parenthood and other relations of kinship. Nonetheless, biomedical, legal, philosophical and political discourses alike remain indebted to the supposed stability of identity, and the emerging micro-biology has yet to have significant impact on the relevant paradigms.

The context of my enquiry must start with the *Human Genome Project*, which officially got underway in the early 1990s. On reaching completion in 2003, it was claimed that the base pairs that make up human DNA had been exhaustively sequenced, thus identifying and accurately mapping 99.99 per cent of the genes of the human genome. For bioscientists and the lay public alike it was an exhilarating moment that promised new understandings of evolutionary history, molecular medicine, health and disease, the significance of mutations, as well as spin-offs such as forensic applications and the explanation, and even prediction, of deviant traits. That initial confidence that the genome would provide some determinate answers and indicate a biological base to many biosocial problems has since subsided in the light of new complexities, but reference to genetic make-up remains a powerful force in both the biological sciences and mainstream discourse. What is perhaps too easily forgotten – and certainly in its media manifestation – is that original *Human Genome Project* was conducted in a highly technical environment. The official website showed scant attention to any input from the humanities, and although the Ethical, Legal, and Social Implications (ELSI) program had a 5 per cent stake in the total budget and ran alongside the *HGP* for its duration, it was set up as a separate entity with an unclear mandate in terms of influence. In short, there is little clear evidence of integrated and mutually effective transdisciplinary thinking.

The hope is that the recent explosion of postgenomics signals a less blinkered approach that far from celebrating scientific ‘certainty’ and reductionism opens onto a time of destabilisation and contestation of authoritative discourses. Whenever research methodologies and disciplinary assemblages are fluid and provisional across both the humanities and postconventional life sciences, the advent of postgenomics signals the opportunity of reconfiguring what is meant by certain previously taken-for-granted categories such as health and disease, reproduction, or bodily anomaly. We need an approach where disciplines work together rather than in parallel, that understands the importance of the socio-political and environmental context and is committed to the intersectionality of multiple factors of difference across geography, race, gender, age and much else. The earlier push to sequence the human genome was never definitive, but it has delivered a certain continuity of interest in genetic factors that the postgenomic impetus can build on, as well as exposing some significant breaks. Microchimerism and the microbiome are central to my critical focus as I attempt to occupy that somewhat ambivalent space and open up a conversation between my own academic background in postconventional philosophy, the sometimes arcane complexities of legal theory, and the ever-surprising explanatory shifts in the critical life sciences. The rethinking of singular personhood and identity has especial relevance to surrogacy – a practice that has worldwide implications – but I want also to hold open the question of how the relations of visceral prostheses are entangled with postgenomic thought.

The attentive reader will by now be increasingly familiar both with the concept of the human microbiome which insistently disrupts the closed circuit of human exceptionalism and with the emergent theorisation of microchimerism that I outlined in detail in Chapter 3. The complex microbiomic community of bacterial, fungal, parasitical and viral components which probably outnumber strictly human cells indicates, at very least, that we are not individuals in the physiological sense but are instantiated as genetically diverse. There is no durable steady form of embodiment as each individual interacts both epigenetically with external environmental conditions and within the body where microbial ecosystems constantly adapt to the ever-changing physiology of the host. This is especially the case during pregnancy when changes to the body are at their most intense. Extensive evidence suggests not just co-existence but a high degree of mutual dependency and benefit between the dynamic differential systems, that is the active microbial viscera and the host body. It is, for example, well-established that gut microbia promote immune tolerance and influence a range of psychological states through their effect on neurotransmitters (Dinan and Cryan 2017). In short, host–microbial relationships are symbiotic (Lloyd-Price *et al* 2016: np) and constitute not singular organisms but holobionts. Human beings can no longer claim conventional individuality, biologically based on a singular genetic code, but figure instead a far more complex and ahuman uniqueness generated by the intra-actions of variable microbial communities.

At the same time, the distinctively human cells of the body cannot be identified as having a single heritable origin in the sex-specific gametes of the male and female parent but have other sources, both iatrogenic and natural, of which mutual maternal–foetal cell engraftment – which is crucial to a new understanding of surrogacy – is the best known. Bioscientific explanations are evolving and uncertain, but the implications for the conventional model of biologically distinct bodies – where each organism gives rise to a single genome – are transformatory. The hitherto unquestioned belief that individual human DNA is unvarying and persists over successive generations is no longer reliable. Chimeras disrupt the expectation of genetic uniformity and problematise the separation of self/non-self, as I will show in tracing some implications of human microchimerism in the field of reproduction. Once the concept of genomic multiplicity is established, the genetic basis for physical and cognitive development, health, disease and identity is all challenged, and it becomes difficult to predict the limits of human plasticity or the integrity of any category of organism. And that raises awkward questions equally for the biological sciences, biopolitics and ethico-legal thought which all remain rooted in a model of self/other conflict and human exceptionalism. In the global North, the stability of genetic identity is largely taken for granted, but on a pragmatic level, it may be that genetic testing as a decisive marker of biological 'truth' – for paternity or maternity, identification in criminal or immigration cases, and so on – will lose its rationale. The more disruptive scenario, however, is that the impact of postgenomic knowledge must eventually disorder the Western socio-cultural imaginary of the model of autonomous, self-complete individuality that precisely underpins our ethico-juridical systems. Before moving on to surrogacy I will consider some initially perplexing stories that have circulated in the popular media, as well as in bioscientific journals.

## Microchimerism and the law

The concept of microchimerism had little leverage before the late twentieth century, despite the first human case being reported in 1953 (Dunsford *et al*: 81) when a Mrs McK donated blood that was found to be of two different types. Her case was the first recorded incident of human microchimerism, though not in this instance from maternal–foetal cellular transfer, a form that was later recognised as ubiquitous. After much suspicion of false results, it was finally determined there must have been an *in utero* transfer of DNA between the female foetus and her twin brother, who had also been a live birth. The resulting female infant carried both her own original DNA *and* that of the dizygotic (non-identical) twin, thus creating a chimera. Mrs McK was simply a scientific puzzle – 'an experiment of surpassing interest' according to those who investigated – but some serious legal implications were at stake in the more recent case of Lydia Fairchild that I referred to in Chapter 3, where a similar explanation was eventually proposed. When her own DNA did not match that of her putative children, Fairchild was freed from the burden of criminalisation only when her lawyers learned of a previous US event of maternal microchimerism in which tests on the three sons of Karen Keegan, who needed a kin donor kidney transplant, revealed that two of them appeared to be genetically unrelated to their mother, although they were genetic brothers. The biomedical resolution of the mystery was of course that the mother displayed tetragametic chimerism (Wolinsky 2007), as also proved to be the explanation in Fairchild's case. That particular form of chimerism occurs when two zygotes fuse *in utero* undetected and go on to develop into a single body with two distinct sets of DNA. It is highly probable that, like Mrs McK, Fairchild and Keegan had both been conceived as a dizygotic twin, whose embryonic form had absorbed the other unsuspected twin. Far from being a rare phenomenon, current research indicates that tetragametic chimerism may develop quite commonly as a result of what is known as the vanishing twin syndrome in which a twin embryo may fuse with the other. There are suggestions that many pregnancies that deliver a singleton begin as unrecognised multiple gestations, and although one foetus disappears, its DNA does not.

At present, the prevalence of microchimerism remains unclear, but it is widely accepted that far from being transient as was first thought, it can persist for decades and probably for life (Maloney *et al* 1999; Kamper-Jørgensen *et al* 2014). And as the known causes multiply, the claim that it may be ubiquitous no longer seems so strange. The cases that claim our attention are unusual in the degree to which microchimerism is present in the body and it may be that lower levels have little effect, but either way there is cause for concern. Maternity and paternity testing for social and domestic legal purposes is becoming increasingly familiar, and, as with the Fairchild case, the presence of microchimerism in the body leaves open the possibility of miscarriages of justice or accusations of negligence. In cases of disputed negative DNA paternity testing, it usually transpires that the clinic or other site of testing has made an error or mixed up samples, but in the circumstances outlined by Sheets *et al* (2018), there was no procedural mistake. After repeated negative paternity results, microarray technology was utilised to show biological kinship between the putative father and new baby, which uncovered not the expected status of genetic father, but an avuncular (uncle/nephew) relationship. Further analysis revealed the man's status as being one of congenital tetragametic chimerism as a result of which he – like the women above – encompassed two distinct genomes with one presumed to have been that of an unborn male twin. His paternity was subsequently confirmed and the fertility clinic which he and his partner had used was exonerated of any claims of a misstep.[1]

The issue here is that although reported cases of microchimerism are rare, it does not mean that the condition itself is rare. It is more the case that because there are few tangible effects on health, there is little impetus to establish the actual prevalence. Maternity and paternity disputes are often emotionally loaded and personally stressful, but consider too how they can impact on public policy with regard to the cross-border migration of refugees and asylum seekers. For many such desperate people, the only hope of gaining leave to stay may be to establish a familial genetic link with residents of the countries to which they travel. DNA testing, which is increasingly becoming the technology of choice to settle contentious immigration claims in countries of the global North, is deployed not so much to legitimate claims to citizenship rights, as to facilitate exclusion and the denial of rights. Critiques of DNA testing are frequently voiced in legal theory, but although some mention may be made of microchimerism (Murdock 2008; Holland 2011) there is little sustained engagement. DNA validation is especially powerful in relation to family reunification cases where immigration policies may require proof of biological relatedness in the absence of convincing legal documentation (Lee and Voigt 2020), and there is no doubt that though most applicants do not benefit from it, some may.[2] The policy argument is that DNA can provide a reliable, objective, tamper-free and cost-efficient way of identifying kinship relations.[3] The validity of such tests is rarely questioned, even though, as Lee and Voigt point out, officials may yet override confirmatory biological 'evidence' in favour of socio-political conceptions of a family. What is especially worrying from a more sceptical bio-perspective is that the tests, which are usually simple buccal (inside cheek) swabs, can detect family mismatches but give no consideration to the possible presence of microchimerism. The point, which has particular significance to legal cases but remains largely unacknowledged, is that microchimerism is irregularly distributed throughout the body. Blood or buccal swab tests are relatively unobtrusive and cheap to administer, but the DNA obtained there may not match that of reproductive organs, for example, or other potential test sites. The overriding assumption in such circumstances is that a sample that fails to confirm genetic kinship is an indication of fraud, regardless of other substantiations of legitimate kinship relations. Political interests and bioscience meet in a symbolic clash where the immunitary boundaries of the State are closed against the blurring of distinctions.

Justice is hard to achieve with the best knowledge, the more so if one conceivably significant input is casually overlooked. If chimerism occurs more frequently than is generally acknowledged then it raises some urgent questions. The conventional reliance on DNA in both social and legal contexts would warrant serious reconsideration, and the possible fallibility of identification 'could undermine the very basis of the forensic DNA system' (Krimsky and Simoncelli 2010). The issue has long been rehearsed in popular TV series such as *House*, *CSI* and *Grey's Anatomy* with previously undiscovered microchimerism providing the dénoument, but that speculative approach finds justification in even the gravest real-life legal proceedings. A case in point, reported by the Alaska State Scientific Crime Detection Laboratory, has direct implications for criminal law. Following a serious sexual assault, semen collected at the crime scene was shown to match the DNA of a blood sample from a man already in the police database. The puzzle was that he was incarcerated in prison at the time of the attack and could not have been responsible. It subsequently transpired that his brother, who had been a sibling bone marrow donor for the original suspect shared an identical *blood* DNA profile – though a buccal swab showed up a different DNA profile – was the actual attacker. This case highlights a small but significant risk that potential donors and recipients of bone marrow – or indeed any transplanted organ – take in having their DNA profile being registered in a police database if the other commits a crime (Aldous 2005).[4]

The possibilities of misidentification as the perpetrator of a crime, or alternately of being wrongly exonerated in the event of a criminal act, should be of concern, and the assumption made by Kaye (2013) that because such cases are exceptional, they present no obstacle to legal practice seems wilfully complacent. There can be no absolute guarantee that the forensic evidence collected will always correspond with the material commonly tested in suspects. In a case of microchimerism – which is unpredictable in its occurrence – it is plausible that the DNA profile of semen might differ from that of blood or skin cells. Even were the investigating authorities to rigorously test both buccal swab and blood samples, there is still a possibility that they would not deliver certainty. Similar problems emerge in many other situations – such as the identification of dead bodies, child custody disputes and sex determination – where a singular genome is assumed. I am not suggesting that doubt should be shed on all DNA identification, but where there is no corroborating evidence and strong denial, it should not be beyond the remit of the state to investigate the possibility of microchimerism. On a more abstract basis, what the cited cases of genetic translocation indicate is both that genetic markers may be complex and multiple, and that the permeability of borders necessitates a new appreciation of intracorporeal malleability. As the authoritative voice of biology wavers, the Western socio-cultural imaginary of a pure, integrated and stable identity established at birth and fixed until death begins to fall apart.

## Entangled maternal/foetal cells and surrogacy

I want now to look more closely at maternal–foetal microchimerism and its specific impact on full surrogacy where the issue of genetic origins is given high significance.[5] Let us first revisit the problematic of pregnancy where the well-established operation of microchimerism underlines the slow shift from the notion of determinate and distinct corporeal boundaries to permeable and leaky bodies. Until relatively recently, the conventional view has been that even maternal and foetal bodies operate as immunologically discrete entities – effectively self and other – rather than as mutually accommodating and entangled. Although the placenta itself has long been recognised as a site of material exchanges between mother and foetus, with oxygen, nutrients and hormones passing in one direction, and products of excretion in the other, it was primarily thought of as a protective barrier keeping apart the distinct nature of maternal body and her conceptus. And it is precisely that supposed distinction that has justified some biopolitically driven interventions into pregnant women's lives, particularly in the context of abortion politics and surrogacy, for example. For immunologists, the puzzle has been why a healthy pregnancy – as a self/other interface interior to the body – does not normally provoke the expected immune response of mutual rejection. Substantial research has now shown beyond doubt that far from functioning as a defensive cordon separating one entity from another, the placental barrier is crossed by both foetal and maternal DNA, without obvious pathological effect, to produce, as a matter of course, signs of microchimerism within each body. To date, the research is usually conducted, for ease of assay, by tracing the incidence of – conventionally out of place – Y-coded (male) cells within the female body, but microchimeric exchanges are to be expected whatever the gender of the foetus.

This paradoxical observation of the active circulation of maternal and foetal cells in the body of the other was long dismissed as a phenomenon of very short duration that was insignificant in terms of ongoing health. It has now been shown, however, that far from being ephemeral, divergent maternal and foetal DNA can remain in the mother or offspring's body for decades after pregnancy (Maloney *et al* 1999; Bianchi and Zickwolf 1996). A further possibility is that the chimeric relationship between mother and child could encompass the translocation of human leucocyte antigens (HLAs) deriving from a *previous* male pregnancy in which foetal markers (effectively traced as XY) had entered the maternal body and continued to circulate in the peripheral blood supply. Any subsequent female offspring of the same mother could then carry non-self-coded HLA, not from her own period of gestation, but from the presence of an older male sibling's cells in the maternal body (Guettier *et al* 2005; Yan *et al* 2005). The unexpected discovery that women who have *never* been pregnant, nor had any history of bone marrow or organ transplants, can carry male DNA (Yan *et al* 2005) – that is, their XX sex chromosomes are supplemented by XY cells – clearly indicates that microchimerism may result from the cellular exchanges between previous generations. For example, any male DNA circulating in my own body may originate from a great uncle whose gestation period preceded that of his sister (my grandmother). She in turn passed on XY cells to any subsequent female foetuses of her own, including my mother, setting up an intergenerational cycle of microchimerism. In short, each of us – regardless of past or present pregnancy status – may carry non-self cells from a variety of genetic relations, and there is at least a strong suggestion that microchimerism – if it can be detected at all ages – can persist without time limits. Such a radical challenge to one of biomedicine's central tenets – the immunological distinction between self and other – deeply undermines the plausibility of genetic purity.

The occurrence of microchimerism has thrown up competing claims with regard to maternal or foetal/infant health status, which I mention again because the implications extend not just to genetic parents but also to surrogates. As I outlined, the recognition that embryonic *stem cells* – often harvested from placental cord blood – can repair and regenerate damaged tissue or bone is by now widely familiar, but at the same time intercorporeal cellular motility has also been marked as a possible trigger for many unexplained autoimmune diseases – such as psoriasis, lupus, thyroiditis – where the immune system appears to misrecognise the self. The debate between proponents for either a beneficial or pathological effect of microchimerism throws light on the persistent nature of the self/non-self paradigm of human health, but what is striking about most of the research is the tenacity of metaphors that pitch the relation between the different cell lines as though they represented two distinct states of personified embodiment. Lee Nelson, for example, who has long been at the heart of the scientific debate, is also engaged in the popular understanding of science, and her provocative article for *Scientific American* (2008) displays a plethora of metaphors revealing the changing 'status' of microchimeric cells. She variously calls them interlopers, undesirable aliens, masqueraders, stowaways, migrants, two-way traffic, emigrées, adopted cells and seeds that take root. Regardless of decades of feminist research that has stressed the phenomenological relationality – the simultaneity of the one and the two – of a gestational mother and foetus (Young 1984; Diprose 1994; Dolezal 2017), the association is still framed, at best, as that of separate entities and, at worst, as oppositional.

It is not that an erasure of difference is called for, but rather a recognition that mother and foetus, and later mother and child, are mutually entangled at multiple levels. As I have demonstrated, the bioscience of microchimerism is not about the hybrid assimilation – and hence disappearance – of 'alien' cells, but about their coterminous existence within the host's body. Like the microbia of the microbiome, they play an active part in conjoint development and problematise the assumption that self and other are distinct. It makes little sense, then, to characterise foetal and maternal microchimeric cells as out of place, as though they 'belong' to an original location; yet, sociocultural normativities persist. Such personalising allusions are particularly evident in the harm/benefit debate where the linkage of microchimerism to both regeneration and disease has caught the interest of evolutionary biologists who slip easily into positing the maternal and foetal entities as figures in a modernist scenario each acting in their own interests. The strengthening of immune tolerance through exposure to 'foreign' antigens is generally taken to enhance future reproductive success in both mother and offspring, but typically Amy Boddy *et al* (2015) refer to foetal microchimerism as *manipulating* maternal tissues. More specifically, David Haig (2014) suggests that foetal cells in mothers' bodies advance their own interests by promoting lactogenesis or by extending the interbirth interval, and that maternal cells in foetal bodies might suppress sibling rivalry. One intriguing lay example of the appeal to liberal individualism comes on the website of a surrogacy agency in the United States which advises potential gestational mothers that being a surrogate can increase their life expectancy. Explaining that surrogate mothers carrying a male foetus were likely to host Y chromosomes for life, it claims: 'Over 80% of women with the chromosome lived until the age of 80, while just over 65% of those without … lived an equal amount of time' (*Physician's Surrogacy*). The statistics may be dubious, but the message is clear: surrogacy is good for you because microchimerism confers *individual* benefit.

In the more prudent measured realms of clinical research, the debate about the nature and effects of intracorporeal cell mobility may remain unresolved, but the simple observation that microchimeric exchanges during pregnancy have biological effects for both mother and foetus that exceed the period of gestation, birth and neonatality have implications beyond bioscience alone. At very least that realisation calls for enquiry into the bioethical and legal dimensions of gestation. If it is the case that in a normal pregnancy, the maternal and foetal bodies incorporate differential and long-lasting populations of potentially active non-inherited antigens, then there is much that needs to be rethought. The very existence of microchimerism and the likelihood that it is omnipresent radically contest any Western-based notion that my status as an autonomous entity can be verified because each cell in my body carries the same unique genetic code. As Aryn Martin (2007) puts it, existential individuality is taken to be prefaced on genetic essentialism, but when this can no longer be asserted biologically, how can we understand kinship claims based on DNA identification? Once there is an awareness that the event of pregnancy has a temporal resonance beyond the nine-month conjunction of maternal and foetal selves, the ongoing split between the supposed pathological or beneficial effects that microchimerism might have on health takes on a different significance. Questions concerning what it means for either mother or child to carry within themselves allogenetic antigens[6] – do they persist after birth, are they tolerated by the host body or simply unrecognised? are the future effects neutral, benign or harmful? does the ageing of maternal cells in the bodies of progeny pose any risk? – are relevant to all gestational mothers whether or not they have a prior genetic relation. Such concerns initially operate within a biomedical problematic, but they raise serious concerns about the adequacy of conventional ethical and legal approaches to the relationship between 'natural' mothers, surrogates and their foetuses.

For the most part, the issue of surrogacy has been largely investigated through a human rights perspective that is both necessary *and* insufficient. Although there are arguments that support surrogacy as women taking control of their own bodies (van Zyl and van Niekerk 2000), there are undoubtedly many instances of exploitation, particularly in relation to commercial gestational surrogacy where the additional risks to the carrying mother of multiple implantations are well-recognised. In biolegal studies, the emphasis is often on contract law, starting with the much-analysed case of Baby M through to more recent instances such as that of Baby Gammy.[7] Both raised serious ethical issues, largely related to the operation of commercial rather than private surrogacy, though my own concerns which I shall outline shortly apply to both. Reproductive tourism is big business (Deonandan 2015), although the issues experienced in the Indian subcontinent and Southeast Asia have largely moved elsewhere.[8] Across both pro- or anti-surrogacy positions, and regardless of whether the emphasis is on the surrogate or on the intending parents, the arguments employed are most often based in the notion of autonomous rights-bearing individuals whose interests may or may not conflict (Sifris 2015). Specifically feminist commentary has tended to be more reflective of issues such as affect, responsibility and relationship (Dolezal 2017) and is wary of fitting surrogacy into an existing ethico-legal framework that takes little account of the technological changes that have supported the practice; yet, postgenomic thinking plays little part. Kalindi Vora (2015) does move in that direction and has persuasively set out the grounds on which gestational surrogacy is putatively divorced from genetic, affective and legal parenthood – particularly with respect to the Indian subcontinent – but although she gestures towards the phenomenon of microchimerism, she does not follow through the implications.

