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Chapter 3 Beyond disintegration: Transhumanism and enactivism by Marilyn Stendera

Abstract: The enactive approach is becoming increasingly influential within the philosophy of cognition, to the extent that it is now one of the dominant models of embodied cognition – an umbrella term for a varied set of discourses sharing the view that our minds don't just happen to be 'in' bodies, but are enabled, shaped and (at least partly) constituted by the specifics of our physicality. This chapter will argue that the rise of enactivism is particularly relevant to transhumanist discourses, and vice versa, because their concerns intersect and conflict in vital ways. The discussion will use three core enactivist themes – organisational integrity, embodiment, and precarity – to draw out the kinds of tensions and intersections that enable enactivism and transhumanism to problematise one another.

Enactivism defines life and cognition in terms of autonomy; that is, it posits that living systems generate and maintain themselves as porous yet bounded self-unities. This sets up a delicate balance – both for the enacting system and for enactivism itself – between the dual imperatives of adaptive self-creation and homeostasis. The system must change constantly in order to sustain itself, yet there is a limit to the system's flexibility. Beyond a certain point, change means disintegration, and disintegration means death. This balance itself resonates within transhumanist discourses, in the tension between the promise of radical self-transformation and the concern about taking this too far. These discourses, however, also challenge enactivism's potential to capture the full potential of the kinds of systems it describes. How do we determine the limits of morphological flexibility for cognisers as complex as ourselves? Are those limits fixed or malleable – and must integration always mean death, or can it facilitate redefinition?

3.1 Introduction

The enactive approach is becoming increasingly influential within the philosophy of cognition, to the extent that it is now one of the dominant models of embodied cognition – an umbrella term for a varied set of discourses sharing the view that our minds don't just happen to be 'in' bodies, but are enabled, shaped and (at least partly) constituted by the specifics of our physicality. This chapter will argue that the rise of enactivism is particularly relevant to transhumanist discourses because their concerns intersect and conflict in vital ways. The discussion will use three core enactivist themes –

organisational integrity, embodiment, and precariousness – to draw out the kinds of tensions and intersections that enable enactivism and transhumanism to problematise one another.

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According to enactivism, moreover, the specificities of a cogniser's embodiment matter. The system's physicality shapes the concerns it will pursue, the world it enacts for itself, and the means by which it does so. On the one hand, the enactive approach thus opens up another way of conceptualising why changing the parameters of our embodiment matters. Not only enhancements but any significant modifications to our bodies can change, enrich, enlarge, reduce, threaten our world, possibilities, and cognitive processes – which makes issues of regulation and access that much more poignant. On the other hand, the enactive approach amplifies the concern that we may no longer be who we are if we change our embodiment too radically; there may be limits to the circumstances under which we can cognise in recognisably human ways.

The enactive definition of cognition and life also means that both are characterised by an inherent precariousness. The system maintains its unity against the threat of disintegration. It must actively strive to maintain homeostasis because there is the continued possibility that it will fail, that external forces will disrupt its organisational unity. It is mortal by definition; for enactivism "life is precious because it is precarious". (Froese, 2017) This forces us to ask how the kind of cogniser we are and the kind of world we enact would change if we were to change the limits of our precariousness, whether by radically decreasing it or even by seeking to transcend it altogether. If enactivism captures something true about what we are – if we are self-generating and self-sustaining systems – what happens if the processes involved in the latter change radically in scope? And what if precariousness is only redefined for some of us?

3.2 What Is Enactivism?

Enactive approaches are part of a broader set of discourses that, while heterogenous, share the view that cognition cannot be adequately captured in computational terms. According to classical computationalism, cognition consists in the manipulation of atomistic elements of symbolic systems according to syntactical rules, such that complex processes can be analysed into simpler constituents. The basic elements modified by these rules are representations as traditionally

