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Extending the Extended Mind

From Cognition to Consciousness

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DOCTORAL DISSERTATION

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Abstract

Where does conscious experience stop and the rest of the world begin? Is the material basis of consciousness confined to the brain, or can it be extended to include other parts of the body and environmental elements? This study proposes an extended account: when all the requirements are fulfilled, an external tool may become part of the realising basis for certain experiential processes. Andy Clark and David Chalmers argued famously that the material basis of cognitive states sometimes extends out of the barriers of skin and skull to external objects such as notebooks and other everyday tools. However, they draw the line there: only cognition, but not consciousness can have an extended base. The central argument of this study is that their constraint is not legitimate. If one is accepted, the other one follows. Many externalist philosophers tend to dismiss this and assume that the experiential side can be ruled out, or rather, left in (the head). This study makes explicit the reasons why conscious experience extends as well.

The first chapter lays an overview of the theoretical background of externalism and the 4E-theories in present-day philosophy of mind and cognitive sciences. It also examines the central concepts, accounts and methodological questions that will be used and further developed in later chapters. The second chapter presents three arguments for the position defended in this thesis, namely the hypothesis of extended conscious mind. The third chapter analyses the ongoing debate in the interface of philosophy of mind and philosophy of science about the causal–constitution distinction, and argues that rather than in mechanist terms, the causal–constitution distinction should be interpreted in diachronic terms when dealing with mental phenomena. When depicted that way, the extension relation in the hypothesis of extended conscious mind counts as constitutive.

The fourth chapter distinguishes between several different levels of extension, from mere short-term extension to more robust functional incorporation, where the external tool has become part of the transparent bodily point of view of the subject. Based on the notion of functional incorporation, a set of demarcation criteria for the hypothesis of extended conscious mind will be developed. The chapter closes by discussing sensory substitution as a concrete example of functional incorporation. Finally, the fifth chapter introduces the most influential counter-arguments that have been set forth against the hypothesis of extended conscious mind. The critiques will be examined and answered.

Abstrakti

Missä tietoinen kokemus loppuu ja muu maailma alkaa? Rajoittuuko tietoisuuden materiaalinen pohja aivotoimintaan vai voiko se laajentua myös muuhun ruumiiseen ja vuorovaikutukseen ympäristön kanssa? Tämä tutkimus puolustaa laajentunutta kantaa: kun tietyt ennakkoehdot on täytetty, ruumiin ulkopuolinen apuväline voi tulla osaksi tietoisten kokemusten materiaalista toteutuspohjaa. Andy Clark ja David Chalmers esittivät kuuluisassa artikkelissaan, että ulkomaailman apuvälineet – kuten muistikirjat tai tietokoneet – voivat olla kognitiivisten prosessien muodostamisessa mukana siinä missä biologiset ruumiinosatkin. Clark ja Chalmers kuitenkin rajoittivat laajentumisen tähän: heidän mukaansa pelkästään *kognitiivisilla* prosesseilla voi olla laajentunut perusta, mutta *tietoinen kokemus* rajoittuu pään sisään. Tämän tutkimuksen ydinargumentti on, että itse asiassa tällaista rajanvetoa ei ole mahdollista tehdä johdonmukaisesti. Jos hyväksymme kognitiivisten tilojen laajentumisen, tietoinen kokemus seuraa usein mukana. Tämän tutkimuksen uusi avaus ja keskeisin tavoite on osoittaa, että tietoiset kokemukset voivat laajentua siinä missä kognitiiviset prosessitkin.

Ensimmäinen luku kartoittaa eksternalistisen mielenfilosofian taustaa sekä asettaa tutkimuksen niin kutsuttujen 4E-teorioiden kontekstiin (*embodied*, *embedded*, *enacted*, *extended*). Toinen luku esittelee kolme argumenttia laajentuneen tietoisen kokemuksen puolesta. Kolmas luku analysoi tieteenfilosofian ja mielenfilosofian rajapinnalla olevaa kysymystä siitä, onko mielen toimintojen laajentumisessa kyse kausaalisesta vai konstitutiivisesta suhteesta. Neljäs luku erottelee laajentumisen tasoja tai asteita, aina lyhytkestoisesta laajentumisesta (esim. kynän ja paperin käyttö) syvempään ”funktionaaliseen inkorporaatioon” (esim. sokeankepin tai aistikorvaavuuslaite-teknologian käyttö). Viides luku esittelee keskeisimmät vasta-argumentit, joita laajentuneen tietoisuuden teoriaa vastaan on esitetty (esim. unien ja hallusinaatioiden olemassaolo ja skeptinen ajatuskoe aivoista altaassa) sekä vastaa niihin.

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Table of Contents

1. A Roadmap from the Extended Mind to the Extended Conscious Mind

1.1. Introduction

In her *Aeon* -essay, Karina Vold (2018) describes a dramatic scene that took place in 2017 in Texas, where a gunman shot 26 people. In the course of fleeing, his car fell into a ditch and he died. The shocking story doesn't end here. During investigations, FBI pressed the dead gunman's finger on his iPhone, which had a fingerprint recognition for unlocking it. Regardless of the fact that the subject happened to be a mass shooter, it is an alarming idea that the police can enter a person's "digital afterlife" by using their corpse.

The lesson learned from this rather distressing story is the same Andy Clark and David Chalmers (1998) set forth in their *Analysis* paper: *where does the mind stop and the rest of the world begin?* Did the police merely break into the gunman's smartphone, or did they also break into his mind? Smartphones are so deeply intertwined with us that it is difficult to disentangle the functions of our minds and the ones we perform with smartphones. Our smartphones "know" us better than our friends, spouses or even ourselves, at least where quantity of information is concerned. Many of the functions that we used to do "in our heads" only a decade ago, are nowadays extended to combine not only our brain functions, but also our smartphones and other similar devices. Smartphones have become part of our *minds*.

In this thesis, I modify Clark and Chalmers's question, and ask instead: *where does conscious experience stop and the rest of the world begin?* I argue that the skin and skull frontier is not always the answer, but sometimes the material realisers of conscious experience extend outside the bodily boundaries to include external elements. Extension happens with devices that are incorporated into the bodily functions, so that they have become part of the transparent perspective of the subject. Consider, for example, a blind person using a white cane in order to be able to move around. The cane has become part of her point of view: she doesn't primarily experience the cane in her hand, but instead the world (what the surfaces feel like, etc.) at the tip of the cane. I argue that the material

realisers of these experiences are extended to involve also the cane, and not only her neural functions. Hence, according to my position, neural functions are necessary, but are not always sufficient for conscious experience.

Philosophy of mind and cognitive sciences have traditionally conceived mental processes as something that occur in the head. Material realisers are strictly limited to neural functions and the central nervous system. However, in the recent couple of decades, an increasing number of philosophers have questioned the brain-boundedness of the mind, and instead characterised mental functions as processes that include the body and the environment. Susan Hurley (2010, 104) asks, "what is so magical about the boundary around internal factors?" She calls this persistent internalist idea the *magical membrane* argument. However, there are no conceptual or logical requirements for internalism: "there is nothing about the notion of the subpersonal that restricts it to the neural in particular" (Ward 2012, 733).

Humans have always used various external tools and technologies to enhance, replace and create new functions. Off-loading the cognitive burden in the environment is not a new phenomenon – even though it has taken striking forms with recent technological development. Already Plato wrote [sic] that *writing* works as an external memory for humans (in his *Phaedrus* dialogue). According to Clark (2003), we have always exploited environmental elements – incorporated and integrated material tools and cultural practices into ourselves. Biology has been intertwined with technology for a long time, and it is a completely "normal" situation for us. It is possible because of brain plasticity: our brains are sculpted by the tools we incorporate and by the activities we engage in.

The "E-Turn"[1] has become an auspicious line in philosophy of mind and the cognitive sciences starting from the 1990s. It includes e.g. *enactivism* and the *embodied approach* (Varela, Thompson & Rosch 1991), *dynamical systems theory* (Thelen & Smith 1994), *distributed cognition* (Hutchins 1995), *extended cognition* (Clark 1997; Clark & Chalmers 1998), and *sensorimotor enactivism* (Hurley 1998; O'Regan & Noë 2001). E-turn is a cluster of philosophical and scientific theories that reject the brain-boundedness of cognition. It is often referred to as the theory of the 4E's (*embodied*, *embedded*, *enacted*, *extended*). The roots of the E's lie, of course, deeper in history. Some of the most important earlier influences include James J. Gibson's (1979) ecological psychology and

[1] A term coined by Dan Hutto.

theory of *affordances*, Rodney Brooks's (1990) experiments in embodied, situated robotics, Jakob von Uexküll's (1934) notion of *Umwelt* as describing the subjectively produced surroundings, and Maurice Merleau-Ponty's (1945) phenomenology of the body. Obviously, the list could be extended, but that has to be left for historical surveys.

One single remarkably influential paper that has promoted the spreading of externalism is Andy Clark's and David Chalmers's "The Extended Mind" (1998), where they set the stage for a long-lasting discussion and debate.[2] According to their *extended mind* thesis (EM), the material basis of *cognition* can be extended across brain, body and world. However, Clark (2009; 2012) and Chalmers (2008; 2017) deny that experiential states, such as perceptual experiences could be extended. Many philosophers who are sympathetic towards cognitive extension tend to agree with Clark (and Chalmers), and leave conscious experience in the head. However, recent developments in the embodied, enacted cognition and sensorimotor approach have created an appeal for a broader view. That is precisely what I will do in this thesis. I will argue for a broader position according to which not only cognition, but also consciousness can extend, and call it the thesis of *extended conscious mind* (ECM).

One worry that arises is that if we accept that the gunman's smartphone was part of his mind, where does that take us? Is my laptop part of my mind, and what about the holiday pictures I have saved on it? What about Wikipedia, or the whole of the Internet? Or consider pen and paper, a calendar, eyeglasses, a blind person's cane, a hearing aid or a navigator. Technologies and skills such as Braille writing, playing the violin, body hacking, augmented reality – or an old couple completing each other's sentences and looking back on their past from their shared point of view. Not all of these examples qualify as extended mind.[3] Clark and Chalmers's EM comes with instructions when and where the extension can happen, and which requirements need to be fulfilled. In this thesis, I will provide a similar treatment regarding ECM. I will give demarcation criteria of what kind of conditions need to be satisfied for something to count as an instance of ECM.

[2] Before 1998, Clark had already introduced the idea of the mind extending outside the skin and skull in his 1997 book. However, the 1998 paper with Chalmers hit the jackpot. Chalmers has not written about these topics much since the original article, whereas it is a lifetime's work for Andy Clark.

[3] This is related to one of the first counter-arguments that was presented against EM, namely the *cognitive bloat argument*, which brings out the difficulty of demarcating the boundaries of extension. Especially the third and fourth chapters will provide responses to this critique.

1.2. The Concepts of Cognition and Consciousness

Let us now inspect two central notions that are used throughout this thesis: cognition and consciousness. There is no consensus amongst philosophers or cognitive scientists about the definition of either of the terms, nor where their limits are, nor how they are materially realised. I do not think it is possible to give stringent definitions for these concepts in the first place, neither do I think there is a *mark of the cognitive* or a *mark of the conscious* that would always lead to an infallible demarcation. (Adams and Aizawa's critique based on the mark of the cognitive will be discussed in the third chapter.) However, in what follows, I will outline some ways in which the concepts have been used in the sciences of the mind, and explain how I will use them in this study.[4]

Let us start with 'cognition'. It is a term used by many, but defined by few. It is found in the titles of research fields (such as *cognitive* science and *cognitive* psychology), but the researchers in these fields might have varying ideas of its meaning. In a call for papers for a journal about cognition, Charles Abramson says he made a brief survey of psychology textbooks, and found fifteen different definitions of cognition (Arstila 2016b). It is often said to contain at least dispositional beliefs, memory, attention, decision-making, reasoning, problem-solving, using language and other features connected with *thinking* in general.

Some take cognition as a *natural kind*, and others think it is better captured by focusing on *typical examples*. Cognition is *not* understood as a natural kind in this thesis. Instead, I follow the latter conduct: defining cognition by appealing to typical examples of cognition. However, this approach is not unproblematic either, because what are considered "typical examples" vary significantly depending on the theoretical framework. (See the discussion in Newen, Gallagher & De Bruin 2018.)

The central discrepancy (for the purposes of this thesis) lies between the *cognitivist* and *enactivist* understandings of 'cognition'.[5] According to the *cognitivist* reading, cognition

[4] When it comes to even more primary terms, I use 'mind' and 'mental' as synonyms, and they contain both cognitive and conscious processes. In other words, cognition and consciousness are subcategories of mind/mental. ('Mental' though is not the most advantageous term, as it might suggest a contrast with 'material'. This, however, is not my aim.)

[5] Both *cognitivism* and *enactivism* are introduced in the next sub-section, and are discussed in further details in later chapters.

is manipulation of representations, while the *enactivist* notion refers to the autonomous embodied agent's interactive relationship with her environment. The former has influenced how the concept is used in analytic philosophy of mind, whereas the latter has to a great extent shaped how it is used in the 4E-framework. However, to make things more complicated, not all of the 4E literature use the concept in the enactivist way. Especially, it is crucial to notice that the original Extended Mind account by Clark and Chalmers is *not* using an enactivist concept of cognition, but rather a functionalist, cognitivism-influenced one that is also familiar from analytic philosophy of mind. This embeds a tension within the research that encompasses both Clark and Chalmers's account and enactivism – from which the present study is not safe. There is an ongoing debate whether accounts based on functionalism (such as Clark & Chalmers's) can be fitted with enactivist accounts (for discussion, see e.g. Kiverstein & Clark 2009). The jury is still out. This thesis is one attempt to bridge the gap, and to bring the two standpoints closer.

Clark and Chalmers's argument was established within the analytic philosophy of mind that understands cognition as something that is realised in the head. Without breaking out of the analytical framework altogether, perhaps the only option was simply to move the physical barrier but not otherwise change the concept. Critical voices have said later (see e.g. Hutto & Myin 2012) that this kind of framing repeats the internalist assumptions: on the default case, cognition is something that occurs in the head, and extensions are just exceptions that bring the normally internally-realised functions into a wider realm. Even though I agree with the criticism that the way Clark and Chalmers (and many of their followers) use the concept of cognition does not reorient it as thoroughly as is needed, I still think the extension they made within the analytical framework was highly valuable. The extending needed to start from somewhere.

On the other hand, in enactivism extension is not a deviation but is inherently embedded in the enactivist concept of cognition. In a way, it doesn't even make sense to talk about extension, because in enactivism, the non-extended cases are the ones that count as abnormalities. In the enactivist account, what requires explanation is cognition that is *not* based on extension and interaction. For example, in the fifth chapter, I look at some enactivist ways to explain the occurrence of dreams (which is an often used example of a phenomenon that at least *prima facie* seems internally realised, and hence exceptional and challenging for enactivists).

Hutto and Myin have introduced the notion of *extensive mind* that aims to improve the problematic nature of Clark and Chalmers's use of *extension*. According to them, "minds are already, in their basic nature, extensive and wide-ranging" (Hutto & Myin 2012, 7). Thus, they distance themselves from the analytical reading of EM that does not exclude internally realised cognitive states. However, my starting point is Clark and Chalmers's EM, hence I am operating in a framework where 'extension' is needed. I will, however, go beyond that framing, and embrace the enactivist picture, which ultimately criticises the analytical framework. Even though the two frameworks proceed to the matter from opposing directions – Clark and Chalmers's EM is trying to find arguments why extension sometimes happens, and enactivism is trying to find explanations why extension sometimes doesn't happen – they still share a common goal: a criticism of intracranialism. Despite the tension, I think the two frameworks can be used together for a common purpose. This thesis pursues to extend the extended mind: lead the analytic reading of EM to the enactivist sphere where consciousness comes along.

Another ambiguity between the two interpretations is that according to the cognitivist reading, cognition is *not* experiential, while according to the enactivist reading, it *is* experiential. As one of my central aims in this study is to show that Clark's EM (which deals with the non-experiential concept of cognition) leads to experiential extension (ECM), I have to use the concepts in the same way as Clark. Hence, cognition, by definition, is *non-experiential*. In addition, there are cognitive processes that are undoubtedly not conscious (such as blind-sight). Cognition and consciousness are *not* identical.

However, *in practice*, they often occur together. As there are non-conscious cognitive processes, there are also cognitive processes that are undoubtedly conscious (such as occurrent episodic memories). It is often impossible to tell where one ends and the other one begins. I will criticise the strict separation of cognition and consciousness in the second chapter (2.2.). The critique concerns empirical occurrences of cognition and consciousness – not the bottom-line conceptual differentiation. The crux is that cognition and consciousness overlap, and they are often difficult to keep apart neatly in real-life situations. Still, the conceptual differentiation remains. (It is also worth noting that the relation between the concepts of cognition and consciousness is not in a central role in chapters 3, 4 or 5, nor in the second and third arguments in chapter 2.)

Let us now turn to the concept of *conscious experience*.[6] If the concept of cognition was already multifaceted, consciousness is undoubtedly one of the most charged concepts in contemporary philosophy of mind. Scientists often try to avoid it altogether, and analytic philosophers of mind have created the most extraordinary ways of treating it – from bats to zombies. However, perhaps somewhat surprisingly, conscious experience is actually simpler to define than cognition, since it covers a narrower area than cognition. In this thesis, conscious experience simply refers to *phenomenality* – that the mental state has a phenomenal side to it, that it feels like something to undergo it. It doesn't refer to the general capability of being a conscious creature, or being awake and possessing awareness; in other words, it doesn't refer to *creature consciousness* (see Bayne 2007). Instead, the concept is used to refer to particular states or processes that are experienced in a certain way.

The discrepancy between the cognitivist and enactivist accounts described earlier also affects how the concept of consciousness is understood. Within analytic philosophy of mind, starting from Thomas Nagel's (1974) famous paper, conscious experience has been understood as certain properties of "somethingness" it feels like to undergo an experience. This *what-it-is-like-ness* is often described in similar terms as the nowadays less fashionable notion, *qualia*. It conceives experiential states as static, intrinsic properties – snap-shots of redness, painfulness, sweetness, coldness and so on. Opponents in the same framework (eliminativists who deny the existence of qualitative states) also use the concept in the same way.

This understanding of consciousness faces trouble when combined with the concept of cognition in the same framework and by the same writers. If cognition is understood in terms of computation, consciousness is difficult to fit into the picture, because consciousness clearly isn't computation. This has resulted famously in the *hard problem of consciousness* (Chalmers 1996) and the *explanatory gap* (Levine 1983). (See the discussion in the second chapter and Kiverstein 2016.) On the other hand, when cognition is understood in terms of enactivism, consciousness is already on board. When cognition is not understood as computation, there is no reason to assume an unbridgeable gap

[6] I use synonymously the terms 'consciousness', 'conscious experience', 'phenomenal experience', 'experiential state', 'experiential process' and other versions of these terms.

between the two. This is the reason why many enactivists state that the "hard problem" doesn't arise in the first place (see e.g. Kiverstein 2016; Silberstein & Chemero 2015).

Further, the explanandum of consciousness is not the same in *autopoietic* and *sensorimotor* enactivisms. (This subdivision within enactivism will be presented in the following section.) While autopoietic enactivism describes consciousness as an autonomous agent's dynamically evolving relationship with its environment, sensorimotor enactivism focuses on *perceptual* experiences, which are based on our actions in the environment. According to sensorimotor enactivism, perceptual experience is "something we do", as Alva Noë (2004, 1) famously wrote. Autopoietic notion is a way to explain *creature consciousness*, whereas sensorimotor enactivism deals with *state consciousness*.

To sum up, my use of 'conscious experience' refers to the phenomenal quality of mental states. It is the same feature that Nagel was referring to – even though I don't ascribe to all of the theoretical assumptions that lie behind the legacy of Nagel's conceptual work. The difference between my use and the analytic philosophy's use is that I reject the static atom-like nature that was encouraged by the notion of qualia. Further, even though I follow Clark and Chalmers's conceptual framework for the sake of argument, overall my view is closer to enactivism's concept of cognition and consciousness. I criticise the cognitivist picture that understands cognition as computation, and this criticism gives the result that phenomenal experience doesn't have to be something extraneous. The target of ECM is *particular perceptual experiences* – processes such as reaching for an object, hearing a melody, or spatial navigation such as moving around in a room, namely, perceptual interactions that have a phenomenal quality in them.

To conclude, ECM is hard to accept for analytic philosophers of mind who are sympathetic towards EM, because it challenges the strict separation between cognition and consciousness. On the other hand, ECM might be trivial for enactivists who accept EM, since for them, cognition by definition already comprises experiential aspects. Hence, this thesis is valuable for both parties; for an analytic philosopher, because it shows that consciousness cannot be cut out neatly from accounts of cognition, and for an enactivist, because it addresses an extension of phenomenality that has been taken for granted but never really spelled out in explicit terms.

1.3. 4E's: Embodied, Embedded, Enacted, Extended

In recent years, different sorts of externalist views in philosophy of mind and the cognitive sciences have often been combined under the title '4E cognition'. Mind is *embodied*, that is, it is partly constituted by bodily processes; mind is *embedded* in its surroundings (Umwelt); mind is *enacted* through the agent's actions in the environment; and finally mind is *extended* to consist of external elements as its constitutive parts. The embeddedness thesis is a causal claim, whereas the extended thesis is a constitutive claim. The causal–constitutive distinction is the demarcation criterion between those two views. The embodiment and enacted theses are used in a less strict way in the literature: they are sometimes used as causal and sometimes as constitutive claims. However, throughout this thesis, I will treat them as constitutive theses. Thus, only one of the E's is causal (embedded), but the rest of the E's always describe a constitutive relation. In the following, I will take a closer look at each of the 4E's.

Embodied

According to the *embodied* mind thesis, different aspects of the mind are intrinsically dependent on bodily functions. Depending on the writer, these aspects can include, for example, cognition (e.g. Gallagher 2005), perceptual experiences (e.g. Noë 2004), or affective states such as emotions and moods (e.g. Colombetti 2014). In all of these cases, the physical body and its functions are part of the constitutive basis for the mental function in question. The body shapes, enables and sets the limits for our minds. Its anatomy, structure, motor capabilities, etc. determine how we perceive the world and what we can do in it.

At least in principle, the embodiment approach can be accepted without the other E's. Consider the claim that *conscious experience* is embodied: technically, it is fulfilled when the body (and no other external processes) makes up part of the material basis of the experience in question. Nevertheless, if one accepts the embodiment, it is quite natural to continue to the other E's. The *embedded* and *extended* theses leak into the picture, because it is difficult to set the limits of the body. A prosthesis, glasses, a blind's cane, sensory substitution devices and other non-biological devices can be incorporated into the body and into the bodily point of view – and as a result, the borders of the body get blurred. The *enacted* thesis, on the other hand, comes in because it is difficult, if not impossible,

to differentiate the body from the actions it performs. The embodiment thesis, on the other hand, is necessary for the other three E's. It is not possible to *embed* or *extend* in the environment without a body as part of the process. Neither is it possible to *enact* in an environment without a body – actions between the subject and her environment are necessarily embodied. Thus, the embodiment thesis is a gateway to the other E's.

The embodied approach will be discussed especially in the second chapter, where I argue that accepting the embodiment of experiences leads to ECM. It will also be discussed in the fourth chapter, where I differentiate between levels of embodiment and extension, from shorter-term uses of external tools to profounder cases of incorporation.

Embedded

According to the *embedded* thesis, the environment is necessary for the mind – the mind is profoundly "environmentally supported" (Sterelny 2010). Minds are never entities in a vacuum, but creations enabled by the interaction with their surroundings. The agent creates its environmental *niche* and adapts to it in a two-way manipulative process (see Odling-Smee et al. 2003); its environment is personalised as an *Umwelt*, perceived from a subjective perspective (see Uexküll 2010).

This is a broader position than the rest of the E's. It is also "lighter", in the sense that many people who are otherwise sceptical about externalist views have accepted it (e.g. Rupert 2009). However, the embedded thesis is not only the trivial claim that the outside world affects our minds. Even an internalist could accept this much, for she could say that the mind depends on the sensory input from the world, but that its processing – the cognitive work – is done inside of the subject. The embedded thesis denies this, and claims for a stronger link. Instead, many of our cognitive processes are directly dependent on the environmental interaction. In metaphysical terms, the embeddedness thesis is a causal rather than a constitutive claim (as opposed to e.g. the extended thesis). The environmental interaction affects, influences, shapes and enables the mind – but it is not part of its constitutive basis. Environmental elements are amongst the etiological reasons how minds are made up. This is the reason why the embedded thesis is easier to accept than the extended thesis.

The terms 'situated' and 'scaffolded' are sometimes used synonymously with 'embeddedness'. However, I follow Krueger and Colombetti (2015), who use *scaffolded* differently – not as a way to differentiate between causal and constitutive, but simply as

a way of stressing the role of environmental interaction without taking a stance to the causal–constitutive debate. They explain the benefits of a neutral term as follows. "As for the ontological question of when, if ever, the environment comes to be part of cognition—this is not something that a supporter of the scaffolded approach needs to provide an answer to" (Colombetti & Krueger 2015, 1159). However, the distinction between causal and constitutive is crucial for the position I am building in this thesis, and hence the distinction between embedded and extended remains important. If used at all, by 'situated' and 'scaffolded' I always refer to the neutral stance that brackets out the causal–constitution question. I will discuss the outcome of the differentiation between the embedded and extended theses (i.e. the *causal–constitution debate*) in the third chapter.[7]

Enacted

According to the *enacted*-thesis, our embodied actions in the environment are a part of the constitutive basis of the mind. The term originates from *enactivism*, which was first introduced as a biological theory of *autopoiesis* by Varela and Maturana in the 1970s and 80s. Enactivism emerged as a criticism towards *classical cognitive science*, also known as *cognitivism*. Thus, it was a critical response to intellectualism, internalism, computationalism and representationalism. According to cognitivism, *computation* is the core feature of cognition (e.g. Fodor 1975). Where there is cognition, there is computation. In the manner of digital computers, human cognition is also inherently manipulation of mental representations: "the mind is thought to operate by manipulating symbols that represent features of the world or represent the world as being a certain way" (Varela et al. 1991, 8). The legacy of cognitivism in the cognitive sciences and philosophy of mind has set the focus on brain functions, and ignored the role of the body and environmental interactions (see e.g. Newen, Gallagher & De Bruin 2018).

The name 'enactivism' was first presented in Varela, Thompson and Rosch (1991). This earliest account is sometimes referred to as *autopoietic enactivism* in virtue of the central role of the *autonomous agent* that produces and maintains itself. 'Autonomous' refers to self-governed, as opposed to 'heteronomous', which refers to other-governed such as cars and computers (Thompson 2007, 98). Living systems "make sense" of their environments

[7] My position specifically addresses the constitutive components of the mind, not its causal background conditions. The distinction is important when discussing metaphysics of mind. However, it is not so relevant in sciences, for example in psychiatry. Consider an Alzheimer patient, who relies on her own familiar home – the order of the furniture, other objects, etc. Whether the home is a causal or constitutive element for her mental capacities is an irrelevant question for psychiatric purposes.

owing to their autonomous and adaptive nature. They care and worry about their world from their point of view – the environment is not indifferent to them, but it gets *meaning* in virtue of the *sense-making* relationship that is created in the interaction between the agent and her environment.[8] Without the sense-making attitude, there cannot be true agency or mind. (See e.g. Thompson 2007.)

Colombetti & Thompson (2008, 55–56) list five main features that describe the enactive approach: 1) Living beings are autonomous systems that actively generate and maintain their identities. They don't just passively process pre-existing information from the world but they *bring forth* or *enact* their own cognitive spheres in ongoing, continuous reciprocal interaction with their environment. 2) The nervous system does not process information in the computationalist way. It should not be understood as *hardware*, but rather as an autonomous system on its own that actively generates its own meaningful patterns in interaction with a sensorimotor network. 3) Cognition is embodied action. Cognitive processes are based on repeated sensorimotor patterns of perception and action.[9] 4) Cognitive agent's environment is not a predetermined or fixed area that is represented in its brain, but rather a relational domain created by the mode of coupling with it. 5) Experience is not considered an epiphenomenal by-product, ergo the questions of cognitive science and phenomenology should not be kept separate from each other.

Apart from autopoietic enactivism as a general approach to the mind, two more focused branches of enactivism are often classified. *Sensorimotor enactivism* is specialised in perceptual experience.[10] According to it, perceptual experience is based on the agent's sensorimotor actions and skills (*sensorimotor contingencies*) in her environment. It is realised in the course of sensorimotor activity itself – perception and action are mutually dependent processes. Finally, *radical enactivism* (or *radical embodied cognitive science*) takes the anti-representationalist side further than the other versions of enactivisms. Thus, it is not only criticising the cognitivist tradition, but also showing that autopoietic and sensorimotor approaches contain leftovers of representationalism.[11] According to the

[8] Compare the concept of 'valence' in psychology – attractiveness vs. averseness of situations, objects, etc.
[9] The third feature on Colombetti & Thompson's list contains a stronger and a weaker claim. First, it states an identity ("cognition *is* embodied action"), and second, a causal or constitutive relation ("cognition is *based on* sensorimotor patterns"). This is a good example that both views can be found in the literature and that they often get confused, as now in this one paragraph.
[10] The most important works of sensorimotor approach include O'Regan & Noë (2001); Noë (2004) and Hurley (1998).
[11] Chemero 2009; Silberstein & Chemero 2012; 2015; Hutto & Myin 2012; 2017.

radical view, basic forms of mind are non-representational and content-free – mind is constitutively "world-involving".

In this thesis, when I use the term 'enactivism' in a general sense, it refers to all of these branches. However, autopoietic and radical versions are not directly related to perceptual experience, and hence they are mostly left in the background. They are not in contradiction with ECM, but their focus is elsewhere. Sensorimotor enactivism, on the other hand, addresses exactly perceptual experience, and that is why most of the enactivism discussed in this thesis considers the sensorimotor branch. However, the roots of sensorimotor enactivism are deeply located in autopoietic enactivism. In addition, I use the notion of *sense-making* (which is more commonly used in autopoietic than in sensorimotor enactivism) to define conscious experience. Sensorimotor enactivism will be discussed especially in the second chapter.

Extended

The last of the E's is the *extended* thesis, according to which non-biological environmental elements – tools, devices, instruments, equipment, props and so on – can become part of the constitutive material basis for certain mental states. It is the strongest and most radical of the E's. It seems to require all the other three E's to hold. What makes it such a striking position is that it is a *constitutive* claim. The tools don't just *affect* the mental processes (whether cognitive or experiential) but are part of what the mental processes are *made of*. The most important work supporting this view is Clark and Chalmers's (1998) theory about extended cognition (EM) – and of course the central goal of this dissertation is to show that ECM belongs to this group as well. Accordingly, the extended thesis is the common thread running through this work. All the chapters deal with the question whether experience is *extended*.

Apart from these above described 4E's, some other notions are sometimes added to the list (even though they don't start with the letter 'E'). I think we should add at least two: *distributed cognition* and *participatory sense-making*. They both touch an issue that is left out from the other E's, namely social and intersubjective relations. The view about *socially distributed* cognition is based particularly on Edwin Hutchins's (1995) work: cognition is not confined to an individual, but spread to other members of the social group as well. Intersubjectivity has been a neglected topic in the enactivist literature until

recently.[12] *Participatory sense-making* is correcting this by shifting the focus to intersubjectively shared features of the mind: it drives the enactivist notion of *sense-making* towards the social domain. According to it, intersubjective processes (e.g. a conversation) also self-organise: subjects coordinate their movements, actions, gestures, etc., and this embodied intersubjectivity allows them to participate in each other's sense-making.[13] I wholeheartedly agree with the role of intersubjectivity for cognitive and experiential processes. However, I don't discuss the social aspect in this thesis apart from a few occasional examples.

All the E's (and other letters) presented here are more or less related to ECM. However, these E-views form a general theoretical framework that operates with a much larger canvas than ECM. Instead, ECM concerns only a narrower area: the constitutive material vehicles of certain perceptual experiences. I argue that three of the E's lead to ECM: *extended*, *enacted* and *embodied*. In the second chapter, I will present three arguments based on these hypotheses respectively.

[12] As Shaun Gallagher (2008, 176) condemns: "[O]ne can read through Noë's book without bumping into anyone else (with the exception of referenced scholars and researchers, of course). The idea that there are other people in the world is almost completely absent from the analysis of perception."
[13] Participatory sense-making was developed by Hanne De Jaegher and Ezequiel Di Paolo. (See e.g. De Jaegher & Di Paolo 2007; De Jaegher, Di Paolo & Gallagher 2010.)

1.4. From the Extended Mind to the Extended Conscious Mind

Let us now turn to the more specific theories of extended mind and extended conscious mind. They both belong to the last of the above-introduced E's (*extended*). In the following sub-sections, I will first introduce the original formulation of EM as it was presented by Clark and Chalmers (1998). Then I will present three waves of research that illustrate how the theory of EM has developed during the last 20 years – ECM is riding on the crest of the third wave. In the latter parts, I will discuss how ECM has been defined in the literature, and formulate my own definition of it. Finally, I will attend to *vehicular* externalism, that is, explain what is meant by the claim that EM and ECM concern the material vehicles of cognition or consciousness respectively.

1.4.1. The Extended Mind

The starting point for my position on ECM is Clark and Chalmers's (1998) account of extended mind.[14] Even though some other theories, especially sensorimotor enactivism, are actually in many ways closer to ECM than Clark and Chalmers's EM is, the latter is still the central inspiration behind ECM. Therefore, let us have a closer look at Clark and Chalmers's argumentation in their ground-breaking work.

Clark and Chalmers offer a delightful number of concrete examples of cognitive extension, of which the most illustrative ones are rotation in Tetris, and the amnesiac Otto and his notebook. In the former, Clark and Chalmers (p. 7–8) ask us to consider three

[14] I use the term *extended mind* (EM for short) throughout this thesis to refer to Clark and Chalmers's theory of extended *cognition*. The term is undeniably slightly misleading, and many writers have recently started to refer to it as the *hypothesis of extended cognition* (HEC for short). However, I think EM works better in the context of this thesis, where it is constantly compared with ECM. The terms are used consistently – the reader just has to remember that EM does not refer to *mind* in general, but only to *cognition*.

cases of problem solving. In the first scenario, a person is watching a game of Tetris on a computer screen, and has to "mentally rotate" the shapes – only by looking at them try to decide which way the shapes would fit the slots. In the second scenario, a person is watching the same geometrical shapes falling, but now she can physically rotate them with a rotation button (as in real Tetris). In the third scenario, a person in the cyberpunk future is playing the same game, but this time she has a neural implant that takes care of the rotation.

The gist of this example is that all three of the scenarios are on a par regarding their functions. According to Clark and Chalmers, the third case (neural implant) is clearly similar to the first case (mental rotation). The second case (rotation button), on the other hand, fulfils the same function as the neural implant, although it is distributed across the player and computer, instead of being internally realised within the player. Clark and Chalmers ask: if the rotation counts as cognitive in the case of the neural implant, by what right do we count the case of the rotation button as fundamentally different? Pointing to the boundaries of the body would just beg the question, since that boundary was at issue in the first place.

Clark and Chalmers (p. 8) discuss an experiment conducted with Tetris players (Kirsch & Maglio 1994). Physical rotation proved to be significantly faster than mental rotation: getting a shape through 90 degrees with a rotation button took 100 milliseconds plus 200 to select the right button, whereas the same action with mental rotation took 1000 milliseconds. Kirsch and Maglio showed that the physical rotation is not only used for positioning the shape to fit the slot, but also as a means to determine if the shape and slot are compatible. They call this an *epistemic action*. Clark and Chalmers (p. 8) take the idea further, and propose that epistemic actions deserve *epistemic credit*. Hence, it is fair to say that the cognitive action in the second case is spread to include also the physical rotation.

The second example is the most famous one, and it wouldn't be unfair to call it the flagship of EM. Otto suffers from a curious version of Alzheimer's[15] that has made him

[15] It has nothing to do with real Alzheimer's syndrome. The Otto example is a thought experiment, where it only matters that his biological memory is non-existent, whatever the diagnostic reason is. In general, I think we should be suspicious of the use of thought experiments in arguments in philosophy of mind. However, this particular thought experiment is rather innocent and quite successful in its purpose. On one hand, it is based on a common everyday tool (a notebook) rather than some science-fiction scenarios or imaginary future technologies, and on the other hand, it works perfectly as an intuition pump that directs even the unaccustomed readers away from internalism towards externalism.

very forgetful. He writes down everything in the notebook he always carries with him, and that's how he is able to cope in society like any of us. One day, he wants to visit the Museum of Modern Art, and as usual, he consults his notebook. He finds the address, walks to the destination, and enjoys the art experience. Inga, on the other hand, has normal memory, and she also appreciates modern art. She decides to go to the same museum with Otto. She thinks for a moment to remember the address, recalls it, walks there, and enjoys herself as much as Otto. Clark and Chalmers (1998, 13) state that the two cases are on a par considering the status of their beliefs.

> [I]n relevant respects the cases are entirely analogous: the notebook plays for Otto the same role that memory plays for Inga. The information in the notebook functions just like the information constituting an ordinary non-occurrent belief; it just happens that this information lies beyond the skin.

The gist of this example is that what makes something count as a belief is the role it plays – rather than whether it is located inside or outside the skin. Otto and his notebook together create a "*coupled system* that can be seen as a cognitive system in its own right" (C&C, 8). Hence, the notebook not only influences Otto's cognitive process of remembering the address, it also becomes part of that cognitive process itself. Clark and Chalmers list requirements that need to be fulfilled in order for something to count as an instance of EM: the external device has to be a *constant* for its user, it has to be easily and directly available, reliable, and automatically endorsed. (These "glue and trust" criteria will be analysed in the fourth chapter.) Especially the example of Otto and his notebook has evoked an abundance of literature in philosophy of mind and related fields – critical comments, answers to critiques, applications to other areas, etc. Many of those critiques will be discussed (and answered) in this thesis.

1.4.2. The Waves to the Extended Conscious Mind

Externalist accounts have developed in various directions since the original argument was presented 20 years ago. Broadly speaking, the research about the extended mind hypothesis has been classified in three different theoretical "waves" (see e.g. Menary 2010b; Gallagher 2018c). *The first wave* refers to the original formulation of EM by Clark and Chalmers that is based on functionalism – the *functional role* the external element plays in the system. When the tool plays the same functional role as the biological process, it merits the same cognitive status. This is called the *parity principle*, which Clark and Chalmers describe as follows:

> If, as we confront some task, a part of the world functions as a process which, *were it done in the head*, we would have no hesitation in recognizing as part of the cognitive process, then that part of the world *is* (so we claim) part of the cognitive process (Clark & Chalmers 1998, 8).