Before addressing that aspect more directly, it is important to note that in the context of global neoliberalism, where exercising reproductive choice can entail paying another woman to undergo a proxy pregnancy, the racialised, colonialist and gendered imbalances of power are all too evident. It is effectively a case of one individual using the body of the other as a prosthetic aid. As Sam Opondo notes – although he is more concerned with other tissues and whole organs – 'ethical questions about the consumption of bodies and body parts are at the core of questions about cohabitation, humanity, community, and the *politics of life itself*' (2015: 120). The ways in which those with power and access can take possession of the biomaterials of more economically and politically vulnerable groups demonstrate again that the biomedical technologies of the global North have no difficulty in temporarily erasing differences for utilitarian ends that benefit the clients of wealthy nations.[9] What may appear as a gesture towards community – the sharing of resources – is no such thing but simply the prelude to a 'neutralizing appropriation' (Opondo 118). Opondo mentions surrogacy merely in passing, but his gloss of Esposito makes clear that it is all of a piece with other forms of the traffic in bodies and biomaterials.[10] Once a transaction is operationalised, immunity is reconstructed and returns the dominant individuals to themselves 'relieving them of obligation toward the other and enclosing them once again in the shell of their own subjectivity' (Esposito 2011: 11). The issue is that some lives and ways of relating to others are expendable, while the biomaterials they supply – whether in the form of solid organs, tissues, stem cells, oocytes, gametes, immortal cell lines or wombs – remain necessary elements for a range of lifesaving, life-extending and life-making technologies. Whatever the participants tell themselves, the transactions are rarely ones of equal exchange that benefit all, but the relegation of some bodies into visceral prostheses for others.

All such considerations should generate close bioethical scrutiny which must take into account the changed technological possibilities of reproduction, the blurring of the boundaries between natural and assisted gestation, and a rethinking of the meanings of kinship. If solid organ transplantation raises the somatechnical question of kin relations, then all the more so does gestational surrogacy. Going further, I want to bring the argument back to the micro-biology of the disordered genetic links figured by microchimerism and to some extent – though it is less prominent in the surrogacy context – by the microbiome. The problematic has so far received very little attention but is at its most acute in the work of a small number of feminist scholars such as Sonja van Wichelen (2016) and Jenny Payne (2016) who have recognised that microchimerism sheds a very different light – both biologically and biolegally – on the process and relations of surrogacy. Although we might well need to rethink the responsibility that exists between *any* pregnant woman or genetic parent and her child, the phenomenon of microchimerism throws up particular issues for a full gestational surrogate, who supposedly has no genetic links with the foetus she carries. Surrogacy already provokes legal and ethical conflicts over who is entitled to be recognised as the mother, but until now the issue has devolved on what value to give genetic and gestational links when the two are seemingly opposed. Whether the process is altruistic or commercial, the general Western expectation is that although the birth mother may be the temporarily recognised legal mother, the commissioning genetic parents may establish claim to the infant once it is born, and that ideally the surrogate should forego any emotional attachment to the foetus. An initial reliance on the enforceability of the contractual relationship between the surrogate and the intending parents was always shaky, as the case of Baby M demonstrated, but courts have repeated awarded custody to the would-be parents on the grounds of the infant's best interests.

Infants do, of course, inherit major aspects of their genetic parents' DNA profile, but there is much else that disrupts the teleology of successive generations passing down definitive genes. The simple heredity mix of chromosomes from one male and one female progenitor is just one aspect of the genetic constitution of their offspring. What has been habitually overlooked is that new biosocial understandings of epigenetics,[11] and more recently microchimerism, might demand a radical rethinking of the relation between a gestational surrogate, and the developing foetus and subsequent child. And although infants are not born with a genetically predetermined microbiome, that too is of some significance in its gradual build-up during both pre- and post-birth periods. The placenta itself is a low-abundance microbiomic tissue (Aagaard *et al* 2014) and at birth the neonate passes through the gestational mother's vaginal canal gathering microflora that are essential for infant development (Mueller *et al* 2015). In all those biological processes, the period of gestation and birth clearly contribute much more than a nurturing environment and will persistently impact on the child, and in the case of microchimerism on the birth mother as well. Both epigenetic changes to the expression of genes – which it is now accepted can be heritable – and the exchange across the placenta of differential non-inherited DNA encapsulated in cellular material indicate that foetal and maternal bodies have significant and enduring links post birth that may emerge in multiple contexts of genetic identity, gene expression, and lifelong health and disease. What, then, does it signify, ethically and legally, when a surrogate mother asserts the permanency of her relation to the neonate?

As a further complication, the probability of intergenerational microchimerism indicates that the DNA of more distant kin than the mother will circulate in the foetal body. At very least, a pregnant woman may carry her own mother's non-inheritable cells and most likely those of prior generations. As a result, the new-born infant will have some genetic markers in common with any body that had previously contributed to the birth mother's own microchimeric status. It is also likely that the foetal transmission of microchimerism *in utero* might tie the intending parents – if they are the source of the gametes – into a complex biological relationship with the gestational mother as well as with the foetus. Far from being a matter of legal negotiation in which one party provides a prosthetic womb for the other without necessarily establishing longer-lasting bonds, surrogacy begins to resemble an assemblage between the birth mother, foetus and biological parents. The exchange of visceral prostheses at the level of microchimeric cells has the potential to radically re-order normative expectations. Leaving aside for a moment the existential questions, who then is ethically and legally responsible for the possible diffusion of states of ill-health, congenital anomalies or susceptibility to disease? It is not that such issues are commonly coming to light, but in the context of a highly imperfect understanding of the prevalence and degree of microchimerism, they cannot be dismissed as having no significance.

To date, none of these questions have been substantially addressed in a juridical context. The closest indicator – and it advances relatively little insight – is an Irish case of disputed motherhood in which the issue of the epigenetic input of the gestational surrogate was aired in court. Court proceedings indicate that the genetic parents of twin babies – supported by the surrogate who was the sister of the genetic mother – applied to Dublin High Court to reverse the refusal of the Registrar General to register the intending parent as the mother despite the agreement of the three adults involved. At that time, and still as I write in 2020, Ireland had no specific laws relating to surrogacy so any judgement sets a precedent. In the case of *R. v. An tArd Chlaraitheoir* (2013), Abbott J. considered the customary legal principle of *mater semper certa est* and heard evidence from experts in epigenetic biology, the majority of whom agreed that *gestation* conferred an unbreakable epigenetic link that justified the nomination of motherhood, even if that posited more than one mother. Nonetheless, Abbott J. rejected the Registrar General's acknowledged reliance on the common law maxim of *mater semper certa est* and found in favour of the intending parents. Regarding the epigenetic elements, he ruled that 'the influence of such epigenetic occurrences is not of such significance as to alter the overriding significance of chromosomal DNA for the purpose of determining identity and inherited characteristics', adding that he considered it unlikely that the '*deterministic* quality of chromosomal DNA' would ever be trumped. The case was subsequently appealed by the State on the grounds that the judgement had not placed 'appropriate weight on the biological role of the gestational mother'. The Supreme Court duly overruled the argument that genetic links conferred primacy and reinstated the surrogate as the reluctant legal mother. It did not, however, cite the epigenetic – still less microchimeric – evidence as a reason for the reversal, simply saying that any change in the customary approach was a matter for the legislature not the courts.

Although the biological evidence in this specific case focused on epigenetics, microchimerism – as the bidirectional placental transfer of cells between foetus and gestational mother – was raised by one expert witness, Dr Molony, although she asserted that it 'does not change the core DNA of the child'. Her testimony may reflect an everyday understanding, but it relies on agreement as to what constitutes 'core DNA'. In any case, there is manifold evidence that microchimerism in the peripheral blood supply may change to macrochimerism in specific organs, as happened in the Fairchild case. Dr Molony effectively made little distinction between epigenetic changes and microchimerism and asserted that neither had irreversible effects. In his judgement, Abbott J. accepted her evidence and opined:

> Even where the epigenetic influences are endogenous to the mother, (such as the migration of cells including microchimeric cells from the mother's body to the body of the foetus) … [they] are not such as to interfere with the inheritable characteristics of the child and are *capable of treatment or correction* if understood. In the case of microchimeric cells, at least, it was conceded by one scientific expert that they were … 'red herrings' in the genetic scenario.
>
> (*R. v. AtC.* 98 (3), *my emphasis*)

Contemporary bioscience disagrees; both epigenetics and microchimerism have life-long and heritable genetic effects. What were dismissed as merely 'interesting' phenomena have the potential to force a rethinking of gestational surrogacy. As one of the Irish Supreme Court judges recognised, there is a serious disjunct between the potential of bioscientific developments and the state of the law that is called on to mediate in cases of dispute. The Supreme Court left no doubt that statute law concerning reproduction was outdated, but my contention is that far more than simple adjustments need to be made. On the level of both law and bioethics, it is surely incumbent to recognise that recourse to normative categories such as motherhood or genetic determinacy is inadequate. The role, value and lasting influence of gestational motherhood demand radical reappraisal, not simply because socio-cultural views change, but because biology itself cannot provide the static and certain grounding in genetics that it has hitherto seemed to offer.

On an affective level, it is likely that the emotional detachment that surrogate mothers are expected to perform would be considerably more burdensome should the extent of their enduring material connection to the child be more widely known. No purely contractual arrangement of the type still offered by countless surrogacy agencies could take proper account of the biological, genetic, psycho-social, ethical and legal issues involved. At the present time, few legal theorists are addressing the issue of microchimerism, or even epigenetics, and of those who do, there is a pronounced tendency to read the problematic through the lens of conventional bioethics and law. If, as now seems clear, surrogate mothers not only exchange genetic material with their foetuses but through intergenerational transmission are opened up to DNA and HLA templates of the genetic parents, then the standard surrogate contract and issues of consent on both sides become very unstable. Given that the bulk of bioscientific research into the significance of microchimerism has focused on the balance between its beneficial and pathological effects, it is surprising that it has not been explored in relation to surrogacy. The arena of DOHaD (Developmental Origins of Health and Disease) has developed an existing literature that identifies pregnancies involving Assisted Reproduction as signalling a greater likelihood of ill-health in subsequent offspring, but its more radical concerns extend no further than exploring the complexity of epigenetic imprinting. As with the biolegal approach, microchimerism itself is scarcely mentioned though it could be of considerable importance to the mix of influences that DOHaD analyses. For now, the best that is possible is to extrapolate some likely responses.

In the current emphasis placed by DOHaD scholars on the function of the placenta as a vital, yet temporary organ that has consequences throughout life, the focus is resolutely on what can go wrong.[12] Genetically the placenta comprises a mix of foetal and maternal tissues with the former supplying by far the greatest part giving substance to many traditional and non-Western beliefs that it is a twin to the developing embryo. In modern medicine postpartum placental material is treated as clinical waste, or even a biohazard, but decolonial knowledge has taken a very different approach, treating the organ as a highly valued living entity in its own right, and as part of a biocultural ecosystem. In their seminal study, Young and Benyshek (2010) investigated practices in over 170 different cultures – ranging across every habitable continent – and found that the dominant practices in traditional societies were highly concerned with following the correct rituals in the disposal of the placenta after birth. As many other anthropological studies have confirmed, a significant number believed that the organ was a child's kin – sometimes a twin, but also a mother or grandmother or some other form of protector (Gonzales 2012). Unlike the Westernised approach that favoured incineration of unhygienic material, the safe and respectful burial of the placenta was believed to ensure the child's and the mother's future good health. In Maori culture the term for placenta is the same as that for earth – *whenua* – and burial was seen as an act of significance for the whole community. I mention these traditional practices precisely to offset the production of biomedical knowledge in the global

North which both historically and in contemporary times has undervalued the enduring influence of the placenta. The translocation of microchimeric cellular material – which clearly does have lasting effects – ties in much more comfortably with traditional beliefs than bioscience is willing to acknowledge. DOHaD has promoted a new concentration on the placenta, but that can still engage with a supposedly conflictual relationship pre-birth. As one science journalist puts it, 'evolutionary biologists now describe [the interaction between mother and fetus] in terms of conflict. The placenta plays for Team Fetus. And when it doesn't perform as it should, it can wreak many forms of havoc' (Blei 2019).

DOHaD can in all cases be critiqued for its concentration on *ill-health* and disease with little recognition that certain changes could be protective or enhancing. And, moreover, as Ismaili M'Hamdi *et al* comment, 'careless interpretations of DOHaD and epigenetic research findings are at risk of unfairly targeting mothers as being primarily responsible for the health of their children' (2018: 59). His point is that epigenetic effects may arise from a mix of endogenous and exogenous biological effects, and without denying individual parental responsibility, he highlights the influence of a range of social and political inequities around poverty, race, education and so on. I would critique the notion of individual responsibility *per se* with its implicit stress on the notion of autonomous choice, but such work is a welcome reminder that the potential penalisation of mothers by either social policy or statute on grounds of potential foetal harm should not be taken lightly. Similarly, Isabel Karpin explicitly references epigenetics and draws attention to 'the medico-legal impetus to target women as modifiable conduits of intergenerational harms who can be schooled to implement precautionary strategies to avoid those future harms' (2016: 141). Again, I would stress that epigenetic and microchimeric changes are not simply operative in the prenatal period but in the *pregestational* context too,[13] which implicates all parents, including gestational surrogates *and* genetic fathers (Bianco-Miotto *et al* 2017). The calls to monitor mothers are loud and clear but belong to a strictly modernist understanding of responsibility.

The bioethical frameworks typically associated with what was once called maternal–child health are deeply unproblematised, and uncritically rely on notions such as reproductive autonomy and its off-shoot, informed consent and the principle of non-maleficence. The canonical and much reprinted text *Principles of Biomedical Ethics* (Beauchamp and Childress 1985) still sets the disembodied pedagogical tone, and it seems that most legislation is similarly ill-matched to the realities of the twenty-first-century bioscience. In a recent DOHaD paper, Roy *et al* (2017) argue that the consequences of AR disrupting 'normal' genomic imprinting demand a painstaking evaluation of the balance between satisfying parental autonomy in the desire to use AR and preventing the potential of epigenetic harm to subsequent children, which I take to mean presumably negative effects on the immune system, brain function, metabolism and so on. For Roy the issue amounts to whether there 'could be a convincing and ethically coherent argument for restricting access to ART, and if so, to what extent' (2017: 437). In another vein, if contracts are to be enforceable, it sounds sensible that all parties to a surrogacy arrangement *should* be enabled to make informed choices through the provision of information about the epigenetic and microchimeric dimensions of the maternal–foetal relationship. Fischbach and Loike, for example, recommend that 'a suitable and heuristic framework must be established to protect all parties involved without extinguishing the cooperation of the surrogate and the hopes and dreams of the expectant couple' (2014: 36). Conventional ethics or law cannot be entirely superseded, but, nonetheless, I see such approaches as entirely inadequate in their desire to find categorical certainty and predictability in issues that are themselves intrinsically indeterminate. It is not simply that the bioscience is still developing and is as yet poorly understood, and that in time there will be definitive answers, but that biology is chaos. We can no more read off new biology than old. How then could we begin to think differently?

## Post-individual corporeal philosophy

Once we begin to think of pregnancy as a phenomenological state that figures neither singularity nor duality, but irreducible connection, the reciprocal, embodied and feminist ethics associated with Rosalyn Diprose points to one way forward. As I outlined in Chapter 2 in relation to transplantation, Diprose (2002) has taken off from the work of Derrida and others on the concept of the gift to develop the term 'corporeal generosity'. It intends a bodily coming together in which giving and receiving are not the acts of existing agents but what generates our being in the world. Diprose addresses surrogacy directly and points out that contract, if one exists, 'effectively constitutes the uniform, intentional, linear transmission, through objective time and space, of a corporeal unit originating in one atomized, static individual and arriving in another' (2002: 48). Her overall thesis is that human life is contingent on multifarious openings to other lives that in turn invoke a fluid array of interlinked relations that undermine the concept of an atomistic self; what surrogacy agreements figure in contrast is a reduction in the ambiguity of bodily connectedness. In Diprose's view, the standard – often feminist – objections to surrogacy as breaching human rights and as coercive miss the point. Rather, beyond the law, the practice could be reconceived as one form of corporeal generosity, which though risky to the integrity of bodies is conducive to opening up new possibilities. In any case, if integrity is understood as the completion and closure of individual bodies, then that can only refer to the modernist illusion of embodiment that has long since lost its certainty, both theoretically and practically, not least through an array of biotechnologies such as those that enable assisted reproduction in its many forms. The contemporary bodies of socio-politics and of bioscience alike are no longer singular, and Diprose's philosophical challenge to the feasibility of the normatively entrenched biomedical and legal narratives of a constant and autonomous self opens on to a more adequate perspective.

In her focus on surrogacy, Diprose has surprisingly little to say about the corporeal generosity of reproduction more generally and makes no mention of either chimerism or epigenetics, but in subsequent work Myra Hird (2007) extends the notion of the 'affective material offering of our body to the other' (Diprose 2002: 191) to the specific relations of pregnancy. She proposes that as well as the transfer of inherited parental DNA, there is a variety of materials such as viruses, antibodies, nutrients, bacteria, biochemical substances and other *cellular* material in transit between maternal and foetal bodies, all of which could be characterised as instances of 'corporeal generosity'. Hird's account is manifestly focused on the dimensions of inter*human* transfer, but it is apparent that such multifaceted transmissions clearly involve components of many other non-human entities that have since become more familiar through research into the microbiome. Surprisingly, Hird does not explore the issue that the microchimerism of pregnancy is bidirectional, but like Diprose, she is insistent that all such embodied gifting is irregular and potentially disruptive in reproduction as elsewhere. She concurs with Donna Haraway that genetic inheritance is in any case far from definitive and approvingly references the latter's observation: 'Short of cloning … neither parent is continued in the child, who is a randomly reassembled genetic package projected into the next generation' (Haraway 1989a: 352). Where bioscience considers the potential of both beneficial and harmful consequences in maternal–foetal microchimerism, corporeal generosity goes beyond binary thinking. What is made clear is that neither corporeal generosity nor chimerism implies any form of assimilation or merging where a new *singular* form materialises; instead, bodies and micro-parts of bodies are conjoined in their irreducible difference. Just as the geep is capable of giving birth to either a lamb or a kid, the significant issue is that chimerism overcomes the immunological interval between self and other without transcending 'difference in itself' (Deleuze 1994). The ethical and juridical task is to recognise the implications of such co-extensive existence.

In place of an identitarian impetus (richly illustrated in the belief in a singular genome), the issue is one of thinking in terms of post-individuality and recognising an ontology that encompasses the one in the other. I have already traced how a postconventional Deleuzian philosophy provides grounds for engaging with microchimerism in general terms, and now, more specifically, it can throw new light on some of the troubling aspects of pregnancy and maternity which are so entangled with post-genomic thought. The move that I am suggesting, away from the familiar paradigm of 'self-versus-other' that is still the dominant model in mainstream bioscientific thought and the law, reflects an understanding of all life as constitutively chimeric. The fixity of singular 'being' gives way to fluid and heterogeneous networks of connection that far exceed individual identity. That notion of what are effectively assemblages facilitates recognition of the biological, socio-political, cultural and bioethical complexities of postgenomic modes of life and I propose that the specific arena of gestational surrogacy could be thought through a similar analysis. As many feminist scholars have suggested, the biosocial assemblages of contemporary times and their rhizomatic offshoots compel new ways of thinking about kinship and that includes moving beyond what Sophie Lewis calls 'unitary maternal authenticity' (2017: 120). The point is to appreciate multiple and entangled sites of motherhood rather than allotting the status to one woman alone. Equally, it should be recognised that the models of parenting prevalent in the global North are often inherently at odds with non-Western patterns of thought and practice around reproduction, and as Amrita Pande's research (2009) in the Indian context shows, non-Westernised women who act as gestational surrogates may express their links to the foetus in ways I have not touched on here. What does seem common across cultures is that surrogacy is a highly complex biological and phenomenological experience.

In the end, biology, philosophy and sociology all contribute to understanding the assemblage, and I want to stress again that despite my extensive referencing of the processes at work in microchimerism, the biosciences – like politics, ethics and the law – offer no objective truths, but are impermanent discourses. Their insights, however, cannot be ignored or sequestered from socio-political issues. On a theoretical level, the emerging importance of biophilosophy which is responding to and thinking through the implications of the materialities of transformed life should be matched by similar moves in the legal field. The fluid and dynamic interplay between genetically distinct cells in a single body, and particularly the entanglements between mother and foetus, raises the question of how a postgenomic knowledge could be implemented. The task ahead, then, is to build on the hitherto marginalised network of relations, interconnections, assemblages that are being uncovered in the realm of reproduction and maternity and reimagine the concept of living beyond singularity. The problematic of surrogacy, which so often has revolved around the limited question of competing rights, demonstrates how bringing material processes and technologies together with theoretical perspectives can open up radically new approaches. If ethics and law are to exceed present normative structures, we need to think the bioethical and juridical conditions not of individual and distinct existences but of an endlessly proliferating chimerical co-existence.