[1] A cogniser is a system that is capable of cognition. For enactive approaches, this means that it must be able to undertake the kind of sense-making outlined in Section 2, which requires autonomy and adaptivity (at least according to those who accept Di Paolo's work on the latter; see Di Paolo, 2005). These terms will be defined later in the chapter. For now, it is worth nothing that the enactive model of cognition is particularly broad, embracing a vast range of different types of systems, arguing for what Thompson calls a "deep continuity of life and mind" (2007, p. 222)

conceived, that is, context-independent in two ways.[2] Firstly, they codify context-independent information about properties, states of affairs, and so forth. Secondly, such representations are not taken to be significantly dependent upon or shaped by the cogniser's non-neural context. The cogniser's specific forms of embodiment, environment, or socialisation are taken to be (at most) 'quirks of the hardware' that are not essential to understanding the representation itself, nor contribute to the representation in a way that would prevent a cogniser with different specifications from working with the representation. Proponents of what are now often referred to as 4E views of cognition – encompassing not only enactive, but also embedded, embodied, and extended models of mind – reject this model and instead view cognition as a process that is shaped by, and can only be understood with reference to, the cogniser's particular non-neural bodily and environmental context.[3] In light of this, the four 'Es' tend to view cognition as primarily action-oriented, with an interest in explaining cognisers' purposive and flexible responsiveness to salience in terms of their specific capacities, needs and ends.[4]

What, then, characterises the 'E' that is the focus of this chapter? Enactive approaches to cognition arose out of Humberto Maturana and Francisco Varela's work on defining life. They proposed that we can characterise living systems in terms of what they called autopoiesis. An autopoietic system continuously generates and specifies its own organisation through its operation as a system of production of its own components, and does this in an endless turnover of components under conditions of continuous perturbations and compensation of perturbations. (Maturana and Varela, 1980, p. 79)

Such systems are autonomous, meaning that "they subordinate all changes to the maintenance of their own organisation" (p. 80) rather than to the achievement of an externally defined end. Their unity and identity are self-produced rather than being defined by an external observer or designer, and their complex responsiveness to changing circumstances cannot be reduced to a simple correspondence between inputs and outputs. (p. 80-81)

Autopoietic theory was initially targeted at the most basic living system, the cell. Recognising the broader value of its insights, however, core aspects of this approach were scaled up to allow their application to domains like cognition. The most significant step in this process was arguably taken by Varela himself, along with Evan Thompson and Eleanor Rosch, in their landmark 1991 work The Embodied Mind. This book wove together autopoietic theory with influences from the phenomenological tradition, cybernetics, developmental psychology and Buddhist philosophy to construct the framework for what is now known as enactive cognitive science. Three key aspects are worth highlighting for our present purposes. Firstly, the book shifted the focus to autonomy (of

[2] I emphasise 'as traditionally conceived' here because there are other models of representation that do not include these characteristics; many of them have been proposed by proponents of 4E approaches. There is some controversy over whether any of these types of representation might be compatible with enactivism.
[3] Since all four 'Es' share an emphasis on the role of the non-neural body in cognition, it might seem strange that 'embodied' cognition is given an 'E' of its own, so to speak, or that enactivism is then also referred to as a type of embodied cognition at the beginning of the chapter. On the one hand, all of the Es do give the body a greater role than computational approaches to the mind, making all of the Es 'embodied' to some extent (for this reason, 'embodied cognition' and '4E cognition' are sometimes used interchangeably in the literature). On the other, each E treats and weights embodiment differently. Enactivism, for example, tends to assign a greater importance to the material specificities of particular types of bodies, while extended cognition is more closely aligned to functionalism. There are also models of embodied cognition that are neither extended nor enactive – hence the separate 'Es' here.
[4] My account of the opposition between computationalism and 4E approaches here draws primarily on Dreyfus 1972; Newen, Gallagher and De Bruin 2018; and Thompson 2007.

which autopoiesis is the most fundamental type).[5] Secondly, it argued for the ineluctable entanglement of perception and action.

Cognitive structures and processes emerge from recurrent sensorimotor patterns of perception and action. Sensorimotor coupling between organism and environment modulates, but does not determine, the formation of endogenous, dynamic patterns of neural activity, which in turn inform sensorimotor coupling. (Thompson, 2005, p. 407)

That is, the cogniser is always "structurally coupled" (Varela, Thompson and Rosch, 2016, p. 156) to its environment, and its cognition is characterised by multiple feedback loops that are enabled and shaped by its embodiment, by the particular sensorimotor capacities it has and the needs it is required to fulfil in order to maintain itself. Finally, in a point closely related to this, these cognitive processes do not reveal a predetermined world that merely impinges upon the cogniser from the outside. Instead, cognition is "a history of structural coupling that brings forth a world". (p. 209, my italics) Through its coupling with its environment, the cogniser enacts a world of significance defined in relation to its needs and ends; there is no cogniser without a world and no world without the cogniser. Only through the latter's particular capacities and projects do specific physical, chemical and biological aspects of the environment become nutrients or poisons, obstacles or tools, risks, opportunities, threats.