The parity principle has been criticised by both the supporters and opponents of EM.[16] One shortcoming is that it might encourage one to think that mental functions can only be found by comparing them with biological, neural functions. Otto's notebook is part of his cognitive system *if* it is on a par with Inga's organic cognitive system. However, this was not what Clark and Chalmers had in mind. As Michael Wheeler writes (2015b, 158, footnote 3), Inga's role as a point of comparison could even have been left out without the core of the argument suffering. In hindsight, without comparing Otto to Inga, the philosophical literature would have been saved from the debate whether the two ways of having a memory are on a functional par or not. In a sense, it was an unfortunate path, because the truth of EM is not dependent on whether Otto's and Inga's beliefs are functionally identical (it is clear that they are not) or even similar enough. On the other hand, the critique led many supporters of EM to move their focus from the original parity-based arguments to other kinds of arguments.

[16] The parity principle will be under scrutiny in sections 2.2., 4.2.2. and 4.3.1. Note also that the term 'parity principle' was not used in C&C's original article. It has been introduced later (e.g. in Clark's contributions in the collection of essays edited by Menary 2010a), and I think the demand for this term evolved exactly from the need to differentiate the first wave from the second wave EM.

The *second wave* arguments dropped the parity principle, and replaced it with theses such as *complementarity* and *integration*. Sutton (2010) initiated the *complementarity principle* that allows that there are dissimilarities between external and internal functions. Biological and external functions can sometimes be on a par, but often the externalised function is in fact altogether different from a biological one – and can still count as cognitive. Hence, parity is no longer a defining feature of extension. Sutton also emphasises that extension varies based on differences in people, situations and environments. Subjects might have different habits of using tools – differing from person to person, situation to situation, and environment to environment. Menary's (2007; 2010c) account of *cognitive integration* is another example of leaving the parity requirement behind, instead focusing on the everyday embodied ways of integrating external means to the cognitive functions we perform. Menary sums up the second wave: "the bodily manipulations of external vehicles are different from, but complementary to, internal processes" (Menary 2010c, 240).

Finally, the *third wave* is an attempt to bring together coherently all the different threads, "a motley connection of factors", that have stayed somewhat disconnected in the earlier waves of arguments – from neurons to cultural practices, and from writing skills to smartphones. Whereas the first and second wave arguments are rather established, the third wave is still in formation. (Gallagher 2018c.) Sutton (2010, 213) describes the third wave as rejecting the idea that internal and external, natural and artificial would have fixed properties, but instead "this third wave would analyse these boundaries as hard-won and fragile developmental and cultural achievements, always open to renegotiation". Instead of fixed properties, the elements are constantly transformed, negotiated and reformatted.

Gallagher (2018c) mentions two attempts that have been initiated in the 4E literature in order to better take into account the dynamical, holistic conception of mind/cognition. On the one hand, *predictive processing* offers a unifying explanatory model, and especially Andy Clark's (e.g. 2013; 2015; 2016) recent work has brought the theories of predictive processing and extended mind together. On the other hand, *enactivism* is a theoretical framework that has always understood cognition in a dynamical way. One defining feature of the third wave has been to try to bring enactivism and extended mind together. The two theories have a lot in common, but they also contain sharp differences, such as diverging attitudes towards functionalism and representations. My dissertation fits

precisely this latter slot – third wave externalism that understands mind in a dynamical enactivist way combined with lessons from the theory of extended mind.

Indeed, we can say that ECM is on the top of the third wave (which has also been described as a tsunami).[17] And as stated, it is also an heir of EM, which has its roots in the first wave. How is ECM different from EM then? Of course, many cognitive states are conscious, and most conscious states are cognitive. Hence the difference between cognitive vs. conscious cannot be used as a straightforward separating factor (even though it seems that most of the critiques assume consciousness can be neatly cut out from cognition). One important difference is related to the question whether the extended state is occurrent or dispositional. The Otto example is about a dispositional belief, and dispositional beliefs are not experiential; therefore, the Otto example is not an instance of ECM. (It is plausible that Otto goes through some sort of experiential states while checking the address, but that is not what the example is about.) ECM applies to occurrent states only, because experiences are always occurrent. However, cognitive states can be both occurrent and dispositional.

Consider the two examples I presented above by Clark and Chalmers (1998). The first one, using the rotation button in Tetris, concerns an occurrent process, while the second one, Otto and his notebook, concerns a dispositional state. Thus, the Tetris example comes closer to ECM than the Otto example. Even though originally intended to give support exclusively to EM, it ends up dealing with aspects that are not only cognitive, but also experiential, namely sensorimotor actions.[18] Playing Tetris also undoubtedly requires cognitive actions – it is a good example of an occurrent mental process that consists of both cognitive and experiential aspects. I will discuss the difference between dispositional and occurrent EM in more detail in the second chapter, arguing that accepting occurrent EM leads to ECM.

In the remainder of this section, I will frame a definition of ECM (and EM). First, let us have a look at how others have defined ECM. Andy Clark[19] (2009) describes ECM as

[17] Gallagher (2018c, 434) writes: "The first two waves of extended mind theory, as I count them, are part of the tidal change of embodied cognition that, on some accounts, has led to a gradual erosion on the shoreline of the classic cognitivists. The third wave promises to be more tsunami like and threatens to wash away that shoreline altogether."

[18] Notice that Clark & Chalmers (1998) do not treat the rotating actions as conscious. As said earlier, they treat them as *epistemic* actions. However, I think their treatment misses the experiential side that is present due to the sensorimotor nature of the task.

[19] Note that Andy Clark himself is not supporting ECM.

follows: “the local material vehicles of some of our conscious experiences might include more than the whirrings and grindings of the brain/CNS” (p. 967) and “the minimal physical substrate for some forms of conscious experience include[s] the goings on in the (rest of the) body and the world” (p. 963). Dave Ward (2012, 732) understands “ECM as the claim that *the subpersonal basis*[20] *of some conscious experiences can include events and properties outside the organismic boundaries of the experiencing subject*”. Ken Pepper (2013, 99) is more specific and stresses the sensorimotor dynamics of perceptual experiences: “Some authors have urged that if it is indeed the case that perceptual experience depends on a bodily engagement with the world, then the implicated patterns of environmental interaction – sensorimotor dynamics – are physical constituents of perceptual experience.” Daniel Hutto and Erik Myin (2012, 158) take a stance from supervenience and write that “phenomenality has a wide supervenience basis – that it constitutively involves parts of the environment. […] Phenomenal experience strongly supervenes on, or is constituted by, temporally extended, interactive worldly engagement.”[21]

What is common in these formulations is that they all concern the constitution of the physical underpinnings of phenomenal experience. These definitions could be summed up as follows: *The constitutive material vehicles (i.e. the material basis) of some conscious experiences can include external parts*. However, my thesis is more specific and limited: it only includes certain kinds of *perceptual* experiences. Further, my position is not modal – it is not a thought exercise what *could* or *can* be the case – but rather it is a claim about the *actual* state of affairs. Finally, my position concerns larger experiential *systems* rather than single experiential states or processes. For example, it deals with the use of a blind person’s cane as a stable, consistent way of perceiving the world, rather

[20] Ward (2012, 733) explains his use of ‘subpersonal’: “I focus on the claim about the subpersonal rather than the material basis only to avoid commitment to the idea that the best way of characterizing that subpersonal basis will be in physical terms (as opposed to, say, the language of ecological optics).”

[21] For example, in the following texts, the writers have explicitly argued for extended conscious experience: Kiverstein & Farina (2013); Kiverstein (2016); Kiverstein & Kirchhoff (2019); Noë (e.g. 2004); Hurley (e.g. 2010); Rowlands (2003; 2010); Ward (2012); Pepper (2013); Loughlin (2012); Vold (2015); Bruno (2013); Silberstein & Chemero (2012; 2015). Many writers are also very close to ECM, but have not fully accepted it, or haven’t taken a stance about it. They include e.g. Hutto and Myin (2012; 2017); Colombetti (e.g. 2014); Wilson (2004). Actually, probably the majority of the 4E-oriented philosophers belong to this group, which makes the central argument of this thesis (that ECM follows from most of the E’s) noteworthy. Yet another option is put forward by Michael Wheeler (2015a; 2015b), who remains deliberately agnostic about ECM. According to him, the arguments for ECM presented in the literature do not yet resolve the case for either externalism or internalism.

than focusing on one successful use of a blind person's cane.[22] Of course, the experiential system consists of individual experiential processes. To be a competent user of the cane, one has to have had a large number of uses of the cane. Thus, it is impossible to categorically differentiate between these. This complication and the differentiation between single short-term extensions, and wider-ranging systemic extensions (or *incorporations*, as I will specify them) will be illuminated in the fourth chapter. Based on all these reflections, I will define ECM and EM as follows:

> **Extended Conscious Mind (ECM)**: The constitutive material components of certain perceptual experiences include external elements on the condition that those components are functionally incorporated into the subject.

> **Extended Mind (EM)**: The constitutive material components of certain cognitive states/processes include external elements on the condition that they are integrated into the subject.

These are the definitions that are used in this thesis for EM and ECM. It is worth noting already at this point that they also contain the demarcation criteria for both EM and ECM – *integration* in EM, and *functional incorporation* in ECM. These requirements will be explained in the fourth chapter.

Further, ECM could be taken as an explanatory or ontological account. Philosophers would probably consider an ontological account a stronger view, whereas empirical scientists probably only deal with explanatory accounts to start with. Hurley is the most important example of a sensorimotor enactivist who commits to explanatory externalism.

> I take issues about internalism and externalism to be issues about explanation. Some boundaries, like the skin, are intuitively salient. But they may not capture the explanation we seek. Intuitive boundaries can cut between factors that are not explanatorily separable. (Hurley 2010, 113–114.)

[22] This last feature is similar to Clark and Chalmers's EM, which is also about the whole memory system of Otto, rather than one individual memory of his.

When our aim is rather to do cognitive science than metaphysics, I do not think it makes much difference whether ECM is considered explanatory or ontological claim. I do agree with Hurley, but still claim that ECM is the "strong" claim that some philosophers would only connect with an ontological claim.

1.4.3. Vehicular externalism

As became clear from the above definitions, both EM and ECM concern the *material vehicles* of mental states (the former of cognition and the latter of consciousness). I use the term 'vehicle' synonymously with 'material basis', 'material underpinnings', 'material realiser', 'sub-personal basis', 'substrate', 'material component', 'constitutive component', 'material part', and other similar combinations modified from these. They are the underlying entities that realise mental states. In internalist accounts of mind, neural functions are considered to be the only constitutive vehicle, whereas EM and ECM add the body and environmental interactions. Needless to say, brain functions are still *necessary* vehicles – they just are not always *sufficient* according to the externalist views.

The fact that EM and ECM concern the material basis separates them from some other well-known theories in philosophy of mind and language. EM and ECM differ from Hilary Putnam's (1975) *semantic externalism* in that the latter is about mental *content*. It is often stressed (e.g. Clark & Chalmers 1998; Menary 2010b) that EM is a form of *active externalism* whereas semantic externalism is *passive* – about the distal (albeit external) causes that have determined the contents of certain mental states. While this distinction is legitimate, I think it dismisses the central disjointing factor. Instead, the crucial difference is simply that EM and ECM are about the concrete material realisation of certain mental states, and not about how meaning, sense, or content is determined. These

two kinds of externalisms need not be in contradiction; they simply deal with completely different matters. (Putnam's account will be discussed in section 2.2.2.)

Further, EM and ECM differ from *panpsychism* (see e.g. Strawson 2006) in that panpsychism concerns mental *character*. EM and ECM do not claim that a notebook or a blind person's cane are cognitive or conscious, nor that they contain "proto" cognitive/conscious elements. These tools can only become part of the realising material basis for some cognitive/conscious state when properly coupled with an (already cognitive/conscious) agent – and this claim is far from panpsychism. Besides, panpsychism is not empirically testable but remains in the analytical sphere.[23] To conclude, EM and ECM do not have almost anything in common with semantic externalism nor panpsychism (except the label 'externalism' in the former case).[24]

1.5. Conclusions and Methodological Remarks

In recent decades, there has been an increase in the amount of literature on naturalistic, empirically responsible philosophy of mind. Rather than relying on speculative *a priori* thought experiments and pure rational reasoning, naturalistic philosophy of mind is in close interplay with empirical research and experiments in fields like cognitive sciences, cognitive psychology, neurosciences, psychiatry, robotics, etc. My research shares this empirically oriented methodology and multidisciplinarity.

[23] Although some panpsychists might oppose this. For example, *integrated information theory* is said to entail panpsychism, and it is promoted as a scientifically testable theory (see e.g. Tononi 2008).
[24] Yet another account to be contrasted with is *naïve realism*, according to which the *objects of perception* constitute the experiences (Martin 2004). As Clark (2009, 968) has pointed out, naïve realism is a "more metaphysical" argument than ECM. ECM targets the material vehicles of experiences, not their objects or contents, and is a more empirically oriented position.

I use thought experiments as little as possible. Sometimes they can be useful in illustrating a phenomenon, such as the example of Otto and his notebook. That particular thought experiment is a good example because it doesn't contain any leaps into science-fiction, but deals with relying on a mundane pair of notebook and pencil. One especially problematic (but common) aspect in philosophy of mind is that people tend to appeal to "future technology", or "future development in neuroscience". My position is not dependent on any "future" inventions, but is rooted in existing artefacts, technology and science.

Not only can the empirical sciences guide philosophy, but philosophy also has a lot to offer the empirical sciences. Furthermore, these topics are related to ethical and societal questions. Apart from being intriguing philosophically, the question about the borders of the mind can also have direct implications on our lives. In democratic societies, citizens' bodies and brains cannot be fiddled with without their permission. However, if the boundaries of our cognitive and experiential functions lie elsewhere, perhaps the legal questions should be adjusted accordingly. Perhaps hacking a laptop should be seen as a personal assault rather than an assault on one's property.[25] Further, if we accept the externalist view, we need to admit that when the FBI searches through somebody's smartphone, they search through part of their *mind*.

[25] Carter & Palermos (2016) have argued that if we accept the hypothesis of extended cognition, we have to update our notion of *personal assault* to include also intentional harm done towards the gadgets that are properly coupled to the system.

2. Arguments for Extended Conscious Mind

2.1. Introduction

In this chapter, I will give three arguments for ECM. The basic idea behind them is quite simple: if we accept the general 4E-framework, we have no other choice than to accept ECM. Hence, in a broad sense, the most important argument for ECM is simply the whole 4E-framework. For this chapter, I have picked up the most important subtypes of it regarding ECM. The inference relations are as follows.[26] 1) If EM, then ECM. 2) If sensorimotor enactivism, then ECM. 3) If the embodiment thesis, then ECM. They are presented in this order in the following sections.[27]

This alone (showing that ECM follows from the three other theories) is an important result – regardless of whether we accept these three theories or not. It is important because several writers argue for the other three theories, but deny ECM.[28] This chapter shows that these views are often inconsistent – however, not always, for there are at least two exceptions. First, it is consistent to commit oneself to a narrow version of (dispositional) EM, but deny ECM. However, a broader reading of EM leads to ECM. Moreover, within the supporters of EM, this broader understanding is very common and widespread: it is what is usually understood by EM at least amongst philosophers of mind (it is supported e.g. by Clark). Second, it is possible to accept the embodiment thesis (experience is embodied), but stop there, and deny that experience could spread outside the bodily frontiers. However, accepting the embodiment thesis is a slippery slope leading towards ECM, as will be shown in the third argument. However, one of the premise theories, viz. sensorimotor enactivism, differs in this sense: I claim that there is no consistent way to accept it but still deny ECM. All these subtleties and refinements will be clarified and analysed in the following sections.

Thus, there are two ways the reader can receive the arguments in this chapter. First, they can be taken as a clarification of what follows from the three premise theories, without

[26] Even though I use the terms 'inference', and 'implication', in none of these arguments the inference relation is a *logical inference* or *material implication*. They are rather *a posteriori* claims that are to be tested on empirical rather than on logical grounds.
[27] The last remaining E (the embeddedness thesis) makes an exception, because it would not lead to ECM since it is by definition a causal account, whereas EM and ECM are constitutive accounts.
[28] For example, Hutto and Myin (2012; 2017); Colombetti (e.g. 2014); Wilson (2004).

the need to commit oneself to any of them. If understood this way, the results could even be used against the premise theories, because a critic of the externalist views could say that if these theories lead to ECM, it is a good enough reason to consider the premise theories false. Even if used in this way, the importance of the matter presented in this chapter remains – whether we are for or against externalism, we have to be consistent in our views. However, my argument for ECM is stronger than this conditional acceptance. Second, the arguments can be taken as reasons why we should accept *both* the premise theories *and* ECM. I claim that the three theories are actually valid/true, therefore so is ECM. Moreover, one does not need to accept all three arguments to reach ECM, even one of them is enough.

2.2. Argument 1: Parity argument

Most of the proponents of EM have not even considered the possibility of ECM. Clark (2009; 2012) makes an exception. As said before, he is probably the best-known supporter of EM, and at the same time the best-known denier of ECM. However, it is not an easy task to both hold on to EM, and deny ECM. Clark needs to use a very complex system to keep the counterbalance, and he ends up making controversial claims in order to uphold EM.[29] Clark's attempt shows that it is very difficult to argue for EM but leave ECM aside. The arguments from straightforward internalists are at least more consistent than Clark's in this case.

[29] I will discuss Clark's objections in full detail in chapter 5. In a nutshell, Clark's argument on high-bandwidth (according to which conscious experience requires high bandwidth processing, and only neural processing is capable of the task) is problematic at least in two ways. First, it is based on dubious assumptions about the body as a low-pass filter that doesn't have empirical support. Second, even if it were true, it would also debunk occurrent EM (which is certainly an unwanted result for Clark).

This first argument for ECM adopts a treatment opposite to Clark's. It proceeds from EM to ECM. Hence, the argument consists of two questions in need of answers: First, why EM? And second, why the bridge from EM to ECM? I will concentrate on the second question, since the first question has been discussed comprehensively in the literature for the last twenty years.

For the weaker version of this argument (*if* we accept EM, ECM follows – without taking a stance whether we should accept EM or not), we don't need any back-up for EM, obviously. In the weaker case, only the bridge from EM to ECM needs arguments. However, the stronger version (if we accept EM, ECM follows – and we have good reason to accept EM, therefore we need to accept ECM as well), requires both those "good reasons" for EM, alongside the arguments for the inference relation.

As mentioned before, the literature is full of arguments for (and against) EM. The leading arguments can be found indubitably from Andy Clark's works (e.g. 2007; 2008; 2010). Besides Clark, Menary (2010a) has edited a worthwhile compilation of defences and criticisms. As mentioned in the previous chapter, the arguments for EM have been classified in first-wave and second-wave arguments (the third wave consists of ECM already, so it is out of this discussion) depending on what aspects they stress (see Menary 2010b; 2010c).

First-wave arguments rely on the *parity principle*, which draws on the functional parity, or uniformity of the (putative) external and internal substrates of cognitive processes. As long as the functional role is the same, it doesn't matter whether the apparatus is inside or outside the skin and skull. The parity principle was first and foremost an intuition pump whose purpose was – alongside the Otto example – to question the Cartesian prejudices looming behind the internalist account of the mind.

The second-wave line of argumentation drops the parity requirement (or parity *metaphor*, depending on the interpretation), and instead states that the external processes don't have to functionally mimic any brain-based cognitive state, but that they complement them instead. Second-way arguments for EM include, for example*, the complementarity argument* (Sutton 2010), and *the cognitive integration argument* (Menary 2007). Instead of the parity principle "the motivation is found in the brute fact of our embodiedness and our bodily manipulation of environmental vehicles" (Menary 2010c, 233).

I think the most central and straightforward reason to accept EM is captured in Susan Hurley's (2010) *no-magical-membrane* argument. There is no reason to assume a "magical" membrane between the brain and its body and environment. The dynamic processes criss-cross between all of them, and they don't respect membranes, magical or mundane. Of course, Hurley's way of putting it is not at odds with the parity (nor complementarity) arguments, but it avoids the problems that can potentially arise from the parity principle. If the parity principle is understood literally instead of as an intuition pump, it can lead to a strong commitment to functionalism, and to an impression that extension is only to be detected with the means of comparing it with internal processes, as if the internal brain processes were a default case. This criticism towards the parity principle has been articulated by many writers (e.g. Di Paolo 2009; Menary 2006; Wilson 2010). Others have criticised the critique for misunderstanding the aim of the parity principle (e.g. Clark 2007; 2008; Wheeler 2010). Kiverstein & Clark (2009, 3) sum up the defence:

> The parity principle was introduced only to engage our rough sense of what might belong to the domain of the cognitive. It was never a requirement that the external entities perform the same or similar role to processes taking place internal to the individual. Parity demands that we count external elements as forming a part of the machinery of cognition even if their causal contribution is unlike anything we find within the head.

This shows that Clark doesn't commit himself to a dubious interpretation of the parity principle, but still, it doesn't remove the fact that the original formulation of the parity principle in Clark and Chalmers (1998) had all the ingredients to encourage these misinterpretations.

Overall, I think the general 4E-framework that was presented in the previous chapter and the numerous arguments formulated in the literature provide good enough reasons to accept EM. It is not considered a very controversial claim in philosophy of mind anymore, which is also backed up by the fact that it has been used extensively in other fields, e.g. in philosophy of psychiatry, cognitive neurosciences and art and literature studies.

The following, and more radical step is to be taken from EM to ECM. At least the following writers have argued that EM cannot be accepted without accepting ECM

alongside it. According to Ken Pepper (2013), if we accept the wider commitments of EM and the lessons from sensorimotor enactivism that Clark needs to accept for his own EM to stay safe, we cannot but accept ECM as well. Victor Loughlin (2012) argues that some cases of Clark's EM already involve conscious experience, even though Clark didn't intend so (i.e. the example of an artist and her sketchpad).[30] Karina Vold (2015) finds Clark's reasons to reject ECM wanting. She pursues the strategy of criticising Clark's criticism based on high-bandwidth, and claims that the arguments Clark is using for EM work for ECM as well, and Clark hasn't been able to consistently disprove this result.[31] As we can see, their reasons differ, but all of them explicitly state that ECM follows from EM.[32]

In principle, yet another way to proceed from EM to ECM would be to claim that all mental states are conscious, or at least potentially conscious. Something like this is proposed by John Searle (1992) and Galen Strawson (1994). Given EM, and given that cognitive states are mental states and therefore conscious states, ECM follows. However, I do not support this view. As presented in the first chapter (1.2.), cognition and consciousness are not identical. There are mental states that are not conscious as e.g. the existence of blind-sight shows. It would not be reasonable to cut the psychological sphere to cover only the phenomenal side.

Of course, this line of argumentation could be used not only as a back-up for ECM, but also as an objection to EM – if all mental states need to be conscious, and the dispositional state described in the Otto example is not conscious, it follows that it is actually not mental. Clark and Chalmers (1998, 16) note this possibility: if dispositional beliefs are not considered real beliefs, because "the only true beliefs are occurrent beliefs", then Otto would not count as an example of EM (and neither would Inga have a real belief before deciding to go to the museum). Obviously, this is a criticism only against dispositional

[30] I think Loughlin's argument is on the right tracks. It touches on the same differentiation that I will present in the following sections, i.e. between the occurrent and dispositional EM. However, he fails to explicitly state the difference between the two types, and how one leads to ECM and the other doesn't, and that slightly reduces the power of his argument.

[31] Vold's criticism towards Clark's high-bandwidth argument is very apt and I fully agree with it. However, in order to argue for ECM, she ends up using a thought experiment, where instead of replacing neurons with silicon chips (as e.g. in Searle's version), the whole silicon apparatus is placed outside the head and connected to the brain with wires through one's ear. Even though this argument is supposed to give support for ECM, I think it is as mistaken and harmful as the similar views in the opposing camp, viz. brain-in-a-vat scenarios.

[32] However, it should be noted that opposing views have been presented as well, of which an example is Wheeler (2015a; 2015b), who supports EM on parity grounds but denies that ECM should follow from it.

EM, not against occurrent EM, let alone ECM. (Clark & Chalmers 1998 themselves don't talk about occurrent vs. dispositional EM, and certainly not about ECM.) Nevertheless, as already mentioned, I don't think there are good reasons to accept the claim that all mental states have to be conscious or occurrent, and hence also the dispositional EM survives this criticism.

In what follows, I will present what I think is the most important reason why one cannot consistently support EM and deny ECM. I will approach the matter from two directions. *First*, I appeal to the close ties between cognition and consciousness, and defend a view that they overlap in many situations. As was discussed in the previous chapter, the strict separation stems from theoretical traditions that have been predominant approximately in the last half of the 20th century. The cognitivist paradigm in cognitive sciences (and its influence on analytic philosophy of mind) has strengthened the gap. The work in the 4E-field has shown that we should drop both the cognitivist paradigm and the deep gap between cognition and consciousness.[33] *Second*, I argue that there is a version of EM that includes experiential states, that is, ECM can already be found in one version of EM (that, for example, Clark himself supports). These two slightly different strategies – whose aim is still to reach the same destination – will be discussed in the following sections.

2.2.1. Cognition and consciousness are often inseparable

Let us start by considering the first option. The first way to proceed is to propose that cognition and consciousness should not be separated in the categorical manner that they have been separated in the (especially analytic) philosophy of mind during the last decades. The motivation behind this idea comes from a critical stance towards classical

[33] Instead of the vocabulary I use, some writers speak about *non-conscious cognition* and *conscious cognition* (see e.g. Kiverstein 2016). Possibly that vocabulary might be more neutral, but for the sake of clarity, I use the terms *cognition* and *consciousness*.

cognitive science (cognitivism), and it has been addressed in some recent enactivist writings (Silberstein & Chemero 2012; 2015; Kiverstein 2016).

As was pointed out in the first chapter (1.2. and 1.3), cognitivism has promoted the view that cognition is inherently computational. When understood as computation, it makes sense that cognition has been thought of as independent from consciousness, for it is difficult to see how conscious experience could be explained in computational terms. Therefore, there is a gap separating the two, and that is reflected e.g. in the famous arguments in analytic philosophy of mind such as the *explanatory gap* and *philosophical zombie* arguments.

Let us just very briefly consider the famous zombie thought experiment (see e.g. Chalmers 1996). According to this argument, conceiving of creatures that are functionally identical with us means conceiving identity in terms of the *cognitive processes*. The phenomenal side is ruled out, because allegedly it is not based on those very same functions – therefore, according to the argument, there is nothing it is like to be a philosophical zombie. When the concepts of cognition and consciousness are separated in such a manner, this argument becomes *conceivable*, a logical possibility. However, this conceivability is only due to assuming that cognition and consciousness can be separated in the first place. Without the separation, the argument is meaningless: zombies would not be conceivable. Creatures functionally identical to us in cognitive terms are also identical to us phenomenologically. (See the discussion in Kiverstein 2016, 132.)

Consider the two ways to understand the concept of cognition that was presented in the previous chapter (section 1.2.). If we conceive cognition in the enactivist way, that is, based on skilled, embodied interaction with the world that already comprises the experiential side, the gap dissolves and there is no longer a need for principled separation. Kiverstein (2016) draws a picture of cognition and consciousness as entangled and inseparable.[34] Instead of "atomic sensations", that is, qualia that are based on intrinsic properties of sensory qualities (pain is intrinsically unpleasant/painful, experience of redness is intrinsically red), Kiverstein builds his theory on enactivism and especially on

[34] Kiverstein also criticises Block's (2002) differentiation between *phenomenal* and *access* consciousness. "Such a distinction only appears necessary because of a computational theory of cognition tailor-made for explaining unconscious cognitive processes" (Kiverstein 2016, 109). I am also critical towards a certain use of the differentiation, viz. when the motive is to set phenomenal consciousness (understood as an abstract property of what-it-is-like-ness) in its own sphere, dissociated from report, memory, reasoning, etc. However, if used more as an epistemic tool, i.e. as describing different aspects of experiential–cognitive processes but not aiming to dissociate them, I think the differentiation still has its place.

Gibsonian affordances. Phenomenal experience is based on *everyday human life* – on the practical engagements we have with our surroundings. We primarily experience a world that offers opportunities for action, rather than properties of sensations, and the phenomenality of experiences is explained by our "intentional directness" to the world. What we experience is the "relevant affordances that move us to act in ways that improve our situation in the world" (Kiverstein 2016, 121).

When the notion of phenomenal consciousness is considered in this way, it becomes a lot easier to see how cognition and consciousness are not very different from each other. Both are based on the same thing – the agent's skilled interactions in its environment. (*Skilled* is an important aspect here – it refers to the *sense-making* stance that is gained in the interactions.) Cognition is not the computation of mental representations, and consciousness is not something alien to the natural world and explanation. There is no "qualia". In my experience of a red apple, there is no separable "raw feeling" that would plainly consist of the property of redness itself. Rather, I see an edible, perhaps even a delicious object, and my *knowing* or *believing* that it is a fruit, that I can eat it, and my visual, olfactory and tactile *perception* of it are not separate from how I experience a red apple.[35]

This kind of understanding of phenomenal consciousness is in particular based on the ideas presented by the *radical enactivists* (Silberstein & Chemero 2012; 2015; Hutto & Myin 2012; 2017), who bridge the gap between cognition and consciousness (or the *mind–mind problem* as they call it). Instead, experience extends jointly and inseparably with cognition: all mental processing is based on coupled animal–environment systems. They describe the phenomenological–cognitive systems in terms of affordances, niche-construction and evolution.

> [W]e can understand phenomenology and cognition as inseparable and complementary aspects of coupled brain–body–environment systems. On our view, experience is cognition and cognition is experiential. Our cognitive, conscious, and behavioural capacities co-explain and co-determine each other dynamically […] The systems that cognitive scientists have identified as extended cognitive systems are in fact

[35] Kiverstein (2016) mentions another interesting view: Sytsma & Machery (2010) have conducted experimental philosophy, according to which consciousness is seen as *valence*, not *something-it-is-like*.

> extended phenomenal-cognitive systems. (Silberstein & Chemero 2012, 40–41.)

If we accept this view, what remains of the difference between cognition and consciousness? Are they simply identical, and is the separation only due to a theoretical–philosophical misunderstanding? The radical enactivists don't have a clear stand on this. However, Kiverstein's (2016) suggestion is worthwhile. According to him, we should understand the linkage as something that happens outside of psychological experiments in laboratories and thought experiments in philosophers' writing desks. To put it concisely: *cognition is experiential in everyday life situations*. They usually occur together. In "normal" situations, "cognitive processes do not unfold independently from conscious processes" (Kiverstein 2016, 114).

However, they are *not identical*. Cognition and consciousness are still separate conceptually; and not only conceptually, but there are occasions where they occur separately. Especially clear are occasions of cognition without consciousness. For example, right now, when I am writing, I don't consciously experience several things in my surroundings (such as unfluctuating noises in the background), but we could still say there is some cognitive processing of these things that I do not experience going on. Psychological experiments have shown that perception can occur without conscious awareness, for example in phenomena such as blind-sight, change blindness and binocular rivalry (see e.g. O'Regan et al. 1999; Prinz 2015; Rensik et al. 1997). Also dispositional beliefs, etc. might be considered as occasions of non-conscious cognition (even though some people deny that they count as mental states at all – but this of course depends on how we define mental states). Overall, cognition comprises several different features (e.g. attention, memory and problem solving, see the list in section 1.2.), and it is clear that not all of them are experiential.

Nevertheless, the fact that cognition and consciousness *can* occur separately, doesn't entail that they are separated all the time, or in the cases we are interested in. The anomalous perceptual states mentioned above (blind-sight, change blindness and binocular rivalry) are conducted in controlled conditions that are "artificial in so far as they abstract away from the normal ecological contexts in which unconscious and conscious cognitive processes normally occur" (Kiverstein 2016, 114). The cases that I am referring to when discussing the similarities of EM and ECM are exactly the above

described everyday-life mundane tasks, such as sketching with pen and paper, dancing to a choreography or deciding whether an apple is good for eating.

To put it in a nutshell: we don't become Chalmers's zombies when undergoing cognitive tasks. Several everyday cognitive processes (such as recognising an apple as food) are experiential, and experiential states (such as seeing the appleness of an apple) are cognitive. A rigid differentiation does not help to solve the empirical questions that for example psychology or cognitive neuroscience deal with. The most important question for the empirically oriented sciences of mind is not *Why is there consciousness at all?* but rather *How does the cognitive-experiential system work?* The question of this thesis is of course the latter one, with a focus on its sub-question: *How is the cognitive-experiential system materially realised*?

2.2.2. Occurrent EM

A slightly different way, which however leads almost to the same result, is to point to the *occurrent* side that is already present in EM. Namely, to start from the fact that the theory of EM itself not only deals with dispositional states (such as Otto and his notebook), but also with occurrent processes (such as calculating with pen and paper). Colombetti & Roberts (2014, 1244) make a significant distinction:

> It is important to distinguish two targets of [EM]: (1) standing, enduring mental states, such as dispositional beliefs; and (2) temporary, fleeting occurrent cognitive processes, such as calculating a complex sum at a certain moment. [EM] is the thesis that, sometimes, the material vehicles that realize both (1) and (2) extend beyond skull and skin, into the world.

This line of proceeding leads to the same conclusion as the previous strategy, but the path of reasoning is slightly different. Instances of occurrent EM already cover the experiential side: they are cognitive(-phenomenological) processes that happen during a certain interval of time, of which the experiential side cannot be carved off (at least in real life situations, conceptually they might be separable, for example in thought experiments). Colombetti & Roberts use an example of calculating to refer to an occurrent cognitive process. I suggest that perhaps an even better example of (2) from the above passage is *calculating with ones fingers*. It is more experiential than "calculating a complex sum", which may be quite abstract (even if completed with pen and paper).

Indeed, the only non-experiential aspect in EM is (1) in the previous quote: standing, dispositional beliefs.[36] Now, Clark most definitely supports occurrent EM, and has come up with the most illuminating examples in his publications over the last couple of decades. I think it is fair to say that the most important and interesting instances of EM belong to this group, and it is what makes EM such a striking and influential theory. The only cases that are left to the group of dispositional, non-occurrent EM are based on memory, knowledge or beliefs such as the Otto thought experiment. In the literature, dispositional and occurrent EM are usually not separated, or if they are, EM is taken as a wider theory that covers both (of which the above quote from Colombetti & Roberts is an example). In general, I follow their example (i.e. when I use the term EM, it covers both sides), but in this chapter, and especially in this first argument, the differences between the two sides play a crucial role.

Of course, this investigation did not only reveal that occurrent EM leads to ECM, but also that dispositional EM does not lead to ECM. But neither does it rule ECM out; the two theories just cover very different phenomena. The Otto example is not the only instance of dispositional EM, for we can also come up with real life manifestations. Probably, the most obvious one would be our everyday use of the "Otto-method": how we have extended part of our memory in the everyday equipment and technologies, such as memories from a summer vacation to pictures in albums and computers, appointments in calendars, and several other commonplace pieces of information in shopping lists, diaries,

[36] Colombetti & Roberts (2014), however, do not aim to support the line of reasoning that the occurrent side in EM leads to consciousness coming on board. Their paper does not discuss the matter. However, I think it is something that everybody who accepts occurrent EM *should* accept.

smartphones, etc. O'Regan already in his 1992 article suggested that the world functions for us as an "outside memory".

It is not common amongst 4E-minded philosophers of mind to support only dispositional, but not occurrent EM.[37] It is questionable whether the plain dispositional EM would even count as *active externalism* anymore, as Clark and Chalmers (1998) described it. What matters for Otto is his interaction with the *object of perception* (his notebook and the sentence that states the whereabouts of the museum), whereas in occurrent EM (and in ECM), the focus is not on the object or content, but rather on the *means of perception* (e.g. using a calculator for solving a maths problem). Hence, extension is obtained in different ways in dispositional and occurrent EM.

Dispositional EM rather resembles *content externalism*, of which Putnam's (1975) *Twin Earth* argument is an example.[38] Of course, the act of checking my calendar or childhood photo album, or Otto checking his notebook, are *active* deeds, whereas the external factors responsible for the beliefs about XYZ or water are passively looming in the distance and in history. Hence, perhaps dispositional EM after all belongs to active externalism, but it is only due to it being contrasted with a very different account, namely Putnam's content externalism. (It is good to remember that Clark and Chalmers (1998) use other examples of EM that belong to the group of occurrent EM, such as the example of playing Tetris.) The dispositional side of EM is the only part of EM that *doesn't* lead to ECM. As I have stressed from the beginning of this thesis: the Otto example doesn't entail ECM.

Susan Goldin-Meadow's (2001) research gives empirical support for the non-instrumental, constitutive role of moving and gesturing for cognitive tasks, such as solving a maths problem. That moving and gesturing is experiential, in addition to being cognitive. Hence, in occurrent cases of EM, such as calculating a maths task with one's fingers, there are both cognitive and experiential sides at work. Calculating is a cognitive task, whereas the embodied act of using one's fingers is an experiential act. Moving one's

[37] On first impression, one would think that supporters of (exclusively) dispositional EM could be found amongst epistemologists who support EM. However, this is not the case, at least not straightforwardly. According to e.g. Pritchard (2010), not only dispositional, but also *occurrent* beliefs extend. Since the target of epistemologists is so different from the targets in cognitive science/philosophy of mind, and the 'occurrence' in the 'occurrent belief' is probably understood very differently, those two disciplines cannot be contrasted without much further investigation (which is not among my aims here).

[38] If we follow Clark and Chalmers's conduct, dispositional EM still belongs to vehicle externalism (as opposed to Putnam's content externalism), because it is supposed to be about the material basis, and not about the contents of those memories or beliefs. However, I am not sure whether in this case the difference between content and vehicle is crucial, precisely because of the blurring of active and passive externalisms.

fingers when counting provides a clear-cut illustration how the cognitive act is also experiential.

Alternatively, consider calculating with pen and paper or with an electronic calculator. Both are unquestionably cognitive acts. Both are also embodied, experiential acts. The difference from counting with one's fingers is just that there is an extra-bodily tool, so the experientiality is not only based on the body parts, but also on the external parts. If we admit those acts of using pen and paper and/or using the calculator counts as instances of EM, they should also be counted as cases of ECM. For it is clear that those acts are both cognitive and experiential, and it is impossible to keep those two aspects apart.