## SECTION THREE

# Towards posthuman embodiment

The substance of *Visceral Prostheses* and the investigation of disparate processes of augmentation, substitution and transformation have resolutely focused on what we know or can surmise of human bodies, albeit with a constant reminder that the human individual is never less than constitutively entangled with other bodies, other species and an array of biotechnologies that may more or less resemble life but are ultimately inorganic. The mode of somatechnics is not confined by human interests alone but encompasses many other forms of living and non/living materiality. In this final section, I want to pull together more clearly some of the threads that strongly suggest that a more appropriate way of referring to our own species would be through the use of implied scare quotes as *'humans'*. Any development of that nomination is concerned with the deconstruction of anthropocentric forms of knowledge not just in relation to other elements of the non/living world but more locally in the critique of ethnic, sexual, gendered, racial, colonial and ableist hierarchies that label some as less human than others. The fantasies of the transhuman and posthuman alike take as their reference point a supposedly unified category which bears little relation to lived realities. With that caution always in mind, I will continue to use the term posthuman embodiment as an imperfect aspiration but one that continues to do a lot of work in progressing the task of thinking differently. If the human no longer exists as such but only as prosthetically constituted, how might we understand matters of temporality, life and death, and what kind of ethics might be invoked to answer the question of how we should live?

In the final two chapters my exploration of these concerns relies less on an empirical teasing out of new forms of knowledge and more on a radically conceptual and speculative approach, though the differing perspectives can never stand entirely alone. In thinking through the meaning of life and death in the varying contexts of organic and inorganic, natural and artificial, and interior and exterior prostheses, it becomes apparent that the dis-integration of the body raises questions about our most familiar notion of time as a teleological progression from one point to another. The notion of the human life span – the inescapable arc that begins in birth and ends in death – resonates strongly with the modernist move to put the sovereign individual at the centre of attention, but it begins to falter once we think in terms of impermanent assemblages. If posthuman embodiment includes technological materials and even insubstantial digital elements, as do many disability prostheses for example, then what exactly constitutes the moment of death? If organs can be transferred from deceased donors, or non-self cells transmitted over successive generations, is death an end? If the myriad organisms of the microbiome are both entangled with and distinct from their putative human host, where does life reside? Many other theorists have tackled the question of whether highly sophisticated, rational and affective robots will in the near future be seen as in effect living beings but that is not an issue I want to address here. What interests me is not that some constructed entity may have 'a life of its own'; rather, it is precisely the interdependence of each element in a posthuman assemblage that is the focus of my enquiry.

As human beings we are the current thinkers of a futurity in which our own species is considerably reduced in significance and possible power. Proponents of technological singularity posit a hypothetical event horizon beyond which human intelligence and physical abilities become irrelevant, or in a best case scenario are uploaded in digital form while retaining consciousness.[1] While such a scenario clearly raises perplexing philosophical and ethical questions, it is not of the order that I understand as posthuman which is concerned not with supercognition and strength but with affect, commensuality and mutual dependencies. It devolves on a new psycho-socio-cultural imaginary in which the human is not destroyed or made entirely redundant but reconceived as one among many. As I have suggested throughout, the ethics of modernity are ill-equipped in the face of contemporary biotechnological transformations in the meaning of embodiment to offer any guide into living well and flourishing. Both transhumanism and posthumanism throw up previously unthought paradoxes and dilemmas which require a new approach to thinking bioethically.

My concluding speculations cannot pretend to arrive at any determinate models, and nor should they. The ground remains slippery, unpredictable and unstable; we know only that things will be otherwise. As we are obliged to stay open to anticipated changes *and* unforeseen contingencies, bioethics needs to be agile and flexible. Chapter 8 is not just a summary, still less a conclusion, but strives instead to take some steps towards what Haraway terms 'the hope of livable worlds' (1994: 60).

# CHAPTER SEVEN

# Temporalities of life and death

In the era of biopolitical thought and its concern with which things constitute the parameters of life, the emphasis has been firmly on the management of the living in every register of existence – social, political, ontological – without fully engaging with what, if anything, constitutes death as an irrecoverable endpoint. We understand that the dead still contribute as data, as Puar (2009) points out; as environmental enrichment (*The Corpse Project*); as the source of biological material though things like transplantation technologies; as the absent presence of memory; and so on, but what is rarely questioned is the putative break between the living and the dead. For all Western culture's interest in zombies, ghosts, vampires and spectres, the intrigue of those uncanny modes arises from the supposition that they are quasi-animate forms that *should not* be living. Certainly life and death intrude upon one another, but the prevailing psycho-social imaginary of the global North remains confident that ambiguities at the edges can ultimately be resolved into a familiar binary difference. What would it mean then to think about death not as a bounded category but as irreducibly entangled in the processes of life? Derrida is perhaps exemplary in his exhortation to live well with the dead and to accept the hauntological dimensions of all existence, by which he conjures up those elements which are neither present nor absent, dead nor alive, while Deleuze provides a further way of challenging the normative temporalities of death. If there is always something about the idea of the non/living that is uncanny, that exceeds rationalist thought, then we should adopt a perspective that queers the concept, not least by considering how visceral prostheses impact the customary beliefs of the modernist mindset.

Among the implications that my exploration of several different forms of visceral prostheses has uncovered is the persistent sense that the reconfiguring of life, any life, in terms of somatic multiplicity necessarily instantiates a fundamental disordering of the regularity of linear temporality. As Varela puts it after his liver transplant, 'The life retaken, is taken differently, forever changed. … This is the living reality of transplantation, my entire identity grazed profoundly by the opening to death, sutured back and left to function in the world with a "new" life' (2001: 270). That disturbance in turn calls, along with many other things, for a further reconceptualisation of the conventional bookends of life and death, and suggests a new ecology of living that is not dominated – for humans at least – by an awareness that each day brings us closer to our own inescapable demise. The complex and indispensable entanglements between human embodiment, biotechnologies and microbial organisms in what is essentially a prosthetic assemblage establish that all bodies contribute, in greater or lesser degrees, towards a queer bio-network in which the multiple rhizomatic linkages are excessive to the linear time of cause and effect. The use here of the term 'queer' indicates a thorough-going critique of normative thought that emerges both as a response to particular conditions of living and dying and as a way of opening up a different understanding of futurity. It is a mode not so much of conscious resistance, as one of suspension, a portal perhaps to an ontological shift. Once the normative teleology of the life course is contested – the one-directional pathway to the point of the expiry of the self – death is no longer an insult to being, but merely one event within a greater sphere of an enduring vitalism. The bioethics of such a conception – on which I speculate in Chapter 8 – has yet to be thought, but I would claim that a reimagination of temporality is a critical component. What can be anticipated is a move away from a thanatoethics, where death is always imminent, to a more affirmative mode that concerns itself with the persistence – even the un-timeliness – of dynamic expansiveness.

Before proceeding with my own deconstructive reflections on the nature of life and death, I want to quickly flag up the bioscientific understanding. In the simplest sense, life refers to the characteristics of material entities that display certain self-sustaining systems, such as sensitivity and adaptation to an environment, reproductive capacities, metabolism and several others, though there is little agreement as to which should be included as necessary, or even sufficient, functions. Entities without at least some of the major functions are assumed to be either once-living but now dead – their biological processes permanently terminated – or they are classed as never-living and therefore always already inanimate. It is the general case that living beings cannot be immortal and will in time die.[1] Recognised forms of life include all plants, animals, fungi, protists, archaea and bacteria, but other undeniably active entities such as viruses and the creations of synthetic biology elude classification. What lies on the boundary between living and non-living causes real difficulties in bioscience but speaks clearly to a strong strand in feminist new materialism that positions all matter as having some form of agency. Jane Bennett (2010), for example, makes the case that non-human and non-biological matter are permeated with a vitality that demonstrates distributed agency in the form of assemblages that intertwine human and non-human actors alike. I remain wary of any attribution of the very humanist term of agency, but Bennett argues that it is not a mode of intentionality and nor is it singular.[2] In a similar way, Karen Barad (2007) replaces an anthropocentric concept of agency with a stress on the complex intra-actions between human and nonhuman matter, time and space. In her model, it is not the human who manipulates, uses or transforms matter, and nor is matter a pre-existing form. Instead, the world is a state of continuous becoming as a result of the coming together of a plethora of human and non-human agential actants. At base there is much that recalls a Deleuzian approach in such formulations, but what makes a difference is the refusal to draw an ontological distinction between animate and inanimate states. As such, Marietta Radomska's term (2016) 'non/living' deftly encapsulates matter without reinstating a hierarchy.

The dimensions of the term 'life' have long been of epistemological concern, but in the main related to the question of human life as precisely a time-limited phenomenon. More recently there has been much discussion of the animacy of some life-like robots, and whether they can be said to die in any meaningful sense. Certainly the status of a robot as a prosthetic companion has resulted in organised funeral rituals in Japan for aibo robot dogs (White and Katsuno 2021), while even entirely functional robotic machines blown up in the course of bomb disposal have been given military honours (Carpenter 2016). The attribution of life in these cases is bestowed by human beings, but the relationality it marks is not simply one-way. In a philosophical register the phrase 'life itself' has become prominent but, as Braidotti has argued, that understanding remains conceptually bound to its supposedly opposite state: '(T)he being-aliveness of the subject (*zoe*) is identified with its perishability, its propensity and vulnerability to death and extinction' (2010b: 206). Unlike Giorgio Agamben who reflects a distinction between *zoe* as biological 'bare' life and *bios* as the form of living, Braidotti's reading of Spinoza and of Deleuze and Guattari encourages her to posit *zoe* affirmatively as the potentiality of all matter to enter into transversal interconnections and networks with all other matter. Her point is that neither *zoe* nor *bios* can be thought in the absence of the other, such that the taken-for-granted binary relationship between life and death, living and non-living, is no longer tenable.[3] In any case, the operative distinctions are firmly indicative of the constrained modernist logos which find little resonance in many traditional and indigenous communities nor in non-Judeo-Christian religions. The complexities of reincarnation and multiply entwined lives speak both to a hauntological relation and a disturbance of normative temporality. Where much postmodernist theory has engaged already with the concept of life as a generative force that escapes the tension inherent in the oppositional structure of binaries to instantiate a form of liveliness that occupies the in-between spaces, Nina Lykke's *Vibrant Death* (2022) proposes a different approach. In a move that turns the perspective inside out, she takes off not from life but from death to position her queer deconstruction of the unstable boundaries.[4] Such an approach speaks to my own concerns, not just theoretically but also in the substantive realm where the anticipation of death and dying figure heavily in the desire to better understand what is at stake in biomedical interventions of various kinds.

Biomedicine is often characterised as the practice of warding off and denying death even to the point of depersonalising and disembodying those it seeks to aid (Brown and Webster 2004; Bishop 2011). The training of medical students remains highly technical and goal-oriented with healing and restoration as the primary purpose such that physicians are expected to work against dying rather than with it.[5] Where death is considered, it is in terms of how to provide dignity and respect, not how to address existential anxieties. The prolongation of life – and more exactly a particular kind of life – supersedes all other considerations to the extent that in the global North the idea of death is almost a taboo. For many people the inevitable encounter with death – whether as a result of the ageing process or as the outcome of accident or disease – is deeply disturbing to a psycho-social imaginary that is heavily invested in normative forms of life. Even with older people, like those with severe dementia, individual death may be seen as a tragedy, a cessation of function that strips the body of life and nullifies the value that was attached to the embodied self. In a parallel way, the response to life-changing disabilities, for example, is – for those who are relatively privileged – to utilise ever-more complex techno-prostheses to augment or take over the biological functions of the body without thought of how to flourish through different ways of living. ‘Life’ in such cases depends on the utilisation of a complex of technological apparatus and human interventions – offered under the rubric of care – that figures an assemblage. The question is whether transformations of the body through technological means can support an enduring self, or does that concept lose validity. The problematic calls to mind the classical Ship of Theseus paradox that asks whether an object – or person – in which the original components have been replaced over time remains the same. If a disabled person lives on as a bioengineered hydrid, or an organ recipient survives by the implantation of the biomaterial of an other, to what extent does it remain the same human life? In a posthumanist context, that question is redundant. As I have discussed in previous chapters, the visceral prostheses figured both by micro-biology and by biotechnologies open up a move beyond the intimation of the supposed degeneration and death associated with disability, disease and dementia to a more constructive mode that concerns itself with an enduring vitalism that might be associated not with the purely human but with the creativity of assemblage.

## Death and organ donation

The field of organ and tissue transplantation as it devolves on deceased donation is a prime site of ontological ambiguities and is deeply shaped by the meanings and limits that are assigned to the putative categories of living and non-living.[6] The theme of heart transplantation which I developed in Chapter 2 focused primarily on the recipient side, but in this chapter attention shifts somewhat to the donor proxies, usually family members or intimates. During the many years of my involvement with the *PITH* and *GOLA* research projects exploring the experience of both heart transplant recipients and donor proxies, the question of death was of crucial importance, albeit in very different registers. For recipients faced otherwise with imminent demise, the death of the donor is a necessary facet of their own survival and it produces, not surprisingly, a complex mix of ambivalent emotions. Initially, many who have received a graft claimed not to think about the provenance of the organ, but in interview the overwhelming majority expressed significant disturbance about their relation to the donor in which the other seems to persist within the self. It might be called a relationship of spectrality in the Derridean sense.[7] At the same time, the transplanted heart is both the condition of a life extended and the certain marker of death that transcends the present moment. It signals both the death of the other, and eventually my own, for the organ will sustain the recipient for only a limited period. For all the public interest in a heroic narrative in which both sides of the transaction can be lauded for their courage, that narrative is undermined insofar as any account of what living on after deceased donation entails brings life and death into an unwelcome contiguity.

With regard to donor proxies, the relation to life and death is even more complex, with the task of consenting to the donation of specific organs falling into a time-limited window during which their close relation is apparently still living. If death has already been declared it is generally too late to evacuate viable organs, with the result that biomedical staff are obliged to solicit consent to donation while at the same time demonstrating continuing care for the dying person. Once a medical determination has been made of brain death, life support can be discontinued so that the heart no longer continues to beat, and it can be removed and transported on ice to the site of implantation into another who is equally marked as dying. The process can be highly emotionally disturbing but biomedical professionals typically display no doubts about the moment at which 'natural' death has occurred and it appears appropriate to terminate any life support technology. Donor families themselves are far less certain and may feel acute distress not only in being asked to rapidly consent during a time of shock and often denial, but also in their uncertainty or outright disbelief that the person before them has really died. A review by Shah, Kasper and Miller of forty-three geographically diverse research papers demonstrated that families, cross-culturally, 'possess hope for a miracle or the belief that their family member may recover after brain death' (2015: 293).

In all but certain unusual cases, however, the normative split between dead and alive does prevail, and where donor families do refuse consent, it is often for reasons other than a questioning of death itself. Yet there are some disturbing and highly visible anomalies that trouble the distinction. For example, even after the machinery that prolongs respiration and heart-beat has been disconnected, a putatively brain dead body may show – very rarely – strong signs of animation in what is called a Lazarus sign (Taskin 2017) which can involve raising the arms over the head and then lowering them onto the chest. The biomedical explanation is that it is merely a spinal reflex arc that occurs independently of brain function and has nothing to do with intentionality. At that point, we might pause to wonder at the justification of excluding such phenomena which though uncommon in 'death' are an intrinsic part of everyday living. Indeed without such reflexes we would suffer all sorts of unnecessary trauma to our embodied selves, but by and large heart transplant teams are not phenomenologists but pragmatists. The connection between biological brain matter and personhood in the philosophy of consciousness is already contentious, but the overwhelming emphasis in the biomedical arena on the complete and bounded brain as the marker of proper life remains a little puzzling.[8] Neuroscientific research has revealed that the heart itself and its immediate surrounds are an area extremely rich in neuron activity that directly modulates the relation between emotion and cardiac function, and while the claim that it constitutes a 'little brain' is deeply misleading, there is a clear indication that the heart is not simply controlled by a central brain. In some invertebrates and particularly cephalopods, such as the octopus, there is effectively no brain at all, but simply a dispersed network of neurons throughout the body. Yet the movement of an octopus cannot be reduced to non-intentional reflex insofar as the animal is thought to have the intelligence of a young human child, with a well-documented capacity for inductive learning and memory (Godfrey-Smith 2016; Richter *et al* 2016). Should the diverse evolutionary paths really lead us to suppose that human reflex has no connection to such higher functions?

Even in the face of growing research, the implications of such considerations remain speculative, but my misgivings become clearer in the recent historical context of what constitutes death for a prospective heart donor. Until the 1960s, death was defined as the failure of the cardio-respiratory system with the permanent cessation of breathing being the unquestioned mark of the end of life. With the invention of the artificial ventilator, however, a dying patient could be resuscitated or stabilised so that the heart would go on beating for an indefinite period. Given that the 1960s were also the point at which organ transplantation became feasible, this technological intervention clearly created a conundrum in that it could no longer be certain that the patient had died. Partly in response to this, the Western-based biomedical definition of death was shifted in 1967 to brain death which it was felt could be accurately assessed even for a body that was warm, breathing and oxygenated.[9] In other words, death was made synonymous with lack of brain function, though there was never a clear explanation as to why the cessation of one organ should become the sole marker. The arch-utilitarian philosopher Peter Singer, who approved the choice, commented nevertheless that the new definition of death was ‘an ethical choice masquerading as a medical fact’ (Singer 1995: 50). What made it ethical for Singer was precisely the utilitarian calculus of weighing the prospect of other lives saved against the possible harm done to the donor. In short, the adoption of the brain dead criterion was always a fudge. In 2008 the US *Presidents Commission* amended the definition to declare that the destruction of the brain constituted death because it meant that the person could no longer engage in ‘commerce with the surrounding world’. It is far from self-evident what that phrase actually means, and many families who go on supporting those on life support machines for months, even years, would claim that there *are* forms of rudimentary communication.[10] The public discourse of biomedicine is not known for its embrace of indeterminacy, however, and such families are habitually characterised as deluded (Shah, Kasper and Miller 2015). At root there is a serious mismatch between the strictly linear and teleological timelines of biomedical practices – such as transplant surgery – and the lingering phenomenological temporality of life and death.[11]

That disparity underpins the bedside scenario of donation and subsequent retrieval of the organ where the codification of passing time is at its most acute and conflicted. As the *GOLA* qualitative study of families who had consented to the donation of one or, more usually, several organs after the donor was pronounced brain dead shows, the clinicians’ desire for a speedy procedure gave little time for bereaved relations to examine their own feelings and doubts. While none of the interviewees overtly questioned the distinction between cardiac and brain death, the sight of a still breathing, at least minimally reactive body, was extremely disturbing for many. As Kathleen Fenton puts it, ‘society as a whole is not completely comfortable with the idea that a warm, pink patient is actually a corpse’ (Clarke, Fenton and Sade 2016: 2056). At an everyday level, the concept of brain death is difficult to grasp – ‘I think he died in front of me’, said one mother, only to be told that her son had already been dead for several hours – and it may not be until the respirator is switched off that there is any final acceptance. What the donor families are unlikely to know is that new techniques – called heart beating transfer – now obviate the need to stop the heart at all. Once the heart can be removed from the ventilated donor, it is placed in a machine that perfuses it during transportation to the recipient’s location where reimplantation takes place. In short, the graft continues beating throughout, and in such cases cardiac death as such never occurs. If for the clinical staff the putative crossing point of the life/death binary is what makes the whole procedure ethically acceptable, it is possible that the new technique will disrupt that certainty once it becomes more widely used. For families, however, the anguish of uncertainty is already all too apparent.

The provision of life support that is necessary during the quasi-death period to maintain the functionality of organs clearly creates an ontological and epistemological quagmire for proxies which does not end once the transplantations have been completed. Nonetheless, all twenty-two of the donor proxies interviewed for the *GOLA* project had consented to donation whatever their misgivings.[12] For just a few, it was a seamless transaction that scarcely raised any existential anxieties and provoked only minimal speculation on the meaning and temporality of death. One robust 80-year-old retired professor who donated her husband's organs told the interviewers: 'I looked down at him and said that's not my husband … .the body is just cells … .they're not the person', while the parents of a deceased daughter remarked: 'We were a little bit on pins and needles to make sure it *[donation]* happened'. Although the clinical staff were sometimes praised for their sensitive approach, it was often not enough to cover over the strangeness and implicit violence of the situation. As one mother put it, they 'were very professional and personal at the same time', but 'in the back of my mind I kept wondering was he really gone'. The majority of respondents experienced the short process of gaining consent as highly disturbing – 'like a pushy used car salesman' said two bereaved sisters who had witnessed their 'dead' brother's legs still twitching and a tear falling from his face; or 'like seagulls circling' as a bereaved husband put it. A mother who still felt traumatised thirty-six months later told us that the time of her daughter dying was unbelievably bad because 'she looked like she was just asleep', so 'I just wanted to punch them in the face … .That's your child being carved up to be doled out to other people'. Another mother, this time of an adult son, described three days of emotional turmoil when 'you listen but you don't hear … it's gut wrenching'. Her profound doubts following consent pervaded her dreams: 'I was having nightmares … when they were removing his heart and eyes, he was screaming', while another, speaking of the same period, said: 'I felt some-one was surgically removing *my* heart'.