The three decades since the first publication of The Embodied Mind have seen a variety of developments to the enactive approach.[6] One that is especially significant to the intersection between it and transhumanist perspectives is Ezequiel Di Paolo's proposal that cognition also requires adaptivity, that is, the ability to respond to self-generated norms of flourishing. (Di Paolo, 2005) According to Di Paolo, a genuinely cognitive system must do more than produce and maintain itself; it must also be able to track whether it is doing better or worse at meeting its needs and staving off disintegration, and adjust accordingly. Another development worth noting here is the growth in the number and variety of analyses that draw on the enactive approach to some extent. Aspects of the enactive framework are being applied to the analysis of, among other things, educational design (e.g. Li, Clark and Winchester, 2010), entrepreneurship (e.g. Fenwick, 2010), nursing practices (e.g. Ousey and Gallagher, 2007), neurodivergent experiences (e.g. De Jaegher, 2020), musical performance (e.g. Høffding, 2018), assistive technologies (e.g. Froese et al., 2012), narrative (e.g. Caracciolo, 2014), art (e.g. Carvalho, 2019) and film (e.g. Rhym, 2018). While some encounters between transhumanist and enactive perspectives have already occurred, the latter's diversity of scope and influence means that these conversations are bound to proliferate. Given what enactive approaches say about the enabling conditions of our cognition – of our very being in the world – this dialogue is both urgent and likely to reveal productive tensions. The rest of this

[5] This point is still controversial within enactivist scholarship. Some couch their analyses primarily in terms of autopoiesis, while others emphasise autonomy (at least at the level of human cognition). This chapter will focus on autonomy mostly in order to circumvent these discussions.

[6] A further development that has become especially relevant in the past decade is the 'splitting', for lack of a better word, into three main strands of enactive discourse: One, associated with figures like Thompson and Di Paolo, has continued the focus on the key themes of *The Embodied Mind*. (This is usually labelled 'autopoietic enactivism', although Thompson points out that this is inaccurate due to the focus being on autonomy in general rather than just the basic autopoietic variety.) A second approach deals almost exclusively with the structures of perception. The third and most recent type – 'radical enactivism' – is mainly concerned with providing an account of what it calls 'basic minds', which involves extending the rejection of traditional representations to representations of all types as well as to content itself. (Ward, Silverman and Villalobos 2017 provides more details about the relations and divergences between the three.) This chapter will only engage with the first approach.

chapter will trace out three core aspects of enactivism that generate such points of intersection and conflict.

3.3 The whole and its parts: Organisational integrity

The first critical junction that I want to explore here is the enactive approach's emphasis on the maintenance of organisational integrity. An autonomous, adaptive system must navigate a delicate balance between two equally vital imperatives. On the one hand, it is an inherently dynamic system. In order to keep itself alive, it must constantly track and respond to changes, not only in its environment and its own wellbeing, but also in the relation between them. Moreover, there will be other systems like it – ones with needs and aims and projects, forming not only potential threats or allies, but co-world builders with whom it can engage in "participatory sensemaking". (De Jaegher and Di Paolo, 2007; De Jaegher, 2019) On the other hand, such a system is defined by its need to maintain its unity and individuality, to persist as itself. It is a relational entity, and its boundaries are porous, yet they are real and essential nonetheless. If a change exceeds the system's ability to "compensate", in Maturana and Varela's terms, the result is "disintegration". (1980, p. 81) The rupture of boundaries, the loss of identity and individuality, lead to dissolution, to death. The enacting cogniser, then, must always change, yet never too much; both stasis and radical disruption are fatal. This tension recalls a familiar theme within debates about the benefits and risks of transhumanism. Many proponents of radical body modification and enhancement position these endeavours as an expression of autonomy, a continuation of the kinds of capacities that have positively shaped human development so far – the ability to adapt, the need to improve, the desire to thrive as well as survive. (See e.g. Bostrom, 2013; More, 2013; Sandberg, 2013) These claims, of course, face the well-known concerns about whether there is a point at which these transformations start to undermine something that defines us. (Ross, 2020) There are worries about drawing lines, about being able to recognise the transition from desirable to undesirable change, especially if the very processes that alter us also re-shape our views about what we are (and our ways of gauging how much change we are prepared to accept). In a sense, these debates enact on a large scale a question that, if enactivism is right, defines us – along with all other autonomous, adaptive systems, down to our very own cells: What is the right amount of change, the level that will let us survive without dissolving us?