Pleading to the occurrent side in EM can perhaps be seen as a more neutral strategy than the previous inseparability argument (in everyday situations), since it doesn't ask us to change our notion of cognition or consciousness. It aims plainly to point out something that has been there all the time, but perhaps just unnoticed by us. However, I think the two strategies are equally important and that they are just two different routes for approaching the very same result: if cognition extends, conscious experience extends as well.

2.2.3. Summing up the first argument

The two strategies presented below are just two different routes for approaching the very same result: if cognition extends, conscious experience extends as well. The core reason why EM cannot be accepted without ECM became apparent from both strategies: cognition and experience cannot be separated in the way they have been separated by the leading supporters of EM. The narrow version of EM (dispositional EM) doesn't lead to ECM, but the wider (occurrent) does – and the latter includes the most important and interesting instances of EM.

A further reason why EM and ECM stand or fall together is that if Clark's counter-arguments against ECM were true, they would also refute his own EM. Especially, his criticism against ECM based on high-bandwidth (Chalmers 2008; Clark 2009; 2012), were it a valid argument, would also – unintentionally – bring down EM. I will argue in chapter 5 that the high-bandwidth argument doesn't work in general, and hence ECM (and EM) survive. Nevertheless, despite its faults, it is a nice example of how EM cannot be defended independently of ECM. (Needless to say, this is quite the opposite way to interpret the matter from Clark's.) Thus, chapter 5 provides yet another argument for the claim that ECM follows from EM.

2.3. Argument 2: Sensorimotor enactivism

Whereas the defenders of EM usually deny ECM, the supporters of ECM are often found amongst sensorimotor enactivists. According to my second argument, if we accept sensorimotor enactivism, ECM follows. Not only do I argue for this entailment, but I also claim that sensorimotor enactivism is an explanatorily powerful theory of perceptual experience, and we should accept it.[39] The benefits of the theory are independent of my purposes with ECM. It provides explanations of some features of perceptual experience that remain unresolved or mysterious in representationalist and cognitivist theories, e.g. experiential differences between sensory modalities, and within one sensory modality. That is, sensorimotor enactivism answers the *comparative explanatory gap*. It has been suggested in the literature (Hurley and Noë 2003; O'Regan 2016) that the explanatory gap (Levine 1983), which is a close relative to the hard problem of consciousness (Chalmers 1996), is not the only (putative) gap in explanation. Apart from this *absolute explanatory gap*, there is the comparative gap: the puzzle why different sensory experiences differ in the way they do. Providing an answer to the comparative gap can be considered to be the most important outcome of sensorimotor enactivism.

Even though sensorimotor enactivism as a theory in cognitive sciences is independent of ECM, I argue that a defender of sensorimotor enactivism cannot consistently deny ECM. This argument consists of two steps. First, I will discuss the reasons why we should accept sensorimotor enactivism, and second, the reasons why sensorimotor enactivism leads to ECM. As previously mentioned, I claim that the second step follows quite straightforwardly, even though not all sensorimotor enactivists explicitly address it, and furthermore, Clark (2009) explicitly rejects the implication (challenges to the implication will be discussed in 2.3.1.).[40] First, I will outline what sensorimotor enactivism actually claims, and then I will sum up what kind of arguments for ECM can be drawn from it.

[39] I use sensorimotor 'enactivism', 'approach', and 'view' synonymously. Proponents include e.g. O'Regan & Noë (2001); Hurley & Noë (2003); Noë (2004; 2012); Silverman (2013); Hurley (1998); Kiverstein (2010). Especially vision is often used as an example of the extended perceptual mode of experience, e.g. in O'Regan & Noë (2001); Bruno (2013); Loughlin (2012); Pepper (2013).

[40] Apart from denying the implication (which is the main focus in his 2009 paper), Clark has also criticised "strong sensorimotor models" (see e.g. Clark 2008, chapter 8), which includes Noë's account for example.

2.3.1. Landscapes of sensorimotor enactivism

Understanding perception as active exploration in the world through sensorimotor skills and patterns is a feature that is very typical of enactivism in general. According to enactivism, the material basis of perception is in the interactions between brain, body and environment, and consciousness is not considered an epiphenomenal by-product, but it already belongs to cognition (see e.g. Colombetti & Thompson 2008; Gangopadhyay & Kiverstein 2009).

As explained in the first chapter, enactivism is composed of three main branches: *autopoietic* (e.g. Varela et al. 1991; Thompson 2007), *sensorimotor* (e.g. Hurley 1998; 2010;[41] O'Regan & Noë 2001; Noë 2004; 2006; 2012) and *radical* (e.g. Chemero 2009; Hutto & Myin 2012; 2017).[42] Even though in this argument I only discuss the second (the sensorimotor branch), this does not mean that the two other branches would be in conflict with it. The types of enactivism do overlap. However, *autopoietic* and *radical* accounts often bypass conscious experience, and instead discuss the minimal conditions of cognition, the "lower levels of mind", i.e. the cognitive system as an autopoietic system (Varela et al. 1991) or "basic minds" (Hutto & Myin 2012) that is already present in simple life forms, e.g. in bacteria. The sensorimotor branch is the one that most directly addresses the issues related to perceptual experience – but it is an independent theory from ECM. Let us now take a closer look at what sensorimotor enactivism involves.

The central feature of the theory lies in the concept of *sensorimotor contingencies* (also referred to as sensorimotor *dependencies*, *loops* or *patterns*) that are "regularities governing how sensory stimulation depends on the activity of the perceiver" (Seth et al. 2016, 267). They highlight the deep interdependence of the sensory input and motor output – the bodily interactive skilful encounters we have with our environment. Our experiences are tied to sensorimotor contingencies or laws that are at work when we are

[41] Susan Hurley's view is sometimes separated from the sensorimotor branch (e.g. in Gangopadhyay & Kiverstein 2009), since Hurley firmly denies the need for a higher-level integration at the conceptual level (as opposed to e.g. O'Regan and Noë). Hurley's view can be considered a version of *strong enactivism* (which will be discussed later in this section): perception truly requires action, and not only *knowledge* of the sensorimotor effects of actions. However, the difference found between Hurley and the other sensorimotor enactivists is not essential for the current purposes of settling the premise theory that entails ECM. Thus, I treat Hurley as one of the sensorimotor enactivists.

[42] When I use the term 'enactivism' without any specifications, I refer to the general view that covers the sub-branches.

in bodily interaction with our environment. Perceivers "know how to exploit them to explore and negotiate their environments" (Hurley & Noë 2003, 146). They are said to determine the *content* and *character*[43] of experience (O'Regan & Noë 2001; Noë 2004; 2012; Ward et al. 2017). "Perceptual experience *just is* a mode of skillful exploration of the world" (Noë 2004, 194).

According to the sensorimotor approach, skilful bodily engagements with the environment determine perceptual experiences, and those engagements themselves are constitutive for the content and character of perceptual experience. Importantly, they not only *enable* or *affect*, but do nothing less than *constitute* the experience. Hutto and Myin (2012, 11) write that perceptual experience is "literally constituted by, and to be understood in terms of, concrete patterns of environmental situated organismic activity, nothing more or less". Ward (2012, 738) is no less clear: "the enactivist's claim is that an evolving perceptual relationship with the world, implicating sensorimotor understanding, *is* our experience of the world".

The connection to Gibson's (1979) *affordances* is unmistakable. The subject perceives the affordances in its environment – what it can e.g. grasp, stroke, eat or avoid. Another source of influence can be traced back to Dewey's *transactionalism* (Dewey & Bentley 1949) that stresses the inseparability of the organism and its environment: the subject's actions, behaviour and mental states (including higher-order epistemic states, "knowings") cannot be explained without referring to the full organism-environment situation. Similarly, the sensorimotor approach takes into account the whole organism-environment sensorimotor loop.

A similar kind of reasoning can be found in the work of the robotics pioneer Rodney Brooks (1990), who started building robots based on the ideas similar to the sensorimotor approach. Rather than trying to create internal representations or symbols, his robots learn from their sensorimotor actions in their environment by "using the world as its own best model". This case from robotics is interesting because with robots, no doubt is left that there would be some hidden symbol manipulation at play. We know (or at least Rodney

[43] 'Content' here means the *character* of the content, i.e. *what* is experienced (compared with *how* the experience is produced – with which vehicles). 'Content' is used in a weak/mild sense, and it doesn't have any technical meaning that would greatly differ from 'character'. It certainly doesn't refer to representations, but rather just simply notifies that experiences are about something. See Hurley (2010) and my discussion about the *what*- and *how*-explanations later in this chapter. From now on, instead of referring to both character and content, I sometimes simply refer to character.

Brooks knows) for a fact how these robots function because they are built by humans.[44] In theory, an internalist about the human mind could always appeal to the current incompleteness of neurosciences: perhaps the places for symbols in the brain will be found in the "future", when the neurosciences develop.[45]

2.3.2. Bridging the comparative explanatory gap

Sensorimotor enactivism deals with the experiential (i.e. qualitative character) side of perceptual experiences. Some proponents also discuss whether the character determines the vehicle – whether the vehicular side is also extended.[46] However, the material basis of experience is not the main explanandum for sensorimotor enactivism (as is it for ECM). It is rather a theory that aims to explain the qualitative side of conscious experiences: qualitative differences between modalities (e.g. visual and auditory), and within one modality (e.g. between different colours or shapes). The sensorimotor approach has an indisputable asset when compared with its internalist competitors: it promises genuinely to *explain* the differences (especially with the notion of *sensorimotor contingencies*), whereas accounts that seek for neural correlates of consciousness – even if they did find them – would always come up with an explanatory gap (O'Regan & Noë 2001, 940–941; Silverman 2013, 152).

[44] Robotics offer an interesting case for 4E-theories; they can learn from each other. However, my thesis is about the human mind – and even though I think that the investigation of the possibility (or impossibility) of an artificial mind could also shed light on the human mind – it is, however, not possible to handle these issues here. The questions are so complicated that they are worth their own research.

[45] These kinds of arguments that deal with their problems by appealing to future sciences, could, in my opinion, be left to future science, and as we only have access to the present and past science, we would never need to see them again.

[46] I will get back to the issue why I think it is legitimate to claim that the experiential level determines the material level.

For example, in visual exploration, the colour and brightness reflected from objects change in regular, lawful ways when we move around, or the light source or the object moves (O'Regan & Noë 2001, 942). Sensorimotor enactivists stress that to be a visual perceiver is "to be capable of exercising mastery of vision-related rules of sensorimotor contingency" (O'Regan & Noë 2001, 943).

> We have expectations how perceptual experience is likely to change due to our own movement and movement of objects that is independent of us. A first law distinguishing visual percepts from perception in other modalities is the fact that when the eyes rotate, the sensory stimulation on the retina shifts and distorts in a very particular way, determined by the size of the eye movement, the spherical shape of the retina, and the nature of the ocular optics. In particular, as the eye moves, contours shift and the curvature of lines changes. (O'Regan & Noë 2001, 941.)

For example, we have an implicit sensorimotor understanding how red objects behave in different lighting. O'Regan and Noë (2001, 951) write that 'red' is knowing the structure of the changes that 'red' causes". The parts that are facing the light look brighter than those that are in the shadow. To know what red is, is to know how it would look different when "colour critical conditions" vary – the colour is "a pattern or structure in appearance" (Noë 2016, 73). The phenomenon of *colour constancy* speaks for this kind of implicit sensorimotor understanding that we possess: despite apparent changes in colour due to change in the illumination conditions or in the contrasting objects, we still perceive a uniform colour, and not a variable appearance (Noë 2004, 127).

This goes for other perceptual experiences as well, such as tactile experience.[47] *Touching* is a good example how the sensorimotor view explains the qualitative differences within a sensory modality. Tactile modality is linked to our movement, action and "to our implicit understanding of the relevant tactile-motor dependencies governing our

[47] Noë (2016) explains *sensory experiences* such as sensations of pain in a similar manner. Pains are context dependent (e.g. compare having a tattoo vs. a tiger mauling your arm), and as such they contain an accessibility or potentiality that resembles the way colours are accessible to us. However, notice that a sensation of pain is not a perceptual experience, and hence not amongst my examples. Noë makes an exception, because usually sensorimotor enactivists only talk about strictly perceptual experiences, and exclude "experiences of thought, emotion, and feelings like hunger and pain" (Degenaar & O'Regan 2015, footnote 1).

interaction with objects" (Noë 2004, 98). Touching is not possible without sensorimotor action; we need to sense the resistance of the object in able to have a tactile experience (see O'Shaughnessy 2000; and chapter 3).

> For example, the quality of softness of a sponge is constituted by – it is nothing more or less than – all the things that one can do with the sponge when one is checking for softness, and all the ways the sponge reacts when one handles it in this softness-checking way. Anything one can potentially say about the quality of softness of the sponge must ultimately boil down to something about how one potentially can interact with the sponge when one is checking whether it is soft. (O'Regan 2016, 41.)

In fact, according to sensorimotor enactivism, not only visual and tactile, but all sensory modalities are constituted by patterns of sensorimotor contingencies. Sensorimotor contingencies also explain phenomenological differences between different sensory modalities. Different sensory modalities are governed by different sensorimotor contingencies: visual experiences are partly governed by eye movements and saccadic movements in a law-like way, whereas for auditory experiences these factors are irrelevant. The sensorimotor contingencies determine why seeing has a certain phenomenological character, and hearing has a different character. We as perceivers are familiar with these law-like contingencies, and we know how to exploit them. This is the core reason why sensorimotor contingencies have more explanatory power than neural correlates.

With neural correlates there is always the accompanying (comparative) explanatory gap without an answer: why is a certain brain chemistry and physics correlated with exactly the experience it is correlated with and not with something else, e.g. the experience of seeing rather than hearing? O'Regan (2011, 115) states that "there is no natural way of making such a link". However, this kind of comparative gap doesn't arise with sensorimotor contingencies. Actions themselves serve as an explanation. (Hurley & Noë 2003, 146–147.) Solving the comparative gap can be counted as a reason why we should embrace sensorimotor enactivism.

2.3.3. Sensorimotor reductionism or sensorimotor integrationism?

The character of perceptual experience (such as seeing a round-shaped red object) is given by the *mastery* of sensorimotor contingencies. So the crux is in our *mastery*, *knowledge* or *understanding* of subject–environment dependencies (O'Regan & Noë 2001, 944; Ward et al. 2017, 371). The word 'knowledge' should not be understood as a propositional attitude, but rather as a basic embodied, implicit, practical understanding of the ways our actions affect the world and our perceptions of it. Especially Noë stresses the role of *knowledge*, whereas radical enactivism on the other hand criticises views where its role is too significant. In order to avoid controversial terminology, 'sensorimotor empathy', 'feeling-into' (Chemero 2016) and 'sensing-in' (Colombetti & Torrance 2009) have among other terms been suggested.[48]

Besides terminological ambiguities, the above considerations are connected to a deeper tension within sensorimotor enactivists. On the one hand, the theory seems to depend upon concrete bodily action, and on the other hand, mere know-how or understanding of the sensorimotor dependencies seems to be enough. Aizawa (2010) has named the former 'strong enactivism' and the latter 'weak enactivism'. Are they really two different versions of sensorimotor enactivism, and if so, is the differentiation important considering ECM?

Undoubtedly, Clark (2009, 974) is right to note that "mere potentialities of experience are surely not what is at issue between the friends and foes of ECM". Of course, ECM is talking about actual, not potential experience. However, I do not think we can cut out the sensorimotor tracking abilities from the actions themselves – at least when talking about perceptual experience in humans. The gist of sensorimotor enactivism lies in the inseparability of sensorimotor actions and understanding their effects. What sensorimotor enactivism means by those actions already presupposes and depends on familiarity, attunement, understanding (or "knowledge", if you want) of sensorimotor

[48] The nature of the sensorimotor contingencies is not a settled issue amongst the enactivists, and the scientific implementations (e.g. in cognitive sciences and robotics) have varied from non-representationalist dynamical interpretations to more representationalist and cognitivist approaches (for an overview see Ward et al. 2012, 371).

contingencies.[49] But that "knowledge" is *knowledge-how*: practical, non-propositional, and bodily in nature.

Keeping Aizawa's differentiation as well as my criticism of it in mind, we might still want to ask: are these sensorimotor actions and the following understanding of the law-like contingencies *everything* that is needed for there to be conscious experience? Is it a necessary and sufficient constitutive basis for perceptual experience?

Of course, it depends on how we understand this "knowledge-how" or "understanding". We can postulate a behaviourism-inspired view where the actions are all that matters. Noë (2016) calls *sensorimotor reductionism* a view according to which someone or something who manifested a "sensorimotor profile" typical for some experience would count as having that experience. For example, a robot that acts as if it is in pain, would be in pain. Noë criticises this view, but he cannot really name any supporters of it. The closest are, according to him, Hutto and Myin (2012) (and probably radical enactivism in general, even though Noë does not say so).

Noë classifies himself as a *sensorimotor integrationalist* (as opposed to a reductionist). The difference with SM-reductionism is that according to Noë's SM-integrationism "we can't give an entirely non-mentalistic account of the substrates of consciousness" (Noë 2016, 71, footnote 3). The non-reducible features in question concern how we achieve the world's presence through our skilful access. He arranges skills of access in three. First, there is our *knowledge* of what and how we can access the world, including conceptual, practical, social and sensorimotor skills or techniques. Second, there is access to the "real world": it is not the world of sense-data but neither is it the world of physics, because before physics, "there are tables, chairs, doors". (Noë is slightly obscure in describing this second feature, but I think he refers to our general situatedness in the world, our attitudes towards it that are based on the *affordances* we can achieve.) And third, there is our "concern, caring and interest" attitude towards our environment: we reach out because we care about what there is. (Noë 2016, 75–76.)

[49] Of course, we can have a system that is capable of sensorimotor actions, but incapable of understanding them in any stronger meaning of "understanding". Consider, for example, a robot vacuum cleaner. Its actions are based on sensorimotor information gained from its actions in the environment. Still, we would probably say it doesn't have the right sort of understanding of the sensorimotor contingencies. However, sensorimotor enactivism is not a theory about vacuum cleaners.

If understood as Noë describes it, SM-reductionism is not a feasible account. However, I think Noë's distinction is based on the same misunderstanding as Aizawa's distinction between strong and weak enactivism. I agree with Noë that "something else" is needed, and I think that something else is more or less the same features Noë himself called for. I wouldn't place such stress on *knowledge* how we can access the world, but rather on our primordial situatedness and *sense-making* attitude[50] (cf. Noë's "concern, caring and interest"). They are needed for there to be conscious experience, such as visual experience of red or a sensation of pain. Now, I don't think it is self-evident that these factors don't get reduced on our sensorimotor actions and contingencies. Or perhaps *emergence* would be a more apt conception here.

The fact that Noë's description of SM-reductionism is a strawman argument makes it difficult to evaluate. Whether we call the (putative) non-reducible features something "non-physical" (or with Noë's euphemistic term "not non-mentalistic") depends how we define mental and physical in the first place. I do not think *sense-making*, *caring about* or *having an interest in* the outcomes of one's sensorimotor actions should be classified as something non-physical. They have physical substrates like any other features of the natural world. The distinction between physical and non-physical in the case of sensorimotor actions is just leading us astray. And this makes the whole SM-reductionism quite an unfair stipulation. Opposite to Noë, I think it is possible that this kind of sense-making attitude could be part of the SM-reductionist account, because perhaps sensorimotor actions and an understanding of the contingencies (the right kind of sensorimotor profile) already comprises the sense-making attitude. With this description (which is not Noë's, but mine), sensorimotor reductionism is a feasible account.

[50] What I am after here with the notion of sense-making has also been referred to by enactivists as *primordial affectivity* (Colombetti 2014), *affective scaffolding* (Colombetti & Krueger 2015; Colombetti & Roberts 2014), and *affective framing* (Maiese 2015).

2.3.4. Temporal nature, virtual presence

Another important feature is that sensorimotor enactivism is committed to *temporal extension* of experiences, which means that "experience is a mode of temporally extended skilful interaction with the world" (Ward 2012, 737). Perceptual experiences unfold over time, they are irreducible to any atom-like atemporal states (as opposed to some 20th century philosophy of mind views that stressed representations and qualia). To explain consistently temporally extended phenomenology, we need a temporally extended material basis. This means that we need to commit ourselves to an *extensional* model of perceptual experience. It is a view that holds that experiences are dynamic temporal phenomena – all the way from the material basis to the experiential level.[51]

> An extensionalist sensorimotor account, in the first place, explains temporal experience by positing that perceptual awareness of a temporally extended event supervenes on a temporally extended process of interaction between the perceiver and the environment, in such a way that the content temporally tracks the vehicle (Silverman 2013, 156).

The temporally extended nature of experiences is related to another central feature of the sensorimotor approach. Our relationship with the world is based on evolving (temporal) processes that are explained by the thesis of *virtual presence* or *presence in absence* (Noë 2004; 2006; 2008). This is the solution of sensorimotor enactivism to some prevalent puzzles of perceptual experience.

We seem to perceive a lot that we don't actually perceive, and we also perceive a lot that we don't notice perceiving. We seem to have a richly detailed, colourful visual experience of the scenery we are facing. However, there is a vast amount of empirical evidence that we (or our brain) are actually not capable of perceiving all that we seem to perceive. This research is well-established and accepted by the research community – the possible ambiguities lie in how to interpret these results. Empirical research about blind spots, impoverished peripheral vision (including peripheral colour vision), saccadic smear,

[51] In the next chapter, I will explain in more detail why ECM and enactivism are forms of the *extensional* model, and compare it with *retentional* and *cinematic* models. The temporal and dynamical nature of experiences in general will be discussed in more detail there.

change blindness, inattentional blindness, etc. show that our visual perception is an impoverished machinery for experiencing the world around us (O'Regan & Noë 2001; Stafford & Webb 2005).

Yet, we don't notice the scarcity. The perceptual experience of the scenery is not monochromatic and blurry in peripheral or parafoveal areas. We are sometimes unaware of dramatic changes in the scenery, as was shown in the famous "invisible gorilla test" (Simons & Chabris 1999) that shows that when we are concentrating on one aspect in our visual field, we easily fail to notice other objects, no matter how striking they are, such as a person walking in and out in a gorilla suit (inattentional blindness). We also tend to fail to notice large changes in our visual field, such as objects disappearing or changing colour – we are unable to track the difference in a picture before and after, or when the picture flickers on and off (change blindness) (see O'Regan et al. 1999). In addition, "most people are completely unaware of how poor their acuity and their color perception are in peripheral vision" (O'Regan & Noë 2001, 951).

This is the puzzle: why do we seem to have a rich visual experience coated with lots of details and colours around us? A common internalist and representationalist response is that the rich visual image is due to our internal representations. We have an inner "picture" of the scenery: the richness of details comes from inner representations being activated. A related response is that the apparent richness is only *illusory* (and hence this view is sometimes called the *grand illusion*). According to this view, we are mistaken in our experience: we *think* we enjoy rich perceptual experiences, but actually we don't. (See discussion in Clark 2009, 973.) However, appealing to an illusory character does not help, because we still do have *phenomenological experience* of the richness, which was the explanandum.

The sensorimotor approach denies both the *grand illusion* and the *internal representations* explanations. The richness of colours and details is true for us on the experiential, phenomenological level. It is not illusory, but phenomenological reality. Furthermore, the richness is not based on representations constructed in the brain, but rather on our skill-based *access* to them in the actual environment.

In other words, sensorimotor enactivists explain the tension by pleading to sensorimotor contingencies. The details of the scenery are present virtually, because of our dynamic sensorimotor access to them. "The flick of the eye, the turn of the head, the movement of

the body, brings us the detail we need as we need it" (Noë 2006, 420). Hence, our perceptual experiences are not only determined by neural states but also by actions and the environment.

Sensorimotor enactivism explains *all* perceptual experiences in this manner (even though the focus is often on visual modality, especially in Kevin O'Regan's work). Apart from the above-discussed neurological deficiencies, the theory also explains the more mundane phenomenon that needs no laboratory experiments: the fact that we only see the parts of the objects we are facing and that are visible to us, but never the hidden, occluded sides. The retinal image can only offer a view of the *fronts* of the objects, it is impossible to see all the sides at once. However, this is not how objects are experienced. Instead, we experience objects as wholes. We have visual experiences of complete three-dimensional cats, dogs and tomatoes, not only their unoccluded parts. "When you see a tomato, you only see, strictly speaking, the visible face of the tomato; but it is also true that you are visually aware of the presence of the parts of the tomato which you don't actually see" (Noë 2006, 414). The same applies for apparent size and shape. We see two trees in our visual field as being the same size, even though the nearer tree looks bigger; and the plate in front of me looks both circular and elliptical. Another example is the already mentioned colour constancy: the wall looks uniformly white, and yet it also looks grey, yellow, darker, lighter, etc. (Noë 2004; 2006.)

In the same manner as earlier, the hidden sides and perceptual ambiguities are explained by sensorimotor contingencies. The world is present to us virtually: with the means of our sensorimotor contact to it, and our understanding of the ways in which our movements and exploratory habits bring the occluded sides to our awareness. We have *access* to the occluded, hidden sides by means of our probing, moving and acting in the environment. We have learned to anticipate how a shape or colour changes when observed from different angles. This is what Noë means by virtual presence.

Noë's account of virtual presence has been criticised (e.g. Clark 2009) for putting too much weight on the *potentiality* of experience. If the rich, detailed perceptual (character of) content is present to us only potentially, what does it tell us about the actual experiential contents, which are surely our focus of interest? However, this criticism is based on a mistaken reading of Noë. Ward clarifies Noë's intentions with his notion of virtual presence:

> We should not interpret his remarks on presence as entailing that the detail of the world, or the occluded parts of objects, are present to us in experience 'only potentially' or in some impoverished sense. Whole objects and detailed scenes are embraced in experience, despite facts about the limits of sensory uptake that might appear to make this problematic. (Ward 2012, 737.)

Hence, the hidden parts are *not* present to us potentially, but on the experiential level they really *are* present. Ward points out that Clark assumes that Noë is talking about the sub-personal level of experience. But instead, the notion of virtual presence is supposed to capture how we perceive the world in a phenomenological sense. (I will discuss the personal vs. sub-personal question in more details in section 2.3.6.) The virtual presence thesis provides a conception of experience (at a phenomenological, personal level) as an interactive relationship between subjects and their environment – and this conception explains all the above-mentioned deficiencies in our perceptual capacities.

The main features of sensorimotor enactivism can be summarised as follows: 1) Perceptual experience depends constitutively on skilful bodily interactions with the environment and the perceiver's implicit understanding of those dependencies (sensorimotor contingencies). 2) Phenomenal qualities are differentiated in line with the subject's actions, expectations and understanding how her movements will change the qualities. 3) Experiences are temporally extended dynamic phenomena. 4) Perception is virtual in the sense that even though we never have a retinal image of a complete scenery, object, colour or other properties, the details are still present due to their accessibility through our skilful sensorimotor actions.

2.3.5. Arguments drawn from sensorimotor enactivism in support of ECM

In this section, I sum up what I think are the most central reasons why sensorimotor enactivism leads to ECM, viz., how the features described in the previous section entail ECM. However, let us first take a look at what others have said about this. In his critical paper, Clark (2009) names the features of sensorimotor enactivism that according to him are the best candidates that support ECM. (His aim is to show that those features *don't* entail ECM.) Since Clark's influential paper, the features he picked up have been to a certain extent accepted to capture the most important arguments for ECM (they are referred in e.g. Ward 2012; Clark 2013; Pepper 2013; Kiverstein & Kirchhoff 2019). I agree that they are important arguments, but I don't think they are the only reasons to accept ECM: apart from them, my first and third arguments in this chapter should also be taken into account. In what follows, I review the standard line of arguments from sensorimotor enactivism in favour of ECM, and discuss whether they work or not.

Clark (2009) calls them arguments from 1) variable neural correlates, 2) virtual representations, and 3) dynamic entanglement + unique temporal signature (DEUTS for short). First, *the variable neural correlates* argument is based on empirical facts about how changing sensorimotor contingencies affect the brain by means of neural plasticity. Sensorimotor enactivists (e.g. Hurley & Noë 2003) give an extensive overview of empirical studies on neural plasticity that show that neural correlates are not fixed. There are cases where the neural processing varies, but the experience remains the same, and on the other hand, there are cases where the experience changes while the neural processing remains the same.

An example of the first kind is inverting goggles (e.g. left–right reversing goggles). When the goggles are first used, visual experience is disrupted dramatically; there is conflict between proprioceptive and visual modalities. Sensorimotor contingencies no longer hold, since objects on the left side are not accessible by visually leftward movements. However, after enough practice and use, the distorting effects of the goggles will disappear, and the user will perceive the world normally again. (For the left–right

reversing goggles experiment, see Taylor 1962; and the discussion in Hurley & Noë 2003.)[52]

An example of the second kind of case (phenomenological experience changes while neural processing remains the same) is sensory substitution, such as tactile-visual sensory substitution systems (TVSS) (see Bach-y-Rita 1972) and auditory-visual sensory substitution systems (e.g. *The vOICe*) (Meijer 1992). (Blind) users of sensory substitution systems will start having vision-like experiences after they have used the instrument long enough to learn how the new mode of interaction with the environment has affected the sensorimotor contingencies. The crucial lesson from the use of sensory substitution devices is that the users acquire experiential changes in accordance with the equipment.

The aim of the variable neural correlates argument is to show that the explanation of experience based solely on neural factors is not sufficient. Instead, experience requires an explanation of the modes of interaction with the environment (i.e. sensorimotor contingencies). The cases of inverting goggles and sensory substitution show that the users must learn new ways how sensorimotor contingencies work, and only after the attunement can they have normal experiences again. Thus, it is the characteristic interaction relation that fixes[53] the qualitative character of experience. "[W]hat determines phenomenology is not neural activity set up by stimulation as such, but the way the neural activity is embedded in sensorimotor dynamic" (Noë 2004, 227).

The variable neural correlates argument stresses the plasticity of the neural mechanisms, the plasticity of the sensorimotor contingencies, and how they affect each other. However, I don't think it is the most important argument that sensorimotor enactivism has to offer in support of ECM. Instead, it is best taken as a reminder of prevalent plasticity considering neural functions, and especially perceptual plasticity. In this general sense, it can be read as a version of the well known *multiple realizability* argument – and as such, encompasses something very essential to externalist views in general.

[52] Another example of neural plasticity that is often used is neural rewiring (visual to auditory) in newborn ferrets. Sur and colleagues (1999) managed to reroute visual input to auditory areas, so that the ferrets' visual modality was connected with the brain parts that were usually associated with hearing. (Discussed in Noë 2004; Hurley & Noë 2003.) However, this example is more controversial than the use of goggles or sensory substitution devices due to reportability issues: we cannot ask the ferrets about their perceptual experiences.

[53] Here, 'fixing' and 'determining' means fixing and determining *constitutively*. Technically, the phrase could also be: "The characteristic interaction relation *is* the qualitative character of experience."

Second, the argument from *virtual representations* draws from the same phenomenon of *virtual presence* (or *presence in absence*) that was already introduced in the previous section. It is indeed one of the most central arguments for the role of sensorimotor contingencies, i.e. for the role of agent–environment loops in constituting our perceptual experiences. This leads directly to ECM: experience is based on those interactive relationships that contain external parts. (I will discuss below and in the next section why the personal level determines the sub-personal level.)

The third and last argument formulated by Clark (playing devil's advocate), the DEUTS argument, consists of two parts. The first part, the *dynamical entanglement* thesis, holds that the material basis of perceptual experience is a dynamic mess criss-crossing the brain, the extra-neural body and the environment (see Hurley 1998; 2010). It is impossible to separate the non-neural elements from the brain functions – organisms are very deeply and complexly intertwined systems (Cosmelli & Thompson 2010). Sometimes referred to as *continuous reciprocal causation* (e.g. Clark 2008, 24), these dynamic complex loops are the material basis for perceptual experiences.

Thus, the dynamical entanglement thesis bridges the other features of the sensorimotor approach (i.e. sensorimotor contingencies, virtual presence, etc.) from the experiential level to the material level. It is basically the other side of the coin of the theory of sensorimotor contingencies and the other features of sensorimotor enactivism that we have learned above – it just stresses material realization rather than experiential realization. As we have now seen, the sensorimotor approach tracks the *content* and *character* of experience. The dynamical entanglement thesis is an exception to this, since it directly addresses the intertwined material underpinnings that criss-cross the brain–body–environment axis.

The second part of DEUTS, the *unique temporal signature* thesis,[54] adds the *temporal extension* thesis (which was already discussed in the previous section) to the dynamic criss-cross of brain–body–world (the first part of this argument). The interactions mentioned above must evolve over time in order to support experiential states. Without the right kind of temporal evolution – which requires extra-neural elements – the experience cannot be the same. If skilful probing and actions are the basis of perceptual

[54] "Signature" here refers to the unique temporal evolution (how it has evolved in time) that each experience has.

experiences, the basis must be temporal. Probing, acting, touching and moving are temporal phenomena. Noë captures this idea neatly:

> If this is right, then a neural duplicate of me now, at a moment in time, won't, by dint of being my duplicate now, have any experience at all. If the duplicate does have experience, it will be thanks to its dynamic, temporally extended interaction with the environment. But then again we must note that there is little reason to think that its experience would or could be like mine unless its environment were also like mine. (Noë 2006, quoted in Clark 2009, 978.)

Thus, taking snap-shots at given moments of neural activity won't capture perceptual experience. The whole dynamic, temporally evolving process is needed. And when we add this to the earlier part of this argument (the dynamic entanglement, which implies that we cannot carve off the non-neural from the neural), we get ECM.[55] Perceptual experiences are based on such feedback loops, and cannot be reduced to neural factors considered apart from such feedback loops.

Clark himself (2009, 975–80) thinks that DEUTS is the most promising of the arguments for ECM. This is not surprising, since the dynamical entanglement thesis directly assesses the material underpinnings of perceptual experiences, and that is what ECM is about. In a sense, I agree with him: it is indeed crucial that we reach the subpersonal level. On the other hand, as Ward (2012, 741) notes, the direct link to the subpersonal level implied in the DEUTS argument follows from sensorimotor enactivism's personal level conception of experience. It is not the primary target for the sensorimotor enactivists themselves when they explain perceptual experience – but it is a further step. It is the core of ECM, and at the same time something that *follows* from sensorimotor enactivism.

Sensorimotor enactivism consists of various theses that I have described above. These aspects are mutually informative, and probably cannot be separated. However, if the aim is to name the features that specifically lead to ECM, I think the most important are the following. 1) The theory of sensorimotor contingencies: this ties our phenomenal experiences to our bodily interactions with the environment. Perceptual experiences are constituted by law-like interactions, and this makes it impossible to have a sufficient

[55] The phenomenon of temporal extension and the criticism of the snap-shot/cinematic view will be discussed in more detail in the next chapter.

neural explanation. 2) Bridging the comparative gap: the differences and similarities in the qualities of experiences (within one and across different sensory modalities) are explained by sensorimotor laws – what we *do* with our body, in our environment – therefore, the constitutive basis for the quality of experience comprises external elements. 3) Temporality and situatedness: the dynamic nature of experiences already includes external substrates. 4) Vehicle is determined by content: the external explanation at the personal level requires an external explanation at the subpersonal level (this feature will be discussed in the next section). As we can see, these features show quite unquestionably that if we accept sensorimotor enactivism, ECM follows.

2.3.6. Does entailment hold? From the personal to the subpersonal level

Let us turn our attention to the bridge again. Does it hold up? Does ECM follow from sensorimotor enactivism? Perhaps a possible critique of the bridge could be to claim that sensorimotor contingencies cannot be (part of) the constituents, since they are only *relations*, and as such cannot form the *material* basis for anything.[56] This would, however, be a problematic and mistaken way to understand the conceptions of 'relation' and 'sensorimotor contingency'. A sensorimotor contingency is a mutual interactive relation between the subject and the world by means of sensorimotor action and feedback-loops. Those components are intrinsically part of it. The contingency consists of the subject, the extra-neural environmental parts, and the loops between them. Hence, this criticism doesn't work. (Understanding 'relation' without the factors it relates to would be a problematic stance to anybody, including internalists.)

Another possible critique would be to argue that sensorimotor skills and actions only causally affect the perceptual experience but do not constitute it. However, the

[56] I haven't seen this kind of critique in the literature though.

sensorimotorists explicitly state that the relation is a constitutive one. I will not discuss this critique here, since it is the topic of the next chapter.

Moreover, can we move from the personal level to the subpersonal level? Even though sensorimotor enactivism mainly approaches perceptual experience on the experiential (character) level, the phenomenal character gained through the mastery of sensorimotor contingencies has consequences on the material level as well. According to Noë (2004, 221), sensorimotor enactivism entails that "the physical substrate of the experience *may* cross boundaries, implicating neural, bodily and environmental features". Pepper (2013, 99) proposes this claim in an even more precise manner: "sensorimotor dynamics – are physical constituents of perceptual experience". If they are right, it is quite clear that the bridge upholds – if sensorimotor enactivism is true, ECM is also true.

However, Clark (2009) claims that sensorimotor enactivism is unable to create a firm ground for ECM. He doesn't criticise all aspects of sensorimotor enactivism as such, but instead he denies the implication (or the "second step") of my argument. Is Clark right, and my argument alongside the enactivist argument mistaken? Ward (2012) has made an important observation: Clark is using a different notion of experience than the enactivists, or rather, they are tracking the phenomenon on different levels. Clark is talking about the material basis of experience, and assumes that enactivism is doing the same. However, sensorimotor enactivism approaches experience as a personal level phenomenon. It is primarily a theory about the qualities of experience (even though the material side is also present, as we will soon see). For example, as mentioned above, Noë's (2004; 2006) account of virtual presence operates with a personal level phenomenon – how objects appear to us – it is not even supposed to explain the sub-personal side. Even when sensorimotor enactivists explicitly argue for extension on the sub-personal level (e.g. the argument from dynamic entanglement), it is only due to an inference from their personal level conception. The sub-personal extension is not sensorimotor enactivism's quintessential argument, but "it is rather a statement of ECM, motivated by their personal level conception of experience" (Ward 2012, 741).