The deep disturbance experienced by donor families can be illustrated with reference to a particular case of a young First Nations man who had drowned but been temporarily revived. The especially lengthy and harrowing story emerged in separate interviews with first the estranged non-indigenous mother, and then her indigenous husband and daughter. While it is important to mark the non-Western context of the narrative, indigeneity is a somewhat uncomfortable blanket term that perpetuates a typically Western form of categorisation. In Canada, indigenous peoples may identify with the very different cultures of Métis, Inuit or First Nations, none of which should be seen as uniform in themselves. In the narrative to hand, the deceased man, Eric,[13] was himself in training to become a traditional elder, and the family all agreed that he was highly spiritual, believed in saving others, and would have wanted to donate his organs. The mother had pressed for donation from the start and saw it as a gift received by recipients – 'to be able to live on – that's a huge gift', rather than as a gift given by her son which would somehow enable *him* to live on *through* them. The father, however, had been uncertain and resisted consent leading to an eight-day gap between the declaration of brain death and donation. During that period he attended a drumming ceremony at the lake where Eric drowned, and felt that he was given certain signs from the natural world that convinced him that donation should go ahead: two loons on the lake that spoke to the calmness of Eric's spirit, a crow that flew up overhead in response to a prayer for a sign from Mother Earth, and finally coming across a seemingly dead, but still sprouting tree which signalled the intertwining of life and death.

For the father, living on did devolve on his son but in two conflicting ways. On the one hand, his traditional First Nation beliefs were opposed to donation because the body is cherished (as a gift in itself), the self is transcendent, and not least because the deceased person's eyes were needed to show the way to the spirit world. On the other hand, he firmly believed that *both* Eric and the recipients would be enabled to live on through donation. Each parent and his sister talked about Eric actively saving five lives through the distribution of his organs and somewhat unusually they explicitly saw his continued being-in-the-world as a matter of everything being connected and sustained. The father's raw grief at his loss was mediated by a sense of Eric's continuing presence in his life and he emphasised how he would like to ask the heart recipient if he ever wanted to ride a horse or climb mountains as his son did. For the family, Eric is both part of the recipients and may guide their behaviour, but he is also everywhere, beyond any specific temporal location. As the mother said about the interview, 'I love talking about Eric … I hope he hears me', while the father and sister are certain they are still in communication. A spirit guide from another indigenous group had even contacted them with a message from Eric which they are inclined to accept at face value. The specific indigenous imaginary at work here is clearly somewhat different from the Canadian mainstream and should remind us of the limitations of Western (effectively colonial) epistemology and ontology,[14] although intriguingly it also seems to speak to the kind of interconnections that Deleuze calls assemblages.

In that mode, dying is both a personal event, experienced within a conventional time frame and a continuing atemporal process that exceeds the binaries of life/death and presence/absence. This is far from the contemporary operation of conventional biopolitics in which the threshold of mortality marks the cessation of being. As such the disturbance of death is the endpoint of the social contract and of any further engagement with others. Such a highly rationalist and masculinist construction of the centrality of the living grounds, on the one hand, the biomedical impetus to preserve life at all costs and, on the other, a plethora of surveillance and control technologies that seek to establish and maintain the distinction between those deserving and undeserving of survival. Both branches are highly evident in the arena of organ donation which above all is situated in the affluent technologised societies of the global North. The largely unseen apparatus of consigning and transporting viable organs – the 'spare parts' – is a highly complex logistical and biopolitical operation that in the end purports to rely solely on an apparently free choice – in most jurisdictions at least – to willingly donate body parts to unknown others. The whole emphasis of what are called in Canada OPOs (organ procurement organisations) is directed towards promoting the supposed altruism of donors while covering over any unsavoury mentions of death or dying. With heart donation, the donor is, of course, always deceased but that would hardly be apparent from the literature which stresses only the altruism of giving the gift of life for the benefit of others. Throughout, disciplinary technologies mesh with the preservation of life and the denial of death.

For all the smooth publicity, however, there is always a shortfall in organs offered and organs needed to meet the demand for transplantation of all sorts to the extent that many countries, especially in Europe and including the UK, are turning to presumed consent where none has been given in advance. At the same time the illegal global trade in organs as a branch of neoliberal capitalism is thriving at the expense of those populations marked as undeserving, just as it does in relation to surrogacy. It is not the purpose of this text to enquire into the expansion of organ trafficking as one often violent response to the perception of scarce resources, but it is important to note, as Sam Opondo reminds us, that in the neo-colonial and racial dimensions of Western biomedicine, including transplantation processes, bodies of colour may serve as 'life extending apparatuses' (2015: 8). In Opondo's analysis, suspicion about 'the redefinition of life and the time of death is not unfounded, given that technoscientific advances taking place against the backdrop of race thinking in various parts of the world have inserted bodies into economies of exchange (gifting, donation, and non-oral cannibalism)' (2015: 121–2). In effect, the visceral prostheses of organs themselves are a subset of treating whole categories of bodies as prosthetic resources in the conventional sense. Literature and film have long elaborated the theme of sequestering bodies in order to harvest their organs – see for example the books and subsequent movies of *Coma*, *Never Let Me Go, Dirty Pretty Things* and *L'Intrus*[15] – where bodily materials flow from the poor to the wealthy, from black and brown bodies to white ones, female to male, and into the global North from the South (Scheper-Hughes 2001).[16] Death haunts the lives of the 'donors' precisely so that they may service the extension of life in others (and in the case of the traffic in living organs – of kidneys, for example – to sustain their own already 'bare' states of existence). The disturbing but silenced contradiction at the centre of transplantation is given full exposure in the economy of organ trafficking.

## Living on and hauntological relations

What does all this mean to donor families reflecting on their decisions to assent to the transplantation process? The question of living on is central to their thinking, although the grief experienced may overwhelm other affects.

The narrative favoured by OPOs clearly promotes the transplant organ as the so-called gift of life that offers the hope of survival to recipients, with the associated benefit to donor proxies that they have engaged in an altruistic act. There is recognition too that altruism is not entirely disinterested in that giving has therapeutic effects in introducing something positive into the scenario of loss. As one woman put it, 'I had to believe in something good. It was the most awful thing', while an upbeat couple whose daughter died in an RTA stressed: 'Do the recipients know how happy we are?' 'Do they know we are on their team?' What is less acknowledged is that many proxies are more or less invested in the belief that through donation it is not only the recipient but also their dead loved one who will live on. It is certainly the case that donor proxies may express a deep concern for recipients and say that they would be devastated again should the recipient fail to flourish, but as the *GOLA* interviews revealed, it is rarely that simple. As the father of a young woman killed in a light aircraft crash told us, 'we don't need any more grief', while his wife adds: 'Ruth [the recipient] is a little piece of Lisa [their daughter] … if something happened to her, it would be another death for Lisa.' The empirical data shows that the majority of donor families go on referring to transplanted hearts as still belonging to their own loved one, and as having an agency independent of the recipient, who in turn habitually experiences the transplanted organ as not fully incorporated to the self, but rather as a living reminder of the deceased donor. Typically as one respondent puts it, 'there's my sister's heart beating away in someone else, bringing them joy', and she thinks of the donated organs as 'keeping them alive, that's what they're doing, they're keeping others alive with their organs'. It is difficult to escape the conclusion that living on refers both to the survival of the recipient *and* to the donor. In some magical sense the necessary death of the donor is negated and she is not so much reincarnated in an other as occupies a new location where aspects of the self can endure. As the mother of a teenage donor puts it, 'I haven't lost him – I know exactly where he is … he's still giving', or a daughter speaking of her father: 'He lives on, he got to share himself with strangers'.

There are perhaps some hints of parasitism in the strange alliance between the deceased donor and the recipient, but given the highly negative connotations of that term, it may better be thought of as a hauntological relation or mutualistic entanglement. In any case, the status of deceased donors, perhaps any 'dead' body, is problematic in that they are both enduringly material – the source of further life – and non-living, a spectral presence. Although in the context of transplantation the acquisition of the organ that is intended to prolong the recipient's life relies on the demise and evisceration of another, neither the organic material of the donor nor the self that it embodied is entirely lost. In the hospital at the centre of the *PITH* research, the ambulatory clinic for post-transplant follow-up is accessed past The Donor Wall, a display of photographs memorialising sixty previous donors. Each image is supplemented by a short tribute from their families, many of which explicitly say that the donor survives in spirit as a result of their generous and selfless gift. One guesses that donor families comfort themselves not so much in knowing that the life of an anonymous recipient has been prolonged, but that their own loved one is somehow staying alive. Perhaps the most striking example of the depth of the recipient/donor hauntological relationship is encapsulated in the issue of the anonymised letters that the two sides are strongly encouraged to exchange. The practice is intended to give the transplantee the opportunity to express gratitude, although donor proxies – longing for some indication of the location of the gifted organ and that it has transposed life – may initiate the correspondence. Given that any identifying text – gender, ethnicity, names of pets, age, employment categories – is redacted at source, it is hardly surprising that the quasi-obligatory engagement does not often provide the resolution that is sought. In the course of the *PITH* and *GOLA* research, speaking of the letters reduced many of the interviewees to tears and marked a focal point of overt disturbance for givers and receivers alike. Reducing the ontological disorders involved to the status of depersonalised notes, and reconciling life and death, proved a very harsh burden.

It is clear that the requirement of anonymity between recipients and proxies, which is enforced in many jurisdictions (albeit breached with some frequency), greatly exacerbates uncertainty. The usual justification offered is that it protects against unwanted intimacy, and evidence does suggest that strong feelings of kinship can develop on either side of the relationship. The problem is that the imposition of anonymity reinforces a mechanistic model of transplantation that overrides the probable emotions of the organ donor proxies and recipients by sterilising the process through which they communicate. As I outlined in Chapter 2, the original *PITH* and the subsequent *GOLA* projects were guided by the philosophy of Merleau-Ponty (1968), for whom the body is never merely an object, and self-identity is not given but constructed through embodied, spatial and temporal connections with others. The approach focuses not simply on the abstract interconnections between self and other, but more fundamentally on an intercorporeality in which bodies are woven together. More specifically, the literal replacement of the hearts of terminally ill patients with donor organs underscores their delicate intercorporeality, drawing together givers and receivers in an intimate, enduring and hauntological relationship in which the boundaries of life and death are reconfigured. Beyond the hard-edged rationalism of the clinical narrative, such an understanding of the embodied self lends credence to reports of complex feelings of connection – even kinship – of heart transplant recipients with their donors. Rather than fragmenting the donor's body, objectifying organs as replaceable mechanical parts and disavowing the deceased donor's once personalised self, the mode of living on becomes in some sense a joint endeavour.

What is really at stake in the seemingly uncaring approach to anonymity in organ procurement and donation opens up another dimension that I will touch on just briefly. While it is ethically routine to decry the international trade in scarce organs, the commodification of the body parts that it evokes is not confined to illicit activity. The systemic de-individualisation of donors is fundamental to the operation of transplantation as both enhancing life and seeking death. The thanatopolitics of transplantation is not simply an aberrant side effect. Once the human body is thought of as an object of commodification in the Marxist sense, its specific fragmentation in the transplant scenario ultimately renders the organs of the deceased donor as objects, with a use-value – determined by quality, quantity and utility – determined through consumption. Evoking Karl Marx's theory of commodity fetishism, Leslie Sharp (2006) provides a compelling interpretation of the anonymous process of organ procurement and transplantation which, she says, relies on elaborate forms of metaphorical thinking, on the part of all those involved, that ultimately obscure the origins of displaced body parts. But, as Sara Wasson reminds us, the process of disentangling those objects from their prior human embodiment is inevitably incomplete: 'Alienation of any object – severing it from its original context and classifying it in new ways that enable it to be transacted – leaves a remnant of strange "life" in the alienated object: ghostly traces of the labour and the relations of production that enabled its manufacture' (2015: 107).

Above all, transplantation is a process of mystification, as can be clearly seen in the contradictory biomedical discourse that strongly encourages the recipient to be grateful to the donor family for the gift of life while at the same time depersonalising the donor as merely the source of transferable spare parts. For biomedical professionals, the suspension of personhood at the moment of brain death marks the moment at which the body becomes 'a reserve of commodities' that will swiftly circulate in the transplant economy. Yet as Lindberg notes, 'the imperceptible transformation of gratuitous organs into precious commodities is one of the big taboos of the transplantation medicine' (2013: 252). Such biopolitical concerns are seemingly far removed from the troubled register of personal exchanges, but in the end they interlock. Under the rubric of transplantation, the once-identifiable human flesh of the donor vacates the space of the intimate and familial and becomes the object of public utility and technological expertise. The sense of an individual death is covered over, and those left behind are denied the physicality of an integral body to mourn, although exchanges between recipients and donor proxies may imaginatively seek to reconceive that lost personhood. Nonetheless, the rhetoric of the gift – that is the underlying currency of any communication – unintentionally flirts with existential danger.

The exchange model of the gift, originally associated with the anthropological work of Marcel Mauss,[17] suggests, as I noted in Chapter 2, that any donation exceeds its mere materiality to figure something intrinsic to the giver. He deploys a Maori term *hau* to describe this haunting element, arguing that 'the thing received is not inactive … the *hau* follows after anyone possessing the thing' (1990: 11–12). In line with the instinctive feelings of proxies, this suggests that something of the donor does indeed live on in another, as is sometimes explicitly acknowledged by recipients themselves. More often, however, the uncanny persistence of the other manifests as a disconcerting awareness that one's own embodied being is now hybrid. The same impressions are strongly reflected in the popular imagination, where representations of transplantation abound with uneasy narratives that express an underlying fear that the personal characteristics of the deceased donor might take possession of the recipient, or that s/he might reappear as a spectral presence. It is not just – as phenomenology might predict – a change that could be assimilated in the fashioning of a new embodied self, but of a self that is haunted by irregular traces of otherness. Although the model proposed by Mauss might appear at odds with the very different understanding of the gift relation offered by Derrida, which does not rely on exchange and where identity *should not* be known, there is in both a hauntological dimension that finds resonance in the concept of 'living on' that is the counterpart of deceased donation.

For Derrida (1994), the coming of the other is inevitable and it always constitutes a hauntological relationship between absence and presence, life and death, as well as self and other, the very issues that frame the existential register of heart transplantation. Moreover, the nature of the relation between donor and recipient specifically disorders temporality: 'A real gift … tears time apart' (Derrida 1992: 9). Existence, and that includes personal being-in-the-world, is always dependent on something else that is not present as such, something not graspable in the immediate moment. What does it mean, then, to respond to a deceased donor, who returns not as remembered a known human being but as a trace? What matters is that the trace of the unknown other should be openly welcomed (and here we might think of visceral prostheses in general), not in the expectation that we will benefit – for that can never be certain – but as a way of securing a future. Derrida himself is unable to accept the finality of 'absolute mortality (that is, without salvation. resurrection, or redemption) – neither for oneself nor for the other' (2007: 24), and he precisely links the idea of living on – and he means for both oneself and the quasi-dead – to the spectral (26). This suggests a radical departure from the notion of temporality as a succession of 'now' moments that confidently assert the distinct realities of past, present and future. It is not a teleological progression but one of discontinuities, loops and emergence that radically destabilises normative expectations. This is strongly mirrored in queer theory which is equally marked by indeterminacy, provisionality, openness and a sense of the *avenir* – the figure of Derrida's monstrous *arrivant* – that which has not yet come, be it from a past or from a future (O'Rourke 2005). The normative distinctions between past and present; past, present and future; between living and non-living; absence and presence; and self and other are all made indistinct when death refuses to settle. The time is out of joint, displaced by a queer non-linear temporality. And as I will explore in the final chapter, the further significance of such a rethinking is that the reconfiguration of time is a significant component in formulating any postmodernist ethics. The move is enabling; as Grosz remarks, 'the more clearly we understand our temporal location as beings straddling the past and the future without the security of a stable and abiding present, the more transformation becomes conceivable' (2004: 14). But first, let me leave the realm of abstraction and return to the substantive context.

All forms of organ and tissue donation might be expected to evoke the absent presence of the other, but throughout both the *PITH* and *GOLA* interview material, which often touched on other forms of donation, it is invariably the heart, with all its cultural baggage, that is the centre of attention. All the respondents spoke of donors who were the source of multiple organ and tissue transplants, but no other organ had the power to disturb the normative teleology of life and death, that was attributed to the heart. One bereaved mother expressed something of this breakdown: 'I miss him, I miss him, I carry him in my heart for ever. You carry him for 9 months, to grow up, to have a normal progression', and unusually she saw the trope of 'living on' as extending to herself. Imagining what she would tell the recipient, she says: 'Take care of the heart and it will look after you for the rest of your life', adding 'I hope he'd look after his heart. After all I created that heart … (I hope) he's a good man.' In that context, it is no surprise that the death of a recipient – if it is known – can come as another personally felt death. As one mother told us, 'we need to know that they lived'. A single respondent cited the spare parts model of transplantation – 'it's like taking an engine out of a car', and a couple more referred to the heart as a pump, but for the majority there is nothing impersonal about the transfer. Against the clinical metaphor of replaceable machine parts, the counternarratives of the gift of life and donor altruism promoted by OPOs are the ones that make most intuitive sense to donor families. Where for the clinical professionals, the success or failure of the procedure is a matter of objective biomedical measures, the longer-term emotional impact of the decision on the lives of donor families and recipients alike tells another story in which the clear distinction between life and death is lost.

With regard to living on, however, the approved notion is supposed to be purely metaphorical, or at least referencing only the recovering recipient. The authorised discourses stop short at a template of a dying, and then deceased, donor being superseded by the putatively restored life proper to the recipient alone. Despite the keen beliefs of donor proxies, indicated in their interviews, there is nothing in official models to disturb the succession of singular selves. In the biomedical imaginary – which constrains but does not wholly suppress the intimations of donor families – if only inanimate material is transferred then there should be no ontological anxiety. At present, the imposition of anonymity matters both positively and, more often, negatively precisely because transplantation *is* seen as an exchange that grounds an intimate and ongoing relation between self and other. Yet, as Gail Davies notes in her UK research on kidney donation, 'attempts by either donor or recipient to construct a social relationship is viewed by professionals as pathological, something to be treated through counselling' (2006: 8). What is really needed is a radical shake-up of a realm where personal identities are the privileged markers of living and dying, that instead move towards a biopolitics of transplantation that emerges from postmodernist insights into multiplicity, fluidity and vitalism. The theoretical models that I favour require a wholesale turning away from the central tenets of the Western imaginary, not least concerning the integrity of bodies, the sovereignty of the self, the meaning of death and the justice of exchange.

Before pursuing that different theoretical – and in the end more affective approach – I want to reiterate that the biology of transplantation (whether of solid organs or stem cells) is far less straightforward than it purports to be. In the context of heart grafts, I have already outlined the difficulty of making a biomedically coherent cut between life and death once a donor body is maintained in a perfused state, and the ontological anxiety that invokes in donor proxies, but there is a further complicating factor, namely the phenomenon of microchimerism. As I explained in Chapter 3, when a heart, or indeed any other organ or tissue is grafted into a recipient, it carries with it the DNA coding and the unique immune system markers (HLA) of the donor. Unlike other forms of hybridity where merging within each cell may occur, the distinctive cell line of the donor circulates widely and is transported not only in the peripheral blood but can migrate and accumulate in organs and tissues other than the one transplanted. The crucial point is that the donor cells persist in parallel to those of the recipient. As such, the circulation of non-identical DNA post-transplant and the potential of visceral transformations in specific organs indicate not simply intracorporeality, but the irreducibility of embodiment into singular and static forms. The processes of such cellular translocations offer a different model of living on that extends far beyond the privileging of modernist forms of human being. The significance is that if self and other are no longer distinct, if the very rigidity of the terms suggests a certain incoherence, then it is not just the space of the body that is contested but the temporal framing of the body too. What does it mean for a body – whose body? which body? – to die?[18]

The implications for a reconsideration of temporality and death extend, of course, far beyond the field of transplantation. In terms of the substantive issues which I have already considered, the impact of microchimerism on immunological distinction is just one side of the coin. If, as I explained in Chapter 3, mismatched maternal and foetal DNA can remain in the mother or offspring's body for decades after pregnancy, or if women who have never been pregnant can carry male DNA (Yan *et al* 2005) derived from a previous generation, then the biological event of any pregnancy is not confined to the palpable conjunction of maternal and foetal bodies over a nine-month period but may reverberate far into the future. Normative forms of reproduction no longer signal normative biological relations, while in surrogacy the probability of continuing interconnection and a different understanding of temporality radically disturb assumptions that the birth mother's contribution is time-limited. The growing recognition that *in utero* states can have a significant impact on adult outcomes, but is usually ascribed to the epigenetic effect of environmental factors, such as the surrogate mother's hormonal condition as well as aspects of her diet, lifestyle and psychological state. Now the ubiquitous and atemporal influence of microchimerism in any pregnancy demands no less consideration, and not only in relation to live births, but to any gestation that does not come to term.

Within the linear model that characterises modernist thought about life and death, the miscarried foetus, as Gowland (2020) points out, is unacknowledged – particularly in early miscarriage – as though it never really existed.[19] Yet in pragmatic terms, microchimeric foetal cells may impact long term on the mother's own health and well-being, both positively and negatively: 'The cells of the foetus have a functional lifespan even if the foetus itself fails to develop' (2020: 269). As such – and regardless of whether the foetus comes to term – microchimerism (and epigenetics in a different mode) not only demands a reconsideration of the genetic self, but challenges conventional models of what constitutes the beginning and end of an individual lifespan. Just as with any infant, the foetal intraconnection uncovers our status as individuals as genomically, physiologically and temporally fluid (Rutherford 2018) and shows that far from being time-bound, our lives resonate with both past and future generations. Gowland is properly concerned with the affective dimensions of miscarriage, but strangely does not appear to see that the implications of microchimerism extend beyond the biomedical. As she understands it, the lost 'child' remains as an absent presence in the ongoing experience of the mother, but she does not link that uncanny maternal feeling with the biological processes at work. To know that the intuitive, but often silenced, psycho-social sense that the child lives on in a different medium is supported by bioscience may be of great comfort to women in counter-balancing feelings of bereavement. As with organ transplantation, the biological, the affective and social states need not be disentangled. Death always remains an event in our personal histories, but rather than being a limit, it also reflects the unstable horizons of other pasts and other hopes for futurity.