This might make transhumanism and enactivism particularly congenial interlocutors, especially if each can learn from the other about different ways to address the question. Cary Wolfe's work on autopoietic theory and posthumanism is illustrative here.[7] Wolfe focuses on the distinction that Maturana and Varela draw between a system's organisation and its structure. The former refers to "those relations that must exist among the components of a system for it to be a member of a specific class" (Varela and Maturana, cited in Wolfe, 1995, p. 52). The latter, meanwhile, is the "components and relations that actually constitute a particular unity". (p. 52) That is, a system's organisation cannot be altered without it losing its identity and dissolving, while its structure is more flexible and can undergo significant modifications. Indeed, it must do so; these are the kinds of changes that a system undergoes due to its coupling with its environment as well as its

[7] Wolfe explicitly focuses on post-, rather than trans-, humanism. The distinction between them is, of course, controversial. I follow Wolfe (1995, 2010) and Harfield (2013) in viewing posthumanism as focusing more on a critique of humanism (especially in terms of anthropocentrism and the privileging of a certain model of rationality). However, I don't take this to be a hard and fast distinction, and follow Ross (2020) in thinking that these vast, disputed, heterogenous regions of discourse are close enough that insights about one can apply to the other.

interactions with others like it. Autopoietic systems, in Wolfe's words, are "both open and closed" (p. 52) a way that he claims resonates deeply with the posthumanist critique of distinctions between the human and the non-human, nature, and culture, self and body and world. On the one hand, Wolfe argues, the way that such a system enacts its world – and the consequence that differences in organisation will lead to differences between such worlds – renders "the environment [in the sense we have been using world], and with it 'the body' […] a virtual, multidimensional space." (2010, p. xxiii) On the other, what was previously a rigid, uncrossable ontological boundary between two sides of the distinction–between nature and culture, between the biological and the mechanical, and so on – is now made dynamic and, as it were, portable in the sense that the same formal mechanism may now be used to think, and link, across what were in the past discrete ontological domains. (p. 206)

This means that for autopoietic theory, just as for posthumanism, "there can be no talk of purity." (p. xxv)

On this level, the potential conceptual sympathies between the two perspectives may go even further than Wolfe proposes here. One of the key consequences of autopoietic theory and the enactive approach founded upon it is that all cognitive systems – from the most basic to the most complex, whether organic or artificial – share the same fundamental structures: Autonomy and adaptivity. This means that enactivism aligns, not only with the posthumanist critique of boundaries and hierarchies but also with its rejection of anthropocentrism and concomitant affirmation of non-human importance. (See Hartfield, 2013) We are more complex than single-celled bacteria, but we share something fundamental with them – something more concretely defined than a mysterious essence of life. More than this, we are already machines: Living, autopoietic machines that are in turn comprised of concatenations of systems; we are, as in the title of one of Varela's essays, "a meshwork of selfless selves". (cited in Froese, 2017, p. 38)

However, the very distinction that Wolfe focuses on – between organisation and structure – also constitutes a point of potential tension if we shift the lens from posthumanism to transhumanism. This is because differentiating between organisational and structural integrity does not dissolve the concern about how much change a system can take; it just gives it a more precise target. The concept of organisational integrity asserts that there is such a limit; regardless of how structurally malleable and adaptive a cogniser may be, there are some types of transformations that will lead to disintegration. For someone interested in modifying and augmenting the body, the question then becomes how we can decide whether a particular change would be structural or organisational for the type of cogniser that we are. It seems that at least some technological enhancements of our physiological capabilities would be the former rather than the latter. The enactivist approach itself has been used to develop technologies allowing sensory substitution (e.g. the enactive torch, which provides haptic and auditory feedback to compensate for reduced vision – see Froese et al., 2012). More radical alterations to perception, however, might raise questions about whether the cogniser's world – enacted through its sensorimotor couplings – remains the same. These concerns would be amplified for technologies that go 'deeper', so to speak, and reach the heart of our self-producing, self-maintaining processes. Would certain types of gene therapy, for example, inaugurate organisational changes if they alter how the "selfless selves" (Varela, 1991) that comprise us produce their components?[8] How much of our materiality can be replaced with radically