To put it in other words, Clark (mistakenly) attributes a sub-personal approach to sensorimotor enactivism, and yet Clark (correctly) attributes a sub-personal approach to ECM. Hence, ECM and enactivism are targeting the same phenomenon (perceptual experience), but they are targeting it from different levels of explanation. Clark fails to

see this difference, and instead assumes both of them are operating from the sub-personal level. Nevertheless, he is right about the sub-personal level approach of ECM (as I have stressed from the beginning: ECM is a theory about the material basis of experience).

Sensorimotor enactivism answers *what* is experienced, and ECM answers *how* it is experienced. This use of *whats* and *hows* is borrowed from Hurley's (2010) terminology (and is also used by Kiverstein & Kirchhoff 2019). *What*-explanations tell what the mental state is about, and *how*-explanations tell how they are materially produced. ECM (and EM) are answers to the *how*-question; sensorimotor enactivism is an answer to the *what*-question.

These considerations lead to very profound questions about the nature of the mind itself, and how we can investigate it. Even if we corrected the misunderstanding between Clark and the enactivists, the fundamental difference remains: enactivism targets experience as a personal level phenomenon, whereas ECM is a theory at the sub-personal level, i.e. a theory about its material basis. Can the different approaches be combined, or are they just independent theories without a connecting interface?[57]

Sensorimotor enactivists themselves take it for granted that the personal level has implications for the sub-personal level. The *what* determines the *how*. Any other view would be counterintuitive, and in conflict with the broader conception of experience that sensorimotor enactivism is committed to. However, as mentioned earlier, in the enactivist literature, this line of reasoning is rather taken for granted than argued for. Ward (2012) makes an exception. He opens up the relation between the personal and sub-personal levels, and explains why sensorimotor enactivism's commitment to the implication from the personal to the sub-personal level is warranted. In a word, internalism at the sub-personal level cannot be combined with externalism at the personal level.

[57] An obvious question would be to ask how the two levels are related: how the sub-personal creates the personal level phenomenon, or how the personal level phenomenon emerges from the subpersonal? But that question is, of course, the *hard problem of consciousness*, i.e. how phenomenological events arise from the material basis. This puzzle is not a challenge for externalism only, but one of the greatest puzzles of philosophy of mind in general, at least if we judge by the number of publications. Actually, I think it is justified to challenge the setting of the hard problem, because it is based on a mistaken view of cognition and consciousness, which stems from cognitivism and has been prevalent in analytic philosophy of mind (see the first argument in this chapter). However, the question I am discussing in this dissertation is not about the jump between the levels, nor the question whether this question is flawed (those questions are exactly the same that the internalists are facing too), but instead what belongs to the set of the material components.

> But understanding enactivism instead as involving a relational conception of experience at the personal level, *with apparent implications for the location of the subpersonal mechanisms of experience*, allows us to make better sense of the enactivist arguments, and make the case for conscious externalism (Ward 2012, 731, italics added).

Two main reasons for accepting these "apparent implications" between the levels are the following (Ward 2012, 744). On the one hand, there is no intelligible reason why the personal level explanation that consists of the dynamic interaction between the subject and her environment should shrink to consist only of neural events on the sub-personal level. Experience, straightforwardly, *is* that dynamic relationship, and "the temptation to go internalist when describing experience at the subpersonal level simply will not arise" (Ward 2012, 744). On the other hand, the same applies when we proceed from the other direction: if we were internalists on the sub-personal level, how could experience at the personal level be the dynamic relationship that partly consists of external elements? If the internalist explanation at the sub-personal level were true, the externalist personal level explanation would be mistaken. Hence, it is easy to see why the enactivists accept ECM as a natural outcome of their view.

> If we adopt the enactivist's conception of experience as a relationship between perceiver and environment then the subpersonal underpinnings of experience must include more than the internal properties of the subject, since those properties leave it underdetermined whether the requisite relationship obtains (Ward 2012, 746).

To what extent does Clark's criticism of the implication from sensorimotor enactivism to ECM (i.e. the second step of my argument) stand up after these clarificatory remarks on levels? I agree with Ward (2012) that Clark (2009) is right to refute the implication when both theories are interpreted concerning the sub-personal level. However, when they are understood as concerning the personal level as the sensorimotor enactivists intended (whether or not they clearly expressed it), Clark's critique loses its edge. Hence, sensorimotor enactivism doesn't straightforwardly give us an account of an extended material basis. Rather, it *entails* it; sensorimotor enactivism entails ECM.

2.3.7. Summing up the second argument

Of the three arguments presented in this chapter, this one contains the most indisputable bridge from the premise theory to ECM. In the first argument, there was still a way to accept one version of EM (i.e. dispositional EM) without accepting ECM. (Another question is whether anyone really supports dispositional EM alone, but at least that is a way to avoid ECM, if that is the wish.) Also, the implication relation in the third argument has restrictions: all embodiment doesn't always lead to ECM. I claim that the argument at hand differs from the other two: we cannot accept sensorimotor enactivism without accepting ECM, because its very core theses inevitably entail ECM.

Besides overlapping, ECM and sensorimotor enactivism are still separate theories, because they emphasise slightly different aspects. One central disparity is that sensorimotor enactivism concerns at least *all perceptual experiences*, or also *all sensational experiences* (also e.g. the sensation of pain), or even *all experience* simpliciter (also non-veridical experiences), depending on the writer. However, my position concerning ECM is a much narrower account that comprises only certain perceptual experiences.

2.4. Argument 3: The leaky body

The third and last argument is based on the embodiment thesis. By embodied experience, I simply mean that the brain is not a minimal sufficient base to create experiences,[58] but the body is part of the constitutive base as well. This much is accepted relatively widely amongst 4E-minded philosophers, enactivists as well as many phenomenologists. The embodied mind approach (see e.g. Varela et al. 1991; Hurley 1998; Hurley & Noë 2003; Gallagher 2005; 2018; Colombetti & Thompson 2008; Cosmelli & Thompson 2010; 2011) has been developed in philosophy of mind as well as e.g. in psychology, neuroscience and developmental robotics. The general claim about the role of the body in explaining cognitive functions is more or less accepted across these fields.[59]

The more debatable part of the argument is the latter part, which is about where does the body end (and the rest of the world begin). According to this second step, our bodies are not always sealed inside our skin, and this opens up a possibility (the third step of the argument) that those external, incorporated parts are partly responsible for the material realisation of some experiences. Thus, the argument is the following. 1) Experience is embodied. 2) The body is sometimes extended to the environment. 3) The incorporated parts sometimes function as substrates for certain experiences.

This argument gives theoretical support for the *functional incorporation* thesis presented in the fourth chapter. The fourth chapter provides concrete examples of embodiment, incorporation and crossing the borders of the body, whereas here I will stay at the theoretical level. This argument will concentrate on explaining the argumentative path: why we are allowed to say that experience is embodied, why borders of the body are extended to the environment, and how all this backs up ECM.

[58] Here, as throughout almost all of this thesis, by experiences I refer to experiential states rather than the general capability of being (phenomenally) conscious. The distinction has been called e.g. state consciousness vs. creature consciousness (see Bayne 2007; Cosmelli & Thompson 2011).

[59] Of course, the view that the mind is realised solely in the brain still has its supporters in the philosophical community (especially amongst analytical philosophers). According to the brain-centred view, the body is not amongst the material realisers for conscious experiences, and it affects our experiences only secondarily by affecting our brain, and in principle an envatted brain could have similar experiences to those of an embodied subject (see criticism of the brain-in-a-vat thought experiment in chapter 5).

2.4.1. Experience is embodied

As a "premise theory" for my argument, the embodiment thesis doesn't require very extensive treatment, since there is already a vast empirical literature about the embodied nature of experiences. The claim that experience is embodied means that (also) the non-neural body is a constitutive basis for perceptual experience. The neural and non-neural parts of the body cannot be separated because they are so intertwined and entangled, and we cannot explain brain functions without acknowledging bodily functions. We can proceed from a negative or positive angle: on the one hand, by criticising the brain-centred, body-deprived view of experience, and on the other hand, by stressing how the body plays a vital role in having experiences. Of course, both ways aim for the same result. In the following, I will use both approaches.

A significant amount of neuroscientific research supports the embodiment thesis (see e.g. Ferri et al. 2012; Hari & Kujala 2009; Gibbs 2006; Chiel & Beer 1997; Gallese et al. 1996). For example, neuroscientist Riitta Hari considers the brain–body–environment triangle a necessary basis for cognition. According to her, the features brought out in the 4E-framework are a fruitful way to explain the human mind (e.g. Hari 2017). It is widely agreed among neuroscientists that the brain itself is *explanatorily inseparable* from the nervous system and peripheral sensorimotor systems: we cannot understand neural activity without looking at the rest of the body (see Cosmelli & Thompson 2010; 2011). As Gallagher (2008, 164) writes, "the structural and functional design of the body shapes the way that we experience the world".

The nervous system constantly receives and responds to the feedback from the body, its movement and its environment, and action–perception loops are essential for a simple movement as well as for more complex cognitive functions (Hari 2017; Chiel & Beer 1997). Cosmelli & Thompson (2010, 12) give a list of functional systems that are dependent on brain–body coupling. They include the interoceptive system, vestibular autonomic regulation, balance and somatic graviception, and interaction between the senses occurring at central and peripheral levels.

An example that is directly connected to perceptual experience is empirical research on vision. Studies in active or animate vision (Ballard 1991; Ballard et al. 1992) has revealed that eyes don't passively record what is in the scene, but eye saccades and head motions

(which are, obviously, bodily actions) are shown to take part in creating the visual experience. Maintaining visual perception is dependent on microsaccades (short, involuntary eye movements): if they are prevented, object perception will fail (Martinez-Conde et al. 2000). Overall, neuroscientific research on vision suggests that visual experience is a strongly embodied phenomenon, dependent on the subject's voluntary and involuntary bodily actions and on connected environmental loops.[60]

Recently, there has been a lot of discussion about the embodied nature of affective states, such as emotions and moods (see e.g. Colombetti and Thompson 2008). The philosophical arguments for embodied affectivity is backed up by a vast amount of empirical research (see overviews in Gibbs 2006; Colombetti & Torrance 2009). For example, facial expressions, gestures and autonomic nervous system activity are partly responsible for affective states. Dimberg et al. (2000) discovered that the non-conscious perception of facial expressions (carried out with the backward masking technique) affect the perceiver's facial expressions. For example, pictures of sad expressions increased activation in the muscle that is usually connected with negative emotions (the *corrugator supercilii* muscle), even though input sad expressions were hidden with backward masking, and hence not consciously experienced.

The embodiment of emotions is starting to be quite widely accepted among both philosophers of emotion and empirical scientists. Although more controversial, the claim that affective states extend *outside* the skin (cf. the second and third steps of my argument), is also being supported by a growing number of researchers (e.g. Colombetti 2014; Colombetti & Roberts 2014; Krueger 2018). Although this line of research does not target exactly the same phenomenon as I am here (i.e. *perceptual* experience), it is clear that the step from (phenomenal) affective experiences to (phenomenal) perceptual experiences is a short one.[61]

[60] Another example of the importance of the body for cognitive and affective states, and information processing located outside the brain is the enteric nervous system, "brain in the gut". However, it is not straightforwardly connected to perception, as opposed to e.g. information processing in the retina.

[61] One more way to argue for ECM would be to start from extended affectivity, and then infer that because affective states are phenomenal experiences, if they are extended, phenomenal consciousness is already extended. As things stand, the hardest part to accept in ECM is undoubtedly the conscious, phenomenal side, and not the fact that it is about *perceptual* experiences. I haven't seen this kind of argument for extended experience in the literature, though. The proponents of extended affectivity (most importantly Colombetti, Roberts and Krueger) are not trying to argue for ECM as such. It is not their target, but I think ECM follows from their account nevertheless. Their examples (e.g. a violinist and her violin) are similar to incorporating non-biological tools into the biological body.

One example of embodiment is the role of bodily gestures and expressions. Bodily gestures are not neural activity, but they are still part of cognitive processing. Goldin-Meadow (2003), based on her thorough experiments about human gestures, shows that gestures do not only express internal states, but have a functional role in thinking; they are part of thinking itself. In an experiment, two groups of children were given a list to memorise, and then they needed to solve a mathematical problem before trying to remember the list again. One group could gesture as they wished during the maths task, but the other group was prevented from gesturing. The results were clear: the freely-gesturing group managed significantly better in the task of remembering the list. (Goldin-Meadow 2001; discussed e.g. in Clark 2008.) Based on this and other experiments, Goldin-Meadow (2001; 2003) ends up concluding that gesturing is not only a motor act separate from cognitive functions, but part of the cognitive process itself.

These examples only scratch the surface of the empirical and philosophical work that has been conducted in recent years that shows that our cognitive and experiential faculties are deeply embodied. Consequently, we could say that the embodiment of experiences is no longer a highly controversial claim, but rather something that a significant part of the research community is starting to accept.

2.4.2. The frontiers of the body are not rigid

The second step of this argument is that the body is "leaky" – it is not always enclosed inside the skin, but it can contain environmental elements. I will distinguish the fine-grained details of different versions of bodily extensions and incorporation in the fourth chapter (from mere extension to functional incorporation), whereas here I discuss in a more general way the claim that the body takes external objects into it.

When we use a stick to reach an apple from a tree, that stick has become an extension of our hand – we stop feeling the stick in our hand and instead we feel the apple through our stick. There is neuroscientific evidence that a stick can become part of the functional body in situations where we reach for something (see e.g. Maravita & Iriki 2004; Berti & Frassinetti 2000). Depending on how we see it, we can either say that the body leaks into the environment, or we can say that it incorporates environmental objects – but the outcome is quite the same.

The notion of 'body' is somewhat ambiguous. Its frontiers may prove to be different depending on what we are looking for. For example, we can refer to *body schema* (body as an object) or to *body image* (body as a subject). (This distinction is explored further in chapter 4.) A central question for this argument is of course: is biology the crucial factor? What about an artificial knee, a dental filling or a pacemaker? What about biological non-human elements located in the body, such as bacteria? What about prostheses, clothes, piercings, hair, wigs, nails, artificial nails, eyeglasses, contact lenses, ocular prostheses, etc.? Or microplastic that humans (and animals) swallow a considerable amount of every day?

It would seem that biology cannot be the defining criterion, since our bodies contain several crucial non-biological components that replace or enhance biological functions. Our bodies are hybrid systems. We are "natural-born cyborgs" or "human-technology symbionts" as Clark (2003) describes. The human body is not a fixed system, but flexible, constantly changing, and incorporating external resources. It is made of both biology and technology, and the borders of the body are negotiable.

If one were reliant on, for example, eyeglasses, a walking stick, a blind person's white cane, a hearing aid or sensory substitution devices, their loss would be somewhat comparable to losing one's body part. Of course, the artificial devices would be easier to substitute with new ones, but in principle biological and non-biological parts play the same role: they are contingent, replaceable. Not even our biological body stays the same: it is different from what it was ten years ago. All the cells (brain cells and other kinds of cells) have been replaced with newly regenerated cells. Instead of a fixed substrate, it is the functions and interactions between the brain, the body and the world that create experience.

2.4.3. External body parts as substrates of experience

If we agree with the first and second step of this argument, we still need to ask: are those external elements part of the constitutive base for experiences? After all, it seems possible to accept that experience is embodied, and that the body is not always defined by the skin, and yet deny that the external parts could be part of the constitutive base for experiences. Indeed, the second step doesn't automatically lead to the third step, because it is possible to hold that bodies may have external parts, but that those parts are only externalisations of the body, but not material realisers of experiential states. However, this line of thought would undermine the first and second steps of the argument. For, if we commit to embodied realisation of certain experiences, and to our capability of incorporating non-biological props into our bodily sensorimotor functions (i.e. into the embodied substrate of those experiences), the third step becomes difficult to deny.

As several empirical experiments have shown (e.g. Maravita & Iriki 2004 about training macaque monkeys to use rakes; Bach-y-Rita & Kercel 2003 about sensory substitution devices), when used in the right way, the external parts will gain a new functional and phenomenological status. For example, when a blind person uses a cane, it is no longer an external object for her, but gradually becomes part of her point of view (see chapter 4 for more elaborated examples). They are no longer merely external objects but become part of the sensing body – part of the (quasi-transparent) subjective point of view rather than an external object. This new status is the reason why they cannot simply be overlooked when searching for the realisers of experience. As we have learned in the first two arguments for ECM, experience *is* that embodied, sensorimotor action in the environment, and that action is partly realised by those incorporated objects. Incorporated tools have their seat in the interface of the body and environment, and if we accept that both the body and the environmental action are parts of the substrate of experiences, there are no good reasons why we should stop short and forbid the mediating element (namely the incorporated object) this role.

Of course, not all kinds of bodily extension will suffice. The object needs to be a certain kind of tool with a sensorimotor function, and it needs to gain a new phenomenological status in use (e.g. a blind's cane), differentiated from a mere tool (e.g. a washing machine) or a mere extension of a material body (e.g. an artificial knee). (For a more detailed

description of the criteria, and a taxonomy of different levels of externalisation and incorporation, see chapter 4.)

The third argument was yet another way to reach the conclusion that external parts can be part of the material realisers for experiences. When we allow that our bodily functions can be partly responsible for some experiential states, it is a small step to the environment. If an action carried out with a hand is included, it is a slippery slope to the tool that the hand is holding. With our bodies extending to the external parts, our experiential states are also sometimes materially realised by those externalisations. A leaky body means a leaky mind.

2.5. Conclusions to the three arguments

These arguments have shown that in order to stay consistent, a supporter of the 4E-framework should accept ECM as well. As the reader might have noticed, the three arguments are not independent of each other, but they are different aspects in a common ground. They can be taken as a cumulative argument for ECM, where the three arguments build on each other: the argument from sensorimotor enactivism and the argument from occurrent EM lead to the argument from embodiment. Each of them, however, also offers a distinct entry to ECM.

The first argument, based on inference from EM to ECM, gives the groundwork for the concept of experience that will be used (and still developed) especially in the second argument. The second argument, based on sensorimotor enactivism, is in a sense the most important argument of them all, because the premise theory itself targets extended experience in a straightforward manner. The third argument about the embodied experience and the leaky body (and hence leaky experience) ends up with a conclusion that is not new, but has nevertheless been stressed in a wide range of philosophical and

empirical research about sensing with tools (see e.g. De Preester & Tsakiris 2009; Maravita & Iriki 2004). In this argument, my way of framing the matter is, however, different from how it is usually presented, and is also different from how I present the same matter in other chapters (especially in chapter 4). I haven't seen this kind of approach in arguing for ECM in the 4E literature.

No doubt these arguments for ECM might be hard to accept for analytic philosophers of mind, because mental phenomena have traditionally been described in such a different way. There is resistance among philosophers of mind as a consequence of the strict separation between cognition (understood as computation) and consciousness (understood as something that doesn't fit the computationalist picture). Empirical scientists don't have the conceptual burden of bats, zombies, Chinese rooms, explanatory gaps, and hard problems of consciousness, and thus these arguments might be easier to accept for them.

3. The Constitution-Turn and ECM

3.1. Introduction

This chapter discusses how to differentiate causal from constitutive relations in general, and specifically in EM and ECM. The focus is on the *concept of constitution*, whereas the fourth chapter describes the constitutive relation in ECM and how to detect it. The demand for these discussions stems from what I call the *constitution-turn* in the extended mind literature. Starting from Adams and Aizawa's causal–constitution objection presented shortly after the original paper of Clark and Chalmers (1998), there has been an increased interest in the concept and ontology of constitution as a culminating question whether externalist views in philosophy of mind are true. Especially in recent years it has gained a great deal of attention in the literature. As Baumgartner and Wilutzky (2017, 1105) put it, in order to escape the stalemate situation about the adequate *mark of the cognitive*, the EM literature has turned into a debate about an adequate *mark of constitution*.

However, an account of constitution in ECM has not yet been written, and because ECM differs from EM, it needs its own treatment – which this chapter aims to provide. By clarifying the concepts of constitution and causality, this chapter will not only respond to the *causal-constitution fallacy*, but also to a closely related critique, i.e. the *cognitive bloat argument* against EM and ECM. I argue that these criticisms arise from a mistaken concept of constitution that should be used with ECM (and occurrent experiences in general), and they can be resolved by analysing and clarifying the notion of constitution.

3.1.1. The causal-constitution fallacy

The causal–constitution distinction is at the centre of the debate concerning externalism in philosophy of mind. The extension (what is meant by *extended* in the 4E's) in both EM and ECM is a *constitutive relation* according to the advocates of EM and ECM.[62] The interaction loops with external objects and devices partly constitute cognition in EM, and experience in ECM. The external parts are constitutive components[63] of cognition/experiences. This is what *extended* refers to in EM and ECM. The external and internal components together constitute the material basis for some mental states, and together they are necessary and sufficient for those states.[64]

However, it has been argued (e.g. Adams and Aizawa 2001; 2010; Aizawa 2010b) that EM has confused causal and constitutive relations, i.e. committed a *causal–constitution fallacy*, also known as a *coupling–constitution fallacy* (C–C fallacy, from now on).[65] According to this objection, the role of external elements is at best causal, but certainly not constitutive: "the fact that object or process X is coupled to object or process Y does not entail that X is part of Y" (Adams & Aizawa 2010, 68). From the fact that environmental phenomena causally affect our cognition, the proponents of EM have mistakenly (according to the C–C fallacy objection) inferred that the causally affecting relation is (or leads to) a constitutive relation. Thus, the C–C fallacy objection aims to be a reminder that one should not draw constitutive conclusions from causal premises. My aim is to show that neither EM nor ECM have committed this error, and the C–C fallacy objection can be rejected.

Adams and Aizawa's original formulation of the critique (which concerns how Clark and Chalmers use the Otto example) is relatively easily solved, because they in the first place have misunderstood Clark and Chalmers's intentions about EM. Adams & Aizawa

[62] As was stated in the first chapter, this is what differentiates *extended* from *embedded* – the latter stresses the causal dependency on the environment, but denies the constitutive extension outside the boundaries of the organism.
[63] By 'components', I refer to 'constitutive components', and I use the terms 'component' and 'constituent' interchangeably throughout this text.
[64] The brain is necessary (at least for present-day human minds), but not always sufficient condition for cognition (according to EM), and for experiences (according to ECM).
[65] I use the term 'coupled' as neutral regarding the causal–constitution question. So if p is coupled with q, we still need to ask whether that relation is a causal or a constitutive one. The use of the term is not consistent in the literature; sometimes it is used synonymously with causal relations, sometimes with constitutive relations.

interpret EM's question to be: under what conditions does a physical object become cognitive? However, EM is not claiming that coupling would make any object *itself* cognitive. Rather, EM is asking – in Clark's (2010b, 84) own words – "when is some physical object or process part of a larger cognitive system"?

In their criticism of EM, Adams and Aizawa appeal to the *mark of the cognitive*, by which they refer to manipulation of representations that bear intrinsic, non-derived content. Allegedly, external parts do not bear non-derived content, and therefore they don't satisfy the requirement for the mark of the cognitive. "Where the symbols written in Otto's notebook have merely derived content, the recollection in Inga's brain has non-derived content" (Adams & Aizawa 2001, 55). It is, however, very unclear what non-derived content actually is, why cognitive states should have it, or why external parts should *a priori* lack it.[66] Menary (2010d) has noted that the distinction between derived and non-derived content is not relevant in cognitive sciences, and that it has no value in scientific research on cognition. (For a thorough discussion about Adams & Aizawa's original critique, see Menary 2010a).

Nevertheless, there is a serious and unsettled matter underlying the original critique that deserves a proper examination, namely the question whether the relation in EM actually is a causal or constitutive one, and how do we distinguish causal from constitutive. The critique was originally directed towards EM, but if it is a sound critique, it also applies to ECM. If correct, the C–C fallacy is as serious a worry for ECM as it is for EM.[67]

Furthermore, Clark (2009) has introduced a more empirically based version of the C–C fallacy objection specifically against ECM (for a more detailed discussion about Clark's critique, see chapter 5). Adams and Aizawa's critique is drawn from metaphysical considerations (viz. the metaphysical assumption of the mark of the cognitive, and the failure of external parts to satisfy it as a reason why EM is not possible), whereas Clark is appealing to the superior processing power of the biological brain as a reason why ECM

[66] Even though I think pleading for non-derived content as the mark of the cognitive is not convincing to start with, if for the sake of argument we accepted it, ECM would actually survive the attack better than EM. It is after all evident that perceptual experiences involve less derivation than some standard examples of dispositional EM. (Of course, Adams & Aizawa never intended their critique to be directed towards ECM.)

[67] There are, however, some differences in how the two can respond to the criticism. I will get back to this later.

is not possible.[68] Accordingly, the former is *a metaphysical argument for the C–C fallacy objection*, and the latter *an empirical argument for the C–C fallacy objection*. The C–C fallacy objection I am dealing with in this chapter is the metaphysical version. It does originate from Adams and Aizawa's writings, but I treat it as a general opposition for the constitutive claim. Even though the whole setting is rather metaphysical, it doesn't rule out empirical investigation. Kirchhoff (2015) writes:

> [B]y scrutinizing the metaphysics of what it means for certain Xs to compose a certain Y now, it is possible, I think, to turn what might look like a metaphysical dispute into a productive recipe for empirical research and to set certain constraints for how such research must be carried out.

The constitution turn has raised the causal–constitutive distinction into the centre of the debate whether the arguments for different versions of extended mind are sound: the proponents claim that the relation is constitutive, and the opponents that it is merely causal. However, problems arise because neither side has clarified what they actually mean by this distinction, and that has created confusion.[69] But the confusion itself is not a reason to attack externalist views, but rather it is an ambiguity that all parties need to address and find a solution to. In order to be able to respond to the C–C fallacy objection (or to keep on using it as a critique towards externalist views), we need to get a clearer picture of the distinction between causal and constitutive relations. The clarification might not only help the discussions about EM and ECM,[70] but also philosophy of mind in general and perhaps the general philosophical question of the concepts of causality and constitution as well, for example by broadening the view of what counts as a constitutive relation.

Answering the objection leads us to a very profound question of what belongs to cognition and experience, and how to set their limits. Kaiser (2018, 5-6) cuts up the question and reveals that these kinds of demarcations actually consist of slightly different sides, for example the *individuation of the whole question* (what is the whole and how it should be

[68] Both Clark and Adams & Aizawa admit that their internalism is a contingent rather than a necessary fact: it is internalism about us "contemporary humans".
[69] There are a couple of recent papers about constitution in EM (e.g. Gallagher 2018; Kirchhoff 2013; 2015), and Kiverstein & Kirchhoff (2019) deal with the metaphysics of constitution in the context of ECM.
[70] Of course, we also need to ask whether we can use the same notion of constitution with both EM and ECM. This chapter will also deal with that question.

identified) is different from the *demarcation question* (where are the boundaries of the whole, and how it can be differentiated from its environment).[71] This can be compared with a distinction between *operational limits* (cf. individuation of the whole) and *spatial boundaries* (cf. demarcation) (Virgo et al. 2011). These two demarcation criteria don't need to coincide: the material boundaries can be different from those of the organismic boundaries. EM literature has focused mainly on the question of material boundaries, even though the question about operational/organisational limits could (and should) be raised as well. In order to set the limits, we need answers to both of these kinds. (This question of course motivates this whole thesis, not only this chapter.)

We need to find a way of setting the boundaries that is "neither too wide nor too narrow, but rather 'just right'", as Weiskopf (2010) has framed the problem (and accordingly called it the "Goldilocks problem"). Of course, what counts as "just right", is a highly complicated question. As Kaplan (2012, 551) has put it, we need to "contend with the problem of partitioning from among the set of causally relevant factors those that are legitimate components of a given mechanism or system from those that play roles as part of the causal background". This is a question worth asking and trying to answer, and the task is not an easy one. Much depends on how we understand the notion of constitution in the first place, how we distinguish it from causation, and how these concepts are applied to EM/ECM frameworks.

[71] Kaiser (2018) is discussing parthood, demarcation, individuation and decomposition in biology. Nevertheless, the same differentiation can (and should) be kept in mind when we are dealing with cognition and experience.

3.1.2. The constituted phenomenon: The dynamic nature of experiences

Before delving into the concept of constitution, let us have a look at the phenomenon in which the constitution relation allegedly occurs (viz. perceptual experience). As was already presented in the second argument for ECM in chapter 2, the nature of experiences is *dynamic* – they are not static states, but rather unfolding over time by means of constant dynamic change.[72] This view of experience is influenced by enactivism, according to which perceptual experience is temporally extended interaction between the agent and its environment governed by sensorimotor contingencies (O'Regan & Noë 2001; Noë 2004; 2006; Buhrmann, Di Paolo & Barandrian 2013; Silverman 2013; Pepper 2013). Experience is not made up of a succession of separate atom-like instances, but instead evolves dynamically between the agent and its surroundings. Silverman (2013, 154) encapsulates sensorimotor enactivism's idea about temporal experience as follows:

> [T]he physical substrate of the experience is a smoothly continuous activity rather than one which breaks down into temporally discrete chunks: hence to explain the physical substrate of perception, one must look at dynamically unfolding interactions, rather than 'object'-like structures in the brain.

This kind of thinking, i.e. the idea of temporality of experiences is embedded in enactivism; accepting enactivism means accepting the temporal, dynamic nature of experiences. Sensorimotor action is not conceivable without temporality. The same applies to ECM. If experience is extended at all, the extension cannot be restricted only to the material sphere, for the temporal dimension follows necessarily. As Noë (2006b, 32) writes: "When you perceive an event unfolding, it is not as if you occupy a dimensionless point of observation". Temporality is a necessary element for interchange between the bodily and environmental elements, and cannot be overlooked when explaining their constitutive basis.

This dynamic unfolding in time is close to how we seem to acquire experiences. And in the case of experiences, which are inherently subjective first-person phenomena, to

[72] A further and unbiased theory regarding the matter at hand is *dynamical systems theory*, which is a mathematical theory of properties of abstract dynamical systems. In cognitive sciences, it has been used as an alternative to computationalism. According to this theory, cognitive systems resemble dynamical systems rather than computational systems (see e.g. Van Gelder 1998).

dismiss the *what-it-is-like* side, is to dismiss the referent of the concept. However, not everybody agrees with the ubiquitous temporality of experiences. For example, Crick and Koch (2003) claim that we do not experience motion, but only static snapshots, and the alleged experience of motion is only imaginary, "painted" on snapshots. Consequently, there is an ongoing debate about how we experience temporal phenomena (see e.g. Dainton 2008; Arstila 2016; Kiverstein & Arstila 2013). Without diving too deeply into the questions of philosophy of time consciousness, let us briefly compare different ways of explaining the alleged temporality of experiences. This will help us see why we wish to embrace an *extensionalist* view of time experience.

Theories of time consciousness can be divided based on whether they are committed to dynamical or static (or diachronic vs. synchronic) explanations of experiencing time. Further, the explanandum is at two levels – material and experiential – and they might have a different explanans.[73] According to *extensional models*, not only the contents of experiences, but also the vehicles (sub-personal realisers) of those experiences are dynamical. The commitment to dynamic, temporally extended vehicles is what differentiates extensional models from *retentional models*, which accept the dynamic nature of the contents of experiences, but do not require that their material vehicles are dynamical (whether the retentionalists hold that they are necessarily instantaneous, remains unclear). Finally, *cinematic models* hold that both the contents and vehicles are instantaneous – the apparent temporality is only an illusion, as in displayed films, which consist of rapid sequences of instantaneous, still images or snap-shots. (The terminology is from Dainton 2018.)

4E-views are clearly at odds with the cinematic view, which is committed to a view that we never experience movement, change and succession, for those are considered illusory. All we perceive is detached static time-slices; direct non-inferential experience of those temporal phenomena is not possible. For example, Crick and Koch (2003) claim that the alleged experience of motion is only imaginary, "painted" on snapshots. This view fits well with the "grand illusion" view described in the previous chapter (section 2.3.4.). We think we enjoy perceptual experiences of the detailed scenery around us with moving objects in it, but we are mistaken – it is only an illusion.

[73] Although some theories of philosophy of time consciousness deny this difference in levels, e.g. a view where time is treated as "its own representation" (see the discussion in Kiverstein & Arstila 2013, 447).

An obvious argument against the cinematic model is that it cannot explain observable dynamicity, and it is hard to see why an experience should be explained in a way that contradicts that experience. It seems obvious that we are capable of experiencing movement, change and succession – otherwise we could have never had an experience of an approaching car or a ball, and it would seem very odd to claim that we haven't. As embodied creatures, we survive by avoiding certain moving objects. A series of instantaneous slices cannot be sufficient in order to experience movement. While cognition and perception can occur unconsciously (e.g. blindsight), experience, by definition, cannot. (Another question is the reportability of conscious experiences: it is not straightforward how to interpret reports of experiences in empirical settings.)

However, this argument is not enough to refute the retentional model (e.g. Husserl 1991),[74] since retentional models admit that at the personal level, experiences *are* temporally extended. This makes the retentional model a far better candidate, but it is still wanting at the vehicular level. To settle for the retentional model would be the same as to accept sensorimotor enactivism but refute ECM, i.e. to accept situatedness at the personal level, but not at the subpersonal level. For reasons that were presented in chapter two (see section 2.3.6.), this position is not tenable – the personal level determines the subpersonal level.[75]

Furthermore, brain events themselves take time – nobody would deny this. Neural processes are *processes*, never instantaneous brain "states", for example action potential takes time. Clark (2009, 978) acknowledges this in his otherwise critical paper: "for information to become conscious, some amount of time needs to pass, so that normally there is no way the brain can 'in an instant' reach the kind of state that supports conscious experience". As a consequence, some kind of temporality at the neural level is already agreed by all parties. However, the retentionalists think that the temporality at the personal level is not in accordance with the temporality on the neural level, and therefore the temporality at the material (neural) level is not important for settling this issue. The problem of the retentionalist model is exactly this: according to this model, the

[74] Autopoietic enactivists Thompson (2007) and Varela (1999) say that they are committed to a Husserlian view of time consciousness.
[75] A coinciding line of thought can be found from the other side of the discussion. Ian Philipps (2014), a philosopher of time consciousness, argues that the experiential time level determines the material (neuro) level.

phenomenal and material events do not match. Hence, neither the retentional model nor the cinematic model is up to the task – what we want is an extensionalist model.

Even though "hearing a melody" is an often-used metaphor for describing a temporal phenomenon, in this case it is slightly misleading, since my claim goes to an even more elemental level. Not only a melody (whose temporality nobody in their right mind would deny), but also a single note has a temporal character. According to Noë (2006b), hearing a note necessarily involves a temporally extended coupling-relationship between the hearer and her environment. According to Foster (1991, 247), we couldn't even conceive of an auditory experience without the temporal dimension. In the same way as there couldn't be an experience of colour without the region of what the colour pervades, there couldn't be sound experience without the period of time that the experience of sound fills.

The same applies for tactile modality. It is quite evident that tactile experience is very closely connected with movement, and movement is necessarily a temporal phenomenon. If we want to know what some surface feels like, we need to move our hands (or the tool we are touching it with). Without movement, which necessarily includes the temporal element, there is no way we can have tactile information about it. Noë (2004, 96–100) refers to Berkeley, who held that touch is the only intrinsically active and spatial sense; it is in fact "a kind of movement". (Noë himself thinks, of course, that even though Berkeley is right about the tactile sense, he is mistaken in that he says it is the *only* active modality.) Noë also refers to O'Shaughnessy (2000, 658), who writes that "touch is in a certain respect the most important and certainly the most primordial of the senses […] it is scarcely to be distinguished from the having of a body that can act in physical space". This underlines how touching an object depends on its resistance when we contact it by pushing, poking, nudging, stroking, etc. The tactile experience is dependent on the very act of movement.

Thus, it seems clear that auditory and tactile experiences are temporally extended phenomena. However, perhaps the temporality of visual modality is not as clear-cut a case, because of the intuitive feeling that when we see say, a red object, we are passive observers rather than active skilful probers. As presented in the previous chapter, the sensorimotor theory of perception (O'Regan & Noë 2001; Noë 2004) is an example of an all-encompassing dynamic view that argues that all perceptual experiences (including sensations, e.g. the sensation of pain) are dynamic and based on our (temporal) actions –

what we *do, probe and inquire*, and not on static states that we passively *receive*.[76] Hurley's (1998) criticism of the "input–output model" is another example that challenges the view that we are just passive receivers of phenomenal states.

The experiences ECM deals with, and which are in need of constitutive explanation for ECM to be a solid theory, are perceptual experiences related to sensorimotor action and movement, especially of tactile, auditory and visual modalities. Examples include hearing with a hearing aid, moving around in a room with the help of a stick or having a quasi-visual experience with tactile–visual sensory substitution technology. The *what-it-is-like* side is present in them too (as in all experiences, by definition), but they are also *action-oriented* in the minimal sense that an active subject is in interaction with her environment. Hence, those experiences are very much dependent on real-time interchanges between the (embodied) subject and its environment.

Even if we were internalists about the material realisers of experience, the notion of experience would still require temporality – for the same reasons I gave in this passage. An experience of, say, sound or touch is inconceivable without the event in time it pervades, no matter whether it is realised in the brain alone or whether environmental interactions are taken on board. Hence, the dynamical–temporal view is not tied to ECM alone.

Moreover, the static vs. dynamic question is not only related to the internalism–externalism debate. The dynamic view has gained support from other areas of philosophy, too. One of the best-known "dynamicists", Tim Van Gelder (1998, 621) has given a characterisation of the dynamical stance on cognition and contrasted it with the computationalist view as follows. Dynamicists are interested in how things change; computationalists are interested in states – state by state. Dynamicists understand a system's states in terms of its position with other states; computationalists focus on internal structure, what the state is made of. Dynamicists think that cognition is laid out temporally, like "speech as opposed to the written word"; computationalists think that everything is laid out at one moment of time.[77]

[76] Technically, my position is not even reliant on whether we accept the dynamical–temporal nature of *visual* modality or not; it is already enough if the above-mentioned tactile and auditory modalities are dynamical–temporal. But as we saw in the previous chapter, the dynamical nature of seeing is also well-founded by the sensorimotor enactivists.

[77] Another strand that stresses dynamicity, and comes outside the externalist views in philosophy of mind is *process philosophy*. The label refers to a variety of views held in e.g. phenomenology and pragmatism

To recapitulate, the need for dynamic explanation stems from the fact that the experiences ECM deals with are based on reciprocal interaction between the subject and her environment – and interaction is always inherently a temporal and dynamical phenomenon. The extension that we are dealing with in ECM is not only spatial, but spatiotemporal. Accordingly, the notion of constitution needs to be such that it takes into account the dynamic nature of experiences. In the next section, I will move from the explanandum to the notion of constitution.