The ramifications of microchimerism have become an arena of deep fascination for biophilosophy, not least for the instability it brings to questions of life and death (Pradeu 2012). If microchimerism is as ubiquitous in pregnancy and transplantation as now seems likely, then it would appear that the intuitive feelings that constitute what I am calling a hauntology have a surprising biological endorsement. Once non-self DNA and HLA are embedded but remain unassimilated in the maternal body or in a transplant recipient, then self-identity is no longer certain and the trope of living on in another begins to make material sense. Microchimerism is as yet a little known aspect of biomedicine – which like other epistemological systems tends to work in silos where cardiologists, gynaecologists or psychiatrists may be unaware of the work of immunologists for example – and it is unlikely that the overwhelming majority of lay people involved have any knowledge of its operation. But just as the public understanding of science has very swiftly encompassed the existence of the human microbiome – although its ontological implications have yet to be grasped – so too microchimerism seems poised to give weight to feelings that have hitherto appeared to be merely speculative and even somewhat discreditable. It is not that bioscience is the final arbiter of the truth of the body, or even that there is any fixed point of truth, but that the question of intracorporeality that microchimerism introduces may aid a more understanding relationship between all those involved in both pregnancy and transplantation.

## Temporality and sustainability

As a biophilosopher concerned with experiential states, I have long felt highly ambivalent about organ transplantation, initially from witnessing the ongoing disruption of recipients, but more recently in response to proxy donors and their distress around the ambiguities of life and death. Fear of death is ubiquitous both for its putative termination of the singular self, and paradoxically because the dead have haunted the imaginaries of every age and culture (Laqueur 2016). The first consideration is easy to understand and hard to shake, but with respect to transplantation the second – on each side of the transfer – has the capacity to evoke both the negative spectre of parasitism where one lives on at the expense of the other, but also the creativity of assemblage and sustainability. Elements of the latter were clearly evident in the donor proxy interview with the retired professor. Despite her cool rationalism, she said something of her husband's death that can move us on: 'It's no longer life, it's potential'. Her words intuitively echo the insight of Deleuze for whom the ontology of death cannot be limited to its manifestation in the sovereign subject: 'Death has an extreme and definite relation to me and my body and is grounded in me, but it also has no relation to me at all – it is incorporeal and infinitive, impersonal, grounded only in itself' (1990: 151). In parallel, human life itself is not a finite essence, actualised in the limited lifespan of an individual, but rather a form that is temporally and spatially expansive, a component of the enveloping cycle of becoming that comprises all types of living beings, organisms, as well, in Deleuzian terms, as technologies. Although each individually identified human life is the locus of multiple here-and-now events such as pregnancy, transplantation or dying, all of which effect radical transformations for that specific person, in a different register, those modes also transcend any singular embodied figure and can be understood as intangible and atemporal drives and points of energy. In the Deleuzian approach, the modernist imaginary that promotes an unchanging sense of independent 'being' gives way to a material and processual state of becoming in which any individuality is provisional and unstable (Deleuze and Guattari 1987). In short, the exclusionary boundaries of the selfsame are superseded by the macro-context of collective becoming.

In the heterogeneous force fields of assemblages – the multifarious elements and interconnections, both organic and inorganic, that exceed unique experiences and comprise life itself – the time of the individual is displaced (Shildrick 2013a). In place of existing epistemologies predefining and limiting the possible spatial and temporal connections open to the singular self, in an assemblage, the dynamic is reversed with the changing matrix generating meaning. That dynamic better enables us to understand what is at stake in micro-biology, where disparate cell lines continue to circulate in conjunction, mutually affective and functioning through a new mode of configuration that is not limited by the lifespan of an originary organism. Where the metaphor of parasitism may at first appear to have some purchase in the mode of living on after organ transplantation,[20] its evocation of self/other antagonism has little in common with the Deleuzian mode of assemblage that has informed my analysis throughout. A post-binary approach insists that human life is always inherently entangled not only with other living beings but with a plethora of more or less animate technologies and processes, the non/living. In blurring the boundaries of otherness, entanglement conjures up neither parasitism nor the absence/presence of Derridean hauntology where an ethical relation must exist. Assemblage theory establishes the productive capacity of connectivity and its incessant transformation, and may offer a template for rethinking all prosthetic relations, not as discrete temporal occurrences, but as *ongoing* and fluid compositions that encompass disparate elements without hierarchy.

Science and technology studies have shown limited take-up to date of the potential of Deleuzian theory to intervene into modernist ontology and epistemology, but as my previous comments on disability, dementia and transplantation of all sorts show, the radical somatechnics that Deleuze suggests provides a significant platform for rethinking prostheses and their associated impact on the temporality of life and death. It is particularly apposite for fathoming the ambiguities of transplantation. In the liberal humanist context in which only individual selfhood counts, it is understandable that donor families, for example, wish to see the donor living on in another, and that recipients should experience disturbance when they feel themselves no longer the self who preceded the surgery. In the Deleuzian rethinking of mortality, life is not the possession of an individual but an intense process of becoming other that does not meet a limit in death. In that sense, the deceased donor – whose varying organs and tissues will typically be distributed among multiple recipients – continues to contribute to the ongoing flux and flow of life. Living on impacts many bodies who are thus brought into relation with one another. With regard to the survival of the transplant recipients, what matters in Deleuzian terms is neither guilt about the donor's death nor any obligation to bear witness to them, but the capacity to affirm life, both in its renewed potential and in its endurance. Living well exceeds the constraints of the individual and takes up the transformative possibilities of becoming other. In an important sense, the death of the donor is negated, but not by the transfer of personal characteristics to another. It is an impersonal relation in which both giver and receiver live on in a new and sometimes volatile assemblage.

Earlier I raised the question of what it means for a body to die, and now the most cogent question becomes: is death a disaster? On a personal level it may always be understood that way, and without doubt biomedicine will continue with its efforts to prolong life, to stave off the inevitable cessation of breathing, and that is precisely what drives incessant research on the nature of the body. Most of us are at one with the Western logos understanding of death as an end, and when Heidegger described life as 'being toward death', he reflected our immersion in human exceptionalism and questions of authenticity and mortality. So what does it signify for death if the materiality, the viscerality of our own bodies, is inherently and irreducibly multiple? And what if, as I have been suggesting, the anticipated temporal predictability of chrononormativity – Elizabeth Freeman's term (2010) – was displaced by a non-sequential mode of becoming? Chrononormativity seems to seamlessly encapsulate the parameters of trauma, death and loss which I see as dependent on the closed frameworks of the life course as conventionally understood that is the temporal processes of reproduction, kinship, inheritability and lineage within relatively stable social structures and power relations. Microbiology, a new thinking of immunity and transplantation disrupt all those things with the span of a life (what life? whose life?) no longer self-evident; with conception and gestation being the site of intensive microchimeric exchanges and immuno-tolerance; with kinship claimed between transplant donors and recipients across age, race and ethnicity; with the dimensions of genetic inheritability and lineage radically multiplied not simply between humans but across species. Although the focus remains the human body, the move towards a posthumanism is inexorably underway. And as Esposito notes, 'flesh is constitutively plural, multiple and deformed. It is … from this point of view that one can begin to imagine an affirmative biopolitics' (in Campbell 2006: 52). It speaks to a new ecology of life.

At the present time, the socio-cultural imaginary of the global North remains dominated by quasi-Cartesian conceptions of the body, and by the separation of self and other, both modes that allow the depersonalisation of biomedical interventions and yet at the same time generate deep anxieties when that model fails to correspond with lived experience. My research on organ transplantation in particular attempts to think beyond the model of a heroic intervention that defies death, and to recognise that organ donation generates a disturbing and potentially painful awareness that the boundaries of the self are no longer certain. It suggests two new registers of thought: first, if the personal event of dying were seen simultaneously not as an end but as the revitalisation of life in new registers, then mortality itself would not be a failure; and second we might reimagine existence not in terms of a recovered self, but through dynamic incorporeal forms of co-existence. Rather than the normative conventions that dominate the acceptable templates of embodied life and death, the Deleuzian mode advocates pushing to the limits of what is possible, embracing an openness to a futurity that rests on sustaining becoming. The task is surely to begin to change the socio-cultural imaginary. One step might be to push the authoritative discourse of biomedicine to give up its investment in mastery and the fixed patterns of chrononormativity and openly explore what lies beyond the wound of the sutured body. It requires a paradigm shift on the part not just of clinicians, but all of us, to bring all the threads together. Revisiting the case of the indigenous donor family, it is apparent that beyond the Westernised mindset there are already more positive ways of thinking death that speak to a wider atemporal vitalism. We cannot deny the immediate pain or grief of individual demise, but it can be mitigated through an open encounter with another dimension where living and dying, self and other, absence and presence are irreducibly entangled. The queer temporality and spatiality of coincident life/death are not things to overcome; rather, they are constitutive of a transformed imaginary.

On a theoretical level, the move that is emerging is away from any attempt to pin down the essence of life, to a biophilosophy 'concerned with articulating those things that ceaselessly transform life' (Thacker 2015: 126). In other words, the project is to elaborate a hitherto unregarded network of relations that dispenses with the boundaries of singular location and time and reimagines the concept of living outside oneself. In an embodied hauntology, the other is always within but equally the self (if we can still call it that) externalises its becoming. In place of the bookends of birth and death that mark a model of sequential mode of existence always faced with its own finitude, we could think in terms of an atemporal co-existence. To counter the fear of dying and adopt an affirmative biopolitical stance, the task is to reverse the closing down of options and explore – as Lykke (2022) does – a welcome to death as the opening to a non-personal vitalism. It marks what Braidotti names as sustainability, 'the very possibility of the future, of duration, of continuity' (2006, 137). Once we acknowledge that life – and death itself – is unlimited in its material manifestations, and that all forms of existence, human, non-human and non/living are intra-active at levels beyond regular control, then there are no grounds for privileged distinctions between one living entity and another. For Braidotti this clearly implies a shift of temporal gears, and she makes the point that if we leave behind oppositional thought, we are no longer 'tied to the present by negation' (2015: 35). Without a reimagined temporality, we are stuck with the somatic facts of pain and death, but the narrative need not end there. It is, finally, about the extent to which we can rethink modernist anthropocentric boundaries and embrace the possibilities of transformation. In the non-teleological time of becoming, the insults of being may be less acute. It does not diminish immediate pain or grief but opens onto another dimension where, as Braidotti puts it, death – rather than being disturbed and disturbing – frees us into life. The risk and vulnerability of life and the fractures in personal teleology are unavoidable, but our inter- and intradependence on our multiple connections enables us to access a more productive dimension. The chimerical context in which we live speaks to both everyday hazards *and* a generative potential which we have hardly begun to explore. And that is not a choice but simply the ecology of a life that is already posthuman.

# CHAPTER EIGHT

# The (bio)ethics of a new imaginary

Towards the end of the twentieth century, a recurrent question asked by philosophers was whether postmodernism – and even the better-established poststructuralism – could deliver an ethics. For those who worked with normative models of right and wrong, true and false, good and bad, permissible and impermissible, the answer was a resounding 'no!' and a vigorous dismissal of any suggestion that a Derridean or Deleuzian-inspired text offered an innovative way of thinking about ethical modes of living. The deconstruction of the familiar binaries and a claim to the instability of, and leakiness between, categories was taken to preclude not only the formulation and justification of moral precepts, but also initially the very possibility of ethical frameworks, particularly in the realm of bioethics – an area that has been of especial interest throughout *Visceral Prostheses*. That refusal to think differently was vitiated for many in the light of the very substantive concerns that were actually addressed by the offending scholars, and by the so-called materialist turn which rooted postmodernism in 'real' world issues. The posthumanist problematic of prostheses and the mode of somatechnics which it intends clearly call for ethical scrutiny that extends well beyond the pragmatic terms of present and future harms and benefits which a normative approach provides, and instead addresses the question of what prostheses tell us about human being and the status of the socio-cultural imaginary in which they develop. In terms of the advent of the posthuman towards which all forms of prostheses – both natural and organic, artificial and technological – point, the conception of ethics becomes decidedly harder to pin down. Against the demand for certainty and closure that characterise traditional models, the account that I propose offers no definitive guidelines but invests in an open-ended commitment of response and responsibility towards multifarious differences both within and beyond human being. It dispenses with the trope of a singular ethical agent to celebrate instead a mode of infinite and ever-changing interaction with both known and unknown others. In a strong sense, a posthuman(ist) world is already queer in the extent to which the currently dominant socio-cultural imaginary of human exceptionalism would find no place.

There are many possible trajectories to follow that arrive at the realisation that the human as a bounded category is no longer viable, and I would contend that the visceral impact of prostheses has a strong claim to being among the more important ones. Whether or not it is recognised, all functional life is dependent on its prosthetic extensions and entanglements in such a way that it could always be asked which is the original entity and which the supplement. It is only because we must perforce think through a human perspective that it is taken for granted that the embodied self precedes its attachments. The lesson of virology – and parasitism more generally – points elsewhere: that the distinction between a host and its other is never clear-cut. And it is not just that a pre-existing entity is transformed by its intertwining with the other, but that the self/other binary is radically disturbed. When Derrida asserts in a purely theoretical vein that 'the guest becomes the host's host' (2000: 125), he catches precisely the instability and ambivalence of the relationship and the constrained temporality of any position of primacy. My own understanding of prostheses, traced through a variety of biomedical, political and theoretical contexts, speaks to just that sense in which even the simplest add-ons – the blind man's white stick, for example – are insinuated into the fabric of life. Mastery is written deep into humanist texts and it seems unremarkable to read prostheses as objects to control. For many people with disabilities who augment their own functionality with mostly technological and sometimes animal aids, the deployment of such devices may appear as neutral occurrences unworthy of ethical comment. A standard hearing aid will scarcely disturb an enduring sense of self, until it becomes apparent that there is an existential difference between the self who hears and verbally communicates and the one who feels herself to be on the outside of everyday sounds and voices. But who is the 'I' that is enabled? If something has changed in the constitution of that self, does that not raise the question of the ethical relation between the putative subject and object? While it is still difficult to assign ethical meaning to inanimate factors, the problematic becomes clearer in the context of visceral prostheses – the tissues, organs, embryos and cells that travel between supposedly unrelated entities. Without wanting to fully subscribe to the new materialist view that all objects have agency, I would, nevertheless, be resistant to dismissing the technological as non-visceral.[1] A brief look at the issue of transhumanism will illustrate this further.

In transhumanist discourses, human beings are represented as agents engaged in an intentional process of transcending their corporeal limitations through a purposeful use of technology. There are of course varying definitions of what transhuman means but one influential standard known as the *Transhumanist Declaration (2002)* speaks in its original form of 'the possibility and desirability of fundamentally improving the human condition through applied reason, especially by developing and making widely available technologies to eliminate aging and to greatly enhance human intellectual, physical, and psychological capacities' (quoted in Bostrom 2003). There is no doubt that visceral interventions into the body in order to intensify human properties and extend them beyond the normal parameters of human corporeality are central to the enterprise. How far the materiality of the body remains in place is an open question – Nick Bostrom (2005), for example, considers the possibility of uploading a human mind to a computer, and living either in virtual reality or by proxy through the control of a robot located in the physical world – but what does persist is a belief that humanity itself is the driving force behind the transformative effects. As many transhumanists would claim, the aim to improve and better human life is intrinsically ethical insofar as improvement is desirable in itself (Roden 2015). On that view, it is simply another stage in the progressive unfolding of our mastery over the natural world, biomedicine and technological interventions alike. In an ideal scenario, the utilisation of future technologies would enhance the quality of all human life, but only at the cost of first eliminating existing congenital physical and cognitive hindrances. It is not difficult to imagine what might count as a hindrance and the fears of people with disabilities that the thanatopolitics of eugenics would find new ground cannot be discounted. For all that a reliance on prostheses is an everyday part of many lives, disabled and otherwise, there is a justified unease about any suggestion that technologies should be celebrated as part of an evolutionary drive towards perfection. Leading transhumanists counter that discriminatory practices such as racism, sexism and nationalism would remain unacceptable, and Bostrom (2005) goes so far as to advocate the well-being of all forms of sentience. In his view, the transhuman is a phase in the journey towards the posthuman, but it would seem clear that most posthumanist scholars would disagree.

The crunch point that marks a distinction between the different perspectives is that where transhumanism overtly promotes human enhancement, posthumanism is more concerned with rethinking what it means to be human. The organisation that published the original *Declaration*, now calls itself *Humanity+*, and like others makes an explicit link with Enlightenment thinking. Bostrom himself unambiguously traces the roots of transhumanism to the secular humanist project that centres on the autonomous subject, and as a result he is able to imply that the potential of enhancements that are already possible, or may become so, is equitable because the transformative changes are a matter of individual choice. As Steve Fuller – who identifies himself as a transhumanist – comments, 'starkly put, posthumanism is anti-humanist, while transhumanism is ultra-humanist' (2013: 40). And that, precisely, encapsulates the ethical issue of why most avowed posthumanists are extremely wary of transhumanism.

The problem is that the latter remains highly ethnocentric – only the Western understanding of the self counts – and is unrepentant in its casual embrace of human exceptionalism. It is not that the humanist project is always ethically wrong or without merit – many of its tenets remain crucial tools in the protection of individuals – but that it is deeply inadequate to the world in which we live. As humans our lives unfold not just as individuals, not just as members of this or that category of people, not just as belonging to one geopolitical location, but as co-participants in a myriad of networks encompassing human, animal and non/living alike, the multiple elements that enfold and transform us in a mutual embrace. Posthumanists may have a local interest in revising the basic principles of humanist thought such as giving greater protections to other sentient non-human species as a stop-gap measure, but the major focus is on decentring the human entirely and dispensing with any commitment to an anthropocentric framework.[2] We cannot think like a bat, still less like a bacterium, but what can be done is to dismantle the hierarchies that lock us into the illusion of sovereignty over the self and others.

I am not suggesting that posthumanist thought alone is the only way of contesting the centrality of our own species and it is important to reiterate that many indigenous peoples have an open-ended history of rejecting the binaries that separate human and non-human life, nature and culture, life and death. As a scholar living and educated under the humanist imaginary of the global North, my affinity with others is disastrously underdeveloped but I can recognise that it need not be, and presumably has not always been so. In a certain sense, posthumanism may recreate aspects of a prehumanist world as it existed before the privileging of autonomy severed our relational links with the animals, plants and inorganic materials that support all forms of life. I do not want to universalise or expropriate indigeneity – either past or present – but simply to note that where it has existed, the absence of ontological and ethical hierarchies enables a holistic understanding of the world and the place of humans in it. The worldviews across a range of indigenous cultures have already inscribed the social self in a co-constitutive relation with the ecological rhythms of the surrounding environment. As such, an open exposure to otherness is the inherent condition of life. What the advent of the European Enlightenment, and the accompanying rise of colonialist violence and dominance, has imposed is the elevation of a very restricted and singular form of the human to a position of mastery. It is not that interdependence can be erased but rather that all the others – human and otherwise – are reduced to the status of utilitarian prostheses. Posthumanism and the parallel discourse of decolonialism are both about disrupting and deactivating that mastery in hope of more liveable futures. There has been some push-back from decolonialist scholars such as Walter Mignolo (2018) with regard to that relationship and the suggestion that the multiple dissimilarities in the history and emergence of the respective fields prohibit any meaningful deployment of decolonialist insights in posthumanist thought, but it seems to me necessary that there should be mutual reflection. The most important overlap is in the rejection of humanist modes of knowledge production.

Advocating a discursive position of anti-humanism is not of course the same as contesting the ideological promotion of the human; there may simply be better systems that answer to the ethical need to support flourishing life while also maintaining human centrality. But if, as I have argued, all human existence is chimerical, then the grounds for exceptionalism are greatly weakened. It is important to note, however, that my rejection of exceptionalism does not require that I should be anti-human as such. I am much in sympathy with philosopher Patricia MacCormack's term 'ahuman' which she develops as a radical experiment with 'an alternate way of writing and reading' in order to 'dismantle the dominance of the human' (2020a: *ix*). In *The Ahuman Manifesto*, MacCormack attempts to establish a speaking position from which it is possible 'to no longer argue like a human, with other humans' (2020a: *ix*). By refusing to designate the other as other and rejecting the binaries of subject/object and dominant/oppressed, her queer approach is deeply ethical in that she sees only 'a relation defined by what intensities are produced in the space between (or not defined at all)' (2020b: 104). In the face of human culpability for the degeneration of planetary life and the extinctions that inevitably follow, MacCormack not only proposes practices of antinatalism, for example, to speed our demise as the polluters and wreckers of other life forms, but identifies as an abolitionist.[3] Her emergent claim is that the final disappearance of our species would be a good in itself: 'The death of the human species is the most life affirming event that could liberate the natural world from oppression and our death could be an act of affirmative ethics which would far exceed any localized acts of compassion' (2020a: 141). Despite her clarion call to abandon the search for our own survival, MacCormack does not advocate radical, albeit humane, extermination for humans but rather proposes that we let extinction run its course, helped along by policies of antinatalism and voluntary euthanasia. There is no suggestion that she is indifferent to human suffering, either now or for future generations, or advocates violence against *homo sapiens* as we have directed it against non-human others; instead, it is an espousal that would intentionally oppose the reproductive desire and the supposed good of human existence *per se*.