[8] Varela's memorable descriptor "selfless selves" comes from the title of a 1991 chapter and refers to what Froese calls the "nesting" (2017, p. 38) way in which many small, basic autonomous systems can comprise larger, more complex ones (e.g. the way that cells form structures within our bodies, and these structures all add up to form us). Within these networks of overlapping processes and concerns, each autonomous unit is a

different substances before a structural change becomes organisational? There is also the question of maintaining ourselves as auto- rather than allopoietic systems. Recall that, for autopoietic theory, the unity and individuality of a living system must be self-generated. Its ends and its boundaries must originate from itself, rather than being determined by the perspective of an external observer or designer. If this is the case, then we might wonder whether it is possible to compromise this – for example, that some types of implants or interfaces would mean that our boundaries are no longer self-originating; or that we might alter parts of ourselves to suit a specific purpose to the extent that we start to have externally-defined and designed ends. These questions, of course, do not only run one way. The enactivist, too, might wonder whether changes in the way that we relate to ourselves, and in the capabilities we have for transformation, should motivate a re-conceptualisation of organisational and structural terms. Perhaps we need to leave space within our models for a type of disintegration that leads to redefinition rather than annihilation – for example, by defining different levels of organisation change.

3.4 Bound(ed) flesh: Embodiment

These concerns about classifying various modifications to ourselves as either structural or organisational also give us cause to look more closely at the enactive model of embodiment, which brings us to the second facet of enactivism that I want to explore here. As noted earlier, for enactivism, cognition is embodied in a radical way. The specificities of a cogniser's embodiment – its sensorimotor capacities, its needs, its specific means of motility and orientation – not only affect but enable cognition; that is, embodiment does not just have a contributory role, but a necessary, constitutive one.

This puts enactivism at odds with some of the more radical proposals under discussion in various transhumanist discourses, such as mind uploading. For one, the enactive approach denies the possibility of disembodied cognition – indeed, it makes this a conceptual impossibility – and therefore rejects any models of cognitive augmentation that see as their end goal the existence of a consciousness with no boundaries or sensorimotor feedback loops, the free-floating streams of virtual data familiar to us from science fiction versions of mind uploading. Of course, many contemporary models of the latter do not advocate for this, and instead suggest processes such as the gradual replacement of neurons by artificial neuron-like structures, the creation of a virtual body, or the transfer of neural processes to an artificial brain (or sufficiently brain-like artefact) connected to an organic or synthetic body. (See Cappuccio, 2017 and Ross, 2020 for discussions of these proposals) However, these do not resolve the tension. The enactive approach also challenges the general "neuro-centrism" (Cappuccio, 2017) of approaches that downplay the role of the non-neural body in cognition, as if cognition could be 'unlocked' through the brain and everything else were just a secondary issue of finding the right matter to enable the transfer. As Cosmelli and Thompson argue, for the enactive model, the well-worn thought experiment of the 'brain in a vat' would simply not be plausible unless said 'vat' were a body like ours anyway, obviating the point of the exercise. (2010) Even if we were able to secure a body much like ours for the uploaded mind, however, a deeper problem remains.

Cappuccio has argued that the real core of the conflict between embodied cognition and mind uploading lies, not in the issue of finding the right kind of material substrate for the mind, but in the

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'self' (in the sense that it is a self-maintaining, self-preserving unity) and yet also 'selfless' (it does not possess a traditional sense of personal identity, and it is not isolated; its role within larger interlocking systems is important to making it what it is).