3.2. Defining Constitution

Constitution is a *building relation*: the whole is made of its parts (Bennett 2011). It is usually explained as a synchronic relation between higher- (*constituted*) and lower- (*constituent/s*) level phenomena, although the synchronicity is not a necessary feature. Causation, on the other hand, aims to give *etiological* explanations that explain events: their origin, changes in their properties, etc. (Ylikoski 2013). Causal explanation explains what *caused* a phenomenon or event, and constitutive explanation *what* the phenomenon *is*, what it *is made of*. There is no reason to assume *a priori* that constitution should be something internal, and causation external (to the organismic boundaries).[78] In what follows, I will present three different ways to outline the causal–constitution distinction: *material*, *mechanist* and *diachronic–dynamical*. I will compare how they fit with EM and ECM. The three models might all serve for some purposes, and my aim is not to judge

that appeals to the role of dynamic processes and temporal activities, rather than to timeless, static substances, when forming accounts of being and reality (Rescher 2000).

[78] Even though this assumption is rather common. Hurley (2010, 106) calls it the "causal–constitutive error error". This kind of assumption is also related to a "primitive notion of spatial inclusion". Kaiser (2018) shows with examples from biology how spatial inclusion is neither sufficient nor necessary for something to be a constitutive part of a biological entity. She goes on to argue that the spatial inclusion criterion is also circular/trivial, because demarcating the spatial boundary of a whole by positing all the parts in it already presupposes what its parts are.

them for being unable to explain *any* constitutive relation – I only examine the cases as they bear on EM and ECM.

3.2.1. Material constitution

The "standard" understanding of constitution derives from analytical metaphysics: it is a static view of *material constitution*. It is also the (often unconscious) presupposition of the writers who accuse EM of having committed the C–C fallacy.

> Material constitution can be summarized as a *synchronic* one-one relation between spatially and materially coincident objects of different kinds, or as a many-one relation, where one object or entity is constituted by an aggregate of objects or entities (Kirchhoff 2013, 320).

In the standard material understanding, constitution is considered a material realization of an object. The basic example is that Michelangelo's *David* is materially constituted by the marble it is made of – it is nothing over and above that piece of marble (Wasserman 2004; Wiggins 1968; for critical a view, see Kirchhoff 2013). A material reading of constitution might explain the constitution in material objects like statues or tables and chairs. I am not taking any stand on whether it is a useful theory for explaining the metaphysics of spatial objects. However, what matters is that it is not a profitable way to explain constitution when discussing EM, ECM or philosophy of mind in general.[79]

As Kirchhoff (2013, 321) analyses, David does not unfold in time – it is constituted at a certain moment of time *t*. Temporality is not essential for its constitution relation. Kirchhoff continues that David's case reveals another feature of material constitution: the

[79] It might be the case that many defenders of EM and ECM also assume a concept of constitution along these lines, because many of them have not delved into analysing the notion of constitution.

constitutive relation that holds between the marble and David coincides materially and spatially. However, demarcating the constitutive relation based on sharing the same material parts is problematic. As Kaiser (2018, 8; see also footnote 73 in the previous section) shows, the "spatial inclusion" criterion faces trouble. It assumes *a priori* "natural" boundaries based on what the spatial inclusion criterion already presupposes. However, this criticism is targeting the life sciences, and may not apply to simple cases of material constitution, such as the statue of David.

Even though material constitution might explain some phenomena, the crucial point (and the only statement I am making about it) is that it cannot explain the phenomenon under scrutiny in my research, because material constitution is unable to explain non-static phenomena. It serves as the basis for an atemporal type of explanation in the sense that constituted entities are assumed to be such that they do not unfold in time but are explained only from given moments – in specific instants of time *t*, snapshot by snapshot. Temporal extendedness plays no role in constituting the entities under examination. Because of its static and atemporal nature, the material conception of constitution is unable to explain cognitive processes and (especially) dynamic conscious experiences, because of their innermost dynamical and processual nature.

Occurrent cognitive and experiential states need a different kind of concept of constitution than that which applies to material objects, because what is essential to the former is not the static one-to-one relation, but a temporally extended dynamic unfolding. So, if the material view of constitution cannot be used to explain cognition, let alone occurrent phenomenal experiences, what are the alternatives? As better candidates for explaining constitution in mental processes, I will consider the *mechanist* and the *diachronic–dynamical* conceptions of constitution. They are both better suited to accounting for the processual and dynamical nature of mental events. Moreover, they make better sense of not only extended mental processes, but of all kinds of temporally extended dynamical phenomena.

One might oppose this line of proceeding because it looks like the result depends on which reading of constitution we choose. If we apply a static view of constitution, the relation of external elements and mental phenomenon is not constitutive. If we apply a non-static view, the relation is constitutive. A critique might ask what allows us to disregard the static view, and instead apply a non-static view. However, I think we are entitled to

discard the material view because it cannot explain dynamical processes like perceptual experiences – whether they are extended or not. The problem is that the explanans and explanandum do not correspond. The choice of the theory of constitution is thus independent of my argument for ECM.

To recap, it is not ECM as such that needs a different kind of understanding of constitution, but the whole dynamical view about the mind that is defended by all the E-views. As I have stressed, the problem with the material view is that it is built on a static understanding of constitution. Externalist views alongside all dynamic views (which I think all the accounts about conscious experience should be for them to be credible theories) need a different approach that appreciates the dynamic nature of the phenomenon to be explained. The solution I start with derives from the *new mechanist approach* in philosophy of science.

3.2.2. Mechanist constitution

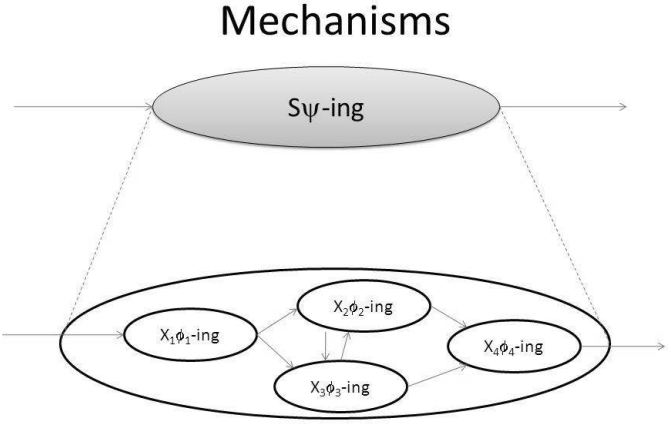
In the *New Mechanist Approach* (e.g. Craver 2007; Craver & Bechtel 2007; Bechtel & Abrahamsen 2005), a phenomenon is explained by referring to its underlying mechanism. The *explanandum* is the phenomenon, and the *explanans* is the mechanism (Craver 2007, 139). Constitution is an inter-level relation between higher and lower systemic levels. The methodology behind this approach is *naturalistic*, and is committed to *descriptive adequacy*, where a theory needs to describe an actual scientific practice in order to be an adequate theory (Craver 2007, 19; Kaiser & Krickel 2017, 750). The mechanist view is very different from the static view of constitution in analytical metaphysics – it aims to *explain* phenomena within empirical research. It is a kind of scientific explanation rather than a metaphysical enquiry into the ontological nature of material objects. Hence, the

notion of constitution cannot be used in the same way as it is used in metaphysics, or in the static material view discussed above.

It is understandable that many EM supporters have been tempted to use the mechanist approach as a backup theory for EM, since it promises to get access to scientific explanations. It is likely that the "constitution-turn" in the EM-literature exists mainly because of the mechanist view; without the considerations in philosophy of science, probably philosophy of mind and the cognitive sciences would not have paid so much attention to the causal–constitution question in the first place. However, as far as I am concerned, the mechanist view has only been used to support EM, but it has not yet been reconciled with ECM. The closest attempts are those of Kirchhoff's and Gallagher's, but they talk about EM, not ECM.[80]

The mechanist view (at least its orthodox reading) makes a strong divide between etiological (i.e. causal) and constitutive explanation: constitutive relation is a non-causal relation and vice versa.[81] Causal mechanisms cause phenomena, whereas constitutive mechanisms non-causally ground, build or constitute phenomena – and the theory promises to say where the causal relation ends and the constitutive begins. In the mechanist view, constitutive (and also causal, but causal mechanisms are not under scrutiny in here) relation holds between the mechanism and the phenomenon. Importantly for my purposes, the mechanism may consist of different elements: not only material objects, but also actions, behaviour, or interactive loops between the agent and the environment.[82] With this rather famous picture, Craver (2007) illustrates how a phenomenon is realised by its mechanism.

[80] Their views, however, are compatible with ECM, whether or not they so intended. Kirchhoff argues for ECM elsewhere (e.g. Kiverstein & Kirchhoff 2019), but Gallagher has not written about the matter.
[81] The notion of constitution, and the distinction to *etiological* and *constitutive* mechanisms, is influenced by Salmon's (1984) work.
[82] But this issue is not straightforward within the proponents of the mechanist view. The mechanist view quite explicitly (e.g. Craver 2007; Ylikoski 2013) requires that the constituents and constituted spatiotemporally overlap – hence it is difficult to see how "actions, behaviour, or interactive loops" could fit the picture. This touches on the ambivalence at the very heart of the mechanist view (I will return to the topic later in this section).



A phenomenon (top) and its mechanism (bottom) (from Craver 2007, p. 7)

Lower-level components of the mechanism constitute the higher-level phenomenon. The components are causally related to each other, and they constitute the system (S), and the higher-order process (ψ-ing). The *intra-level* relations are causal (the arrows in the lower part of the picture), and the *inter-level* relations constitutive. Something is a compositional constituent of a system if it is a working part "that non-causally results in the 'work' done by the relevant whole" (Gillett 2013, 319). Constitutive elements are *part of the phenomenon* itself; in the constitutive relation, the parts and how they are organised constitute the phenomenon (the whole). It is a compositional view – the phenomena under examination consist of parts that together constitute the whole.

If we consider Craver's model in terms of EM, S ψ-ing (the whole) could be e.g. solving a mathematical problem, and x1φ1-ing–x4φ4-ing (the parts) sub-personal processes in the following way: "say, x3ϕ3-ing would be the brain processing information […] x1φ1-ing might be the eye performing a saccade, where x4φ4-ing might be writing with a pencil" (Aizawa 2014, 24; see also Gallagher 2018). There is causal interaction between the lower-level parts (the brain processes, saccade and writing with a pencil), and they together constitute the higher-level process (solving a maths problem).

The following three features describe constitutive relations as they are usually understood in the mechanist framework. Firstly, the constitutive relation is *asymmetric*: the

components constitute the whole, but not the other way around, and the parts are independent of the whole, but not the other way around. Secondly, it is *irreflexive*: nothing constitutes itself. Thirdly, it is *synchronous*: constitution takes no time. It is common (but there is no consensus) amongst the proponents of the mechanist view to claim that causal processes take time, but constitution does not – and hence processes are out of reach of constitutive explanation (Ylikoski 2013, 282.) This last feature is problematic, as we will soon see.

According to the mechanist view, what differentiates constitution from causation is that causal relations are not synchronous but are diachronic by nature. Thus, they differ in the third feature. All parties agree about the diachronicity of causal relations, but the necessity of the synchronicity of constitutive relations will be under critical scrutiny soon (even though it is widely accepted by the advocates of the mechanist and the material views). The third feature (synchronicity) makes the mechanist model problematic for explaining the constitutive relations in mental processes. Since constitution does not take time according to the mechanist picture, whereas mental processes do take time, they are clearly incompatible.

The incompatibility between the view I am supporting and the mechanist view can be found in a passage from Ylikoski (2013, 280). While he agrees that the ultimate goal of constitutive explaining is to understand a system's *behaviour*, he nevertheless claims that this can be achieved while leaving out some behavioural aspects and "orchestrated activities of the parts". He admits that constitutive explaining makes "heavy abstractions", but that they are needed for picking out the constitutive questions.

> When building an understanding of a system's behavior, scientists pose more focused questions that *abstract away some dimensions of the system's behavior*. […] One could say that the question only addresses a synchronous time-slice of the system. (Ylikoski 2013, 280, italics added.)

This might be a useful way to deal with the examples philosophers of science use (e.g. questions in philosophy of biology). However, it simply does not work with the phenomenon I am working with. It is impossible to abstract away the intrinsic dynamical-temporal aspects from experiences – if we did, what is left over would be something else than experiences.

In spite of these inadequacies, the mechanist view is a much better way to understand constitution if we compare it with the material view, because it relies less on metaphysical assumptions, and instead aims to grasp how natural scientists explain phenomena. This promise of scientific adequacy, or arguably empirical adequacy, is undoubtedly one of the main reasons why some advocates of EM have used the mechanist view as a supporting theory.

So, how does all this relate to EM and ECM? It looks like the mechanist view *can* explain constitution in non-occurrent dispositional beliefs (like Otto's case), because they are not temporally extended in nature. However, the mechanist view cannot explain constitutive relations in ECM or in occurrent cases of EM. This only applies if we interpret the mechanist view in its orthodox reading. Nevertheless, it would also explain occurrent EM and ECM if understood in a less orthodox way that takes diachronic relations on board – but then it could no longer be called the mechanist view. The problem with the mechanist view (for my purposes) is that it is synchronic/contemporaneous. Instead, we need a model of constitution that takes into account the intrinsic dynamic and diachronic nature that experiential states bear.

Thus, the mechanist view of constitution only fits with a narrow understanding of EM (that considers non-occurrent cognitive states). However, the mechanist model lacks the ability to explain experiences – and also occurrent cognitive processes – because of their highly dynamical, temporal and process-like nature. That is why we need to combine the aforementioned features with our concept of constitution.

3.2.2.1. The ambiguity in the mechanistic model

Apart from its very explicitly stated requirement for synchronicity,[83] the mechanist view would be a good way to explain the constitutive relation in ECM and EM. The reason for this is that whether or not the proponents of the mechanist view so intended, it would seem that diachronicity is already in their notion of constitution, even though they state in various places that the relation is synchronic. An example of this kind of ambiguity can be found in Craver's (2007) *mutual manipulability* criterion (which is probably the best-known application of the mechanist theory). It relies on *causal* powers, defined in terms of Woodward's (2003) interventionist theory.[84]

Some mechanists explicitly stress the importance of processes (e.g. Kaiser 2018; Krickel 2018; Kaiser & Krickel 2017; Harbecke 2010). Some other mechanists are committed to views that take diachronicity on board, whether they intended to or not. For example, it has been said of Craver's (2007) analysis of *action potential* (a change in electrical potential in neurons, also known as nerve impulse) that it requires a commitment to temporally evolving phenomena. Kaiser & Krickel (2017, 755–756) show that the action potential cannot be explained only by referring to spatial parthood, but that temporal parthood is also needed. It is what the action potential mechanism does, and when it does it. An ion-channel opening must occur during an occurrence of the action potential for it to be constitutively relevant for it. Kaiser & Krickel go on to argue that (also in other cases besides the action potential) mechanisms are composed of objects and occurrents,[85] or rather, they are *object-involving occurrents* (p. 768).

> [M]echanisms themselves not only have locations, more or less clear spatial boundaries, and spatial parts, they also have durations, involve changes, and have temporal parts. Hence, mechanisms are also things that occur. There is something going on when a mechanism occurs. Mechanisms do not merely consist of spatially extended component-objects that

[83] E.g. Craver (2007, 153) leaves no doubt about the matter: "the constitution relationship is synchronic". Ylikoski (2013, 282) agrees: "the relation of constitution is synchronous".
[84] All of these topics are covered in more detail in the following section.
[85] Their view has similarities with *entity–activity dualism* as a characterisation of a mechanism, according to which mechanisms consist of both entities (as in material objects) and activities (what objects do) (e.g. Machamer et al. 2000). It is also similar to Craver's (2007, 189) notion of *acting entity*, which also stresses what objects do.

> are only disposed to act but do not actually perform any action [.] (Kaiser & Krickel 2017, 765.)

Thus, the mechanist view comprises slightly different readings, and it seems like e.g. Kaiser & Krickel's view that mechanisms can contain external and temporal parts fits rather well with my purposes. However, even if we agreed that diachronicity was already (more or less implicitly) embedded in the mechanist model, I couldn't call the view I am supporting "the mechanist view with a diachronic twist", since the orthodox mechanist view so clearly commits itself to synchronicity, and I myself so clearly reject it.[86]

Furthermore, Craver is not an internalist – he acknowledges that the mechanism often extends outside the organismic boundaries. In the case of the action potential, for example, ions that are outside the neuron are still part of the mechanism. "The mechanism of the action potential relies crucially on the fact that some components of the mechanism are inside the membrane and some are outside" (Craver 2007, 141). Interestingly, Craver then proceeds to cognitive extension, stating that "many cognitive mechanisms draw upon resources outside of the brain and outside of the body to such an extent that it may not be fruitful to see the skin, or the surface of the CNS, as a useful boundary" (Craver 2007, 141).

Hence, it seems that Craver himself is happy to extend cognitive phenomena within his mechanist model, or at least he does not oppose the idea. However, the problems I raised earlier remain. The request for synchronicity found in the heart of the mechanist model stands in the way of extending (most) cognitive phenomena, and all experiential phenomena.

Why is the restriction of the diachronic side (and temporality) to etiological relations so crucial for mechanists? It is important to notice that synchronicity is not a necessary property of constitution. Even some mechanists admit that "we should not require that building relations be synchronic" (Bennett 2011, 94). It is embedded in the orthodox reading of the mechanist view, but we can have a consistent view that drops this requirement while keeping the distinction between etiological and constitutive relations.

[86] Whether the mechanist view is already diachronic (and whether the two views should be separated at all) is an interesting question, and would no doubt deserve to be examined in depth. However, since my thesis about ECM is not dependent on this question, I will not go into more details about the topic.

3.2.3. Diachronic–dynamical constitution

Kirchhoff (2013, 341) has aptly phrased the problem that arises from the mechanist view:

> [H]ow does something that is inherently temporal (the complex causal relations between processes and their component parts at a lower level) atemporally constitute something that is inherently temporal at a higher level (e.g., the distributed process of remembering)?

As hinted in the previous section, I go along with Kirchhoff's worry and do not think this is a possible or the most plausible way to explain the constitutive relation. It is difficult to see why the diachronic lower-level and the diachronic higher-level should be connected with a non-diachronic relation.

The third view of constitution to be presented (and the one I argue for) responds to this problem, and casts aside the requirement for synchronicity. I shall call it the *diachronic–dynamical view of constitution*. This move allows there to be causal (or causal-like) features within the notion of constitution. It stresses the dynamic nature whose roots were already set down in the mechanist view (at least implicitly, and even explicitly in some texts, e.g. Krickel 2018; Kaiser & Krickel 2017). Thus, the central features of this view are that it is both dynamic and diachronic. The notions of causal and constitutive remain separate, but this view also allows there to be non-synchronic, non-contemporaneous elements in the constitutive relations.

The static notion of constitution (and its use with regard to EM) have recently been criticised from an enactivist viewpoint. Kirchhoff (2013; 2015) has developed an alternative (to the mechanist) view of constitution that he calls "diachronic process constitution". Gallagher (2018) has been working with a quite similar dynamical view of constitution using Varela's (1999) neurophenomenological analysis of cognitive processes occurring on different timescales. My formulation of diachronic–dynamical constitution draws from both of these accounts.

If the paradigm example of material constitution was the statue of David, with diachronic–dynamical constitution it could be a Watt (centrifugal) governor. This example has been used in cognitive sciences to describe a dynamical system in general

(e.g. van Gelder 1995). Kirchhoff (2013, 328–329; 346), however, uses the Watt governor as an example precisely for diachronic constitution. A Watt governor is a mechanism that controls the speed in a steam engine so that it maintains constant speed for the flywheel. It contains two "arms" that are free to rise and fall in accordance with the speed of the governor on account of centrifugal force. As a result, the governor controls the amount of steam that drives the flywheel.

> The key feature of the governor's behaviour is the angle at which the arms are hanging, for this angle determines how much the throttle valve is opened or closed. Therefore, in order to understand the behaviour of the governor, we need to understand the basic principles governing how arm angle changes over time. (van Gelder 1995, 356).

In the governor, maintaining the constant speed of the flywheel does not happen at a certain time *t*, but is rather expanded in the unfolding process. Hence, it is a temporally extended system. Moreover, the Watt governor is not tied to a particular location: "It has parts, to be sure, and its overall behaviour is the direct result of the organised interaction of those parts" (van Gelder 1995, 355). Hence, the processes it is performing "must be individuated in terms of their roles in a dynamic context" (Kirchhoff 2013, 346). Those processes are what constitute it.

Regarding ECM and the notion of constitution, the case of the Watt governor shows that processes are not tied to a single location necessarily, and not to a single moment of time. The C–C fallacy objection treats its target with the concept of constitution drawn from the statue of David rather than the Watt governor, and that is why it seems to succeed. However, experience cannot be treated in these terms, and hence the C–C fallacy objection's outcome is misleading.

Accepting causal features for our concept of constitution doesn't mean we should rule out compositional relations, i.e. the diachronic–dynamical view does not require non-synchronicity, but rather that constitutive relations can include both synchronic and non-synchronic properties. The big picture remains similar with the mechanist view: constitution is an *interlevel* relation, and causation an *intralevel* relation. As Kirchhoff (2013, 324) writes, constitutive relations occur "between the putative higher-level

distributed cognitive processes and its lower level sub-processes and their components".[87] What is different from the mechanist view is that in the diachronic–dynamical view, the constituents also include "sub-*processes*". Accepting processes as part of the constitutive relation brings temporality on board, because processes are necessarily temporal.

It is quite natural to say that processes occur or unfold in *time*. But what does it mean to "unfold in time"? One should notice that processes are continuous in time on both levels: both *constituted* (at the higher-level) and its *constituents* (at the lower-level) are temporal (in their own way). Kirchhoff (2013, 234) describes the constitution relation as "dynamically embedded at multiple timescales". There are multiple timescales included, and they intertwine in a complex way; for example, neural processes, sensorimotor actions and social practices lie on different timescales. Temporality is not restricted only to intra-level relations. Higher-level phenomena (e.g. solving a maths problem or hearing a melody) usually stretch over a longer period of time than lower-level components (e.g. neural and extra-neural processes, such as manipulation of pen and paper). Thus, it is impossible to fix the constitution relation synchronically – since the phenomenon to be explained is temporal on all levels.

So far, we have mostly discussed the diachronic side of the diachronic–dynamical view. To get to grips with the second part or the term, we need to look closer at how the concept of diachronicity is used in a *dynamical* sense. Getting rid of the snapshot picture is very important, since snapshots cannot constitute dynamic processes. However, we need more than this. Diachronicity should not be understood as a sequential, linear process. As was stated, the diachronic–dynamical view stresses the process-like nature of evolving experiential events as opposed to synchronic contemporaneous states. However, the processual nature of experiences doesn't need to mean that the relation between constituent sub-processes is sequential, i.e. linear in time. Experiential processes are temporal not only in the sense of succession in time, they are also *non-linearly dynamic* across timescales. This is what I mean by the 'diachronic-*dynamical*' view. Perceptual

[87] Kirchhoff's use of the term 'component' is slightly misleading, since the term can (and should, in my opinion) refer to any kind of constituents – including processes, even though in his use these two are separated, and it sounds like he refers to material parts when talking about components (at least in the sentence quoted). My use of 'component' is wider than Kirchhoff's: it includes not only material parts, but also (sub-)processes. I don't see as very useful the task of trying to carve and separate the material parts (components, in Kirchhoff's use) out of sub-processes.

experiences are not contemporaneous, but extending in time; not linear, but non-linear; not static, but dynamic.

Let us look back on the levels familiar from the mechanist view (see Craver's picture in section 3.2.2.). The lower-level consists of components that are tied together with causal relations (an advocate of the mechanist view would agree so far). According to the diachronic–dynamical view, it is this mutually influencing causality, i.e. *processuality*, between the components that *makes* them the constitutive components of the occurrent cognitive/conscious process. Hence, it is causal/diachronic relations that ground constitution. This kind of thinking can be found in Clark (2008) as well, even though he is not using the notion to explain the concept of constitution. His notion of *continuous reciprocal causality* fits very well with the diachronic–dynamical view: it is this continuous reciprocal causality that grounds constitution. (I will return to this notion later.)

The higher-level phenomena are temporal processes (e.g. counting with pen and paper), and their underpinnings unfold diachronically (e.g. brain processes, sensorimotor interactions with the hand and pen, etc.). The processual elements, i.e. the "elements engaged in processes that constitute across different timescales the occurrent cognitive process" constitute the cognitive/conscious system (Gallagher 2018). Or to put it in other words, the processual relations among the elements (both external and internal) *is* the cognitive/conscious processing itself (part of it).

This way of thinking is familiar from enactivism. (However, enactivists have not written much about the causal–constitution distinction as such, and the question is not discussed in these terms.) In enactivism, it *is* the (causal) reciprocal relationships between the subject and the environment that constitutes cognition – and according to enactivism, cognition includes experience. Cognition (and experience) *is* that interactive relationship. (For more details, see chapter 2.) Hence, the diachronic–dynamical view fits best not only with ECM but also with enactivism.

To sum up, the diachronic–dynamical view of constitution is the best model for ECM because it takes into account the diachronicity (understood as wider than in a merely sequential sense) required in explaining the dynamical nature of experiences. Furthermore, of the three models of constitution I presented, it is the only one that can explain constitution in an enactivist framework – which is important, since ECM relies

on enactivism. The active cognitive system enactivism deals with must include not only synchronic relations but also diachronic processes, since the cognitive system and its processes are constituted on that precise reciprocal dynamic change that happens in time. The other two models of constitution are incommensurate with the phenomenon to be explained, whereas the diachronic–dynamical model is not.

Fair enough, a critical reader might say. Perhaps this understanding of constitution really is the most suitable for a phenomenon like conscious experience. But does that imply that it is true? I think this question is slightly misleading. It is enough to say that it is the best way to explain the phenomenon under scrutiny. For example, biological phenomena cannot be explained with the material view of constitution, but require a view that is attuned to their intrinsic features (e.g. the mechanistic model of constitution). In the same manner experience – whether extended or not – requires an explanation that takes into account its special features. If they were left out, we would no longer be dealing with experience.

3.3. Demarcating the system boundaries

We have now proceeded from the static view, through a mechanist view to the diachronic–dynamical view. In this section, the approach is more pragmatic: the aim is to test the view developed in the previous section, and survey how it can be applied to demarcate what is constitutive and what is not. Constitutive relation is supposed to tell us which elements are genuinely components of the system and which are not. Giving an answer to "how does one demarcate the constitutive components from the causal background conditions of an experience?", will not only tell us what is a constitutive component of an experience, but also the method how to find that fact out. Therefore, by answering the causal–constitutive question, we will also get the other side of the coin: an answer to the problem how to demarcate the system boundaries. If we know the conditions for something to play a constitutive role, we also know that things that fulfil them are "inside the boundaries" of cognition/consciousness (where "inside" does not refer to the skin and skull barriers but to system barriers, which vary depending on the action we are examining). Therefore, those conditions function as general demarcation criteria for cognition/consciousness.

An eligible criterion for constitutive relevance will also respond to a criticism closely related to the C–C fallacy, i.e. the "cognitive bloat" problem (Adams and Aizawa 2001, 57), or the problem of "rampant expansion" (Sprevak 2009). It is a worry that "cognition bleeds into everything". It is clearly an unwanted effect of the externalist theory if it allows the mind to extend e.g. to the whole of the Internet (Clark & Chalmers 1998, 17), or to all the books on my bookshelf. Since the cognitive bloat problem is the outcome of committing the C–C fallacy, solving the C–C fallacy by giving apt criteria for constitution also solves the cognitive bloat problem. In other words, we need to solve the question of how to distinguish genuine components from causal background, and by doing so, we will also prevent the over-extension problem.

3.3.1. Mutual Manipulability as a Demarcation Criterion

Advocates of the externalist views have offered a wide variety of demarcation criteria. These conditions need to be fulfilled for there to be extension, i.e. when we can count something to be a genuine constitutive component/part. The suggestions for requirements include, for example, Clark and Chalmers's (1998) original "glue & trust" conditions, "the responsibility condition" (e.g. Roberts 2012; Cash 2013) and Gallagher's (2013) appealing to enactive engagements that grounds the "ownership of a process". These criteria stem from the externalist views themselves and they do not take into account the concept of constitution itself. (All these criteria are scrutinised in more detail in the following chapter.)

However, in what follows I will discuss a criterion that is neutral regarding EM and ECM, and instead starts from the notion of constitution itself. It provides a general criterion for demarcating what counts as a constitutive component, and I will discuss whether it can be used to demarcate the boundaries of cognition and consciousness in EM and ECM. This criterion is *mutual manipulability* (MM), and it derives from the new mechanist literature (e.g. Craver 2007a; 2007b). Even though MM originates from the mechanist view, it can be used with the diachronic–dynamical view, too. (Of course, the diachronic–dynamical view itself rose from the mechanist view.) Whether MM works is not dependent on the differences between the mechanist and the diachronic–dynamical view, but on other issues (which will be discussed later in this chapter).

Similar ideas have also been presented in the externalist side, e.g. "continuous-reciprocal-coupling criteria" (Menary 2007; Palermos 2014; Kirchhoff 2016). Clark (2008, 24) himself calls *continuous reciprocal causation* the interaction that "occurs when some system S is both continuously affecting and simultaneously being affected by activity in some other system O". Clark uses it in the same way as MM is used – a criterion to test whether something is a real component – or rather a real coupled system in his terminology. For Clark, continuous reciprocal causation is, however, only a sufficient but not a necessary condition for extension. For him, only the glue & trust criteria are necessary (though they are not sufficient) conditions. Palermos (2014, 34) disagrees, and takes the criterion of "continuous mutual interaction on the basis of feedback loops" to be a necessary and sufficient condition for constitution. MM, as I present it, is necessary

and sufficient for constitutive relations (on condition that it is a valid criterion in the first place). This is how the mechanists usually interpret it (e.g. Craver 2007, 159). Otherwise, it would be too easy to satisfy.

In MM, for something to count as a component (i.e. it being in a constitutive role for the phenomenon), an intervention on part(s) of the system (bottom-up) must affect the whole system, and an intervention on the whole (top-down) must affect its parts.

> [A] component is relevant to the behavior of a mechanism as a whole when one can wiggle the behavior of the whole by wiggling the behavior of the component and one can wiggle the behavior of the component by wiggling the behavior as a whole. The two are related as part and whole and they are mutually manipulable. (Craver 2007a, 153.)

MM is supposed to be able to capture how (e.g. neuro-) scientists experimentally determine the system boundaries. It is an interventionist method of distinguishing components from the causal background. Inter-level impact is a way to settle the boundaries by testing whether intervening on the putative system components (parts) have an effect on the higher-level phenomenon (whole), and on the other hand, by testing whether intervening on the phenomenon affects the putative parts. Constitutive dependency relations are bidirectional and the constitutive relevance can be tested based on this bidirectionality – whether the target is mutually manipulable. Causal relations are manipulative too, but only in one direction (from cause to effect). (Craver 2007a.)

There are at least three reasons supporting the use of MM as a demarcation criterion. First, it has no bias regarding the externalism–internalism debate, but it is a neutral way to set up the debate. Second, it is compatible with the interventionist view of causation (Woodward 2003), which is widely supported in philosophy of science these days. And third, I claim that it supports the diachronic–dynamical view (over the mechanist view – although it was originally part of the mechanist view).

Even though MM is part of the mechanist theory, it seems that it actually fits better with the diachronic–dynamical view. The reason is that in the mechanist view, causality and constitution are supposed to stay separated, but MM picks out constitutive relations that are causal – that is, inter-level wigglings are causal, so the innermost basis of constitution is actually causal. Craver uses Woodward's (2003) interventionist concept of causality to

explain the inter-level wigglings. This Woodwardian interventionist method brings causality into constitution – which is problematic for Craver's original mechanist model (but not for the diachronic–dynamical view). Depending on the standpoint, this can be seen either as a problem for the mechanist view in general, or for Craver's original formulation of the mechanist view, or for the MM requirement, or for the causal–constitutive distinction in general. However, it is not a problem for the diachronic–dynamical view. MM, the Woodwardian interventionist model and the diachronic–dynamical view fit all together – and can be used as a demarcation criterion when our scope is to set the boundaries of constitutive elements of experience in ECM.

3.3.1.1. Mutual Manipulability in Practice

Examples of how MM can be used to separate background conditions from constitutive parts stem from empirical experiments.[88] Kaplan (2012, 561) refers to Fisk et al. (1993), where they investigated the impact of gravitational forces on human sensorimotor capacities, such as reaching. They found out (quite unsurprisingly) that changing the gravitational force (from the normal background 1G) affects the performance of the sensorimotor task: the reaching performance does not remain the same in different force conditions. This is an instance of a bottom-up intervention – wiggling the putative component, which in this case is the gravitational force. So one side of MM is satisfied.

[88] Baumgartner & Wilutzky (2017) have criticised this central methodological claim of MM though. According to them, it is impossible to set the boundaries between causes and constituents empirically – instead the matter is purely *pragmatic*, e.g. constitution outperforms causation in explanatory power. Their view is rather inconvenient for the devotees of the constitution turn, and e.g. Kirchhoff's (2015) defence for opportunities of empirical research stemming from the causal–constitution debate (mentioned earlier in this chapter) is against this view. I think both sides are partly right: as the question itself is metaphysically loaded (as already stated at the beginning of this chapter), it already sets the frame for possible outcomes. However, even if the framework turned out to give us only *pragmatic* results, the hypotheses can be used in further empirical investigations.

According to Kaplan, if only the first part is obtained, we can take it as a preliminary but incomplete reason to consider the putative part as constitutive for the system.

To accomplish MM, top-down intervention must also have an effect on the putative part. An intervention on the subject in a reaching task, changing the set-up somehow – wiggling the whole – should have an effect on the gravitational force. This outcome is implausible enough, so we can rule out MM in this case. Hence, we can conclude that the 1G gravitational environment is not a constitutive component for the sensorimotor task, but a background condition. In this same manner, we can also say that oxygen supply and blood circulation are not components of cognition, because the two sides of MM are not fulfilled. Interfering with them bottom-up has a crucial effect on cognitive capacities, but interfering with cognitive capacities top-down doesn't affect the general abilities of respiration or circulation. So, with the help of MM, we can categorise them as background conditions for cognitive (or sensorimotor) capacities, not constitutive parts.

As our aim is to examine occurrent experiences, a relevant MM relation occurs between the putative components and the experiential state. Gallagher (2018) puts it in more fine-grained words: the MM relation lies between the processual elements of the (putative) components and what he dubs *occurrent cognitive processes*. The latter captures the ongoing engagements of a system's cognitive process – created by the processual elements of the components. Of course, instead of *occurrent cognitive processes*, my focus is on *occurrent experiential processes*, or *experiential processes*, for short. (Gallagher does not discuss the possibility that there would be any experiential properties involved.)

Intervening on the experiential processes (top-down intervention) affects the whole process. It can be done e.g. by setting a task and interfering somehow with its whole set-up. The aforementioned experiment of changing the gravitational forces during a reaching task could have been interpreted like this; however, it was not used as an outer intervention/wiggling in Kaplan's example, but as a putative component. (And as a putative component it satisfied the bottom-up wiggling side, but not the top-down side – hence, Kaplan concluded that it is a background condition.) It is an interesting feature in MM how the two levels and interventions on them easily get mixed up. This could be due to the fact that actually they cannot be separated in the first place, or at least we cannot

put our fingers on them, but all we get is holistic wigglings. (Baumgartner's *fat-handed intervention* tackles a closely related issue, but I will come to that in the next section.)

Anyway, for MM to be an eligible demarcation criterion for constitution, we must be able to differentiate not only between the two levels, but also the higher-level phenomenon (i.e. the experiential process) from the *intervention* on the higher-level phenomenon, and the lower-level components from the *intervention* on the lower-level components. Nevertheless, mixing up does happen in the literature relatively frequently. All this said, I think (at least to some extent) that the levels *can* be separated. Moreover, the interventions can also be separated from the phenomena and the components. For example, I would say that changing gravitational forces could be taken as an instance of a top-down *intervention* (against Kaplan's intuitions). This should not be conflated with the higher-level *phenomenon*, but as a means to test the phenomenon, e.g. a reaching task.

Bottom-up intervention, on the other hand, is easier to track. It is targeted to the (putative) components and their processual elements, i.e. how they are causally related to each other. This is easier to picture: it can contain wiggling the brain (e.g. with transcranial magnetic stimulation), wiggling some part of the body (e.g. tying hands together during a reaching task), or wiggling an external object (e.g. changing the way a calculator functions or change the material of a blind's cane).

Let us consider the hallmark example of EM, poor old forgetful Otto. It should be noted that the part–whole relation in Otto's case is not between the notebook and the brain – these two are both (putative) lower-level components. The inter-level relation is instead between the notebook, or rather between the *use* of the notebook (the part), and the act of remembering (the whole). (Clark and Chalmers present it as a dispositional memory, though that is not necessary and not very useful for my purposes). It is clear that wiggling the notebook (bottom-up) has an effect on remembering, e.g. tearing a page out makes a significant difference on the memory or the act of remembering.

But what about the other way around? Gallagher (2018) has suggested that wiggling Otto's remembering process (top-down) could be achieved by giving him the information in a different way. For example, Inga could tell him the address of the museum, and that would make the *role* (i.e. the *use*) of the notebook redundant – and making the role of the notebook redundant counts as affecting it, at least according to Gallagher. Kaplan (2012, 567), on the other hand, suggests that in a top-down intervention, engaging Otto in a

memory-demanding task would make him modify (by rewriting, etc.) the contents of his notebook when needed.

I think an even more simple top-down wiggling would be to intoxicate Otto and by so doing alter his remembering processes. Perhaps he would forget to consult his notebook, or have problems in reading the words correctly – which would cause him to go to a wrong address. Hence, it seems that we can say that the Otto case fulfils both sides of the MM criteria. However, this outcome is rather limited. The general problem with the Otto case is that it is a highly speculative thought experiment, and as such, does not reveal much about any real cognitive capacities.