As the ethics of a new imaginary, that thesis is hard to fault and yet I disagree. Mass extinctions are inevitable, and no one species is exempt. The end-time for human beings will undoubtedly come,[4] most probably hastened, but not necessarily caused by our own deadly behaviours, such that the scenario is as much biological as of ethical import. Extinctions happen, both naturally as the necessary co-partner of continuity, and as the result of single species dominance that can override the symbiotic processes of survival. For most postconventional thinkers – and that certainly includes MacCormack, Rosi Braidotti and to some extent Donna Haraway – the binary of life and death has segued into an opposition between human life and life itself. *The Ahuman Manifesto* is heavily focused on individuals and does not offer any substantive account of the entanglement of humans, other organisms and the inorganic. Rather strangely, life itself in MacCormack's account seems not to include our own species as at least one element of an ongoing vitalism, as though *homo sapiens* were ethically disqualified.[5] This seems to me to be a mistaken approach in that for all the horrors of environmental toxicity, out-of-control climate change, and imminent mass extinctions, forms of life continue to emerge and regenerate. Human beings are surely as much part of that fluid and uncertain mix as leopard seals and parasitic nematode worms, and although we may reasonably attribute *responsibility* to our species alone for a substantial breakdown of life as we have so far known it, that is not to say that our entanglements in the whole system could or should be excised. It is now very common in posthumanist and new materialist thought to acknowledge the irreducible and undecidable interconnections between assemblages of human and non-human, living and non-living entities, as well as between the organic and inorganic, so it seems contradictory to both celebrate that interdependency *and* advocate the extraction of the universalised category of the human. It is not part of MacCormack's remit to address the question of prostheses, but her remark – 'We are always parasite, never host' (2020b:103) – demonstrates an awareness of a prosthetic relation in which human beings do not stand alone.

For those who are horrified by the prospect of human extinction, there appear to be two distinct options: on the one hand, we could engage in the 'scholarship of lament' (Braidotti 2019) and mourn the loss of our own species as a disaster that demolishes human exceptionalism, or we could acknowledge our complicity in the annihilation of others and seek to counter the next cycle of extinction in general. For transhumanists, the second and more self-interested response would be to explore every possibility of extending the time of human beings, either through the fantasy of technological solutions such as colonising other worlds or by reimaging the human as fully integrated into AI systems even to the point of immateriality. Such moves are already discussed as life-affirming, but only in the sense that they speak to an overwhelming belief in the value of human or quasi-human life. Whether the proposed solutions are individually motivated – *I* don't deserve to die – or species oriented – *we humans* should be preserved at any cost – the effect is one that denies any connection between our own nominal species and other supposedly inferior ones. The part played by technology is transformative not least in terms of hybrid corporeality, but it supposes that the prosthetic relation is all one way. The underlying assumption is that some form of human subjectivity remains. In contradistinction, an alternate posthumanist response is to understand our own probable demise as a species in the context of extinction as a universal leveller for which our high degree of accountability is offset by the hope of flourishing in a different register. The assemblages within which our becomings are manifest are always provisional, and we might celebrate the realisation that we cannot anticipate what new forms of life will emerge. In short, the very nexus of decay and degeneration – even to the point of human extinction – is irreducibly linked to the energisation of life otherwise.[6]

For the immediate future, posthumanism is compelled to account for the condition of the human and the overwhelming focus of this text has been on the embodiment of human beings in the context of how visceral prostheses, both natural and technological, have undermined that very category by rendering it always multiple and fragmented. The steps to thinking a new imaginary have been evident long before present day concerns with either extinction or the advent of powerful new technologies that threaten to displace the traditional hierarchies of dominance. Our being-in-the-world – as Merleau-Ponty (1962) understands human existence – that already speaks to interdependence has, in theory at least, moved seamlessly to a state of becoming-in-the-world-with-others in which the self is not a pre-existing element but the emergent form arising from our entanglements. There *is* something distinctively human in that matrix but it has meaning and substance only as part of an encompassing whole. The urge to privilege human life above other forms has resulted in a highly constrained and impermeable understanding of what counts as vital, while in contrast posthumanist thought has exposed the leakiness of those boundaries and enabled an appreciation of the complex webs of connection between different registers and energies. The implications for ethics are succinctly summarised by Braidotti: 'Ethical relations … are the driving forces that concretize actual, material relations and can thus constitute a network, web, or rhizome of interconnection with others' (2015: 35). If we think of life in terms of a holobiont, then differences are not erased but recontextualised in the mode of rhizomatic entanglements. In that sense, posthuman/ism does not refer to concepts that simply supersede the human, and nor are humanism and its central concerns made obsolete.[7] Instead it speaks to contesting those unquestioned precepts in humanist thought that have generated such damaging disregard of others across all forms of the living world. Above all, posthumanism reveals that the ethical parameters that have conventionally been limited to human activity are deeply inadequate. In recognising a more holistic model that goes beyond categorical identifications, it can pose an inclusive ethics based on shared response and responsibility to one another, whatever form that might take.

The issue is not whether our intrinsic worldly interconnections mark the evolution of the human into the posthuman – although my own contention is that we are always/already posthuman – but how to contest the socio-cultural imaginary of the global North that still privileges independent thought as the marker of a proper ethics. Relationality is already the driving force behind many contemporary critiques of modernist ethical systems but it is limited to human or at best human–animal interaction and seems, moreover, to simply arrive at the same deontological and utilitarian principles in a more plural mode. Virtue ethics, which has found favour in some feminist thinking in particular (Hutchings 2000; Held 2006) and is strongly associated with an ethics of care, is no better given that the virtuous agent must rely on the aforementioned principles to guide behaviour. Certainly there is an urgent need to move beyond the straitjacket of subject/object relations and acknowledge the emergence and immersion of the human in ever-changing and non-hierarchical assemblages.[8] Donna Haraway has been a pioneering force in that respect, particularly in using her bioscientific background to give substance to what might have once appeared purely speculative claims. She has long proposed that feminist theory take seriously the unavoidably prosthetic nature of human life, from cyborgs (1991) through bodily enhancements (1997) to our entanglement with other existent species (2008a) and those yet to come (2016). Although Haraway delights in fabulations, her thought experiments give energy to her most optimistic hope: that once we are able to recognise and accept the interwoven human/animal/machinic texture of life, it will become possible to take apart the hierarchical oppositions of gender, race, species and many others. Her sustained deconstruction of spatial and temporal relations opens up creative possibilities for ontology, epistemology and an innovative multispecies ethics of response-ability. As she remarks:

> the accountabilities are extensive and permanently unfinished. Indeed, responsibility in and for the worldings in play … requires the cultivation of viral response-abilities, carrying meanings and materials across kinds in order to infect processes and practices that might yet ignite epidemics of multispecies recuperation and maybe even flourishing on terra in ordinary times and places.
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> (2016:114)

Haraway's perspective has much in common with Derrida's exposition of hospitality which for him is the heart of ethical endeavour: '*ethics is hospitality*' (2001: 17, emphasis original). Derrida is less overtly concerned with the multidirectional circulation of the ethical response, but if, as he asserts, the guest becomes the host's host, then the flow cannot be limited to human beings alone. It is certainly reasonable to extend the analysis to the other prosthetic relationships. In the Derridean mode, the question of identity is turned on its head and becomes that which should not be established. The welcoming embrace of hospitality – if it is to be worthy of that name – devolves on (theoretically) an absolute openness to the other. As Henriksen explains in her commentary on hauntology, 'the ethical task is to stay with the uncertainty of not knowing what this something is prior to its arrival. Only in this not-knowing can the truly different and other take place' (2016: 20). To give an unreserved welcome to that which Derrida characterises as variously the stranger or the monstrous *arrivant* is an inherently insecure move, the outcome of which cannot be determined or calculated in advance. The other – whatever form it takes – is always excessive to normative expectations, and Derrida concedes: 'For unconditional hospitality to take place you have to accept the risk of the other coming and destroying the place, initiating a revolution, stealing everything, and killing everyone' (1999: 71). The paradoxical point is that absolute hospitality is both necessary and impossible; our horizons of aspiration are undecidable and therefore both potentially destructive, *and* the point of positive expectation. What follows, then, if we are compelled to reject the distinction not simply between one embodied form and another, but between a body that would be foundational and its augmented configuration? I have already engaged with hospitality in relation to heart transplantation, and want now to quickly reconsider the issue of anonymity which I raised in Chapter 7.

Let me recap the basic concerns. Despite the widespread terminology of the gift of life to describe the transplanted organ, which implies an intimacy in the relation between donor and recipient, anonymity has been central to biomedical, psychosocial and societal practices and discourses around the process. The result is an inevitable disjunct between significant evidence that both individual recipients and donor families may be emotionally troubled by the prohibition and the wider biopolitical context of transplantation procedures which operate through a systemic de-individualisation of donors which enables an endorsement of the commodification of their bodies. The practice of anonymous donation is deemed a public good – mediated by the biomedical community – in which the gift is not personal at all, but becomes an expression of community cohesion rather than an enactment between individuals. The bitter irony, nevertheless, is that those most intimately concerned are simultaneously encouraged to celebrate the individual 'gift' relationship and denied knowledge of their counterparts as either recipients or donors. Either way, anonymity intends to effect a profound depersonalisation that enables organs to be translocated in the service of utilitarian ethics. Although OPOs are not unaware of the strength of negative feeling about imposed anonymity, they go to some lengths to conceal identities and override the potentially mutual choices of those involved. While such objectivity sometimes does serve a protective purpose in shielding both sides from unwanted expressions of intimacy, the bureaucratic operation of transplant support services dehumanises the participants and removes emotion from the logistical and biomedical procedures of procuring and transporting organs, matching donors and recipients on the basis of biometrics, and providing post-transplantation support. It is at times a deeply inappropriate and unwelcome scenario, given the deliberative disregard of human interaction. The relentless objectification of what is an inherently subjective and intimate process can be deeply damaging.[9]

In terms of conventional ethics, the answer would be to reconsider the grounds for anonymity and make it easier – with appropriate precautionary measures in place – for mutually consenting parties to enter into dialogue.

It becomes a matter of autonomous subjects making supposedly rational choices. Once, however, the focus is switched to hospitality, its enactment could be seen as a shared medium rather than centring on the recipient alone. Although it would not be hospitality in the absolute Derridean sense, it would ground a much clearer understanding that the donor heart was not a simple augmentation of an existent embodied self. In any case, Derrida is well aware that his horizons of aspiration must operate within the strictures of a modernist socio-cultural imaginary. As he explains:

> it is a question of knowing how to transform and improve the law, and of knowing if this improvement is possible within an historical space which takes place *between* the Law of an unconditional hospitality, offered *a priori* to every other, to all newcomers, *whoever they may be*, and *the* conditional laws of a right to hospitality, without which *The* unconditional Law of hospitality would be in danger of remaining a pious and irresponsible desire, without form and without potency.
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> (2001: 22–3)

Posthumanist ethics does not set out to provide resolutions, but neither is its willing embrace of an open-ended approach reducible to a relativism that is incapable of ethical standing, nor to an equally empty self-determination based in subjective privilege. For Derrida, responsibility in the absence of formal rules is at the heart of living well for it forces an ethical appraisal that cannot default to ‘calculation, program, causality’ (1991: 108). Where the ethics of modernity fails to respond to the uncertain, posthumanism takes on the very undecidability of our relations with others to ensure that modernist structures of ontology and ethics can be opened on to different horizons of living. As Derrida sees it, what matters is the requirement to ‘protect the other’s otherness’ (111), and that is why hospitality – before the name – is so essential. His extension of that concept beyond the brute binary of living and non-living to an alternative hauntological ethics (as I touched on in the last chapter) marks the unconstrained scope of who or what might constitute the other.

In his later work, Derrida became increasingly occupied with substantive issues and with the significance of technologies *per se*, but his ethics remain tantalisingly immaterial. Whenever a new imaginary is proposed – not here, not now, but on the horizon – there is difficulty in specifying its ethical content. In a similar way, most posthumanist scholars see potential but are unable to offer much beyond generalities. Rosi Braidotti, writing in a mode heavily influenced by Deleuze, is perhaps the most expansive and has much to say that makes a posthumanist ethics seem not just attainable but perhaps even inevitable. Like many other philosophers – and notably Derrida and Esposito – Braidotti is concerned to explicate an affirmative ethics that moves beyond the thanatopolitics that have dominated the twentieth century. Her approach is by no means based in a utopian optimism but on a clear belief that we do not have to accept that the conditions for political and ethical agency are dependent on the normative structures that currently surround us. As such, she does not downplay the horror and violence that marks contemporary socio-political structures nor fail to note its deadly connection to modernist philosophy in which mastery of the other is intrinsic to subject formation. And she is equally adamant that in some modes of life that are seen as postmodern – notably in the rapid expansion of digital technologies and biotechnologies – the oppression and injustices of global capitalism are perpetuated in even more lethal forms (Braidotti 2017).[10] Braidotti is especially concerned with the take-up of biogenetics, which – in contrast to my own work in relation to microchimerism and the microbiome – she sees not as a powerful realisation of communality at the cellular level, but as an expression of 'a shared form of vulnerability … a global sense of interconnection between the human and the non-human environment in the face of common threats' (2013: 50). Because, for Braidotti, vulnerability is a negative quality, and perhaps because she does not explore the impact of such micro-biology on innovative bioscientific thought, she concludes that what is required of a positive posthumanism is 'an affirmative bond that locates the subject in the flow of relations with multiple others' (2013). It would be pointless to deny that the creation of bioscientific knowledge is beyond the influence of a particular normative imaginary, or that it is regularly expropriated to support an existing political system, but that should not impede the promotion of alternative explications that are already affirmative.

In other respects, the transformation of the negative into the positive is at the centre of Braidotti's ethical perspective, and she repeatedly makes the point that once we leave behind oppositional thought, we are no longer tied to the present by negation. As she insists, 'what is positive in the ethics of affirmation is the belief that negative affects can be transformed. This implies a dynamic view of all affects, even the traumas that freeze us in pain, horror, or mourning' (2015: 51). Like Deleuze (1990), Braidotti understands the good life on the personal level as one that flourishes by overflowing individual boundaries and transforming itself even in the face of adversity, moving always towards new possibilities of becoming other than itself. What enables personal existence to be experienced as a positive force is the potency of affirming life by striving to realize one's potentials. That in turn opens up a shift of emphasis away from the normative focus on the individual life course to a depersonalised, decentred vitalist force – what Braidotti calls a vital materialism – in which my own practices and affects are minor components. What matters ethically are the qualities of relationality that consist 'of the deep sense of negotiations with multiple ecologies – social, environmental and psychic – that constitute us' (Braidotti 2017: 298). Yet even as we recognise our lives may be formed through multiple entanglements that does not preclude personal responsibility. We should aim, as Deleuze puts it, 'not to be unworthy of what happens to us' (1990: 149). While individuals will face temporal adversities – disease, disability, death – the task is to meet such events with endurance in the light of affirming life as a wider incorporeal force in which the human is simply one participating element. For Braidotti, such impersonal flourishing devolves on maximising radical relationality by striving to enter into multiple assemblages. The ethical good plays out both in the individual life and in a posthuman future beyond identity.

In the previous chapter, I outlined how death itself might offer the release of potential, but it is important to note that for Braidotti what we do in life is no less important. The ethics of affirmation have a strong political element that plays out in an active refusal of the necropolitics of the present day in which some lives are privileged, while others are let die. To think and try to live alternatives requires the mobilisation of a new ethical imaginary which on a personal level centres on our irreducible interweaving with others, the communality that our prosthetic relations with the world entail. Braidotti has given posthumanist ethics the serious and detailed consideration it deserves, but where I differ from her is around her apparent view that the ethical impetus can only be effective if it is grounded in a positive mode of coming together. Her approach explicitly rejects the notion of an intrinsic vulnerability that might draw together communities of living beings – humans and other species – as being a negative bond 'which is itself a consequence of human actions upon the environment' (2013: 79). Transhumanism too – though I am not suggesting that Braidotti has any time for it – positions vulnerability as a problem that we could transcend by becoming biological–mechanical hybrids or disembodied minds operating within a virtual world. Yet as Mark Coeckelbergh points out, transhumanist enhancement could not erase our current vulnerabilities because the imagined posthumans would remain 'dependent on their physical environment, on their bodies, on the technological and biological systems that embody and extend their minds, on other posthumans and on the people and things they value' (2011: 7). Vulnerability, then, is much more than a passive union of shared helplessness: rather it is the very condition of interdependent, chimerical life. The entanglements that are the experience of all ensure that at a meaningful level, all are precarious. Put bluntly, we cannot save ourselves as humans and nor can we save those others with whom we co-exist and die. The exemplary desire to overturn racism, disableism, speciesism and many other forms of social and environmental violence is an important first stage that demands vigorous engagement, but the challenge of alterity is not that *we* should take action in that register so much as recognise the ultimate futility of sovereign endeavours.

The problematic of vulnerability is one that I have previously addressed at length in *Embodying the Monster: Encounters with the Vulnerable Self* (Shildrick 2002) which addressed the concept as one that might be reclaimed from its negative connotations. The modernist desire for an invulnerable self necessarily disavows embodiment and abjects as monstrous the fleshy materiality of all those others – human and non-human – who threaten the supposed purity and self-sufficiency of the singular subject. As a consequence certain categories that fail to fit the normative standards of the global North – principally people with disabilities, ethnic and racial others, those who are ill or aged, women, and animals – are held apart as peculiarly vulnerable and/or inadequate, yet at the same time portending the collapse of all or any corporeal boundaries. It is, for example, a well-worked truism in disability studies that '(i)f we tell people about our pain … we remind them of the existence of pain, the imperfection and fragility of the body, the possibility of their own pain, the inevitability of it … and we will become "the Others"' (Wendell 1996: 91). Such conventional depictions of the putative vulnerability of disability offer a diminished sense of the human self beyond any progressive or emancipatory possibilities, and yet as Wendell and many others make clear, it is the common condition of being human.[11] While we are all assailed in greater and lesser degree by the material precariousness of global life under late capitalism – warfare, homelessness, racism, climate change, epidemic sickness are just a few of the ongoing hazards – vulnerability is also an existential state that may belong to any one of us. It is no surprise that it can be uniformly characterised as a negative attribute, the focus on which holds back a more affirmative way forward, but I want to introduce much more flexibility and complexity into the debate.

The vulnerability that I want to think with, rather than against, does not deny the negative circumstances that produce an experience of material precarity but goes further in unpacking how it might also be an irreducible condition of life itself. In an intriguing article, the disability theorists Kathryn Ecclestone and Dan Goodley pursue seemingly opposing approaches but concur that the 'recognition of collective vulnerability as a springboard for new conceptualisations of resistance … disrupt[s] materialist narratives of the human subject as a coherent, unified and rational agent of history' (2016: 175). The more humanist perspective on what it is to be vulnerable speaks clearly to shared experience and the potential at least of collective action, while the existential lens enables a vision of what already deconstructs human primacy and locks us into a universal web of interconnectivity. Our prosthetic and chimerical relations open us to otherness in all its forms, and it is that envelopment in a dynamic and unpredictable context where assemblages are provisional and often transitory that implants vulnerability at the heart of human becoming. As such, a posthumanist bioethics must avoid rigid categorisations of diverse life forms and the prescriptive obligations of the humanist model. Instead, it could be predicated on the mode of encounter – never without risk – that acknowledges a shared basis of being alive and the embodied vulnerability of existence in general. Judith Butler (2006) for one has built her own conception of bioethics on just such a recognition that the precarity of human life is related to its interconnections. In her initial understanding, Butler stressed that social vulnerability and exposure always manifest in a political form, and required that attention be paid to the wider structural context. More recently, however, that outward contestation of neoliberalism has been supplemented with an alertness to the phenomenological embodiment of the experience. In an acknowledgement that vulnerability signifies more than simple injurability, Butler has turned to a more positive take and positions it 'as a form of activism, or as that which is in some sense mobilized in forms of resistance' (2014: 99). And in a quasi-Deleuzian mode, she asserts: 'we cannot understand bodily vulnerability outside of [the] conception of its constitutive relations to other humans, living processes, and inorganic conditions and vehicles for living' (103) and makes the link to its transformative potential.