assumption that the mind is the kind of thing that can be transferred between material substrates at all. (2017) Enactivism – like other forms of embodied cognition – allows that minds can be instantiated in different types of materials; Maturana and Varela emphasised this right at the start. (1980) However, Cappuccio argues, it must reject the claim that a mind instantiated in one type of material assemblage can be moved into another type of materiality while remaining qualitatively and numerically the same. (2017) Mind uploading "posits criteria of continuity and identity of a mind that are extrinsic to its physical and functional constituents, and unrelated to the specific contextual integration of the mind-body-world system". (p. 438) For embodied models of cognition meanwhile, especially enactivism:

The patterns of these body-world interaction loops have a constitutive valence for the cognitive system but at the same time are merely relational in nature, i.e. situated, context-sensitive, non-exportable. Therefore, they are essentially irreplaceable in the unique way they are individuated in relation to neuronal and extra-cranial bodily interactions and to the beyond-the-skin world: that is why [embodied cognition] implies that the concrete instantiation of the mind in a contingent flow of material circumstances doesn't only define its functionality and phenomenology, but also its very conditions of ipseity and, therefore, the historically determined modes of its existence and persistence through time. (p. 440)

Here, more than perhaps at any other point, we find a fundamental incompatibility between core enactivist claims and one type of transhumanist endeavour. Whether either side here is right will perhaps ultimately have to be determined in practice; if a version of mind uploading takes place, a host of discourses will need to re-evaluate critical aspects of their framework. This possibility in itself raises questions about how we would determine the success of such an event. How would we know it worked? Would we ask the uploaded one (presuming the result of the procedure is capable of responding)? This recalls the old concern about whether a mind deeply affected by artificial processes would be able to tell what it is. If the process destroyed the original system and created a new type of cogniser, the latter might nonetheless believe itself to be identical to the former. Ezequiel Di Paolo considers a similar issue in a recent paper, applying the enactive framework to the replicants of Ridley Scott's Bladerunner – some of whom famously are not aware of what they are. (2020) Focusing on a point that the quote by Cappuccio also highlights – the historical determination of the mind – Di Paolo argues that the enactive approach ultimately speaks against the feasibility of implanted memories being sufficient to convince a replicant that they are human. This is because embodiment is historical. For Di Paolo, "these activities [of 'bodies in action'] do not only leave traces in (many) brains but practically everywhere. In my body and yours, in my surroundings, my shoes, my desk, my digital pursuits, and so on." (p. 22) This means that, while it is possible to create artificial bodies, "the idea that a full real bodily history can be faked" is "implausible". (p. 23) This suggests that it is not only embodiment but the history of embodied action, the temporal fabric of sensorimotor coupling, that is constitutive of cognition. Severing the link between a cogniser and its embodied history thus fundamentally alters, and possibly destroys, the former. Bringing this back to mind uploading, we can see here another way to support Cappuccio's claim about the non-exportability and irreplaceability of a mind's particular material instantiation. Moreover, we also find a hint of how the result of an upload might respond if the process did not work. Di Paolo finds it "hard to imagine" that Roy Batty would speak about his impending demise as he famously does in Blade Runner despite only having been alive for four years, and suggests that a mind lacking an embodied history may not even be able to engage in language, at least not in a way that we would understand. (2020, p. 23) Perhaps this would also apply to the product of a mind upload. It might try to say that it is the same mind, but do so in a way that reveals it cannot be.

Of course, mind uploading is only one particularly drastic way of modifying bodily cognition. Would enactivists be similarly concerned about less radical changes? One response is that the enactive model of cognition at the very least gives us another way of understanding why altering our bodies matters. It decisively rejects the notion that such transformations are merely superficial or cosmetic. Recall that, for enactivism, cognition is "[a] history of structural coupling that brings forth a world" that works "[t]hrough a network consisting of multiple levels of interconnected, sensorimotor subnetworks". (Varela, Thompson and Rosch, 2016, p. 206) If cognition and the cogniser are inherently embodied in this way, then changing that embodiment not only changes who the cogniser is, what their projects might be and how they think, but also their world itself. This might seem like it would entail a negative response to body modification, yet it is important to remember that the cogniser's world is not static anyway. Just as the cognitive system can never stay still, so must its world remain dynamic, reshaped continuously in light of shifting significances generated by the cogniser's needs, ends and capacities, as well as its responsiveness to its physical and social environments. Structural change is, as we saw in the previous section, almost an imperative for the autonomous, adaptive system. Changing ourselves and our world is a defining feature of what we are, something we share with other cognisers; perhaps, then, those transhumanist voices who view body modification as an expression of deep-seated drives are onto something after all. On the other hand, this raises concerns for the impact upon our shared worlds. After all, our worlds are not ours alone; we enact them together.