Still, for the sake of argument, let us look at how this example would work with ECM. In ECM, the whole is the occurrent conscious experience and the part some processual element of a putative component. Let us consider a case where a blind person is using a cane to move around in a room. The lower-level putative component is the cane and the process how it is used, and the higher-level phenomenon is the occurrent experiential process of moving around. It is clear that removing the cane affects the experiential process, but how could wiggling the occurrent moving experience affect the cane? But in fact, to satisfy MM, it doesn't have to affect the cane itself – but rather the *use* of the cane. Perhaps we could wiggle the moving experience by changing the way the blind person gets a sense of the room in such a way that the role of the cane will change – maybe it becomes redundant or it gives wrong or different results. If we add another external resource, e.g. Inga or a guide dog, the cane becomes redundant. Alternatively, if we intoxicate the blind person, she might become unable to use her cane in the correct way anymore. It is important to remember that the intervention as such is not what we are examining; it is just a means to examine the phenomenon. In this case, it also looks like both sides of MM are fulfilled.

We might still want more empirical framing of the problem. Let us now consider an example that has actually been tested empirically: solving a maths problem. So far this experiment has been used exclusively regarding EM (e.g. Gallagher 2018; Kaplan 2012; Clark 2008), but I see no reason why it should not work with ECM as well (for reasons I will soon give).

When solving a simple maths problem, we use several faculties, which may include e.g. visual perception, language, memory, bodily positions and movements, pen and paper,

calculator and other devices. Intervening on the lower-level could be done by intervening on neural processing (e.g. by transcranial magnetic stimulation, or by some drug), or by preventing eye movements (e.g. saccadic eye movements as was done in Ballard et al. 1995), or by preventing bodily movements and gestures (e.g. if the hand gestures are prevented by forcing individuals to sit on their hands, solving a maths problem will take more time and be less accurate, as was shown in Goldin-Meadow et al. 2001.) (About the role of the gestures, see also the second chapter, section 2.4.1.) These bottom-up interventions clearly have an effect on the experiential process – therefore the first half of the MM requirement is satisfied.

But what about the other way around, i.e. wiggling top-down to detect the results in the lower-level components? Solving a maths problem is a complex set of cognitive and experiential factors, a complex experiential process. How can we get a grip on that as a whole? Wiggling the whole, as already hinted, can be achieved through somehow changing the whole set-up, e.g. engaging the subject in a task, and monitoring the lower-level effects. This is a method commonly used in neuroscience: engaging subjects in tasks and detecting changes in their neural activity. Gallagher (2018) contemplates ways of doing this in the case of maths problems.[89] He suggest we could wiggle the whole by setting up a time limit, or a competition to see who solves the task quickest, or having a distractive audience who witnesses the counting act.[90]

Gallagher himself does not consider it in the following sense, but I myself think it is clear that these kind of top-down interventions can have an effect on the components. They would probably change the bodily postures and gestures, eye saccades, use of external tools (e.g. pen and paper or calculator), brain processing, etc. Therefore, the second part of MM is also satisfied, and we can conclude that the elements that were wiggled both ways are components of this cognitive (and potentially also experiential) process.

[89] Gallagher's own train of thought goes in a wrong direction there, though. He seems to have mixed up the intervention and the target of the intervention, and infers from the lack of change in the intervention itself that it is not a component – which it was not supposed to be, but only a way to trigger the putative components.

[90] Perhaps an even more illuminating example of MM is the role of saccadic eye movements (Ballard et al. 1995; discussed in Kaplan 2012, 563–564; and in Clark 2008). It was shown experimentally that during a memory-demanding copying task, the subjects were three times slower when their saccadic movements were prevented (therefore the bottom-up side was satisfied). The task itself is the top-down intervention: the subjects needed to cope with the cognitively demanding task, and for that reason begun the pattern with eye saccades. This example shows in a precise way how bodily skills are part of the cognitive functions. However, it speaks only for the embodiment thesis, not the extension thesis, and as such it is not straightforward evidence for my case.

Even though others have used this example only in order to support EM, I think it is a hasty way to see the issue. People don't suddenly become Chalmers's zombies when solving maths problems – many cognitive tasks (but not all) are also experiential. As I have argued in the first and second chapter, there is often something it is like when undergoing a cognitive task. Of course, someone might say that this "something-it-is-like" is irrelevant for the cognitive task, that it is just some kind of added extra or epiphenomenal factor for the completion of the task. But is this view coherent? Clearly cognitive tasks (such as solving a maths problem) can involve experiential features (e.g. gesturing with your hands, counting using your fingers, playing with one's pen, smiling, frowning, etc.). These features play a real role in how the task is completed (easier, quicker, more accurate), and they do feel like something. Several empirical experiments have shown that these features matter (e.g. sitting on your hands, preventing gesturing, preventing saccades, Clark & Chalmers's Tetris example), so they cannot be dubbed epiphenomenal features of the cognitive task. Hence, we can say that this example speaks about both EM and ECM alike.

3.3.1.2. Limitations of Mutual Manipulability

The MM criterion for constitutive relevance has also been criticised, for various reasons. The most apparent problem that arose from the discussion above seems to be that it is still unclear whether we really reached the "whole" in the top-down "wiggling the whole". It appears that bottom-up intervention can be done, but top-down is hard to achieve. It might be difficult to put one's finger on the system as a whole. What exactly is the "whole" in the case of cognitive or conscious process? It is difficult to talk about the whole process without actually referring to some part of it. As Gallagher (2018, 219) has noted, the intervention "has to occur 'some where' or in some aspect" of the system – the whole might be a "part" too after all. It is difficult to find the right level of "wholeness" that we

should be wiggling. This depends on how we frame the question in the first place. The differentiation between bottom-up and top-down interventions might be clear conceptually, but this might only be due to our theoretical framing of the question.

As we learned from the previous chapter, the connection between the sub-personal and personal level is one of the most discussed topics in the history of philosophy of mind (although with different terminology). These two levels are connected with bottom-up and top-down methods, even though they do not have identical meanings.

On the one hand, using a bottom-up method (i.e. a sub-personal approach), we cannot obtain any whole, since there is no distinct whole in that level. The "whole" is just the combination of the material parts, and nothing more. It is not "the conscious experience being experienced" or "the subject of the experience", because that would be a personal level phenomenon. All we get is a list of material parts, e.g. brains, bodies and blind persons' canes. On the other hand, using a top-down method (i.e. a personal level approach), we cannot obtain any parts, because approaching from the phenomenological whole, the experience is not dividable into parts as it was at the sub-personal level. However, to have a constitutive relation, we need the relation between the constituent and the constituted. As I presented in chapter 2 (see section 2.3.6.), enactivism offers a solution, and binds the two levels together.

Besides, the usefulness of MM for demarcating constitution would be doubtful if Kaplan (2012, 560) was right and it only revealed a sufficient condition for something to be a component. If that was the case, one could not conclude from a failure to fulfil MM that something is not a component – it would be too favourable a criterion. However, as Baumgartner and Wilutzky (2017, 1122) remark, Kaplan's interpretation is wrong. They point out that Craver (2007, 159) presents MM as a sufficient condition for constitutive relevance, and a lack of MM as a sufficient condition for constitutive irrelevance. Therefore, MM is both sufficient and necessary.

In the literature, however, the main focus of the criticism towards MM has been the inconsistency between the requirement for non-causality on the one hand, and the use of Woodwardian (causal) interventionism on the other (as mentioned in the previous sections). There have been various attempts to solve the problem (uphold the causal–constitution distinction while also upholding interventionism). One of these attempts is the so-called "fat-handed intervention", where the intervention is said to wiggle both

levels simultaneously by means of one common cause (Baumgartner & Gebhartner 2016; Baumgartner & Wilutzky 2017).

The reason for employing the notion of fat-handedness is the same worry that we are familiar with now. According to fat-handedness critiques, it is impossible to put our fingers (whether fat or not) on one level only – to *surgically* intervene on one level and thereby affect the other level. "Mechanist systems can only be manipulated on all their levels at the same time" (Baumgartner & Wilutzky 2017, 1113). However, Baumgartner and Wilutzky's aim is to criticise MM as a criterion for constitutive relevance in the case of EM – not to save it by using the fat-handedness argument.

Krickel (2018) criticises the fat-handedness approach for several reasons, e.g. that it loses the ability to distinguish between top-down and bottom-up interventions, since interventions always happen at both levels simultaneously. This is a problem, because the motivation behind Craver's MM was precisely this – to show how scientists intervene ("wiggle") in their experiments using either bottom-up or top-down interventions. Her own solution (how to uphold both interventionism and the causal–constitution distinction) is based on a move that acknowledges the problems that arise from the requirement of synchronicity I pointed out earlier in this chapter. She interprets MM in diachronic, rather than synchronic terms: the two sides that manipulate each other mutually are macro-level temporal parts of the phenomenon and micro-level component parts of the mechanism. Since the "whole" is a temporal process, an intervention on a lower-level component/process needs only to affect a temporal part of the whole.[91]

Even though my primary goal is not to solve the debates within mechanist literature about constitution, it seems fair to say that their understanding of the inter-level relations needs an update. Instead of synchronic, atemporal relations, they are better conceived as temporal, diachronic and hence including causal features. This way of thinking saves interventionism from the fat-handedness arguments if we accept Krickel's (2018) account. It also enables us to keep the fundamental difference between causal and constitutive relevance.

[91] There has also been a couple of attempts to formulate alternative demarcation criteria for constitutive relevance that do not rely on MM and interventionism. Harbecke (2010; 2015) and Couch (2011), for example, have argued for a *regularity theory of constitution* that rejects the idea that constitutive relevance can be explained by means of interventions.

Furthermore, MM leads to another problem: on what criteria should we decide whether MM is fulfilled or not? From what level of explanation should we go and look for the putative components? The level of explanation depends on what we want to explain, of course. The mechanist view is inherently a *compositional* view – and so is the diachronic–dynamical view as I have framed it here – the phenomena under examination consist of parts and wholes. If our aim is to explain *cognitive systems*, this kind of thinking makes sense: it is intelligible to talk about the parts and whole of a cognitive system. A cognitive *system* can be conceived as a whole that consists of its parts.

However, if the aim is to explain cognitive *processes*, the part–whole relation is not as straightforward. Gallagher (2018, 209) asks whether we should also think of cognitive processes as composed of parts, where one part of a process is distinct from another part of the process, and each part itself is a process, and together they form the larger process as a whole – without giving an explicit answer. Kirchhoff, on the other hand, explicitly states that in diachronic process constitution, processes have distinguishable individual parts. "A process might involve any number of component parts, but it always involves *some* parts" (Kirchhoff 2013, 343). The reason for this is that the explanation must stop somewhere. According to Kirchhoff, even though physics might tell us that strictly speaking individuals do not exist (because, e.g. only quantum fields exist), this level of explanation does not make much sense in cognitive sciences, where instead we must be able to identify not only entities but also their activities.

> To appropriately characterize "part" in processual terms, we must replace what Seibt has recently called the "particularist conception of individuals" – i.e., entities that are intrinsically individuated and which have a determinate unique location – with a view of individual parts that focuses not so much on "location but on '*specificity-in-functioning*' in the widest sense of 'functioning', i.e., focuses on the dynamic role of an entity (e.g., an activity) *within a certain dynamic context*" (Seibt 2009, p. 484; italics added, quoted in Kirchhoff 2013, 344–345).

With this in mind, it is possible to say that even experiential processes have parts – only without a determinate spacetime location. Moreover, I think there is even a simpler way

out, and we can uphold a compositional view in the case of experiences. It makes sense to divide the material basis of experiences into parts on the sub-personal level, or into lower-level components in MM terms. The explanandum of ECM is the material basis of perceptual experiences – answering the question which components take part in forming the material basis of certain perceptual experiences. Therefore, it is possible to interpret ECM in compositional terms, but it must be done along the lines of the diachronic–dynamical and not the synchronic approach. What is at stake here, however, is not the validity of ECM, but the validity of MM, and whether it can be used to demonstrate the constitutive relation in ECM.

3.5. Conclusions

EM and ECM concern components and how they are organised, and are not concerned with the etiological history of the components. The causal question would be: What are the factors that cause cognitive/conscious processes and what is their etiological history? Instead, EM and ECM are answers to the constitutive question: What are the factors that make up the cognitive/conscious processes?

The C–C fallacy objection does not work against either EM or ECM because its premise (the material view of constitution) is a wrong way to treat mental phenomena, and especially dynamic experiences. The synchronic notion of constitution that is embedded in the C–C fallacy objection makes it unable to pick out the temporal dynamics that are inherent for the phenomena ECM is dealing with. Even though the C–C critique is the same for both EM and ECM, there is a difference in how they might answer the critique. This mistaken notion of constitution is in fact not inaccurate in the case of EM, or at least with the original Otto example. The reason is that the Otto case deals with dispositional beliefs, and dispositional beliefs are in fact static in nature (at least if we compare them

with experiential states). My belief about the dates of my parents' birthdays or about the address of a museum are not occurrent in nature as long as I don't consider them. But my experience of seeing a red tomato or feeling pain in my right foot are never dispositional but occur in a temporal mode, in a certain here and now. Phenomenal experiences are always occurrent in nature. Because of this difference, it is even easier to see why the C–C fallacy objection does not work against ECM than against EM.

However, in Clark's defence, we need to remember that Otto is not the only case of EM – the story of Otto serves rather as an intuition pump for a very much wider phenomenon. Clark's entire theory of EM avoids the problem that might arise if one focused only on dispositional beliefs (which could, at least on some reading, fit easier with the static view of constitution). Whereas Otto and his notebook represent an example of dispositional EM, for example counting with pen and paper works as an example of occurrent EM. The latter example drifts away from a static understanding of constitution in the same way as cases of ECM.

The C–C fallacy criticism presented by Adams and Aizawa assumes that constitution is a synchronic, atemporal relation. As I showed in this chapter, occurrent cognitive and experiential states are temporal. Hence, the presumed synchronic notion of constitution is unable to pick out the phenomena it is trying to explain. The C–C fallacy objection relies on a false premise and it is a question-begging argument.

Not only can we conclude that the C–C fallacy is mistaken, but also that the diachronic–dynamical concept of constitution creates a positive way to understand the *extended*-relation as a constitutive one. We can conclude that some experiences are synchronically and diachronically constituted by external elements. I have argued in this chapter that both synchronic and diachronic relations can fall under the label of constitution – when all requirements are fulfilled, of course.[92] Furthermore, it has been argued that even if diachronic relations fell under causality, it would not justify the C–C fallacy criticism.[93] The reason for this is that the importance of external resources for our experiential events remains evident in any case – regardless of what our stance to the rather metaphysical causal–constitution quarrel is. For a cognitive scientist, their explanatory power is quite

[92] The following chapter deals with these requirements in more detail.

[93] E.g. Levy (2011, 294) does not think our conceptualisation makes much difference: "If neuroethicists and philosophers wish to call only some part of human cognitive machinery our minds, and call the rest its [causal] scaffolding, so be it. […] All that is lost […] is the rhetorical power which comes from the identification of extended mechanisms with the mind."

similar, and the ontological status doesn't make much difference (for similar views, see Sprevak 2010; Colombetti & Krueger 2015; Krueger 2018).[94]

However, it was important to show that ECM goes under the label 'extended' rather than 'embedded'. Another question is how fruitful that distinction is for an empirically attuned philosopher of mind or cognitive scientist. How could we ever test empirically whether something is causal or constitutive without just relying on our conceptualisations of them, which are more or less based on "one intuition over another" as Colombetti & Krueger (2015, 1159) have phrased it? The notion of constitution needed clarification, and especially constitution in the case of dynamical experiences. However, metaphysical inquiry will not provide us with answers about how experiences are actually extended, and what their limits and criteria are. This is the more pragmatic and empirical task of the next chapter.

[94] Ross & Ladyman (2010) go as far as to argue that the causal–constitution distinction plays no role in the natural sciences: therefore it should not be a problem in cognitive sciences either. However, I think they are wrong in drawing conclusions from the natural sciences to philosophy of mind. Although in physics, for example, the causal–constitution differentiation is quite meaningless, we cannot infer from this that this is necessarily so in all fields.

4. From Mere Extension to Functional Incorporation

4.1. Introduction

In this chapter, I will outline the preconditions for my position concerning ECM. I will state what is needed for there to be a case of ECM, namely which requirements need to be fulfilled. This chapter is more about setting the limits of what is constitutive specifically in ECM, and is more pragmatically and empirically oriented than the previous chapter. However, the underlying question remains the same: how to distinguish constitutive components from etiological/causal background conditions. In this chapter, the question concerns my own theory, that is how I am drawing the lines in my thesis on ECM. The borderlines I draw are much narrower than in many other general 4E-accounts. Whereas the second chapter provided arguments why we should accept ECM and the third chapter surveyed how the relation can be constitutive, the present chapter is more descriptive. It doesn't aim to *argue* for ECM or for its constitutive character, but rather show what is meant by (constitutive) extension in ECM. The criteria I will set for ECM should be taken as *epistemic tools* rather than ontological statements – the criteria itself are not answers to the question of what constitutes the phenomena they are about, but rather tools that help us to see what belongs to those constituents.

The chapter will proceed as follows. First, I will demarcate different degrees of extensions, from mere non-functional short-term extension to functional, sensorimotorically controlled incorporation. I will then review the literature on what *glue & trust* criteria have been proposed for different sorts of externalisms so far, and finally give my own glue & trust conditions for ECM. Finally, I will discuss one concrete example that I suggest fulfils my glue & trust conditions, namely *sensory substitution* technology.

4.2. The spectrum of extensions

I will differentiate between four "types" of extension – from weaker to stronger, from fleeting to more robust. This taxonomy should not be read as a categorisation of different kinds or classes of extensions, but rather as a scale or spectrum where the borders between different groups are not steadfast. In the literature, the differences in extension have usually been presented in pairs of two – e.g. *extension* vs. *incorporation* (De Preester & Tsakiris 2009; Thompson & Stapleton 2009; De Preester 2011) and *use* vs. *incorporation* (Clark 2008). The distinctions have been justified with the help of neurophysiological research on how tool use affects body schema (Maravita & Iriki 2004; Berti & Frassinetti 2000). According to Thompson & Stapleton (2009), the difference between extension and incorporation is that with the former, we extend our abilities, and with the latter, we not only extend our abilities, but also a phenomenologically different status is gained.[95] This differentiation is closest to the distinction I draw between the first two types (short-term extension and integration) together contrasted with the last one (functional incorporation).

Another distinction made in the literature is between *dispositional* and *occurrent extension* (see the discussion in the second chapter, and Colombetti & Roberts 2014). The former refers to standing non-occurrent mental states (such as a standing belief of a museum's address written down in one's notebook), and the latter to cases of temporary states that occur at a certain moment (such as the act of counting realised with pen and paper). As my aim is to examine experience, and because experience is always occurrent, all my examples here fall under occurrent extension. Thus, dispositional extension is not discussed in this chapter.

Distinctions have also been made within the notion of incorporation. Colombetti (2016) notes that Merleau-Ponty deals with two kinds of incorporation. She calls them *habit incorporation* and *object incorporation*. Merleau-Ponty's (1945, 166) example of habit incorporation is an experienced typist who doesn't have to pay attention to the keyboard. Her fingers "know" what to do. The bodily awareness (gained through habit) of where each letter is on the keyboard is similar to our habitual awareness of where our limbs are.

[95] They mention that their distinction is indebted to De Preester's work. Perhaps due to limited space, Thompson and Stapleton make the distinction sound simpler than it is. De Preester & Tsakiris (2009) and De Preester (2011) have probed deeper into the topic, and revealed the complexity of the matter.

Object incorporation, on the other hand, refers to cases where *material objects* are incorporated into the body schema, e.g. a blind person's cane. However, my differentiation within the notion of incorporation is different from Merleau-Ponty's (and Colombetti's). Nonetheless, it is good to recognise the existence of habit incorporation as well, and the different ways the term incorporation can be used.

I think it is useful to have an even more fine-grained taxonomy than any of these, which is why I will present four degrees or dimensions of extensions. I have labelled them as follows: *short-term extension*, *integration*, *prosthetic incorporation* and *functional incorporation*. The taxonomy will reveal the differences in the degree of attachment: how firmly the external part is part of the system (this doesn't mean the level of physical attachment). It is important to notice that all four groupings fall under (constitutive) extension.[96] They are different ways for an external element to be a constitutive component of a mental state, process or system. Hence, the distinction between extended and embedded is outside of this setting – all four dimensions belong to the class of *extended* (as differentiated in the first chapter, section 1.3.)

The grading of extensions also helps us to see the difference between EM and ECM. Revealing the difference is not straightforward, because all types of extensions describe occurrent states that are both cognitive and experiential, and as such all of them (except prosthetic incorporation) could be considered to belong to both EM and ECM. However, I classify EM as something that belongs to the group of *integration*. Even though the type of integration includes experiential qualities, I claim that it is not enough to qualify as ECM. On the other hand, even though functional incorporation surely contains cognitive processing as well, it only qualifies as a group of ECM and not of EM, because the experiential aspects are what differentiates it.

The main demarcating question is rather *what* is extended: an experiential state or process contrasted with an experiencing subject. The latter is needed for there to be a genuine case of ECM. This differentiation is similar to Clark and Chalmers's (1998), when they separate *cognitive processing* from the *mind* (by *mind* they mainly refer to *beliefs*). The former involves individual acts such as using a rotation button while playing Tetris, and the latter involves the whole of Otto's memory/belief system. In a similar vein, in my

[96] Even in prosthetic incorporation, we can say that the external component is constitutive for the certain bodily function it serves – that function just doesn't fall into EM or ECM because the function in question is neither cognitive nor experiential.

differentiation, the first two degrees describe extension of experiential (and cognitive) states or processes (such as the act of counting using pen and paper), and the fourth degree describes extension of a larger system (such as a person using a blind person's cane). The third group, prosthetic incorporation, is included only for clarificatory purposes, it is neither an instance of EM nor ECM. Nevertheless, it is necessary to distinguish this type of extension from the fourth one. These levels of extension should be taken as epistemic tools rather than ontological statements. Their purpose is to explain the differences in how an external object may become part of a coupled system that realises an experiential state.

An important aspect in the demarcation of these levels of extension is the notion of *functionality*. It does not refer to *functionalism* as it is understood in analytic philosophy of mind. Obviously, I do not oppose functionalism's core thesis, according to which mental states depend on the functions they have or the roles they play, rather than on their material realization.[97] This, however, is not what I am aiming at with the notion. Instead, I refer to something that is taken as part of the *functional system* – not only that it has a function that it fulfils. Being a physical part is not enough; the tool has to be under the sensorimotor control of the subject, and it has to become part of the transparent subjective point of view. It goes without saying that my notion of functional incorporation is very much influenced by Merleau-Ponty's (1945) views on incorporation.

Another aspect that needs some further clarification is the concept of *tool*. It is perhaps the most central concept in this chapter – extension occurs in and by means of tools. For the position I am arguing for, the tool needs to be a material object. Thus, habits, cultural practices, etc. are ruled out from my use of the concept.[98] Frédérique De Vignemont (2018) refers to Beck's (1980) landmark book on animal tool use, and spells out that tools extend our *motor*, *sensory* or *spatial* capacities. Helena De Preester's (2011, 121) list is slightly different – according to her, tools extend *motor*, *sensory* or *cognitive* capacities.[99] A *tool* does not refer to any object, but only to "unattached external objects that one

[97] This much is obviously true for anyone who supports any kind of externalist view about the mind. Still, functionalism as a doctrine in analytic philosophy of mind is somewhat problematic, and should not be confused with the views presented in here.

[98] However, I by no means oppose the idea that habits and cultural practices can also be ways of extension (e.g. Merleau-Ponty's habit incorporation). They are just not what I am after with my notion of ECM, which is a narrower concept that includes only object extension.

[99] I think it is problematic to distinguish 'cognitive' from the other capacities. All the instances of tool use that I use as examples here are not purely cognitive but are also sensory or motor as well.

actively manipulates – and not simply holds – for functional purpose" (de Vignemont 2018, 2).

De Vignemont's and De Preester's definitions leave some unanswered questions. For example, how *unattached* do the objects need to be? Even though hearing aids and sensory substitution devices are rather firmly attached to the body, I think they should be treated as tools. I suggest that the level of attachment is not a crucial question when we need to decide whether something is or is not a tool. Neither is the fact whether the tool is replacing (e.g. an artificial limb), substituting (e.g. a sensory substitution device), enhancing (e.g. a hearing aid) or creating (e.g. a hammer or a robotic sixth finger)[100] a body part or function. However, the location of the putative tool – whether it is located inside or outside the skin – might affect the criteria because the location is related to the possibility of the subject's motor control.[101] Moreover, if taken literally, de Vignemont's definition would also lead to a situation where if somebody was just holding e.g. a fork or a hammer, they wouldn't count as tools.

However, I agree that active manipulation, adaptation and a functional goal-drivenness are necessary for what we are looking for. Merely holding an object (even if it was a hammer) doesn't count as *tool use* in the sense we are after here. To understand what is meant by 'tool', we need to look at its different roles for the user. These issues show that we cannot actually define the meaning of tool without its *use*. Whether something counts as a tool depends on how it is used and on its relation to the tool user. The level of attachment and entrenchment varies, and simply talking of 'tool use' still leaves open what kind of relation is in question. The following sections aim to shed light on the different dimensions of tool use as instances of extension, integration and incorporation.

[100] For the robotic sixth finger, see Meraz et al. (2018).

[101] I am not saying that a device located under the skin (endoprosthesis) could not count as a tool *in principle*, or that the skin would be an absolute demarcating barrier. I just want to draw attention to practical limitations. What matters is the possibility of taking the tool under one's control, and it is more difficult with an endoprosthesis. I will discuss this in the section on *prosthetic incorporation*.

4.2.1. Short-term extension

Consider an everyday task carried out with a tool. For example, imagine me cutting someone's hair with scissors. I am not an expert, and the result would not look pretty, but I am still capable of shortening hair because I can use scissors. The relation between the scissors and me is only temporary, but it is goal-driven and we can say that a sensorimotor *state* is extended. We are surrounded by tools that are potential for short-term extension – pens, spoons, hammers, axes, rakes, spades, tennis rackets and so on. They are the very common "artifacts that we use and control in order to extend our abilities" (Thompson & Stapleton 2009).[102] As Clark (e.g. 2008) has clearly shown, we off-load cognitive burden to the environment (to tools and by means of tools), and create new ways of cognising with tools. However, this off-loading does not only happen in the cognitive sphere, it is also very much a sensorimotor and perceptual phenomenon. It extends the sensorimotor body.

This type covers incompetent tool users, i.e., people who are beginners in using some tool. For example, think about somebody starting to practice to play the violin. The instrument fulfils its role, but the violin doesn't become part of the (transparent) system: it is not rooted to the system and made one's "own". Of course, sometimes also the tools we have used for a long time can stay merely short-term extended, e.g. consider somebody who has played the violin for 10 years, but still feels quite uncoordinated and detached from her violin, unable to express what she would like to express with it. A fluent tool user is a different story and belongs to the type of integration or incorporation – depending on which aspects we are looking at. As I have stressed, the borders of these degrees of extension are not set in stone, and each case might require individual conditions.

Technically speaking, perhaps we should demarcate a group of extension even below this one: *mere tool use* without extension. Consider somebody just holding a tool without intentionally manipulating anything with it. The task might still get accomplished, but there is no sense of agency or control over the tool included. For example, consider a small child holding a knife – she might accidentally cut something without realising and without aiming to cut anything. Or somebody might move a pen on paper while doing

[102] I would not disagree that some techniques in general – such as writing – also count as instances of extension, but I limit the discussion to concrete material objects.

something else that captures her awareness completely. However, as the reason for presenting these four types is that they are different kinds of instances of extension, *mere tool use without extension* wouldn't belong to that setting.

Short-term extension is a predecessor and a more fleeting version of integration. In short-term extension, the tool extends only certain *states* (e.g. cognitive, sensorimotor or perceptual), but the whole *system* (of which the aspect can be e.g. cognitive, sensorimotor or perceptual) is left untouched. Integration, on the other hand, extends the whole system. So the difference between these two types is about what aspect or entity we are asking about. Moreover, the type of short-term extension is not functional in that specific way in which I use the notion (which will be discussed further later). *Short-term extended* tools surely have a function in a general sense of the term (e.g. the scissors succeed in their function of cutting hair). But this is not enough to count as 'functional' in the way I am using the concept.

Even though I think that even with a short-term tool use externalisation may occur, I admit that the fleeting nature of tools that are used only rarely or sometimes might be problematic for the theory. Already in their seminal paper, Clark and Chalmers (1998) restricted their theory: they argued that the notebook must play a *constant* and *stable* role in Otto's life. I am going to restrict my position in a similar way. Thus, the type of short-term extension is not enough for something to count as ECM.

4.2.2. Integrated extension

This time, think about Sweeney Todd, who cuts his customers' hair and throats with an expertise he had gained during his years as a barber in Fleet Street. The razor-sharp scissors move effortlessly, without a need to pay attention where his hand ends and the tool begins. Whereas an unexperienced scissor user won't notice the difference between

one pair of scissors and another, Sweeney Todd has created a special relationship with his scissors that can even be two-sided. His way of using scissors has partly created their sharpness, and on the other hand, the special features of the scissors have shaped how the barber cuts with them.

This kind of coupling is more transparent, stable and individualised than short-term extension. Sweeney Todd doesn't have to concentrate on the technical details of the cutting act or the scissors, but he has a direct, transparent access to his target in the world (hair) and how he wants it to be cut and shaped. In a similar way as a skilful artist paints a portrait without needing to look at her model before every brush stroke (see Noë 2015), a skilful barber works with hair. Following Noë's idea, this action is an interactive, dynamic process that more closely resembles dancing than it does the representing of ideas. I suggest that the scissors are *integrated* into Sweeney Todd's sensorimotor, perceptual and cognitive systems.[103] In his case, not only a temporary occurrent sensorimotor *state* extends, but he and his scissors together form a new whole – a coupled system whose function is to cut hair (and throats).

This type of extension is about the same phenomenon that was described in the previous section, but it is more permanent and affects a larger area than short-term extension. Otto could be seen as an example of this kind: an external element (the notebook) is *integrated* into the system (Otto's memory capacity). It is not only about a specific museum visit, but about his whole memory system. Also the way most of us use smartphones these days counts as an example of integration. The phone has been taken into our system: it is trusted, it has gained an almost transparent status, and if it is taken away, many of our cognitive functions suffer. As a guide in differentiation, we can use similar criteria with Clark and Chalmers (1998). Especially their first glue & trust criterion – constancy, durability and reliability – is what differentiates integration from short-term extension. The difference between short-term extension and integration is a question of degree, and as said, should be considered separately in each case.

The term 'integration' or 'integrated' has been used in the literature, e.g. by Menary (2007; 2010c), who defines EM in terms of integration. He uses the term for

[103] With *integration*, it is not evident *into what* the external tool is actually integrated – it could be the mind, the cognitive system, an organism, the self, etc. Instead, in the case of in*corporation*, the target is quite self-evidently the *corpus* (the body) and the bodily stance or point of view.

differentiating his view from arguments based on cognitive *parity*. According to him, since EM does not rely on the parity principle, the external elements do not have to be similar or have similar functions with the biological ones – they do not have to be "functionally equivalent". Instead of parity, the external elements are integrated into the system in a complementary way. Menary (2010c, 235) writes that "it is because the external vehicles provide a different kind of functionality and because they can coordinate with internal processes that they are integral parts of our cognitive systems".

However, I use the term in a slightly different way. I accept Menary's view, and agree that his account of integration is a better way to understand externalist views than the first-wave views based on parity principle. However, this is not what I am after with the notion of *integration*. My aim is to differentiate integration, on the one hand, from short-term extension, where the external element doesn't get integrated into the system, and on the other, from incorporation, where bodily ownership is required. Integration, according to my reading, is hence a stronger relation than short-term extension, and a weaker relation than incorporation. This reading is lacking from Menary's view.

Integration is a type of extension that happens in EM. Even though an experiential side is included, some aspects are not present that are needed for ECM. For example, the body schema doesn't get extended in this type of extension. This might give empirical methods to track the difference between integration and incorporation (for neurophysiological studies on the extension of body schema, see Maravita & Iriki 2004; Berti & Frassinetti 2000). I will list the other differentiating aspects in the section on functional incorporation. However, before that, let us look at another type of incorporation.

4.2.3. Prosthetic incorporation

Consider a patient using a cardiac pacemaker to maintain a healthy heart rate. It is implanted in her body, and will become a non-biological part of the body. Or consider an endoprosthesis, i.e. a prosthesis that is located inside the body, e.g. in the hip where a dysfunctional joint is replaced with an artificial one. The pacemaker and the prosthetic hip enable bodily functions that keep the patient alive, or at least improve the quality of her life significantly. We can also think of a transplant (e.g. heart or kidney) – a biological version of prosthetic incorporation. (Or if we want to continue with hair-related examples, we can think of somebody using a wig.)

This kind of incorporation is *mechanical* rather than functional. An endoprosthesis is functional only in the narrow sense that it becomes part of the physical, bodily functions. It is not functionality as I define it in this taxonomy of extensions. The crucial difference between a prosthesis that is located inside the body and a tool that the subject is using is that the former is not under the control of the experiencing subject, whereas the latter is. Moreover, we cannot feel the world through an endoprosthesis, the transitive nature of a tool is lacking. Thus, an endoprosthesis or other prosthetically incorporated object is not a tool.

A terminological clarification is needed here. I use the term 'prosthesis' to refer only to cases that fall under prosthetic incorporation. I don't call them 'tools', since they don't satisfy the requirements of how I define 'tool': they are not unattached objects taken under the ownership, control and point of view of the user. These concepts are not used consistently in the literature, for example 'prosthesis' sometimes refers to any device that the subject can *use* or i*ncorporate*, and hence also includes what I refer to as tools (e.g. De Preester 2011).[104]

There are two different ways for an object to belong to the group of prosthetic incorporation. First, when they are *replacing* body parts or functions, as was the case with the pacemaker and artificial hip (especially internal body parts, i.e. endoprostheses, but the distinction between external and internal replacements is not rigid, but may vary

[104] I will discuss artificial limbs briefly in the section about functional incorporation. It is not a simple question whether they should be treated as prostheses or tools.

depending on the case and what aspect of it we are interested in).[105] Second, the object can create an extra part or function that does not replace any pre-existing function. This is possible at least in principle, and in the case of Australian performance artist Stelarc and his many prosthetic objects, such as a statue in his stomach.[106]

Even though the type of prosthetic incorporation is non-functional, it still deserves to be called incorporation, instead of short-term extension or integration, because an external, non-biological element is taken as a part of the (physical) body. Furthermore, this kind of extension should still technically go under the label of *constitutive*, because artificial body parts clearly work as constitutive components for the *bodily* functions in question. However, prosthetic incorporation is not very interesting for my purposes – it is not the kind of extension that is needed for ECM. Still, this type's existence is important to acknowledge, because it shows that incorporation can be divided into two: prosthetic and functional incorporation, where the former is mechanical and passive, and the latter active and goal-driven. Apart from showing what kind of incorporation is needed for ECM (i.e. functional rather than prosthetic), pinpointing the group of prosthetic incorporation also sorts out one potential misunderstanding that could be used as a critical note against ECM, namely the claim that ECM's proponents allegedly argue for ECM on the grounds of prosthetic incorporation.[107] One unfortunate passage by Andy Clark (2009b) initiated the problem, and others by Katalin Farkas (2012), and Karina Vold (2015) made it even worse.

> [I]magine a case in which a person (call her Diva) suffers minor brain damage and loses the ability to perform a simple task of arithmetic division using only her neural resources. An external silicon circuit is added that restores the previous functionality. Diva can now divide just as before, only some small part of the work is distributed across the brain and the silicon circuit: a genuinely mental process (division) is supported by a hybrid bio-technological system. That

[105] This group also contains thought experiments where neurons are replaced by silicon circuits. Apart from philosophers' armchairs and science fiction, this kind of experiment has in fact been conducted with California spiny lobster (even though with only one of its neurons). I will discuss lobsters and silicon circuits soon.

[106] Yet another interesting question is chemical altering of the brain (e.g. with drugs or antidepressants) and whether that would belong to the group of prosthetic incorporation or not. However, that question will remain unanswered here.

[107] 'Prosthetic incorporation' is my term, though. None of the writers referred to here use that term.

> alone, if you accept it, establishes the key principle of [EM]. (Clark 2009b.)[108]

Farkas (2012) – quite justifiably – writes that if one accepts this much, there is no reason to leave conscious experience out. (I agree with her about this, but I don't accept Clark's original claim.) In order to show that Clark's method is not restricted to the cognitive sphere, but that it encompasses consciousness as well, Farkas modifies Clark's example slightly.

> [C]onsider the example of Hera, who suffers minor brain damage and loses the ability to process auditory signals using only her neural resources. Therefore she does not have auditory experiences anymore. An external silicon circuit is added that restores the previous functionality. Hera's experience of hearing is completely restored: but now a genuinely conscious event (an auditory experience) is supported by a hybrid biotechnological system. (Farkas 2012, 443–444).

Farkas's main reason for using the *silicon chip* argument is to show Clark's inconsistency, and not to argue directly for ECM with it. Vold's (2015) position, on the other hand, is more difficult to excuse, because she is using the silicon chip argument as an explicit argument for ECM. She asks us to imagine a situation where a patient's brain functions are deteriorating and doctors start replacing her biological neurons with artificial ones that are programmed to behave identically with the original ones.

> Now imagine that instead of entering your skull to replace your deteriorated neurons where they are, doctors consider it preferable and less intrusive to the biological shell to do as much as they can externally. So doctors tell you it will be safer to attach your remaining well-functioning neurons through tiny electrical nodes to an implant that threads a wire out your ear. They then attach this wire to an external device that contains your programmed silicon chips and which attaches to your person. We can imagine that after the operation you come to with a small wire now reaching out of one of your earholes. Attached to

[108] In Clark's defence, he wrote this passage as an answer to Fodor's critique to his book *Supersizing the Mind*, and the example of Diva is tailored for that purpose. Clark has argued for EM in better ways countless times elsewhere.

> this wire is a small device that hugs your ear, much like a hearing aid. Doctors call it an iCog. (Vold 2015, 27.)

By placing the silicon chips outside the body, Vold probably wanted to stress the externalist side – which is after all the ultimate goal behind all of these examples. However, the thought experiment doesn't get any more convincing by relocating the vehicle outside the skin and skull. It is irrelevant where the artificial neurons are *located* or *what they are made of*, as should be clear for anyone who has read their 4E literature. Instead the important question is can we actively interact with them – use them, do things with them – and as a result take them into our system as genuine parts. Externalism is not established by stipulating a logical possibility of replacing neurons with silicon chips and placing them outside the head. I claim that these thought experiments do not promote externalism at all because they have misunderstood the most crucial features of EM and ECM.