Much as I agree with what Butler has to say about the lines of enquiry that she takes up, her analysis of vulnerability is still primarily focused on the human and on external relations. Butler is acutely aware that certain groups of people are differentially exposed to vulnerability in its political context but she does not, even within that limited framework, make any sustained move to other forms of life. Moreover, as I outlined in *Embodying the Monster*, we are always and everywhere vulnerable to otherness not simply as an exteriority, but as an aspect of both the in-between state that is already entangled as self and other and the interior status of the embodied individual. Whether in a wholly organic form, as in surrogacy, organ and stem cell transplants; as a techno-organic hybrid, as many forms of disability demonstrate; or as the unexceptional ubiquity of microbiomic and microchimeric diversity, all forms of prosthetic assemblages show up the fault-lines in the closure of normativity, and gesture towards other modes of existence. What is at issue in all cases is the permeability of the boundaries that guarantee the normatively embodied self. The point here is that although final meaning, full presence, and fixed substance are all deferred, the promise is not one of unproductive dis-integration, but rather of dynamic new incorporations. To acknowledge that vulnerability is not a debased condition of the other, but the very condition of becoming is a step of profound importance, not least because it leads us to question the certainty and centrality of human being itself. My research on prostheses that motivates this text has grown directly out my original work on the experience of the monstrous – not least in reference to the phenomena of conjoined twins who most surely exemplify a mutually prosthetic relation – and the appraisal I set out then still resonates:

> To resist closure, to be open to the trace of the other within, the other that is both self and irreducibly alien in its excess, to resist the normalisation of the strange, is to accept vulnerability. It is the very possibility of our becoming, for ourselves and with others, and it commands us to give up the comfort of familiarity and willingly embrace the risky ethics of uncertainty.
>
> (Shildrick 2002: 132)

What I was unaware of at that time of writing, and what greatly strengthens the case that no sustainable division can be drawn between the diverse elements of a prosthetic relationship, is the significance of micro-biology. Human embodiment is never self-complete, as is already apparent in the prenatal engagement and microchimeric exchanges between the carrying mother and the foetus, and with the first introduction of microbiomic organisms occurring during the process of birth. It is clear that long before an infant encounters the many other supplements – and I use the word in its Derridean sense – that accompany human life, it is already in a prosthetic relation with multiple others, both human and non-human. That relation is not simply a neutral aspect of biology but the initial signs of an enabling mode that permeates all existence and grounds the condition for a posthuman ethics. The incoming of the other – both organic and inorganic – indicates a profound corporeal undecidability and marks embodiment itself as a form of world openness. The point of such an approach is to trace the effects of mutualistic interactions across radically different registers and to avoid privileging any one component above others. Some normative elements will remain in play, but there is no central position of dominance as there would be in the configuration of conventional forms of embodiment. Indeed, the nature of the entanglements is such that it becomes impossible to designate which elements are prostheses and which are hosts. The problematic of visceral prostheses revolves around a plethora of substantive and speculative concerns and it raises the urgent question posed by Dominik Ohrem: ‘What kinds of ontological and ethical imaginings … are sustained, or foreclosed, by the concepts and epistemic frameworks we work with, including those that we have inherited from a predominantly anthropocentric tradition of thought’ (2017: 44)? In Ohrem’s view, a turn to vulnerability as an inherent feature of postanthropocentric embodiment, offers a way forward, but what I would add, as I have suggested above, is that vulnerability is too easily recuperated within prevailing conventions and needs to be thought in the context of a new imaginary. It is a modality that opens up the question of how to develop – provisionally – other more adequate structures that can accommodate posthuman corporeality in its many forms. Where the pre-existing ontologies and epistemologies of the modernist subject govern and limit the nature of possible ethical connections, the dynamic of life in the mode of an assemblage, together with its rhizomatic extensions, is such that the conjunctions themselves engender meanings and a corresponding (bio)ethics.

The implicit promise afforded by the recognition of visceral prostheses is predicated on the failure of the existing structures of Westernised knowledge to address urgent newly emerging concerns in three arenas: postmodernist philosophy, social-cultural imaginaries and exploratory bioscience. Rethought together, those domains can steer us away from a stale anthropocentrism and constitute instead a novel somatechnics. The incorporation of an assortment of biotechnologies around and embedded in the body and the persistence of internal microbial and microchimeric life open up a variably unfamiliar perspective on which to build a new imaginary that is necessarily inclusive of difference and fluidity. The (bio)ethical demands are complex, and once the conditions for ethical engagement move beyond the present normative structures, it is no longer feasible to lay out any detailed template in advance. The only certainty is that the critique of the modernist conventions that underlie the discourse of the global North ensures that whatever arises will have a very different trajectory. Beyond critique, far more attention needs to be paid to alternative forms of knowledge – both traditional and speculative – than I have been able to give here and I hope others who are less embedded in Western models of thought will find different starting places and destinations. The task is to find a way forward by moving beyond humanist ethics to fashion a different mode of living that engenders unthought kinds of bodies and new relations that are about neither protecting us from bodily vulnerabilities nor re-establishing the primacy of the human. Although we may set out with a particular understanding of life, the conjunction of relations, energies and materialities that constitute prosthetic assemblages give rise to both creative growth and decomposition where neither represents an end point. The moment of ethical decision cannot rest and must continually be reaffirmed and transformed: an atemporal bioethics of vitalist entanglement beckons. Our possible futures and the full realisation of the posthuman in the imaginary are yet to be explored but the adventure is already underway.

# NOTES

## Introduction

1 It is worth noting that there is an extensive literature that identifies technology itself with prostheses in the sense that the technological supplements 'natural' human endeavour. See, for example, Grosz (2005), Selzer (1992), Stone (1995) and Wigley (1991).

2 See the hyperrealised images of US army veterans in the series shot by Michael Stokes, which along with the technical elegance of the prostheses and the assumed heroism of the photographic subjects celebrate an unabashed machismo and nationalism (Stokes 2015). Jenna Pitchford-Hyde (2017) provides a detailed analysis of what is at stake in such representations.

3 I am using the hyphenated term 'micro-biology' to distinguish it from the narrower discipline of microbiology which names the study of unicellular, multicellular or acellular micro-organisms. The latter includes the composition of the microbiome, but not microchimerism, both of which impact on the body's immune system.

4 Beyond everyday discourse – in which it signals the loss or impairment of bodily function or morphology – disability is a highly disputed term. The complexities inherent in the differences between physical and cognitive disabilities, long- and short-term duration, congenital or acquired states, and many more variables make universal claims contentious, although sometimes unavoidable. At very least, a critical awareness of the scope of the problematic is essential. I use the term 'putative' disability as a reminder that many of those labelled as disabled – people who identify as Deaf, for example, may see Sign Language as simply an alternative but equally effective form of communication – reject any implication that their forms of embodiment are somehow incomplete.

5 The New Materialism of the early twenty-first century marks the turn but was more than anticipated over previous decades by scholars such as Donna Haraway, Evelyn Fox Keller, Anne Fausto-Sterling and Lynda Birke who have been unafraid of engaging with the biological sciences.

6 The entrenchment of binary thinking invites contestation not simply as an unsustainable mode within its own intellectual context, as postmodernist theory has long demonstrated, but from the radically different ontologies and epistemologies of non-Western perspectives.

7 There is no one decolonial approach to follow, but a wide variety of – depending on the specific history and context – more or less suppressed indigenous philosophies that contest Western-based imaginaries and posit alternatives in which interconnectivity is a central element.

8 Throughout *Visceral Prostheses*, I use the term 'queer' to denote a deviation, or more radically a rupture, from any entrenched norm rather than as a term of sexual identity. In that sense, it has much in common with and often interchangeable with the term 'crip' which has developed in critical disability studies to serve a similar purpose. In my text, queering operates, then, as an analytic methodology.

## Section One

1 Left ventricular assist devices (LVADs) are a largely internal electromechanical system that pumps blood for those in end-stage heart failure, while extracorporeal membrane oxygenation (ECMO) effectively provides a heart–lung bypass to support cardiac and respiratory functions. Both procedures rely on advanced technological prostheses.

2 Eukaryotes include all animal, plant and fungal organisms as well as some unicellular organisms, but not bacteria or viruses, all of which may be present in the microbiome.

## Chapter One

1 See Stuart Murray's grim assessment of transhumanism: 'Its appeal to technological knowledge is simply an updated version of an old story that in its ultimate form leads to genocide and the characterisation of "a life not worth living"' (2020: 130).

2 During the same inter-war period, the work of physician and popular science writer Fritz Kahn became hugely popular. His unusual and lavishly illustrated approach to human biology stressed the analogies between machines and the human body in general, not just those of disabled/prostheticised subjects.

3 I use the term 'well-Being' to denote an ontological status rather than the well-being of good health.

4 Phantom limb refers to the sensation of still feeling the presence of a lost limb.

5 Vivian Sobchack, for example, remarks: 'In most situations, the prosthetic as lived in use is usually *transparent*; that is, it is as "absent" … as is the rest of our body when we're focused outward to the world and successfully engaged in the various projects of our daily life' (2005: 22).

6 In drawing attention to human–animal conjunctions, I reserve comment here on the ethical considerations of deploying other species in this way. Carey Wolfe expresses some of my misgivings: 'instead of seeing the nonhuman animal as merely a prop or tool for allowing the disabled to be mainstreamed into liberal society and its values, wouldn't we do better to imagine [the conjunction] as an irreducibly different and unique form of subjectivity … a shared transspecies being-in-the-world constituted by complex relations of trust, respect, dependence, and communication' (Wolfe 2010: 140–1).

7 I shall not deal with artistic representations *of* disability, but will note that the viewing or listening experience could be characterised as 'narrative

prosthesis' to use David Mitchell and Sharon Snyder's term (2000). In their view, figurations of disability may be used wholly metaphorically to transmit meanings quite separate from any understanding the lived experience itself. As they see it, portrayals of disability signal a prosthetic addition to the main text that can reflect, but also displace, all the individual and socio-cultural weaknesses, fragilities or anxieties of the normative narrative onto a form of embodiment that is already in a putative state of failure. In other words, disability is framed as an uber-signifier that always points to something else that defers any real engagement with those others who live with its effects.

8 Freak shows and their promotion of non-normative performativity – with and without prosthetic aids – were an historic source of waged employment for those with anomalous bodies. Without doubt there was widespread exploitation, and more contemporary public sensitivities have viewed the spectacles as staging the devaluation and abjection of disabled people. Although there has been a revival of similar shows in the recent decades and some commentaries have offered approbation, the term freak remains contentious (see Stephens 2005).

9 See Bufano's webpage for video links: http://lisabufano.com/video.php.

10 The world record for 1,500 m for a conventional athlete is almost fifteen seconds slower than that for a wheelchair athlete.

11 See *Dangerous Discourses* (Shildrick 2009) for an analysis of Foucauldian governmentality in relation to disability.

12 It is worth noting that where the ideas developed by Deleuze and Guattari with regard to the connectivity and implications of desiring machines have struggled for understanding, the similar and almost contemporaneous – albeit partially ironic – speculations of Donna Haraway in 'A Cyborg Manifesto' – originally a 1983 conference paper – have become, for feminist and crip/queer theorists at least, seminal fare.

13 The move beyond the biotechnology of machinic prostheses to an expansive interconnectivity with the environment is highly significant in posthumanist thought. See Moritz Ingwersen for an insightful supplementary commentary on Gibson's work which references Amanda Baggs's video 'In My Language' (2007) in which they flap their hands 'mimicking' a flag outside and create a variety of scraped metal sounds. Ingwersen characterises the movements as 'an affective interaction with her [*sic*] environment that celebrates an opening of corporeal interfaces to noise and creative interferences' (2017: 165), and it illustrates what he identifies as a cybernetic feedback relationship with the environment.

14 The Hindu concept of *karma* strongly influences the Indian response to misfortune, usually pitching it as delayed punishment for individual or collective misdeeds in an earlier life. And as Anita Ghai (2015) notes, 'disability as retribution has created a stoic acceptance of a disabled person's fate', meaning that little account is taken of structural issues of poverty, violence, work-based accidents, lack of healthcare and education and so on.

15 Disability theorists have approached the notion of queer in a both more and less radical ways, but most would concur with Michael Warner that queer is defined 'against the normal rather than the heterosexual' (1993: xxvi). See in particular work by Shelley Tremain (2000), Robert McRuer (2003, 2006), McRuer and Abby Wilkerson (2003), as well as several other articles focusing

on the intersections between disability and queer in a special issue of *GLQ: A Journal of Lesbian and Gay Studies* 9(1–2) (2003).

## Chapter Two

1 WHO data analysed from 2008 for 104 countries, covering almost 90 per cent of the worldwide population, showed over 100,000 solid organ transplants are performed each year, although recipients are predominantly live in wealthier countries (see https://www.who.int/transplantation/gkt/statistics/en/). Heart transplantation is the third most common transplant procedure (after kidney and liver grafts) and is mainly limited by the perennial shortage of donor organs and economic cost.

2 One year US survival rates in 2018 were over 90 per cent for adult recipients and around 60 per cent at ten years (Colvin *et al* 2020). On average, recipients lived for twelve additional years. The immediate risk is not so much from the operative procedure itself as from the fragile state of the recipient, given that transplantation is only offered to those facing imminent organ failure.

3 The heart has been the iconic centre of multiple cultural, religious and cosmological speculations and beliefs. In Catholic mysticism in the eleventh and twelfth centuries, for example, the Sacred Heart is proffered both metaphorically and literally by Christ for the redemption of true believers. Contemporary biomedicine holds out a similar promise that the heart is not simply life giving, but a moveable organ that is open to inspection, repair and ultimately transfer.

4 In antiquity, the liver was commonly seen by Babylonians, Assyrians, Etruscans and, later, the Hebrews, Greeks and Romans as at least the equal of, and sometimes superior to, the heart as the most important life force, and some cultures in Malaysia and Indonesia retain similar beliefs. Traditional Chinese medicine also ascribes great affective significance to the gallbladder (Sharifian *et al* 2008).

5 This is especially evident in the context of the world's first heart transplant in South Africa in which the organ of a donor designated as 'coloured' was grafted into a white recipient, a degree of intimacy that under apartheid law would have been unthinkable in life. It is a case of biomedicine erasing the differences that biopolitics constructs.

6 The first heart transplant was greeted by a universal excitement scarcely dented by the reality that despite the success of the operation, the patient died. The leader of the surgical team, Christiaan Barnard, achieved immediate celebrity status as the man who had quasi-successfully challenged our biggest vulnerability of all: death.

7 *PITH* project REB File # 07-0822-BE. The team comprised Heather Ross (the medical director of the transplant clinic where initial empirical research was based), Susan Abbey (the unit's director of psychiatry), Jennifer Poole (mental health researcher), Patricia McKeever (medical sociologist) and myself (biophilosopher), as well as two nurse-trained researchers – Oliver Mauthner and Enza DeLuca – who were familiar with transplant procedures. We were later joined by several visual artists – Alexa Wright, Ingrid Bachman, Andrew Carnie, Dana del Po, Emily Jan – and cultural theorist Tammer El-Sheik.

8 Unlike the donation of organs such as the liver or kidney, heart transplants rely solely on deceased donation. The donor proxies were those – usually close family – who had consented to the organs being transferred to recipients.

9 That cohort of recipients comprised well over 90 per cent of the eligible interviewees in the geographical area surrounding the major city where transplantations were carried out. Given the relatively low numbers it was impossible to make confident comparisons between various groups of recipients, but their varying experiences did suggest possible trends. See Poole *et al* (2010) for more demographic details.

10 Using a self-report symptom checklist, Dew and DiMartini (2005) identified substantial distress in just 33 per cent of their sample of transplant recipients, but our results are significantly higher at near 80 per cent.

11 The human-to-human element is not always in play, however. Procedures such as ECMO and the implantation of LVADs rely on advanced technological prostheses. Extracorporeal membrane oxygenation (ECMO) effectively provides a heart–lung bypass to support cardiac and respiratory functions, while a left ventricular assist device (LVAD) is a largely internal electromechanical system that pumps blood for those in end-stage heart failure.

12 I am not implying that some ‘natural’ bodies are beyond the ascription of hybridity (Waldby and Mitchell 2006; Hird 2007), but making the point that although the term is very rarely used in either clinical or lay literature, the recipient of a donor organ or a mechanical LVAD is undeniably constituted as hybrid. In phenomenological terms there is nothing exceptional about that: the embodied self only comes into being through an intrinsic intercorporeality with an array of others (2007).

13 The majority of the videos show just two participants, but it was not unusual for recipients to choose to be interviewed in the presence of a family member, or for others – along with a variety of pets – to be in and out of the background of the defined location.

14 The phrase comes originally from Heidegger’s *Being and Time* and was given further development by Merleau-Ponty.

15 Incongruities could be classed as either *upgrades* where recipients displayed guarded body comportment or distressed expressions while voicing positive feelings (‘I’m a 100 per cent satisfied’ said in an assertive voice while the speaker held herself in a comforting hug), or *downgrades* in which body language was assessed as non-distressed and open, despite the markedly negative content of verbal communication (the laughing participant who spoke of the ‘expiry date’ of the transplanted organ).

16 The issue of donor proxy beliefs around the idea of living on is addressed in depth in Chapter 7.

17 Subsequent disclosure of the hospital’s transplant records showed that there was very little correspondence between what was imagined of a donor or recipient and who that person actually was.

18 Transplantation researchers Fox and Swazey (1992: 199) attributed their decision to leave the field to ‘participant-observer burnout’, but they made clear not only their own distress at observing the disturbance to other people’s lives, but also their disquiet with biomedicine’s ‘zealous determination to maintain life at any cost; and a relentless, hubris-ridden refusal to accept limits’. The *PITH* team had similar concerns.

19 The phrase ‘I’m still the same person’, and its variants, is repeated again and again by post-transplant recipients, even as they embody signs of personal disruption.

20 The term is widely used to head up public campaigns to encourage people to sign donor cards; it is emblazoned on hospital vehicles including those that actually transport the organs; it is the slogan of the biennial Transplant Games; and it is constantly on show within transplant clinics and their literature.

21 Donors are memorialised in a range of formats: the Donor Wall (see Chapter 7); international sporting events like the Transplant Games; religious services for recipients and donors/proxies alike; public campaigns by OPOs (organ procurement organisations); and the award of commemorative mementos to donor proxies.

22 All transplant clinics enforce a varying degree of confidentiality regarding both donor and recipient. In the Canadian jurisdiction of *PITH*, the amount of identifying information given on either side of the transplant relationship – age, sex, ethnicity and so on – is strictly limited.

23 The phrase the ‘tyranny of the gift’ was first used by Fox and Swazey (1992).

24 This is powerfully exemplified in the documentary *Corey’s Heart* (2010) in which the young mother of deceased donor, Corey, meets with the middle-aged woman who has received her son’s heart. Interestingly, the new lines of kinship position the older woman as almost a mother to the younger one. In the final interchange the grieving mother exclaims: ‘She’s going to be in my life forever’; ‘New family; new family; new family’, responds the other.

25 In older literature, the transplant is referred to as a graft, surely a term of *différance* that captures the ambiguous meaning of the gift of life: does it save the life of the dying cardiac patient or merely use the host body in order to sustain its own life?

26 See, for example, Sara Wasson’s book, *Gothic Transplantation* (2020). It is not only hearts that evoke such responses. Eye and hand transplants are seen as equally disturbing elements. See, for example, the movies *The Eye* (2008); *The Hands of Orlac* (1924); *Face/Off* (1997); and *Hybrid* (2007) which deals with transspecies transmission of capacity.

27 The revulsion rests on the notion that non-human others are impure, abject, not that it would ethically wrong to exploit them in the service of human beings.

## Chapter Three

1 In a rare paper co-written by biologists and humanities scholars, Rees, Bosch and Douglas (2018) propose something similar.

2 Cephalopods – the class of marine molluscs – are known to have extremely complex nervous systems and are credited with the intelligence of small children, and have a well-documented capacity for inductive learning and memory (Godfrey-Smith 2016). Under the *Animals (Scientific Procedures) Act* 1986 (amended 2012) which establishes what is permitted in the UK and is closely mirrored in EU law, procedures on the cephalopod family are strictly limited and must be licensed.

3 See the work of the Animal Free Research Group who endeavour to put ethical concerns at the heart of science: https://www.animalfreeresearchuk.org/animal-replacement/.

4 Stilling *et al* caution: 'We cannot ever fully appreciate whether a given micro-organism is rather symbiotic or parasitic until we know how evolution and development would look without it' (2014b: 80). Strictly speaking, parasitism is a form of symbiosis, albeit with negative outcomes for the host. Other forms include a commensal relation – where the benefit is to a host alone – or a mutualistic interaction which implies that there are gains for each component.

5 An unavoidable truism in the midst of the corona virus pandemic of 2020.

6 Faecal microbiota transplantation (FMT) is an infusion of faeces from a healthy donor into the gastro-intestinal tract of a recipient in order to treat a disease associated with an unhealthy gut microbiome.

7 There is a further development in what is called helminth therapy where live or helminth-derived products are applied to aid survival of allografts. See Kiss *et al* (2020).

8 The thousands of different species in the microbiome each have their own DNA indicating that the additional genetic diversity is far greater than the base human genome (Dekaboruah *et al* 2020).

9 The percentages for each geopolitical block vary greatly with the highest incidence in Africa and the smallest in the industrialised nations of the global North.

10 To say *H. pylori* is simply harmless is somewhat misleading as it is well known to promote many protective and beneficial processes (Amin Talebi 2014).

11 The medical term used here should not be taken to diminish the recent work within disability studies on reclaiming the positive potential of neurodiversity particularly with regard to autism (Armstrong 2015; McWade *et al* 2015).

12 The immune system is triggered by molecules known as antigens, but contrary to lay beliefs, not all are pathological or necessarily 'foreign'. Numerous auto-immune diseases result from the misrecognition of self cells.

13 A holobiont – a term initially defined by Lynn Margulis (1991) – consists in an assemblage of a putative host and many other diverse organisms living and interacting together in a semi-permanent and intimate state to form their own ecological unit.

14 In his *Nature* lectures, Merleau-Ponty (2003) too raises the issue of the supra-human aspects of human corporeality – our 'strange kin' – to challenge the absolute ontological distinction between human and non-human (2003: 271), but he fails to develop it further.