> Sensorimotor bodies, moreover, are enacted together. […] There are in social encounters situations where the sensemaking of a participant is literally modulated or enabled by the activity of others, and in some cases, sensemaking is constituted jointly in co-authored social acts. (Di Paolo, 2020, p. 17)

In altering my embodiment, then, I am not only reshaping my world, but also ours – and the ability to make it ours. At what point, then, do changes to the bodies of some disrupt their ability to generate and navigate significance in concert with others? This adds another layer of urgency to questions about equity of access to augmentations. The concern that only some will be able to utilise such advances, entrenching existing axes of disadvantage and potentially creating new ones, is a familiar trope in transhumanist debates. (Ross, 2020; Sandberg, 2013) Enaction opens up a further way to conceptualise what is at stake – namely, our ability to participate in shared world-building. Of course, we have always shared and made worlds with cognisers of different embodiments, so it seems that there is a certain amount of flexibility to 'participatory sensemaking'. The question then seems to be, again, one of finding a way to draw a line, of asking when our worlds are at risk of becoming irreconcilable.

3.5 Life as perpetual struggle: Precariousness

The final aspect of enactivism that I want to place in dialogue with transhumanist concerns is one that is already suggested by the idea of an inherently embodied system striving to preserve its organisational integrity. That is, the enacting cogniser is characterised by precariousness in a way that, I want to suggest here, both challenges and is challenged by transhumanist attitudes to the limitations of the human condition. (See also Di Paolo, 2020; Froese, 2017) As noted earlier, the autopoietic, adaptive system is by nature dynamic, constantly adjusting in response to shifting relationships between environmental circumstances and its needs, capacities, and projects. These relationships, however, cannot be finished or perfected; there will always be gaps between what the system needs and what its environment supplies, between risks and rewards; even if circumstances

are favourable, they can always change. Even the processes through which the system produces and maintains itself come with an inherent risk; complex cognisers especially need to keep their own components in check, lest they become, for example, cancerous threats to the whole. This perpetual threat of disintegration, however, is more than a constraint. After all, the very project of self-maintenance only makes sense if it is possible for that process to fail; self-individuation requires something against which and in the face of which the system must unify itself, bound itself, keep itself going. This is a life that defines itself through the possibility of its own end. To that extent, we might almost say that enaction is founded upon a perpetual negation.

If the enacting cogniser is characterised by precariousness to this extent, then it becomes difficult to reconcile this model of cognition with transhumanist endeavours aimed at radically reducing or even transcending such limitations. At first glance, this may seem like just another version of the familiar concern that struggle is what makes life worth living, that the inevitability of death somehow gives human life value. (Ross, 2020) While this rings true to some extent, there is nonetheless more to the enactivist angle here. Tom Froese, for example, argues that the precariousness of the enactive cogniser is what enables it to have any concerns or projects in the first place – to enact significance, to bring forth a meaningful world. (2017) For enactivism, "to live is to always be concerned with something, most fundamentally with the continuation of one's individual manner of living." (p. 24) It is the imperative to survive in the face of potential annihilation that lets the system generate the most basic meanings – nutrition, lack, threat, and so forth. The struggle with precariousness generates the first and ultimate endogenous ends; it is the reason that anything at all can matter to the system. According to Froese, this means that

taking seriously the biologically embodied mind cannot avoid bringing us face to face with the inevitability of our own finitude, which conflicts with the transhumanist goal of defeating death by engineering our bodies to stay forever young (p. 47)

It is important to clarify here, of course, that the transhumanist perspectives to which Froese is referring here are not advocating for immortality as such. Even Aubrey de Grey frames his goals in terms of 'amortality', not only to avoid the conceptual baggage that the more familiar term brings with it, but also to acknowledge that the augmented individual could still die. (Ross, 2020) The issue, then, is not so much one of escaping precariousness as of radically modifying its parameters. Indeed, one might say that a human cogniser who seeks to extend their life is only expressing the fundamental self-maintaining striving that characterises all autonomous, adaptive systems; perhaps amortality is taking enaction to its limits. One concern here might be that this is a self-undermining endeavour. If precariousness is an enabling condition of cognition, then the cogniser that successfully eliminates it thereby brings to an end its way of being. This is a recurring theme within a vast range of discourses – that we are characterised by a lack whose overcoming would be our destruction, that "nothing finished can live" (Jaspers, 1970, p. 200). Di Paolo articulates this in terms of the incompatibility of perfect self-production or individuation with life:

In neither case, maximal self-production or maximal self-distinction, do we have a living system. The dialectical resolution of this tension is the regulated deferral of openings and closings to environmental influences that keep the system viable. Such regulation with respect to viability conditions is what we have called sensemaking. (2020, p. 16)

The transhumanist could still respond here that even significant extensions to one's lifespan would be reducing and reformulating, rather than eliminating, this vital precariousness. As Nick Bostrom writes, the "posthuman could be vulnerable, dependent, and limited". (2013, p. 48) However, at least two concerns would continue to generate tensions between this perspective and the enactive

approach. On the one hand, we face another version of the point about irreconcilable worlds that was raised at the end of the previous section. Precariousness enables, shapes, and constrains the enaction of a world of significance, which means that changing the former changes the latter. As noted before, we make worlds with cognisers whose embodiment differs from ours; surely, this also applies to the specifics of precariousness. However, as with embodiment, we might wonder whether there is a point at which modifications to our precariousness interfere with our ability to make and navigate meaning together, where our projects become more difficult to weave together with the interests of those whose lives are much more or less precarious than our own. On the other hand, there may be what Froese calls a "mismatch at the conceptual level: Transhumanism views mortality as a burden to be removed or at least as something to be postponed indefinitely by scientific progress, rather than as constitutive of a meaningful way of life." (2017, p. 47) We can extend this beyond mortality to other limitations, which transhumanist discourses tend to cash out as something to be overcome, even if they cannot be left behind altogether. (e.g. More, 2013; Bostrom, 2013) Striving beyond them is an imperative, something that we should at least try to do. For the enactive approach, meanwhile, limitations are often also enabling conditions. In saying this, it is important to avoid relegating enactivism to what More calls "apologism – the view that it is wrong for humans to attempt to alter the conditions of life for the better." (2013, p. 14) As detailed in the first section, continuous change, as well as the aim to do well and better according to its own standards of flourishing, define the autonomous, adaptive system; the cogniser must engage in structural modifications in pursuit of these. Even in light of this clarification, we might still worry that the emphasis on precariousness could lead to the veneration of suffering and hardship. However, we must not confuse the basic limitations of cognition with particular forms that they might take at the 'macro' level. The former do not necessitate or legitimise the latter. Moreover, the claim is not that it is 'good' or 'right' that cognisers must maintain a fragile unity in the face of internal and external threats, that they must operate by means of imperfect feedback looks to resist disintegration. Rather, these are simply the necessary conditions for us being in any way at all. Limitless cognition is an oxymoron.

3.6 Concluding remarks

Does all of this mean that enactive approaches to cognition are by nature bioconservative? One point worth considering is that enactivism's resistance to some transhumanist endeavours is grounded in very different concerns to those of more familiar critiques. That is, the enactive perspective outlined here does not proceed from the assumption that humans are fundamentally different to all other entities, nor does it argue for some mysterious human essence or telos that must be preserved. (See Harfield, 2013; More, 2013; Ross, 2020) Instead, it takes the opposite approach. The tension with transhumanist imperatives is not generated by what sets us apart, but by what we share with all cognisers – autonomy and adaptivity, the need to preserve organisational integrity while negotiating structural changes, the coupling of body and world, precariousness. This arguably makes the prospect of a sustained dialogue between the perspectives particularly promising. On the one hand, the enactivist challenge is couched in terms that are themselves at least minimally congenial to transhumanist (and posthumanist) discourses. Both perspectives suggest that we are dynamic rather than static creatures, that our bodies matter and that distinctions between the human and non-human are neither straightforward nor rigid. On the other hand, transhumanist projects are well-suited to function as test cases for enactive models of cognition. If the former can achieve something that the latter claim should not be possible, then the autonomy and adaptivity,

organisational integrity, embodiment, and precariousness may need to be radically reconceptualised.

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