Thus, the silicon chip argument is inadequate and misguided for two reasons. First, because it is a highly speculative thought experiment that belongs to science-fiction rather than to science.[109] The Otto thought experiment was at least based on existing, everyday "technology". However, an even more serious problem is the second one: the silicon chip argument belongs to the group of *prosthetic incorporation*. I will explain in the following why prosthetic incorporation is incapable of backing up EM or ECM.

David Chalmers (2017)[110] ends up reaching a similar conclusion, even though I find his path of argumentation wanting, because he doesn't differentiate between prosthetic and functional incorporation (actually he doesn't talk about any 'incorporation', but instead only about 'extension' without contrastive subtleties). Nevertheless, he also concludes that the silicon chip argument is weak. As a clear indication of the weakness, he mentions that even the best-known opponents of the externalist views accept the silicon chip

[109] Even though, something like this has been done in science. A group of scientists has successfully managed to replace one neuron of a California spiny lobster with an artificial, electronic one that functioned well with the biological ones, and they aim to replace gradually more neurons. (See Szucs et al. 2000, and discussion in Clark 2008.)

[110] Chalmers has stayed out of the extended mind debates since his original article with Clark, apart from on two occasions: his foreword to Clark's book *Supersizing the Mind* (2008), and the short article referred to here, which was published in a collection of essays titled *Andy Clark and His Critics* (2017). On both occasions, he tries to deny ECM. In my view, especially in this latest paper, he fails thoroughly – he simply repeats the central features of sensorimotor enactivism that entail ECM.

argument: Adams & Aizawa (2008) and Rupert (2009) have all declared that they can agree with science-fiction -type thought experiments that include imaginary future technology, such as silicon chips replacing brain functions. I agree with Chalmers that already this alone shows that there is something wrong with the silicon chip arguments and the like. Somewhat surprisingly, he finds a solution that follows a well-trodden path – or to put it bluntly, he reinvents the wheel. Chalmers's solution to the inadequacy of the silicon chip arguments is virtually *sensorimotor enactivism*, although he doesn't make a reference to sensorimotor enactivism. He states that what is distinctive for EM, is "interacting via perception and action", and that is what makes Otto and his notebook as well as rotation in Tetris count as EM, whereas the silicon chip examples are ruled out. He gives an updated definition of EM:

> A subject's cognitive processes and mental states can be partly constituted by entities that are external to the subject, in virtue of the subject's sensorimotor interaction with these entities (Chalmers 2007).

It is easy to agree with Chalmers's statement (even though he presents it in a short and sketchy fashion) – it is the core assertion that I have made throughout this thesis: extension is based on an interaction relationship via perception and action between the subject and the external element. Without that relationship, there is no extension in the sense that it is understood in EM or ECM.

Let us recapitulate why prosthetic incorporation is insufficient for ECM. To start with, the prosthetically incorporated objects are not 'tools', as I have described a 'tool' based on De Preester's (2011) and De Vignemont's (2018) definitions. They are not "unattached external objects that one actively manipulates" to extend our "motor, sensory or spatial capacities". Further, there is no sensorimotor control over the prosthetically incorporated objects – the subject is not in charge – and hence a sense of agency will not develop. From these reasons it follows that the subject cannot manipulate her surroundings with the device, it is beyond her control.

Unlike the previously presented ways of extensions (and functional incorporation, which will be presented next), prosthetic incorporation is not on the same scale: a cardiac pacemaker either works or doesn't work, whereas the level of coupling between a violinist and her violin is always a matter of degree. The three other ways of extension require

training: a process in which the tool is taken as one's "own". A successful coupling and extension only happens as a result of this effort. Prosthetic incorporation is different in this sense, its functioning is quite out of reach of the subject's training.

Thus, prosthetic incorporation is not only "not enough" as an argument for ECM, but it is an altogether wrong way to proceed. I do not think prosthetic incorporation provides any support *at all* for ECM. All the defining features of ECM are missing. Even if we could replace all of the neurons and brain functions with silicon chips (or some other non-biological material) that would not yet tell us anything about ECM being true or not. Let us now turn to the positive story – what features are required then if not prosthetic incorporation?

4.2.4. Functional incorporation

Finally, consider Edward Scissorhands. For him, scissors are part of his body, and he experiences the world through them in a way that is not possible for even the most competent of Fleet Street barbers. Is there a difference in kinds of extensions between the cases where the tool is used fluently (Sweeney Todd) and when the tool is part of the body (Edward Scissorhands)?[111] Of course, the latter case is science fiction (and the former is fiction, but that is not relevant). Even though scissors as body parts exist only in science fiction, this comparison still reveals a crucial question: how firmly and in what sense does a tool need to be attached to the body for it to be considered *functionally incorporated*?[112]

[111] The idea for contrasting Sweeney Todd with Edward Scissorhands is borrowed from Thompson and Stapleton (2009) (although they don't develop the example further, it is just briefly mentioned to stress the importance of intimate coupling and bodily regulation for incorporation relations).

[112] The Australian performance artist Stelarc could almost be called a real life example of Edward Scissorhands. He is famous for enhancing his body by technical means, e.g. he has transplanted an ear in

From everything we have learned so far, it has become clear that the tool doesn't have to be biological. Nor does it have to be attached permanently (or not even firmly in a physical sense) to the body, as Edward's scissor-hands are, or as an artificial cardiac pacemaker is. To understand what is meant by this fourth group of extension, we need to look at both terms – *functional* and *incorporated.* In the following, I will discuss these two concepts – separately and together – and aim to show how functional incorporation differs from the other three types of extensions.[113]

Let us first look at the term *incorporated*. Here, it is understood differently than in the prosthetic version of incorporation – it doesn't need to involve taking the external tool literally inside the boundaries of the body (as in the previous incorporation). Rather, the external part needs to be taken into the *bodily point of view* – so that the subject doesn't experience the external part as an object, but the world through it. The notion of *body schema* is a central feature when defining functional incorporation. It is differentiated from *body image*, and this conceptual pair is used in both philosophical (starting from Merleau-Ponty 1945) and scientific (starting from Head & Holmes 1911) discourses.

Body image refers to the intentional and reflective stance we have towards our bodies – the body experienced as an object. It is "composed of a system of experiences, attitudes, and beliefs where the object of such intentional states is one's own body" (Gallagher & Zahavi 2008, 164). *Body schema,* on the other hand, refers to the body as a pre-reflective subject of experiences – the body from a first-person perspective. It is a "system of sensory-motor capacities that function without awareness or the necessity of perceptual monitoring" (Gallagher 2005, 24). Body schema is our point of view to the world that is below conscious monitoring. We can grasp an apple without considering consciously the posture of our hands, jump over a small brook without considering the movements of our legs, and bend down to enter a car without considering how to adjust our posture. The objects that matter are the apple, the brook and the car – not the body. If we hit our head while climbing into a car, we might lose the transparent stance and start seeing the body as an object again.

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his hand (that is "partly surgically constructed, partly cell-grown") and a robotic third arm (See Atzori & Woolford 1995; Dayal 2012).

[113] In functional incorporation, extension is obtained by means of perception, instead of in interaction with *objects* of perception. The difference was briefly discussed in second chapter (2.2.2.) when comparing differences between dispositional and occurrent EM.

Even though these concepts are sometimes treated inconsistently in the literature,[114] it is undeniable that this distinction is legitimate, and it also has empirical support, namely in cases of *double dissociation*. There is neuroscientific evidence of cases where the body image is injured but the body schema is intact, and the other way around, where the body schema is injured but the body image is intact. The best-known phenomenon is probably phantom limb pain – a patient who has lost a limb can still feel pain in "it" after amputation.

Gallagher (2005, 25) gives examples of both kinds. An example of the former (intact body schema, injured body image) is unilateral neglect, a condition following brain damage, where the patient fails to recognise items that are located on one side of a space (left or right). According to a research set-up by Denny-Brown, a person suffering from a brain lesion (in the hemisphere opposite of the neglected side) fails to be aware of the left side of her body. She doesn't dress the left side of her body or comb the left side of her hair. However, she is still able to use her left side quite normally for motor tasks that require both sides of the body, such as using her left hand to button up clothes on the right side of her body. (Denny-Brown, Meyer & Horenstein 1952, reported in Gallagher 2015, 25, 40.)

An example of the latter (injured body schema, intact body image) is found in some rare cases of deafferentation. The symptoms are caused by a nerve fibre neuropathy that causes a loss of tactile sensations from the neck down. The patients can control their movements only by "cognitive intervention", e.g. they use a visual perception of their body in order to compensate for the lack of proprioceptive and tactile feeling in their body. (Gallagher 2015, 25; Cole 1995.) Gallagher & Cole (1995) suggest that in some of these cases, the patient has lost the body schema, even though the body image stays intact.

An interesting aspect of body schema is that it is not tied to physiological body boundaries; instead it is plastic and open to adaptation. By *functional incorporation*, I refer to situations where the body schema takes external elements into it, namely, the body schema extends outside the biological body boundaries. To find out whether there is functional incorporation, we need to ask whether an external element can become

[114] Perhaps the most unfortunate confusion is that Merlau-Ponty's term *schéma corporel* was translated *body image* in the first English translation in 1962. Besides terminological confusions, there are also conceptual open questions – the case is far from settled, but after all, the distinction is more useful than confusing.

incorporated into the *organization of the system*, rather than merely extending an individual experiential state every now and then. When properly functionally incorporated, the previously external element becomes part of the organisation of an experiential system. Apart from enactivism,[115] it is related to the *embodiment* thesis and to the Merleau-Pontian divide between the *objective, material body* and the *phenomenological, lived body*. Coupling happens with the latter kind of understanding of the body. It has an impact on the structure of experience, and the world is experienced through the incorporated external part transparently. Functional incorporation creates a *sense of ownership* over the incorporated part, which can be tested by removing the part: removing a prosthetic limb or a blind man's cane are closer to removing a body part than removing a fork or a notebook.

Let us then look at the term *functional.* Its purpose in my taxonomy is to differentiate functional from prosthetic incorporation. Colombetti (2016) draws from Merleau-Pontian differentiation, and talks about 'phenomenological incorporation'. The reason why I don't follow her terminology, but instead talk about *functional* incorporation, is that firstly, according to my view, the phenomenological side is already present in the first two types (i.e. in short-term extension and integration), and secondly, I want to emphasise the importance of *functionality* as a purposeful, goal-driven property as opposed to the *phenomenological* side that would instead sound as if something was more passively received. (Of course, functional incorporation *is* phenomenological.) The external element needs to be under the "functional" control of the subject – controlled sensorimotorically by the active agent. Being a physical part (coupled within the biological body) is not sufficient.

Merleau-Ponty's (1945, 165–166) classic examples of incorporation[116] are famous and often cited in the literature. The best known is of course the blind person's cane: the cane is not (primarily) an object, but functions as if it were a sense organ through which the blind person experiences her surroundings. Merleau-Ponty's other examples include a driver and her car, and a woman and her feather hat. The driver and the hatted woman have extended their bodily frontiers to include the size of a car and the feather, and they

[115] Enactivism starts from the phenomenal side, whereas ECM starts from the material basis – but this feature doesn't make them incompatible.
[116] Regarding the distinction presented earlier in this chapter between *habit incorporation* and *object incorporation* (see Colombetti 2016), in these examples, the notion of incorporation used by Merleau-Ponty (1945) goes of course under *object incorporation*.

know (i.e. feel) without calculating whether they can pass through a narrow opening – just as we don't have to calculate our body size to find out whether we can pass through a door or not. "To get used to a hat, a car or a stick is to be transplanted into them, or conversely, to incorporate them into the bulk of our own body" (Merleau-Ponty 1945, 166).

From Merleu-Ponty's examples, the blind person's cane fits well with my definition of functional incorporation. The cane clearly fulfils a sensorimotor function, is transparent (or quasi-transparent) and extends the body schema. The hat and the car examples undoubtedly extend the body schema as well – but it is less clear whether they have a sensorimotor function or purpose of the right kind. A sensorimotor stance is certainly included, but it occurs as a side effect. Especially having a feather in one's hat would rather belong better to my definition of prosthetic incorporation. The function of the feather is not to extend its carrier's sensorimotor area or the scope of sensitivity (the feather is not comparable to a cat's whiskers for example). Even though something of this sort can happen when wearing a hat (we could call it a weak imitation of a cat's whiskers), feather hats are not usually used for sensorimotor probing.

The car example comes closer to functional incorporation, at least by changing the focus of interest a little. Here, too, the right sort of incorporation is of course technically also a side effect or by-product, since the main function of the car is – obviously – to enable passengers to move (faster than by foot) in space. But consider somebody driving on an oily or icy surface, or driving over small obstacles like stones, etc. The feeling is probably even stronger with a sport car, since there is less material between the driver and the road. The focal point of sensorimotor sensitivity is transformed from the borders of the body to the borders of the car. In all of Merleau-Ponty's examples, pieces of the environment become incorporated into the body schema, but not into the body image. (Although perhaps incorporation into the body image is also possible after long-term use.)

An external piece is properly functionally incorporated when it functions *transparently* as part of the system. Thompson & Stapleton (2009) call this requirement a *transparency constraint*, according to which: "*For anything external to the body's boundary to count as a part of the cognitive system it must function transparently in the body's sense-making interactions with the environment*". The transparency constraint is a phenomenological criterion for incorporation. It emphasises phenomenological considerations – the first-

person experience of the subject – as a criterion for incorporation. When some element is incorporated into the body, it is no longer felt as an object, but the world is experienced through it. It is reminiscent of the transparent status of the biological body in normal experience, and it modifies the way in which world is experienced. Moreover, it doesn't stay in the phenomenological realm alone. I agree with Thompson and Stapleton (2009) when they hypothesise that "tools and aids that conform to transparency are incorporated into the neurophysiological body schema". This idea is not only based on philosophical hypothesising but also has empirical support (e.g. Maravita & Iriki 2004).

However, I think we should adjust the transparency constraint a little. The tool doesn't have to be absolutely transparent because, strictly speaking, it might be that no tool is completely transparent – otherwise it would no longer be a tool. A sufficient level of transparency is needed, so that the focus of the attention and significance is not in the tool, but in the target of the coupled system formed by the subject and her tool. Although not a physical tool, speaking a foreign language that one has learned as an adult is an example of this kind of partial transparency. At least when the speaker is not fluent in the language, there is always a certain barrier that prevents total transparency (as opposed to one's native language). Colombetti (2016, 240) describes this kind of partially transparent tool as "quasi-transparent, i.e., as 'withdrawn' from experience (not attended, not taken as an intentional object) but still present".[117] She continues that the tool is presented to its user as "that through which" the world is experienced. This "that through which" nature of the tool is necessary for functional incorporation.

When asking which tools can become functionally incorporated, one should not look at the tool itself, but rather at its use. Whether a tool can be incorporated depends on the subject's interactive relation with it – rather than on the tool's design, internal structure, effective functioning, portability, etc. Instead, it is crucial that the tool can be manipulated and controlled by the subject.

> It is as if the tool withdraws into the sensorium of the body, or rather, as if the tool extends not only the motor body, but also the sensorium of the body. This results into a feeling of quasi-transparency in which the tool co-enables our experience but is itself not in the focus of our experience. The quasi-transparency of the tool is related to a feeling of non-mediation, caused by the altered correlation between

[117] For quasi-transparency or semi-transparency, see also Ihde (1990) and De Preester (2011).

> somatosensory and visual information. (De Preester 2011, 123.)

Sometimes it is difficult to see whether a tool is a mediating or non-mediating tool, and placing it into one single group is complicated. For example, an artificial limb is an ambiguous case.[118] Consider a person using an artificial leg, for instance. Is it functionally or prosthetically incorporated? The answer depends on what dimension we are looking at, and how profoundly the device has been taken into the system. It goes without saying that the actual users of artificial limbs would prefer them to become as incorporated as possible. However, this doesn't always happen, for the artificial limb may remain an external tool that is not felt as part of the body. De Preester & Tsakiris (2009, 310) suggest that it should become a "*knowing* body-part, in other words, something that shares in the knowledge of the body". Experiments with artificial limb users have shown that they may become "knowing body-parts", but only in a limited sense (De Preester & Tsakiris 2009; see also Murray 2004).

Of course, there are exemplars of successful artificial limb incorporation, as for example the famous South-African sprinter Oscar Pistorius proves. Both of his legs were amputated in his infancy, and he wears running blades that enabled him to not only succeed in the Paralympics, but also in the Olympics. The blades turned out to outperform biological legs in certain aspects that affected the running speed. The way Pistorius ran with his blades is an interesting case for science in many ways, and importantly for our purposes, it looks like a possible case of functional incorporation.[119] Hence, an artificial limb may or may not belong to the group of functional incorporation, depending on the case.

The benefits of restricting ECM to cases of functional incorporation are that it gives a demarcation criteria for ECM, it ties 'embodied' (in*corpo*rated), 'enacted' (active, functional sensorimotor stance) and 'extended' (non-biological object/tool is included) together. The disadvantage is that it excludes cases that belong to 'short-term extension' and 'integrated' sections. Even though they clearly have an experiential side to them, the

[118] Artificial limbs are of course called *prostheses*, but I use the word 'prosthesis' referring to prosthetic incorporation only, and artificial limb may or may not belong to that group regardless of this terminological matter.
[119] Although he doesn't run anymore, because he was convicted of killing his girlfriend in 2014 (Lindstrom 2019).

reason for leaving them out is that the coupling is not strong and stable enough – they only extend individual experiential states, but don't become part of the organisation of the experiential system or subject. They don't contain a sense of ownership in the same way as functional incorporation does. However, this doesn't mean that extension based on short-term extension and integration would be non-experiential. As I have stated earlier, we don't transform into Chalmers's zombies in real life cases of sensorimotor tasks and cognitive reasoning. However, these cases are exempted from my narrow definition of ECM.[120] They can be taken rather as support for a general tendency for experiential extension.

This section aimed at differentiating functional incorporation from weaker sorts of extensions. However, as for example the example of an artificial limb showed, whether something counts as functional incorporation needs to be analysed case by case. In the following sections, I will investigate functional incorporation from slightly different angles. First, I will set the criteria for it even more explicitly in the form of *glue and trust* conditions for ECM, and in the final part of this chapter, I will discuss one concrete example of functional incorporation, namely *sensory substitution* technology.

[120] Even though 'integrated' tools are not included in ECM, the experiential, "non-zombieness" feature in the integrated-extension of course supports my general view, and especially the argument for ECM from parity of cognition and consciousness.

4.2.5. Summing up the four degrees of extension

	Functional or not?	**Incorporated or not?**
Short-term extension	no	no
Integrated extension	yes	no
Prosthetic incorporation	no	yes
Functional incorporation	yes	yes

This illustration sums up the crucial differences within the taxonomy I have outlined. Let us review briefly how the different levels of extensions are separated from each other. The difference between *short-term extension* and *integrated extension* is that the former is more fleeting – a tool that one uses as an external prop for a motor or cognitive, etc. task, but it is not taken into the system as a genuine part. Many of the tools we use every day belong to this group, such as knives, forks, pens and toothbrushes. However, becoming *part of the system* is required for something to count as integrated extension. I suggested that Clark and Chalmers's original Otto example belongs to this group. Also, someone who has played, say, the violin long enough, has probably *integrated* the instrument in a more stable way into her system. The first two groups of extensions, hence, are on the same scale, the latter being a stronger and more permanent relation.

The third group of extension, *prosthetic incorporation*, is neither an instance of EM nor ECM. It is not on the same scale of extensions with the other three groups, but is included in the taxonomy in order that its difference from functional incorporation becomes evident. Prosthetic incorporation differs from *functional incorporation* in that the former doesn't involve sensorimotor control over the incorporated part – and the other exemplary features of functional incorporation remain absent as well. An example of a prosthetically

incorporated part could be a cardiac pacemaker or an electronic neuron, whereas the best examples of functional incorporation are devices that have an active role in forming sensorimotor, perceptual experiences, such as a blind person's cane or a sensory substitution device.

Further, short-term and integrated extensions differ from functional incorporation in that the former pair do not involve a bodily sense of ownership that shapes the body schema, whereas functional incorporation does. When one loses a part that has been functionally incorporated (such as a blind person's cane), the loss is different compared to losing a tool that might have had an important status, but which hasn't been part of the bodily self. Even in a short-term extended or integrated tool use (such as using a pair of scissors or a paintbrush), the tool can be under the motor control of the user, and hence a feeling of control over the tool can develop. However, the relationship to the tool is still not as if it was part of the body or bodily functions. Removing the external part is a way to reveal whether a sense of bodily ownership was involved. Removing a cane or a TVSS-device from a blind person is comparable to losing a body part, whereas taking away a paintbrush from an artist is not – even though the paintbrush might be of great importance to the artist. After having demarcated these degrees of extensions, let us now turn to the criteria that are needed specifically for ECM.

4.3. “Glue & Trust” conditions

Glue and trust conditions refer to criteria that need to be fulfilled for there to be genuine extension. They are the guiding instructions when some external element is “glued” to the system tightly enough that it can be trusted as part of that system – so that a new coupled system is formed. The criteria might vary from case to case, and hence it is impossible to give all-encompassing rules that would fit all situations. The criteria nevertheless help us to demarcate genuine extension (or *integration*, in the case of EM, and *functional incorporation*, in the case of ECM). Setting the criteria is an effective way to resist the slippery slope of the *cognitive bloat* argument (which has already been discussed in chapter 3). Let us start with how the limits of EM have been set in the literature, and then compare how these criteria fit with ECM. Finally, we can then set the glue and trust conditions for ECM.

4.3.1. Glue & Trust conditions for EM

Clark and Chalmers (1998) and Clark (2010) have phrased quite clearly their conditions for the extension of cognition. They stress, however, that these are not categorical conditions for extension, but rather guidelines for what kind of features should be included at least in cases that resemble the Otto case. Clark and Chalmers’s *glue and trust* conditions include:

> 1. That the resource be reliably available and typically invoked. […]
>
> 2. That any information thus retrieved be more or less automatically endorsed. It should not usually be subject to critical scrutiny (unlike the opinions of other people, for example). […]

> 3. That information contained in the resource should be easily accessible as and when required.
>
> (Clark 2010, 46.)[121]

The tool needs to be "*glued*" to the system: it needs to be a constant, reliable resource. When properly glued, it will be *trusted*: it is automatically accepted, and not questioned.[122] The result is a *coupled system* in a two-way interaction – from the external resource to cognition and from the cognitive function to the resource. It is clear that these conditions are written with Otto and his notebook in mind. As said, they are set up using a *case-by-case method*, which makes them *a posteriori* rather than *a priori*. For example, it is clear that the conditions cannot be the same for situations where one is using a notebook compared to, say, a situation where one is using a prosthetic limb or a walking stick. According to Hurley (2010, 126), we should "consider externalist explanations on their empirical merits, case by case". For example, in the case of Otto and his notebook, an externalist explanation is clearly better than an internalist one, as the original text aptly shows. I consider the case-by-case method to be the best way to embrace glue and trust conditions (whatever they may be), because we cannot set *a priori* rules to match all situations, and that was never the aim of Clark and Chalmers's criteria.

As a more general condition, Clark and Chalmers originally offered the *parity principle*, according to which extended cognitive processes must play the same functional roles as brain-bound cognitive processes. The parity principle would serve as a convenient general rule (as opposed to a case-by-case rule), only if it wasn't so problematic when taken literally, and not taken as an intuition pump (for criticism of the parity principle, see chapters 1 and 2). A better way to explain extension is the *complementarity argument*, according to which environmental functions can play different, complementary roles from the internal, biological ones. However, it doesn't provide such an explicit toolkit we are after in here.

[121] Clark and Chalmers (1998, 17) added a tentative fourth requirement, *prior endorsement*: the information in the notebook must have been consciously endorsed at some point in the past. However, they themselves admitted that the fourth condition is dubious, because not even all biological memories are consciously endorsed (consider e.g. memory tampering).

[122] Clark and Chalmers never specified a literal meaning with the term 'glue & trust' (and in fact it is often referred to as 'trust & glue').

Kim Sterelny (2010) is along the same lines with Hurley.[123] Instead of an all-embracing requirement for a trusted, reliable relationship between one agent and an external resource (such as Otto's relationship with his notebook), he stresses variability between different cases. However, he names three dimensions where we should go looking for clues: 1) the level of *trust* when a person uses an external resource, 2) the level of how much the external resource is *entrenched* and *individualised*, 3) the level of how it can be *shared* with other agents.[124] Thus, Sterelny's way of demarcation is rather setting a scale than positing either–or responses. This way resembles the scale or spectrum of extensions I framed in the beginning of this chapter.

Further, Mark Rowlands (2009) suggests *ownership* as a demarcation criterion (for cognitive states in general, whether extended or not). "EM has an obligation to demonstrate the sense in which the extended processes it invokes – manipulation, transformation, and exploitation of relevant environmental structures – can be owned, or in an appropriate way belong to, a cognitive subject" (Rowlands 2009, 15). Thus, a demarcation criterion is not any material barrier, but the belonging relationship. Gallagher (2013) trusts in ownership as well: the enactive engagements determine the ownership of a process. A similar requirement has been proposed by Mason Cash (2013, 65). According to his *responsibility condition*, the solution is "in our shared, evolving, normative and social practices of holding people responsible for their actions". Instead of asking "what makes a process cognitive", we should ask "what makes any thought or action mine". Likewise, Tom Roberts (2012) stresses responsibility: "Extended resources can house an individual's beliefs, I propose, only if she has taken responsibility for their sources in a suitable way". I think both *ownership* and the closely related *responsibility* are important aspects. Otto's notebook, for example, has to be under his control, "owned" by him, and hence he is responsible for the contents in it, and for his actions based on the contents (as opposed to contents e.g. in Wikipedia). I will soon evaluate how these conditions fit with the preconditions for ECM.[125]

[123] Sterelny represents an interesting position. He criticises Clark's EM for the reason that it is restricting the phenomenon of cognitive extension to a too narrow area, to specific cases such as the use of a notebook. Instead, he supports a broader view he calls *scaffolded mind*, where distinction between causal and constitutive relations with the environmental resources is not made.

[124] First two of his conditions are similar with Clark and Chalmers's conditions (just in slightly different terms), but the third condition about intersubjective dimension is new, and missing from most of the criteria presented in the literature.

[125] I consider it promising that many writers have ended up with quite similar criteria (even though slightly different terms are used).

Yet another proposal to set the limits is the *mutual manipulation* criterion that was discussed in length in the previous chapter. Apart from the original formulation by Craver (2007) and the ensuing literature in the new mechanist approach, a similar account has been suggested by the supporters of EM, namely the *continuous reciprocal causation criteria* (Clark 2008; Palermos 2014). Its strengths and weaknesses were presented in the previous chapter. In what follows, I will evaluate whether these criteria help us to set the glue and trust criteria for ECM.

4.3.2. Criteria compared with ECM

Let us now turn to ECM, and reflect the above listed suggestions for demarcating EM: could they be used as demarcation criteria also for ECM? First, let us compare Clark and Chalmers's original glue & trust conditions with ECM. Should the externalisations of experiential states be reliable, available, automatically endorsed and easily accessible?

Let's say a blind person's cane is a part of the material basis for his tactile experience. Is it necessary that the cane is constantly and reliably available for him? Wouldn't just one successful case of extension be enough to show that ECM is true? Of course, the same question can also be asked in the case of extended cognition. If Otto uses his notebook only occasionally (but successfully in those cases), or if the notebook is not easily accessible for him, and he needs a little effort to reach it, why should these mitigations affect EM? Does his notebook still count as reliable if he showers without it? On the other hand, Inga's memory is not always reliable either – when she sleeps or is intoxicated, for example. This shows how setting limits is always somewhat arbitrary. It is impossible to set absolute criteria for easy accessibility or reliability – they are always a matter of degree.

The answer to these questions lies in the scale of extensions I presented earlier. Even though one successful use of a blind person's cane or a notebook contains some kind of experiential extension (in the case of the blind person's cane) and some kind of cognitive extension (in the case of the notebook), they would belong to the lower groups of extension, such as short-term *extension*. In order for Otto's use of a notebook to belong to the group of *integrated* extension, and in order for a blind person's use of a cane to belong to a group of *functional incorporation*, Clark and Chalmers's original conditions are required. Thus, it seems Clark and Chalmers were on the right track with their criteria – they clearly capture some essential features of what differentiates EM from the more short-term fleeting extension of individual cognitive states or processes.

I suggest the same applies to ECM – especially as a means to differentiate short-term extension from functional incorporation. One successful use of a blind person's cane or using a stick to reach for something on the highest shelf only extends an individual experiential state. However, for an experiential *system* to be extended, a more profound and stable relation is needed. Therefore, *availability*, *reliability* and *accessibility* should also be counted in ECM's demarcation criteria. Further, with the blind person's cane, *automatic endorsement* comes along if the reliability and availability conditions are satisfied. When a person successfully uses a device, it becomes transparent in a way that we could say it is "automatically endorsed". Thus, this requirement should also be counted in the glue and trusts of ECM. However, I don't use these exact same terms for my criteria of ECM, because my emphasis is different, and Clark and Chalmers's criteria fit into some wider concepts I use, such as *transparency* and *ownership*.

What about the demarcation suggestions set forth by others? I think most of the above-mentioned criteria of EM (especially ownership, responsibility, trust, entrenchment and individualisation) apply more or less to ECM as well – the emphasis just varies slightly. It is clear that the *parity argument* is not a good criterion for ECM, but, as I have made clear, it is not a good criterion for EM either. Neither the requirements based on *mutual manipulability* nor *continuous reciprocal causation* are unproblematic – but again, the problems are not specific to ECM, but apply to EM as well.

Consequently, are there no differences in the glue and trust criteria between EM and ECM? Even though all of the criteria for EM also count as criteria for ECM (at least with a slightly modified emphasis), the same doesn't apply the other way around – hence the

criteria are not the same. Some of ECM's criteria apply to perceptual experience only, namely those conditions that deal with sensorimotor control and bodily stance. Thus, ECM requires more than EM.

4.3.3. Glue & Trust conditions for ECM

In this section, I will outline the conditions that need to be fulfilled in order to have an instance of ECM. As we saw, Clark and Chalmers's original criteria with the supplementing conditions presented by others serve as a starting point for criteria for ECM. However, apart from these conditions, the core of my glue & trust conditions for ECM is the fourth type of extension presented in the taxonomy above, namely *functional incorporation*. With that notion, I refer to quite a wide-ranging phenomenon, as already stated earlier. The relevant features embedded in that notion are the following:

1) It needs to be part of the quasi-transparent bodily point of view
2) It needs to be under sensorimotor control of the subject
3) Ownership (entrenched, individualisation and fluency) (and hence responsibility?)
4) Sense of agency
5) Sense-making attitude (a purpose, goal-drivenness)

These are the glue & trust conditions for ECM. They are not isolated from each other but are linked in several ways. In order to gain (quasi-)transparency, the external part needs to be taken under one's control – to make it one's *own* by individualising and entrenching

it.[126] A feeling of ownership emerges gradually with constant practice and use. This creates fluency, which increases transparency: the tool becomes transparent for a fluent tool user. Because ECM deals with perceptual experience, the component needs to be under the bodily, sensorimotor control of the subject. When it is taken under the user's voluntary control, a sense of agency will be gained. All this requires a *sense-making* attitude – a programmed robot just following rules would not count as having conscious experiences.

Further, my suggestions for conditions are not in contradiction with Clark and Chalmers's criteria, but as said earlier, their original glue and trusts fit mine. I also consider that Sterelny's (2010) way of talking about dimensions and levels of extensions is an advantageous way to proceed. In a similar vein as with the scale of extensions I presented at the beginning of this chapter, the glue and trust criteria for ECM should not be taken as categorical, but rather as a matter of degree. They provide a guideline of what should be taken into account – but still each case has to be examined separately, and the emphasis of the criteria might vary depending on the case. I do not think the lack of a clear-cut assemblage of all-embracing criteria should be seen as a problem for externalist theories, because a need for categorical criteria stems from the idea that there is a distinct *mark of the cognitive* or *mark of the consciousness* at play. However, as I have argued earlier, the request for the mark of the mental is a misguided way of proceeding in demarcating cognition and consciousness.

To summarise, according to ECM, *the constitutive material components (i.e. the material basis) of some experiential states can include external elements on the condition that they are functionally incorporated into the system.* Functional incorporation involves *quasi-transparency*, *sensorimotor control*, *ownership*, *a sense of agency* and *a sense-making attitude*. In the following section, I will discuss an example where the criteria are fulfilled.

[126] The ownership doesn't have to be restricted to the subject but can be shared between other individuals. Collaborative processes, shared tools or environments that are 'owned' by a group of people, can also contain ownership in the right sense (see Sterelny 2010; Cash 2013).

4.5. An example of functional incorporation: Sensory Substitution

Sensory substitution (SS for short) provides an illustrative and paradigmatic example of functional incorporation, that is, an example where all the glue & trust conditions of ECM are met. An increasing number of philosophers of perception, cognitive sciences and neurosciences have been interested in this phenomenon – which is not surprising because it offers intriguing empirical ways to investigate some of the key questions in these research fields (see e.g. a recent collection edited by Fiona Macpherson 2018). However, the relationship between sensory substitution and 4E-views has not been analysed thoroughly in the literature. There are some exceptions. In particular, Andy Clark has argued that SS provides empirical evidence for EM (e.g. Clark 2003; 2008; Kiverstein, Farina & Clark 2015) and Alva Noë that it gives empirical evidence for ECM (e.g. Hurley & Noë 2003; Noë 2004; 2009; see also Kiverstein & Farina 2012). In this section, I will outline the main features of sensory substitution, introduce some examples of SS-technology, and argue that the previously set glue & trust conditions are fulfilled in a proper use of SS-devices (after sufficient training).

The term sensory substitution refers to cases where one sensory modality is replaced with another sensory modality (for example vision with touch), or within the same sensory modality (for example touch in the fingers with touch in the forehead). Sensory substitution systems are used to restore or compensate for lost senses (e.g. for blind or deaf subjects), or to enhance or create completely new senses (e.g. a feeling of magnetic North)[127] by exploiting other senses. The latter is sometimes more specifically referred to as *sensory augmentation*. Users of SS-technology gradually learn for example to do localisation tasks, motor tasks such as batting a ball, and recognising the shapes of objects (Macpherson 2018; Bach-y-Rita 2002; Auvray & Myin 2009; Kiverstein, Farina & Clark 2015).

Sensory substitution and augmentation are both forms of intervening sensory paths using an auxiliary system. It is possible because of brain plasticity: the devices exploit the cross-

[127] The *feelSpace* project at the University of Osnabrück is conducting research on a sensory augmentation device: *naviBelt*, a vibrotactile magnetic compass belt that subjects wear around their waist. After training, the subjects learn to recognise magnetic North instead of just feeling a vibration at their waist. (See König et al. 2016; and for the project, https://www.feelspace.de/?lang=en).

modal plasticity of the sensory cortex.[128] Instead of a biological sense organ, an artificial receptor is delivering the environmental information to the brain via a *human-machine interface*. Importantly, the device needs to be under the *motor control* of the user, e.g. a hand-held camera that the agent can move. Especially the pioneering work of an American neuroscientist Paul Bach-y-Rita and his work in neuroplasticity and earliest forms of sensory substitution devices has opened up this field of research (and industry). (See e.g. Bach-y-Rita 1972; 2002; Bach-y-Rita & Kercel 2003; Auvray & Myin 2009; Macpherson 2011; Farina 2013.)

On a general note, sensory substitution is a reminder that the way we perceive the world is not the only possible way – it is only our take on it. The world appears very different to a hound dog, who mostly relies on olfactory sense, or to a bat, who uses echolocation to navigate in the dark. Besides helping to restore and compensate for lost senses, sensory substitution technology can also be used as way of accessing perceptual experiences that have previously been inaccessible for humans. Broadly understood, the phenomenon is not restricted to modern technology, but has been used long before the rise of recent technological developments. Braille language as used by blind people is sometimes labelled as the most successful sensory substitution system. In Braille, visual sensing (reading) is substituted by tactile sensing in the fingertips. In a similar vein, sign language used by deaf people is a way to replace auditory senses with visual senses. Yet another obvious example is a blind person using a cane, where visual information is replaced by tactile information. Bach-y-Rita & Kercel (2003, 541) even suggest that *reading* could be considered the first SS-system – because reading doesn't occur naturally but is a way of substituting auditory modality (the spoken word) with visual modality. These examples reveal the very elementary function of sensory substitution. However, in what follows, I refer specifically to the technological devices that have been developed during the last 50 years or so (starting from Bach-y-Rita's pioneering work in the late 1960s), instead of the more general capability of replacing senses with other senses.

[128] However, Kevin O'Regan (2018) has argued that the reason why sensory substitution is possible is actually not cortical plasticity as such, but rather the sensorimotor changes in the modes of environmental interaction that the user undergoes while using the device. I am sympathetic to his claim because, as he says, stressing the role of cortical plasticity may lead to an assumption that the cortical areas are the only material realisers of experience. However, I do not think that cortical plasticity and changes in sensorimotor interactions as explanations necessarily exclude each other, and thus this is not a problem when tying SS and ECM together.

The most common SS-devices belong to two kinds of systems: visual-to-tactile systems, which convert visual pictures to tactile patterns, and visual-to-auditory systems, which convert visual pictures to patterns of sounds (Farina 2013, 640; Auvray, Hanneton & O'Regan 2007, 416). Perhaps the best-known example of the former is *tactile visual sensory substitution system* (TVSS) and its application *Tongue Display Unit* (TDU) (see Bach-y-Rita & Kercel 2003), and of the latter, *The vOICe* (see Meijer, 1992).

TVSS was first invented by Bach-y-Rita and colleagues in the 60s and 70s, and several versions have been developed since then, e.g. the *Brain Port* and the *AuxDeco Forehead Sensory Recognition System*, (*FSRS*) (see Nau et al. 2015). TVSS has been described as a way for the blind "to see by touch". TVSS subjects have a receptor in their skin that takes input from a head-mounted or hand-held video camera (there are different versions of electrotactile and vibrotactile receptors, which can be located e.g. in the abdomen, the back, the fingertip – and the tongue has proved to be a particularly suitable place). In response to the camera input, the unit in the skin activates and gives tactile stimulation, which is first felt as it is – tactile, cutaneous stimulation – but after the subject has used the device for some time, the feeling starts to be transformed from tactile to something that resembles visual experience. Whether visual or not, subjects can act *as if* they had visual experiences. They report experiencing images in space, rather than on the skin. They can make judgement based on visual information, such as depth estimations, perspective and hand-eye coordination tasks. (Bach-y-Rita & Kercel 2003.)