15 In the conventional allopathic model of biomedical discourse, all the cells of the body incorporate the HLA that marks them as self. When the immune system encounters cells without these precise combinations – as, for example, in bacterial or viral infections, tumours or transplants – it identifies them as not-self and launches an immune response that treats the unrecognised material as pathogens to be neutralised.

16 There are two major types of MHC (major histocompatibility complex) protein molecules – class I and class II – that span the membrane of almost every cell in an organism. In humans these molecules – HLA – are encoded and expressed by several genes all clustered in the same region on chromosome 6.

17 This is far from speculative science with the *Human Microbiome Project* receiving substantial ongoing funding from the *National Institutes of Health* in the United States. Nonetheless, the task of identifying the genetic entanglements of the specific biomass lends itself to profound speculation on the nature of the human.

18 Very rarely, a female mule may produce offspring although the incidence is almost negligible. The problem is that horse and donkey chromosomes are sufficiently unalike to adequately pair up in the gametes and that as there are sixty-three parental chromosomes, there is always one that remains unpaired.

19 See also Yu *et al* (2002) and Norton and Zehner (2008) for a highly bioscientific report of a similar phenomenon and a cultural studies take respectively.

20 As Medawar explained at the time, '"immunological tolerance" may be described as a state of indifference or non-reactivity towards a substance that would normally be expected to excite an immunological response' (Medawar 1960).

21 A relatively recent report in *Nature*, announcing the newly sequenced genome of the marmoset monkey refers to its 'unique' capacity to produce 'dizygotic twins that exchange hematopoietic stem cells *in utero*, a process that leads to lifelong chimerism' (Marmoset Genome Sequencing and Analysis Consortium 2014). This is odd as Medawar himself, referring to earlier work by R.D. Owen in 1945, was well aware of the similar process in dizygotic twin cattle (Medawar 1960).

22 In addition, as Susan Kelly (2012) points out, cellular therapies – such as those involving bone marrow – and regenerative medicine in general already challenge the illusion of the atomistic individual body.

23 A similar approach has been suggested in relation to xenotransplantation which is of enduring interest as a possible source of organs suitable for human recipients. The problematic is that although the cellular immunologic rejection of xenografts is even stronger than with allografts, it might be overcome if prior chimerism were induced in, for example, the human recipient of a pig's heart through the use of porcine bone marrow (Abe *et al* 2002). The bioethics of such a scenario should be enough to prevent its take-up, but xenotransplantation is almost universally banned, not for ethical reasons, but for cultural distaste and modelling that shows it is not as effective as anticipated.

24 The greatest part of the research on microchimerism focuses on female bodies simply because of the comparative ease with which Y chromosomes can be detected as 'out of place' in among women's XX cells. There is no suggestion that microchimerism is limited to one sex rather than the other.

25 See also Rotman (2008) for a popular science commentary on the case.

26 The problem is that having once identified maternal–foetal chimerism, few researchers are actively looking elsewhere for it.

27 I am, nonetheless, a little wary of invoking something equivalent to the eighteenth-century doctrine of preformation (see Shildrick 2002).

28 Tetragametic chimerism occurs when two zygotes fuse and develop into a single body with two distinct sets of DNA.

29 *Pace* Jamieson (2015), who argues that it is new materialism that challenges the putative distinctions made by Cohen. Though I broadly agree with her, the

same conclusions can be reached via a feminist uptake of Derrida and others that applies the deconstructive drive to substantive contexts.

30 See Goffey (2015) for a helpful overview of the relation between bioscientific and humanities understanding of immunity.

31 The maternal process of providing placentally mediated immunity to the foetus also changes the mother's own immune system. Her cell-mediated T cells, which might otherwise attack the foetus, become weaker, while the B cells of humoral immunity show an increase.

32 My own first presentation on the implications of microchimerism was met with a dismissive denial by a biochemist of the very possibility of such a process. After I referred him to a plethora of bioscientific papers backing up my claims, his response was that if it was ubiquitous, then there was nothing interesting to say about it. See Aryn Martin (2010) for an account of the hostility encountered by Diana Bianchi's initial research into microchimerism and prenatal genomics.

## Section Two

1 At the time of writing, news media are excitedly reporting on a Chinese–American project that has successfully injected human stem cells into primate embryos which then continued to develop for up to twenty days. See Tan *et al* (2021).

## Chapter Four

1 Queer research includes Linn Sandberg (2018), Andrew King (2016), Sue Westwood (2016), while Kontos *et al* (2016) explore sexuality more generally.

2 Examples include Annelieke Driessen (2018), and the work of music scholar and composer Jill Halstead for the Norwegian project Living Senescence.

3 The phenomenon of the Uncanny Valley effect, first proposed by Mori (2005), posits a limit to the likeability of humanoid robots. At a certain advanced point the very similarity of their responses to those of humans elicits a deep sense of unease and rejection.

4 There is no direct research to confirm this, but a recent study on group interactions in the presence of a participating robot suggests that communication is enhanced if the robot presents itself as having vulnerabilities (Traeger, Sebo *et al* 2020).

5 See Calo, Hunt-Ball *et al* who spell out that although 'Paro was not designed as a *replacement* for social interaction with people, one still might observe that, during actual occasions when it becomes the focus of attention for elder humans, it often may be *substituting* human-robot interaction (HRI) for human-*human* interaction (HHI)' (2011: 23).

6 For more about an encounter with Pepper, see Murray (2020).

7 It is currently the case that the majority of care and empathy robots are produced by Southeast Asian companies, but are most widely used in Western-based scenarios.

8 I am grateful to Kazuki Yamada for bringing these points to my attention in his insightful commentary on my paper presented at the *Technosomata* conference at the University of Exeter (2019).

9 *Medscape* is a commercially owned, free to use, US-based website that aims to improve biomedical care by providing comprehensive and constantly updated clinical information and resources to doctors and healthcare professionals, though it is accessible to non-specialists. The site collates and summarises a wide range of recently published bioscientific articles and offers one-click access to the full originals.

10 In biomedical terms, dementia is not a specific disease as such but more a group of symptoms that are caused by other identifiable diseases like Alzheimer's disease. Vascular disorders and various infections are heavily implicated as causal factors. In all cases the brain is adversely affected and gives rise to such things as memory loss, social and spatial confusion and lack of rational and problem solving thought, as well as agitation and personality changes.

11 The blood–brain barrier, which has the function of protecting the brain against toxins and pathogens carried in the blood, was thought to be impermeable to cells, but recent studies have demonstrated that microchimeric cells can be found in the maternal brain tissue.

12 There are already signs of an intuitive understanding that sustainability can extend beyond death. The existing trend in many countries of the global North towards woodland and organic burials – mirrored in Eastern practices of sky burial for example – are now becoming commercialised in companies such as the US-based Recompose (https://recompose.life) which offers natural organic reduction or human composting, a process heavily reliant on microbial action.

## Chapter Five

1 The 2021 reports of the first successful production of living, self-healing robots created from the cells of frog embryos are further evidence of the intense bioscientific interest in utilising the unique capacities of stem cells. The resultant xenobots could theoretically carry medicine inside human bodies or patrol our arteries to scrape out plaque. The project, inevitably, was funded by DARPA which may have less beneficial aims.

2 I will refer directly to empirical material collected under the auspices of a sibling stem cell project which interviewed seventeen families. I am very grateful to the research team – Christina Schües, Christoph Reimann-Sutter, Martina Jürgensen and Madeleine Herzog at University of Lübeck – for giving me access to some of the data which forms the basis of their edited collection: *The Child's Body: Stem Cell Transplantations between Siblings as Social Phenomena* (2022). All unreferenced family quotes are taken from the anonymised data gathered by the Lübeck team.

3 See 'Messy Entanglements' (Shildrick *et al* 2018).

4 Bone marrow donation is most widely used form in children under the age of twelve as it is better tolerated and the stem cells are more easily collected.

5 See Derrida's exposition in *Spectres of Marx* (1994) which lends itself to the implementation of spectrality in many different guises.

6 Survival rates, not surprisingly, depend heavily on the nature of the underlying malignancy, and do not appear to be as positive as those arising from heart transplantation. There is some evidence that the younger the donor, the greater chance there is of recipient recovery (Shaw *et al* 2018). Survival of children undergoing allogeneic BMT has steadily increased during the past three decades, but as Holmquist *et al* (20) report, such recipients – compared with the general population – have an elevated risk of late mortality even twenty-five years or more after SCT, pointing to the need for lifelong follow-up.

7 The interchange between a donor and her mother in the Bahr family interview spells out the pressure:

> D: I still think it was right, but for me as a child I was still aware: if I don't do this, I'm to blame.
> M: Exactly, if Björn dies, exactly.
> Many parents determined to push ahead with familial donation and simply overrode their children's hesitations, as evidenced by the Kunow family donor; Rodhe father; Jaschke mother and Preuss father.

8 See Herzog *et al* (2022: Introduction) for an extended discussion of the normative ethical complexities and for a run-through of the potential medical harms that might be experienced by a donor.

9 The international medical services provider Mediglobus estimated the costs in Germany in 2018 as averaging over €100,000 for an autologous bone marrow transplant (using previously stored self-cells), over €200,000 for an allogeneic transplant from a related donor and more than €250,000 for an unrelated donor (mediglobus.com/cost-of-bone-marrow-transplantation-and-where-is-it-performed/). Costs for sources of bone marrow in less wealthy nations were considerably lower.

10 Whether for adult or paediatric SCT there is a striking lack of phenomenological accounts that go beyond the biomedical concerns. One ubiquitously cited paper, by a practising psychiatrist (Morstyn 2009), refers to Merleau-Ponty to enhance his own understanding, but it is limited to challenging the conventional split between body and mind. There is, moreover, a complete lack of concern for the donor so that any relation remains unthought.

11 The disregard is striking in the light of the paper by Pillay *et al* (2012) that reported that 68 per cent of donors see emotional distress as being the most challenging aspect of donation compared to just 41 per cent who named physical discomfort as the major problem. The authors' account of what constitutes emotional distress is, however, very thin.

12 Starzl's own explanation for the hiatus in research was that the efficacy of the stem cell infusions was obviated by the practice of giving them too close to the administration of immunosuppressant drugs at the time of transplantation.

13 I stress clinicians here in distinction to those doing SCT research. Talking to immunologists I have been struck by the disjunct between the pragmatic treatments on offer and strictly research findings – often in relation to murine models – that indicate more effective ways forward. Clinicians cannot of course experiment on patients, but many seem unaware of alternative therapies.

14 The issue of shared identity may be expressed in many ways with most donor–recipient dyads preferring to speak of heightened bonds rather than direct identity transfer.

15 See also the take-up of Esposito in the work of Brown, Machin and McLeod *et al* (2011), Brown and Williams (2015) and Kent and Meachum (2019).

16 It is noticeable that it is often fathers who carry the joke as in the Diedrich or Kunow families. The comment offered by the Minz family recipient is typical:

> R: my Dad sometimes makes silly comments, if it's like (.) I dunno, if Malle [the donor], if there's some kind of opinion about Malle or Malle is supposed to make some kind of decision and isn't here, then he can – my Dad always says: yes, Marlena can do it, she has the same thoughts as he has, he has the same bone marrow or something like that, me and my brother, I mean we always think this is quite idiotic (laughs) or like that.

17 I will flesh this out in Chapter 7.

18 The supposed homogeneity and unity of family life following sibling donation – in other words, a coming together on characteristically parental terms – may in fact be the source of disquiet for the young siblings involved. Forinder and Posse found that the stress on families is high, and that a minority of recipients suffer significant psycho-social problems. As they put it, 'their parents had already given so much of their time and they [the recipients] were afraid to "burden" them by talking about how they really felt inside' (2008: 307). This somewhat flat explanation misses, I would argue, the complexity of the ontological disturbances of all involved.

19 The growing literature on microchimerism makes clear that it is not simply the outcome of certain intercorporeal interventions but may the condition of all human life. See Shildrick (2019).

## Chapter Six

1 See also Sloan (2021) for a wide-ranging overview of the implications of (micro)chimerism in the context of parental/family law in the UK. On the issue of paternity, Sloan raises the intriguing possibility that a child's genetic 'father' might be an unborn twin absorbed *in utero*, who therefore never became a legal person.

2 DNA testing might also facilitate the reversal of the Trump-era policy of separating children and parents at the US–Mexican border that has led to thousands of young people being 'lost' without record in a deliberately hostile system.

3 Applicants themselves usually bear the costs of DNA testing.

4 Translocated microchimeric DNA is not of course limited to organ and tissue transplantation.

5 In the assisted reproductive technology of gestational or full surrogacy, the carrying mother is (formally) genetically unrelated to the embryo that is implanted in her uterus following *in vitro* fertilisation. Both the egg and the sperm, one or the other, or neither – if an external donor is used – may come from the intending parents.

6 In conventional immunology, the intrinsic antigens carried by both self and other are not mutually tolerant.

7 The well-rehearsed case of Baby M – who was conceived through IVF using the intending father's sperm – was the first (traditional) surrogacy case to come before the US courts in 1987. The birth mother was recognised as the legal mother but custody was finally awarded to the father and his wife. See Rothenberg (1988); Diprose (1994). Baby Gammy, born from a gestational surrogacy arrangement in Thailand 2013, was the centre of worldwide attention when it transpired that the intending parents, an Australian couple, had taken his twin sister out of the country but left Baby G – who had Down Syndrome – with his surrogate mother. The case is very murky – particularly in view of a sensationalist media coverage – but it appears that the birth mother had exercised her legal right to keep the infant in her own care. See Callaghan and Newson (2014) and Lee (2015).

8 Recent changes in the legal framework of some jurisdictions – notably India, Thailand and Cambodia – previously known for facilitating cross-border surrogacy mean that there are now fewer legal options, although loopholes and 'black market' operations still exist. The emphasis has switched to Russia, Ukraine, Greece and many US states where regulations allow for non-resident arrangements and to some South American countries which lack relevant legislation to either promote or prohibit the practice.

9 Countless others have explored the global traffic in biomaterials from a socio-political and literary perspective (see Scheper-Hughes 2003; Bass 2005; Zwart 2016) that highlight the legal, ethical and imaginative concerns, but in this text, I want to move away from such conventional frameworks. Suffice it to say that in a strong sense the bodies of vulnerable donors are themselves visceral prostheses.

10 See also Catherine Waldby (2019) for a searing analysis of the global market in oocytes which are traded and exchanged as reproductive prostheses.

11 As epigenetics has been a significant growth field in recent years with many influential new texts published, I have not covered it in any detail in my own text. See Squier (2017) and Meloni (2019) for some engaging perspectives.

12 See also *The Human Placenta Project*, another generously funded US research enterprise that looks mainly for placental involvement in pregnancy complications (Guttmacher, Maddox and Spong 2014).

13 Much of the foundational work on human epigenetics is based on research around reproduction either during *or after* the Dutch Hunger Winter of 1944. As Samantha Frost (2016) points out, any environmental provocation in pregnancy is embedded in subsequent generations through the incipient transmission of germ cells that develop from those initially affected.

## Section Three

1 See Chalmers (2010).

# Chapter Seven

1 Even that certainty is contested by the discovery of a jellyfish – *Turritopsis nutricula* – that appears able to revert to an earlier form of its development and continually regenerate itself.

2 Slavoj Žižek's critique (2014) – that the new materialist attempt to undo some specific aspects of modernist thought merely re-inscribes humanist values in extending agency and vitality to non-human material – is hard to dismiss.

3 Peta Hinton (2017) disagrees and faults Braidotti: 'In affirmation (as opposed to negativity), humanity (as opposed to inhumanity) and liveliness (as opposed to death), there is a space in which life and death are necessarily, and always already the beginning and end of each other' (Hinton 2017, 242).

4 Lykke is acutely alert to the limitations of Westernised conceptions of dead and alive and draws on, among others, Chukchi beliefs to illustrate her reclamation of death. See also Bathsheba Dumuth (2019) for an exposition of the practices of Chukchi, Yupik and Iñupiat peoples – from the Siberian and Alaskan sides of the Bering Strait – regarding their relationship with the animals that they have traditionally hunted for food and many other forms of sustenance. Mutual cooperation and respect between human and animal are assumed, and souls may transmigrate in both directions. As such, 'non-human' creatures – and the non/living aspects of the contextual environment – are not mere supplements to existence but the irreducible substance of it.

5 As I write these lines in 2021, the whole world is in the grip of the ongoing Covid-19 pandemic which has brought the question of death to every population, but scarcely dented – in the global North at least – the view of death as a harrowing termination of individual life.

6 Aside from the elements that I have already explored, another form of visceral prosthesis that moves between living and less commonly deceased donation concerns the practices of cryo-reproduction, the freezing of sperm and embryos for later implantation. As Kroløkke *et al* (2020) suggest, the process of storing biomaterials on ice suspends decay and constitutes a way of 'cheating' death.

7 Spectrality here denotes the absent presence, phenomenal and non-phenomenal, of an intimate other whom I cannot acknowledge. As Derrida puts it, 'from the moment that I cannot exchange or meet a glance, I am dealing with the other, who comes before me; an absolute autonomy is already no longer possible' (Derrida and Stiegler 2002: 122).

8 See Campos *et al* (2018). Research on dispersed 'brain-like' activity is focused on animal studies, but the implications for human physiology cannot be overlooked.

9 In recent years, donation after circulatory death (DCD) has been reinstated as an acceptable procedure. Donors may be those who do not fulfil brain death criteria but have no hope of recovery, and for whom the withdrawal of life-support is in their supposed best interests (Manara, Murphy and O'Callaghan 2012). In 2016, the British Transplantation Society recommended against DCD for heart transplants, but restricted – and mostly paediatric – procedures are underway in the UK, as elsewhere.

10 For Agamben, the brain-dead body is a paradigm case of bare life and therefore open to sacrifice, but for those at the bedside, hopes of recovery – or perhaps just endurance – are sustained by the sense, not of death, but of the extreme vulnerability of a still embodied self.

11 See Margaret Lock (2002) for an analysis of the criteria and meaning of death in contrasting North American and Japanese contexts.

12 Donor families were drawn from three different provinces in Canada.

13 In the interests of anonymity, the name has been changed and the specific First Nations identification not given.

14 There are relatively few studies of organ transplantation within indigenous populations, although the work of Robert Webb and Rhonda Shaw (2011, 2021) with Maori communities is an exception.

15 The original text authors and film directors are *Coma* (Wood 1977/Crichton 1978), *Never Let Me Go* (Ishiguro 2005/Romanek 2010)*, Dirty Pretty Things* (Frears 2002) and *L'Intrus* (Nancy 2002 /Denis 2004).

16 See McCormack (2012) and Wasson (2020).

17 The exchange itself is theoretically endless with each party consecutively occupying the position of giver or receiver. In the context of heart transplantation, the initial sending of a 'thank you' letter – even under the strictures of anonymity – implicitly demands a reply which in turn necessitates its own reply and so on.

18 I am reminded of Dolly the sheep, cloned from her 'mother' at the Roslin Institute in 1996. When she died well before the normal life span of her breed, which sheep exactly had expired?

19 The disavowal of the naturally terminated, or even the stillborn, foetus in the global North is not a universal characteristic (Cecil 1996).

20 Jean-Luc Nancy's text *L'Intrus*, written after his own heart transplant, initially suggests a form of parasitism although it moves to a more Derridean conclusion: 'The *intrus* is no other than me, my self' (2002: 13).

## Chapter Eight

1 Tomasz Pietrzykowski notes that continuing technological development obfuscates distinctions between natural creatures and their cyber-counterparts: 'This applies equally to artificially synthesised biological organisms (that is, organisms based on a lab-generated genetic code), to animal imitating robots, and to the emerging technologies of artificial implants inserted into a living biological organism and influencing its function' (2018: 63).

2 Anthropocentrism is a convenient umbrella term but in reality it is always situated as a temporally and geopolitically specific ideology that takes many forms in the circulation of liberalism, capitalism, colonialism and speciesism. It may be better to think about anthropocentrisms in the plural. See Rafi Youatt (2017).

3 Abolitionism generally opposes any use of sentient beings – human or otherwise – by our own dominant and self-privileging species. MacCormack does not see this as an issue of extending rights, but of dispensing with the human race. See also David Benatar (2006).

4 *Pace* the transhumanist dream of immortality.

5 On this point MacCormack is explicit: ‘I am a speciesist, but only in reference to one species – humans’ (2020a: 54).

6 See Neel Ahuja (2015) on the question of extinction and life otherwise.

7 See Carey Wolfe (2010) for an extensive account.

8 The philosophical model of object-oriented ontology also rejects the subject/object hierarchy and disallows human exceptionalism. It differs, however, from the approach I am proposing here in that it posits objects as having an ontological surplus that is ‘already there’ rather than emerging through relationality.

9 Over 80 per cent of the *PITH* recipient cohort, for example, was reduced to tears of distress or despair in describing their struggles to write the anonymous letter implicitly demanded by their receiving the gift of life, while on the donor side, the *GOLA* research uncovered similar anguish if nothing was heard from the anonymous recipients.

10 Sam Opondo’s work is especially pertinent in reminding us that biocolonial economies – like that around organ transplantation – exhibit several features of the posthuman concerning questions of the body, life and death that can be deadly for the colonised: ‘The imperative to save specific human lives and the recognition of the entanglement of human lives erases certain bodily boundaries while enabling forms of bodily fragmentation, appropriation, and commodification that create a “sense of ontological insecurity” for those whose bodies are considered a reservoir of spare parts or a depository or conduit for trial drugs’ (2015: 123).

11 See Thomas Couser (1997), Henri-Jacques Stiker (1999) and Carol Thomas (2007).

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