The best-known visual-to-auditory SS-device is *The vOICe*, first developed by Meijer (1992).[129] It is a way to translate visual inputs into audible patterns – from video to audio. Objects that are high in the visual field produce high-pitched sounds, and lower objects produce lower-pitched sounds. Lateral location is related to the balance of the stereo sound, and brightness with loudness, etc. The *human-machine -interface* is simpler in visual-to-auditory devices than in TVSS. *The vOICe* consists of three components: a video camera embedded in sunglasses, a smartphone running the algorithm, and stereo earbuds (Farina 2013, 640). Technology needed for *The vOICe* and other kinds of visual-to-auditory devices is very common nowadays, which is an asset compared to visual-to-tactile technology. As with TVSS, subjects who use *The vOICe* for a sufficient period of

[129] Another example of a visual-to-auditory device is the software program *EyeMusic* that translates visual stimuli into sounds (Nau et. al 2015).

time, will be able to perform tasks that usually require visual modality, such as recognising objects.[130] (See Clark 2008, 173; Auvray, Hanneton & O'Regan 2007.)

Apart from visual-to-tactile and visual-to-auditory, there is also for example *tactile-to-tactile* and *tactile-to-vestibular* sensory substitution systems. An interesting application of tactile-to-tactile sensory substitution technology is the so-called *leprosy glove* (Bach-y-Rita & Kercel 2003). Subjects who have lost peripheral sensation (e.g. due to leprosy), can start feeling again with their fingertips – or rather, with the fingertips of the gloves. The glove has artificial contact sensors coupled to a forehead-mounted tactile disc-array. After training, the subjects reported experiencing "the data generated in the glove as if they were originating in the fingertips, ignoring the sensations in the forehead" (Bach-y-Rita & Kercel 2003, 541).

There are a number of other applications of SS-technology as well, but these examples suffice for understanding the relevant features for discussion about functional incorporation and ECM. But before analysing how these applications of sensory substitution fit into my glue and trusts, one clarification should be made. Many writers have addressed the question of what kind of experience the substituted experience is. The options are roughly: 1) It stays in the substituting modality (e.g. tactile in the case of TVSS). 2) After sufficient training, it switches to the new modality (e.g. visual in the case of TVSS). 3) It is neither of these, but a genuinely new kind of perception, or as Auvray and Myin (2009) phrase it, a "novel form of perceptual interaction with the environment". (See Farina 2013 for an overview.)

However, this question, even though otherwise highly intriguing, is not essential for my purposes. For it doesn't matter to which modality the experience belongs, as long as there is a transformation in sensory experience with the device – and that much is evident. After all, it is good to notice that all (at least present-day) sensory substitution technology is incomplete – no one has ever *really* seen the whole rich scenery with all the finest details with tongue or with sounds (for an overview of the limitations, see Deroy & Auvray 2012). However, this doesn't undermine my argument: it suffices that the subjects using the devices are going through sensory experiences that enable them to perform tasks that they wouldn't be able to perform otherwise.

[130] *The vOICe* has been reported to function for both early-blind and blindfolded-sighted subjects (Auvray, Hanneton & O'Regan 2007).

Let us now turn to the question how the use of sensory substitution devices counts as an instance of functional incorporation. The central feature in order for sensory substitution technology to work is "goal-driven motor engagement" (Clark 2007b, 269). The subject needs training in order to get gradually used to the device, to gain a *sense of ownership* over it. In order to work, it is important that the "new agent-world circuits be trained and calibrated in the context of a whole agent engaged in world-directed (goal-driven) activity" (Clark 2007b, 270). For example in TVSS and *The vOICe*, one needs to be in motor control of the camera; uncontrolled, passively received visual information coming through the camera will not produce an effective result. The training period can be seen as an individualisation process: the user makes the device her own, it becomes rooted and entrenched in the system. Hence, the requirements of *sensorimotor control* and *sense of ownership* are fulfilled. These features also ensure that a *sense of agency* is gained. The user of the SS-device is in charge – she actively brings about the changes in her perceptual sphere.

Furthermore, there is an interesting similarity between sensory substitution and the enactivist notion of *sense-making.* According to enactivism, there is no pregiven world, as agents create their environments (or their *Umwelt*s, to use Uexküll's term) with the perceptual machinery they have. The same environment appears different for a bat and for a bee, and for a blind and for a sighted person. Sensory substitution technology opens a door for experiencing other kinds of previously unfamiliar *Umwelt*s – ways of making sense of the environment in new ways. For example, a blind person who gets access to what usually belongs to visual modality, or a person with normal human sensory modalities who gets access to a completely new modality – such as a feeling of magnetic North – gains access to an environment that is felt differently due to the coupling with the SS-device. The teleological aspects embedded in the notion of sense-making are also present in using SS-devices. Using SS-devices is always goal-driven: the successful use requires "goal-driven motor engagement", as mentioned earlier. Thus, we can say that in the successful use of sensory substitution technology, there is a goal-driven, *Umwelt*-creating sense-making attitude at work.

Finally, the (quasi-)transparent bodily point of view develops with the successful use of SS-technology. For example, with TVSS, the subject stops feeling the tingling sensation on the skin, and starts sensing the external cause (such as a ball being thrown towards her). The subject doesn't feel the device anymore, but the world outside her, i.e. the

coupled user-device system. In the same way as a blind person doesn't feel the cane in her hand, but the world at the tip of her cane, a TVSS-user doesn't feel the device but the world around her. The device fades from view – in other words, it becomes transparent. Thus, the (quasi-) transparency constraint is also fulfilled. This new coupled system, or the "new agent-world circuit", emerges gradually when transformation from a mere tool to a (quasi)-transparent incorporated part of the perceptual machinery happens. The SS-device becomes part of the constitutive base for the cognitive and experiential system, letting the user of the device have experiences that would not otherwise be possible.

Thus, all of the glue and trust requirements are satisfied in the successful use of sensory substitution devices: the device becomes part of the quasi-transparent bodily point of view; it is under the sensorimotor control of the subject; a sense of ownership develops; a sense of agency develops; and a sense-making attitude is involved. Thus, a sensory substitution device (when properly used, and after sufficient training) becomes *functionally incorporated* into a subject's perceptual and experiential system. The result is a new integrated system, or a new systemic whole that consists of the subject and the device – and the constitutive basis of those new perceptual, sensory experiences is extended to include also the device.

Perhaps an opponent of ECM would admit some sort of extension in sensory capabilities, but still be doubtful whether there is in fact *conscious experience* involved in substituted sensing.[131] Bach-y-Rita (2002) explicitly asks whether there is *qualia* involved (his answer is that there most likely is, when the SS-system has been in use from early childhood).[132] Needless to say, I think Bach-y-Rita's question is misleading. Insofar as conscious experience is understood in the enactivist way, the question of whether there is some extra quality of experientiality or phenomenality involved (whether we call it *qualia* or *something-it-is-like-ness* or something else along these lines) simply doesn't arise. Successful use of a SS-system clearly involves conscious experience, when conscious experience is understood as an active embodied sense-making interaction with one's environment – and this is exactly what using SS-devices is all about. This much should

[131] For example, Wheeler (2015a; 2015b) has criticised the use of SS-devices as an argument for ECM. His aim is not to deny that SS counts as incorporation (or functional incorporation, in my terms), but he questions the inference from incorporation to the SS-device becoming part of the material realiser of the substituted experience. According to him, the jury is still out on the latter step.

[132] Bach-y-Rita (2002, 510) remarks that SS-systems for blind babies indicate that when used from infancy, the device becomes a part of the child's *personality*, and a phenomenal feel comparable to the phenomenal feel of the sighted can develop.

also be evident for someone who denies ECM. Further, I think the sceptic should also acknowledge that SS is a case of functional incorporation as I have described it – whether or not she agrees that functional incorporation is a sign of ECM. However, if functional incorporation is accepted as a demarcation criterion for ECM, then we need to accept that sensory substitution is a case of ECM.

4.6. Conclusions

In this chapter, I differentiated between four degrees of extension. Even though also the first two of them (*short-term* and *integrated extension*) can involve experiential states, they are not stable enough to provide a relation that is needed for ECM. I argued that only the last one, *functional incorporation*, is suitable for ECM. For clarificatory purposes, I introduced a group (*prosthetic incorporation*) that doesn't qualify as any kind of extension as extension is understood in EM and ECM.

I then set up the criteria needed for ECM, namely the *glue and trust* conditions. The external part needs to be: 1) part of the (quasi)-transparent bodily point of view, 2) under the sensorimotor control of the subject, 3) entrenched and individualised as the subject's own; and there needs to be 4) a sense of agency involved, and 5) a goal-driven, sense-making attitude.

Finally, I analysed an example that fulfils these conditions. I showed that the use of sensory substitution devices, such as TVSS or *The vOICe*, fits well with my description of functional incorporation and the features included in it, namely the glue & trust criteria for ECM.

5. Possible Objections to ECM

5. 1. Introduction

In this chapter, I discuss four objections or counter-arguments that have been presented against ECM. They are 1) the argument from high-bandwidth, 2) predictive processing, 3) the brain-in-a-vat thought experiment, and 4) dreaming and hallucinations. The reason I have chosen exactly these counter-arguments is that I think they are either the most challenging (1 & 2), or the most common (3), or the most interesting (4). I will answer them, and conclude that none of them refutes ECM.

The first two counter-arguments (as they are used by Clark) are meant to block the inference from EM to ECM, that is, my first argument in the second chapter. The last two criticisms especially challenge my second argument for ECM (the inference from sensorimotor enactivism to ECM), but also my third argument (the inference from embodiment to ECM). However, I will argue that they are not successful in cutting off the inference relations of these arguments.

The last two objections touch upon the same concern: if we can have (or conceive, in the case of the brain-in-a-vat thought experiment) instances of phenomenal experience without access to the environmental interactions, how can we claim that the interaction has a constitutive role for (other, e.g. veridical, non-envatted fully embodied waking life) phenomenal experiences. The concern indeed is real, of which the existence of dreams is perhaps the clearest expression. Another real-life example is receiving electric impulses in one's brain, and in this way creating phenomenal experiences. Moreover, there are a number of different brain injury -based pathologies, such as the locked-in syndrome, that are manifestations of the same phenomenon. The reason why I took the highly speculative brain-in-a-vat thought experiment alongside these empirical cases, is that it puts into words the centuries-old scepticism about the constitutive role of the outside world for our perception and mind.

5.1.1. Clark's criticisms of ECM

Because one person (Andy Clark) has come up with so many counter-arguments for ECM, I will start this chapter by briefly summing up his line of thought. The contradiction between Clark being on the one hand the first and most famous supporter of EM, and on the other hand the most ardent opponent of ECM, is a thrilling one. Of course, the discrepancy is not only thrilling, but also inconsistent, as I have already presented in the first argument of the second chapter (where I argued that if we accept EM, we need to accept ECM as well), and as I will show in this chapter as well.

As was briefly mentioned in the third chapter, Clark (2009) argues against ECM along the same lines as Adams and Aizawa did against Clark's own EM: he claims that the relation between the external tool and conscious experience is causal, but not constitutive. Accordingly, Clark continues, ECM commits a causal–constitution (C–C) fallacy. However, Clark's approach or underlying method is different from Adams and Aizawa's. Whereas the latter's argument was drawn from metaphysical considerations, Clark's argument is supposed to be based on empirical grounds. Clark (2008, 138) himself admits that the metaphysical C–C debate is "unproductive". We could call Clark's version an *empirical C–C -fallacy*. Whereas Adams & Aizawa appealed to the metaphysical assumption about the lack of the "mark of the cognitive", Clark appeals to empirical reasons, such as the superior processing power of the biological brain. Even though a fact like the processing power of the brain is undoubtedly a more empirically verifiable/falsifiable than Adams and Aizawa's non-derived content, I claim that it nevertheless falls into the same kind of *a priori* claim about the "mark of the conscious". It leans on a presupposed border between conscious experience and the rest. (I will return to this issue in the answers for the high-bandwidth argument.)

Of the four counter-arguments presented in this chapter, two are used by Clark, namely the arguments from high-bandwidth and predictive processing. The former states that high-speed processing power is crucial in the construction of conscious experiences, and only neural processes are able to achieve it (Clark 2009). The latter states that the neuroscientific theory of predictive processing is able to explain all the positive features of ECM, while securing internalism (Clark 2012). Note, however, that Clark does not think that predictive processing is in conflict with externalism in general. On the contrary,

he declares that they have much in common, and that predictive processing is a "perfect neuro-computational partner for work on the embodied mind" (Clark 2016). He simply considers that conscious experience is out of the scope.

However, Clark explicitly admits that two of the counter-arguments that I will present *do not* refute ECM, namely the brain-in-a-vat argument and the argument from dreams and hallucinations. Clark (2009, 981) recapitulates neatly why the envatted brain argument is mistaken:

> If the vat does not fill in everything the world provides, the experiment is unfair. If it does, it cannot prove anything, as the filled in contributions might […] still be essential for that very experience. The brain-in-a-vat considerations are thus unable to advance the argument.

Furthermore, according to Clark (2009, 981), the existence of states such as dreams and hallucinations can only show that there are *some experiences* that are not realised by means of external interaction. This doesn't yet tell anything about the rest of the experiences. He also acknowledges that the cases where the body and the world are in the loop outnumber the non-loop cases.

These rejections are reasonable of course, since these counter-examples would threaten Clark's own EM as well. The brain-in-a-vat thought experiment (had it any argumentative power) would upset EM directly for obvious reasons. It seems that Clark realises that if used against ECM, it would also rebut EM. The rejection of the dream counter-argument, however, is a slightly more perplexing case. Dream experiences are experiential states, and hence in the range of ECM and not EM – and for that reason one would think Clark would want to employ it. Nevertheless, in his 2009 paper, Clark is hesitant to use it against ECM because he acknowledges that ECM follows the same pattern as his own EM: for EM or ECM to be a legitimate theory, it is not required that all cognitive (in the case of EM) or all experiential (in the case of ECM) states be extended. This argumentation is the most straightforward reason to reject the counter-argument based on dreams and hallucinations.

However, as we will see in section 5.5., the dream argument leads to some complexities, and requires a more thorough treatment with finer details. Moreover, even though Clark rejected it in 2009, he re-adopted it in his 2012 paper, where he states that dreams and

hallucinations are problematic for ECM. He has a solution: unlike ECM and enactivism, which are unable to explain these phenomena, a framework from cognitive science, i.e. *predictive processing*, is capable of offering a coherent explanation for them. In what follows, I will show why Clark should also drop his arguments based on high-bandwidth and predictive processing – if he wishes to uphold EM.

5.2. The argument from high-bandwidth

Clark (2009) bases his first counter-argument against ECM on a short passage about timing and bandwidth from a foreword to his own (2008) book written by Chalmers.[133] Chalmers's suggestion offers Clark a concrete explanation how ECM falls into the above-mentioned empirical causal–constitution fallacy. Clark draws a picture according to which ECM fails because the material basis of consciousness requires access to information on a very high bandwidth, and our relation to the environment is on too low a bandwidth. Clark develops Chalmers's idea, and thus appeals to the biological brain as "the only adequate vehicle" for consciousness.

[133] Chalmers (2008) only throws this idea in the air, he does not develop it further. However, in his more recent (also short) treatment considering EM and ECM (Chalmers 2017), he admits that the high-bandwidth argument might have been wrong, because some perceptual processes, such as vision, are extremely high in bandwidth. He alters the argument slightly: "I think the right explanation is not that consciousness requires high-bandwidth access to information, but that it requires relatively *direct* access" (Chalmers 2017, italics original). This way of reasoning is not very far from the original high-bandwidth claim, and especially because Chalmers doesn't specify what he means by "direct" (and if it is needed, why is it not needed in the case of occurrent cognitive states?). It is difficult to see how "direct" is actually different from temporally high (i.e. quick) bandwidth. However, this new counter-argument is in a sense more metaphysical, since Chalmers's argumentation relies on considerations very similar to arguments based on the differentiation between derived vs. non-derived content (see Adams & Aizawa 2001). Moreover, Chalmers suddenly appeals to action–perception loops or sensorimotor interaction as a requirement for truly extended cognition – a requirement that has been promoted by sensorimotor enactivists and supporters of ECM all the time, and which in no way would refute ECM, but quite the contrary would promote it.

Thus, speed matters. Clark suggests that there are time-scales that are only reachable for neural processes. According to him, consciousness "requires cortical operations that involve extremely precise temporal resolutions" (Clark 2009, 985). He combines this with Eliasmith's (2008) suggestion that neural and extra-neural dynamics are different in speed of information flow (bandwidth), and that the extra-neural body functions as a "low-pass filter". A low-pass filter is a physical barrier that allows low frequency signals through, and blocks high frequency signals. For example, the walls of a room function as a low-pass filter for a sound: the lower frequencies (such as the base) are heard better than the higher frequencies outside the room (Clark 2009, 985).

> [T]he extra-neural body, implicated in all cases of active vision and motor loops, acts as a kind of low pass filter for signals coming from the environment. What this means in practice is that for phenomena that depend on, for example, the very fast temporal binding or processing of signals, the only locus in which such operations can (as a matter of fact) occur lies within the brain/CNS. (Clark 2009, 985.)

Hence, conscious experiences cannot be extended, because everything that involves bodily, sensorimotor actions (e.g. eye saccades) will be "screened off" by the bodily low-pass filter. Clark ends up noting that the bodily, environmental aspects *do have* a role in constructing conscious experiences, but the role is merely causal.

5.2.1. Answers to the high-bandwidth argument

This counter-argument is problematic in many ways. *First*, it presumes *a priori* predominance of the neural that is very much in conflict with Clark's larger views about the human mind. It draws a principled barrier between the brain and the rest of the body

(and the world). As I wrote earlier, Clark's reasoning resembles Adams and Aizawa's original critique towards his own EM. High-bandwidth is used as the *mark of the conscious* in a similar manner as non-derived content was used as the *mark of the cognitive*. Even though the argument is based on two empirical claims (information flow on a high-bandwidth and body as a low-pass filter), the way they are used builds up a principled gap between the neural and non-neural, and consciousness and the rest, respectively. Moreover, it also seems the latter of these claims is false on empirical grounds, as we will soon see.

Second, the argument is based on dubious assumptions about the body as a low-pass filter that do not have empirical support. Empirical research doesn't back up the claim that our bodies function as low-pass filters.[134] Vold (2015) has criticised Clark's high-bandwidth argument based on research on visual perception. Visual modality is a non-neural system, and as such should be low in bandwidth if the high-bandwidth argument were true. However, visual perception is actually higher in speed than the neural processes dealing with vision.

> Information about the surfaces of objects is transferred when light hits the eye, which is subsequently transmitted to the brain. But the brain, which cannot transfer or receive information at the speed of light, slows this information processing down. So non-neural processes must be constantly reporting information back to the brain, through the low-pass filter Clark describes, at least as quickly as neural processes can operate. (Vold 2015, 21.)

Therefore, it seems that the claim that the body is a low-pass filter is simply mistaken. This alone suffices to refute the high-bandwidth counter-argument because even if the high-speed processing were still necessary, there is no reason why it should be delimited in neural processing any more. All in all, as an empirical claim, the high-bandwidth argument is very ambiguous since Clark does not specify which neural activity he refers to.

[134] See e.g. Holcombe 2009; Elliott & Giersch 2016; Sweet 1953. One problem in differentiating high and low bandwidth is that it is dependent on the feature we want to describe, and cannot be defined independently.

Third, the fact that conscious experiences require fast neural processing, even if true, only shows that neural processing is necessary (as a matter of contingent, empirical fact about humans, as Clark also reminds us) for consciousness. No one would deny this, and it is fully compatible with ECM. Neural processing is a necessary criterion for conscious experiencing, and it is undoubtedly high in bandwidth. However, the high-bandwidth argument gives no reasons why the neural sphere would be a sufficient condition for realising conscious experiences. The fact that the brain is necessary does not entail that the brain is sufficient for constructing experiences.

Fourth, even if it were true, it would also debunk occurrent EM (which is certainly an unwanted result for Clark). According to Vold, there is no evidence that high-bandwidth would *not* be necessary for cognition. For example, motor skills in expert behaviour, such as the skills used in driving a car, require processes that "are unconscious but still work fast enough to control our real-time behaviours" Vold (2015, 25). Bodily factors certainly matter in occurrent cognitive states just as they matter in experiential states – if the body really acted as a low-pass filter, these cognitive processes would turn out to be internal in the same way as experiential processes. At least, for the reason that Clark is raising such a strong distinction between neural and non-neural processing, he should provide convincing reasons why cognition is different from consciousness – otherwise he is creating an objection against himself. Of course, this is not a knockdown to the high-bandwidth argument as such, but is surely a reason why Clark should not want to use it. However, as I showed above, there are plenty of reasons why the argument based on high-bandwidth is not a convincing way to debunk ECM in the first place.

5.3. Predictive processing

Clark's second attempt at criticising ECM was published in his 2012 paper, where he answered Ward's (2012) answer to his 2009 paper, and came up with a new line of criticism towards ECM. This time, he appeals to *predictive processing* as a positive story how phenomenal consciousness is realised in the brain (alone). Clark claims that predictive processing is not only able to explain veridical, wakeful experiences, but also explanatorily problematic experiences in dreams, hallucinations and imagination. Clark himself, among other things, is famous for developing the theory of predictive processing: the branch he promotes is referred to as *action-oriented predictive processing* or *radical predictive processing*, and in general it is compatible with (at least some of) the 4E and situated views (see e.g. Clark 2012; 2013; 2015; 2016).[135]

Predictive processing is a theory used in cognitive sciences, computational psychiatry, and other related sciences of the mind, concerning the generative power of the brain (see e.g. Friston 2003; 2010; Wiese & Metzinger 2017). Brains, to put it bluntly, are prediction machines whose task is to correct and minimise errors. The brain is generating and constantly updating a model of the environment based on the sensory information it receives. Prediction-driven processing is meant to reduce prediction errors, namely the difference between actual and predicted sensory signals. The world does not "come inside" the brain, so the brain predicts how the world is likely to be (Clark 2012, 759).

> To successfully represent the world in perception, if these models are correct, depends crucially upon cancelling out sensory prediction error. Perception thus involves "explaining away" the driving (incoming) sensory signal by matching it with a cascade of predictions pitched at a variety of spatial and temporal scales. These predictions reflect what the system already knows about the world (including the body) and the uncertainties associated with its own processing. […] What we perceive depends heavily upon the set of priors (including any relevant hyper-priors) that the brain brings to bear in its best

[135] The branch that Clark supports is contrasted with a *moderate* or *conservative* account of predictive processing that is committed to the view that generative power comes from full-blown (internal) representations (for overviews, see Clark 2015; Dolega 2017). However, as my interest here is not in the theories of predictive processing as such, but rather in the counter-arguments against ECM, I will focus on the branch promoted by Clark, i.e. action-oriented predictive processing.

> attempt to predict the current sensory signal. (Clark 2013, 187).

Clark's account is compatible with the externalist views. He himself states: "Embodiment and action fit very naturally within such a framework" (Clark 2012, 760). Embodied agents can actively control their sensory input stream, and that enables better and faster predictions. For example, turning one's head or walking towards an object are ways of controlling the sensory input, and hence the prediction process. Clark calls this "self-structuring of information flows" (a term borrowed from Pfeifer et al. 2007). The self-produced action creates a "known transform": I can move my head such-and-such ways to transform the incoming sensory data (Clark 2012, 760).

As we can see, Clark aims to come up with a view that would explain the positive results of sensorimotor enactivism and ECM (the features of sensorimotor enactivism that were presented in the second chapter, such as virtual presence/presence in absence and variable neural correlates) – while preserving an internalist account of conscious experiences. However, the most important asset for Clark (2012) is that he claims that the predictive processing framework can explain how perception-like states, such as dreams and hallucinations, resemble "normal" veridical perceiving phenomenologically, yet they don't have a direct link to the outside world. Clark claims that his account can explain the similarities and differences – in a way that supports the internalist explanation of the realisers of conscious experiences. Clark's idea is that in "normal" veridical perception, the generative models of predictive processing enable us to engage (at least to some extent directly) with the outside world. These same generative models are at play in the absence of the sensory information from the outside world, that is, in dreams and hallucinations. Accordingly, according to Clark, perception and perception-like states have the same (internal) neural basis.

Hence, (this time) Clark rejects ECM because of the "super-tight link" between the mechanisms of perception and the mechanisms of phenomenally close states, such as dreams, hallucinations and imaginings, and we should "consider these latter cases as co-arising within the general setting of mechanisms for veridical perception and effective action" (Clark 2012, 767). According to Clark, the predictive processing framework shows how we can have a genuine "not-indirect" access to the outside world – yet seal

the mechanisms for perceptual experience in the head, because the mechanism is the same as in (internal) dreams.

5.3.1. Answering the counter-argument from predictive processing

My aim is not to criticise the action-oriented predictive processing framework itself. I think it provides a convincing story about how the brain anticipates its states, and how this enables perception to reach a world that appears coherent. However, I disagree with Clark in that it would refute ECM. I claim that the predictive processing framework is fully compatible with external material realisers of perceptual experience.

Pepper (2014, 101) takes a step further, and states that the predictive processing framework is "conducive to ECM and the enactive approach generally, as it puts the anticipatory structure of perception on a firm neurocomputational footing hitherto absent from the discussion". Kiverstein & Kirchhoff (2019) are on the same track and not only argue that the predictive processing framework does not refute ECM, but also argue that it provides further support for ECM. Hence, this is the altogether opposite of Clark – instead of using the theory to criticise ECM, they use it to reinforce it – but their reasons are based on the same empirical evidence. My aim here is more moderate: I do not aim to argue for predictive processing as such, nor argue that it leads to ECM, but merely to show that it is *not incompatible* with ECM, and therefore we can disregard the counter-argument based on it.

First, it is important to notice that Clark doesn't commit himself to an indirect view of perception – which would at least seem to be a quite straightforward way to deny ECM and set up internalism. If the world out there was just a model in our brains, the denial of the environmental interaction would be much easier to establish. However, Clark's intention is that we don't perceive the generative models in our brains, but we perceive

the world. “Equipped with brains like ours we become porous to the world. Its structure and statistical regularities flow through us in as real a way as do food and water through the digestive tract” (2012, 767).

The directness of perception is related to the reason why Clark cannot consistently maintain his view. Pepper (2014) emphasises that if perception really is direct, then the phenomenological differences between veridical perception and dreams and other non-veridical processing are explained by the external elements in the world. He refers to O’Regan’s notion of the world as an *external working memory*: “the stability of the waking perception is explained not in terms of sameness of representational content, but in terms of the stability and continual availability of information in the world itself” (Pepper 2014, 105). The external parts that are available in veridical perception, but absent in dreams, make a difference. I will discuss the dream question in more detail in section 5.5.

The main reason why the predictive processing framework doesn’t work as an objection to ECM is embedded in Clark’s own philosophy. If we accept the *action*-oriented side of the theory that Clark himself promotes, ECM fits very well into the picture. As mentioned earlier, Clark (2012, 760) talks about “the self-structuring of information flows”, namely bodily actions that are taken in order to obtain better and faster predictions. Accordingly, Pepper (2014, 102) draws the following conclusion:

> It is an unnoticed consequence of Clark’s position that the EM theorist who endorses the [action-oriented predictive processing] framework cannot deny extended perceptual cognition on pain of inconsistency. This is because the centrality of informational self-structuring to [action-oriented predictive processing], when considered in light of some key commitments of EM expressed by Clark elsewhere, unwittingly commits the EM theorist to an extended physical basis of perceptual cognition.

Throughout his other writings, Clark (see especially 2008) has emphasised that informational self-structuring is one of the exemplar cases of (occurrent) EM. How we position our bodies, turn our heads, make use of eye saccades, perform gestures and so on, should be seen as part of the cognitive processing itself – and not something that just affects, enables or shapes it. There is a great deal of empirical evidence for this, for

example Goldin-Meadow's (2001; 2003) studies on the role of gestures as part of the thinking process (for details, see sections 2.4.1. and 3.3.1.1.). Clark is famous for arguing for this kind of off-loading of the cognitive burden into the environment.

Pepper (2014, 102) points out that according to Clark's own characterization of informational self-structuring (as sketched above), bodily actions have a constitutive role for the mechanisms of perception. Therefore, if one wants to hold on to EM (as Clark defines it) and also embrace the action-oriented predictive processing framework (as Clark defines it), one cannot just rule out the external elements – because otherwise EM would be cut out too. Therefore, Clark's criticism, as he presents it in his 2012 paper, does not work.

However, one might try a less direct form of criticism. As we saw, the direct rejecting of the role of the external elements in perception did not work out. But perhaps Clark would declare that he is only talking about the cognitive aspects of the mechanisms of perception, but not the experiential aspects. For this claim, he would need an additional argument, because the theory of the active-oriented predictive processing did not provide one. The high-bandwidth argument (i.e. consciousness requires faster processing power than cognition) would be an option, but as I showed earlier, it does not work. As I have argued elsewhere in this thesis (see especially chapter 2, argument 1), the cognitive and conscious aspects cannot be separated as Clark has claimed. Clark's (2012) other alternative is the existence of dreams and hallucinations, and the "super-tight link" between them and veridical perceptions. I will discuss in more detail in section 5.5 why this route doesn't provide the result that Clark wants.

To recap, the (active-oriented) predictive processing framework does not provide independent reasons to reject ECM. It needs further reasons for the now very familiar problem: how is one to uphold EM while denying ECM? As has now become clear, the task is very difficult, if not impossible, and in the best case the surviving EM would be a reduced version that would cover only dispositional states and leave out the main aspects that characterise Clark's theory of EM.

5.4. The brain-in-a-vat thought experiment

What if we removed some poor chap's brain from his head, placed it in a vat with nutrients, and simulated the inputs usually coming from the rest of the body and environment by wires to a supercomputer? Would this envatted brain have the same experiences (or at least some experiences) as a person with a normal brain situation? If that would be the case, it would prove quite efficiently that the brain is a necessary and sufficient material realiser for experiences.

The brain-in-a-vat is an archetypal example of a *thought experiment* in (analytical) philosophy. Its origin can be traced back as far as Cartesian scepticism, and it has certainly provided food for thought for generations of philosophers.[136] However, a thought experiment as a method is problematic when applied to empirically oriented philosophy of mind. The reason for this is that whether a brain-in-a-vat scenario is conceivable, i.e. metaphysically or conceptually possible *in principle*, doesn't yet have any impact on EM or ECM, or questions generally related to cognitive and neurosciences. Hurley (2010, 109) calls these kinds of arguments *supervenience thought experiments*, which "assume that internal and external factors do not vary together in relevant possible worlds – that internal factors can be unplugged from one array of external factors and plugged into another". However, if the internal factors turn out to be unpluggable, then the supervenience thought experiment is not possible in the first place (see Thompson & Cosmelli 2011, 173).

However, Thompson and Cosmelli (2011) (and see also Cosmelli & Thompson 2010) have approached the matter from an interesting point of view. It is interesting for two reasons. First, it very effectively nips in the bud the brain-in-a-vat counter-argument, and second, this refutation (i.e. the practical impossibility of envatting the brain) demonstrates that the body and environmental stimulation are necessary for the mind and consciousness. Therefore, they end up using the thought experiment for exactly the opposite purpose, namely for supporting the embodied, extended mind.

[136] For some early versions of the argument, see Dennett (1978); Putnam (1981); Smith (1984). Locked-in syndrome could be considered a "real-life case" of the brain-in-a-vat thought experiment. There are some enactivist answers about how to deal with the challenge the locked-in syndrome poses to 4E-views (see e.g. Kyselo & Di Paolo 2013).

Thompson and Cosmelli make it clear that in order to have any argumentative power, the question must be addressed from a technical, bioengineering perspective. They follow Dennett's (1991) idea presented in a prelude to his book *Consciousness Explained*, where he asks what it would take to envat a brain so that it would function like a normal, embodied brain. Dennett's treatment shows that sometimes "*impossibility in fact* is theoretically more interesting than a *possibility in principle*" (Dennett 1991, 4; quoted in Thompson & Cosmelli 2011, 168). First, the brain needs to be kept alive and protected by something that replaces the skull.

> [T]his system must involve at least the capacity to keep up with the energetic, ionic, osmotic, and recycling needs of the brain. It will therefore include some kind of circulatory system, plus the necessary pumps, oxygenating devices, and additional subsystems for ensuring the maintenance of physiological levels in the circulating fluid. […] [W]hat the brain requires at any given instant depends on its own ongoing, moment-to-moment activity. Therefore, the life-sustaining system must not only be supportive of this activity, but also locally and systemically receptive and responsive to it at any given instant, independent of any external evaluation of the brain's needs. Consequently, to keep the brain alive and functioning, this responsive system will most likely need to be energetically open, and self-maintaining in a highly selective manner. (Cosmelli & Thompson 2010, 368–369.)

Thus, this system needs to be robust and self-regulating – as organisms are. As Thompson and Cosmelli (2011, 170) note, this system begins to resemble more a body than a vat. And this is not enough. The thought-experimenter must also fix the following issues: brain's self-generated activity must be tightly coupled with the "body", and the stimulation that the nervous system usually receives from the body and environment must somehow be replaced. These are highly problematic requirements. First, it is not enough to try to mimic the normal inputs, since identical inputs don't lead to identical states.

> It's not the case that an embodied brain and its envatted duplicate will remain qualitatively identical simply because they receive identical inputs throughout their lives. The brain isn't a reflex machine whose activity is externally controllable through input instructions. Rather, it's a highly

> nonlinear and self-organizing dynamical system whose activity exhibits an extreme sensitive dependence on initial conditions. Inputs perturb such complex systems, but don't specify particular outcomes. Furthermore, most inputs arise as a consequence of the system's own intrinsic activity. Hence to get the body-type inputs to match the normal inputs precisely would require getting them to match the bodily inputs to the brain that arise from the brain's nonlinear and unpredictable intrinsic activity. (Thompson & Cosmelli 2011, 171.)

The thought-experimenting engineer should find out how to produce phenomenal experiences that would match those of the normal experiencers. As we learnt from the previous passage, this is not a simple task. Rather, it is very probably an *impossible* task. Some kind of stimulating device would be needed that would be "in perfect synchrony with the brain's exploratory motor efference signals as its sensory systems scan through the virtual image, and updating its activity so as to match precisely the sensory reafference" (Thompson & Cosmelli 2011, 172). Further, the stimulating device should not disturb the life-sustaining system: every stimulation creates a disturbance in the homeostasis that needs to be compensated by the system. (Thompson & Cosmelli 2011, 172; Dennett 1991, 5.)

Studies in computational neuroscience[137] indicate that adaptive behaviour rises from the dynamical coupling and feedback between the nervous system and the peripheral sensorimotor systems – it is not a one-directional process programmed by the brain. Hence, the "vat" should have the required flexibility and capability to ensure this dynamical coupling relation. As Thompson and Cosmelli (2011, 172) point out, "the best and probably only way to establish this coupling is to give our brain real sensorimotor systems it can control". Hence, the brain in its vat looks very much like an embodied agent in the world.

Therefore, *envatting* the brain actually requires *embodying* the brain. It doesn't have to be identical with our body, but it needs to fulfil certain functional requirements,[138] that is,

[137] Thompson & Cosmelli refer for example to a study made by Chiel and Beer (1997), where it is shown that feedback loops between the nervous system, body and world are essential for behaviour. See also e.g. Ferri et al. (2012) and Chiel et al. (2009).
[138] This leaves the door open for the possibility of an *artificial mind* (e.g. a robot). Thompson & Cosmelli, however, do not address the questions of developmental robotics and artificial intelligence.

it has to be a *surrogate body*. This makes the thought experiment impossible, because – if we recall Hurley's notion of *supervenience thought experiment* – the factors (brain vs. body) were meant to be separable for the purposes of the thought experiment. Nevertheless, they are not. The brain is not a brain (as we know it) without its body and environment. The brain is explanatorily and physically unpluggable from the body.

As I mentioned at the beginning of this chapter, Clark (2009, 981) explicitly rejects the brain-in-a-vat argument: if the vat doesn't imitate everything the real world provides, the thought experiment is not fair, and if it does, it is unable to prove anything, since it is impossible to separate what is the role of the substituting external interactions. Clark's reasoning is close to what I have been arguing so far, and what I think is the main reason why the brain-in-a-vat is not a good argument: if the "vat" doesn't mimic everything, the experiment isn't fair – and if it does, the result is a surrogate body situated in a surrogate environment.

Moreover, the idea of a disembodied brain creating experiences by itself is in general very far from the enactivist and 4E framework. Dave Ward illustrates this with two comparisons. A man performing movements identical to tangoing on his own doesn't qualify as dancing a tango, since the relation with a partner and music are necessary for something to count as dancing a tango. Similarly, "driving" an overturned car is just spinning its wheels and not driving, since the act of driving requires a relationship between the car and the road (or other surface). The same goes for brain activity and experiencing. "A disembodied brain going through a sequence of physical states in limbo is not experiencing, for it is in no meaningful relationship with its environment" (Ward 2012, 746–747). Disembodied legs are not walking, and a disembodied brain is not experiencing because the necessary parts of the picture are missing.

Finally, even if the brain-in-a-vat scenario were possible, it would only speak for that specific brain in that specific vat, and it might still be that with real embodied people, the experiences were constructed in the interactions with their bodies and environment. To recap, this counter-argument is unsuccessful all the way down the line, and is of no threat to the externalist views. Somewhat surprisingly, despite all this, I think the brain-in-a-vat argument still manages to reveal something. Its impossibility illustrates that "the brain and body are so deeply entangled, structurally and dynamically, that they are explanatorily inseparable" (Thompson & Cosmelli 2011, 168). In order to maintain a

mind, the brain simply cannot be unplugged from the body. Body states, brain states and environmental interactions are inseparable, and belong to the constitutive basis of experiences.

5.5. Dreams and hallucinations

The counter-argument based on the existence of dreams and hallucinations is perhaps the most straightforward (and most *natural*, in a sense) that has been presented against ECM. The central idea is similar to the brain-in-a-vat argument, but with one striking difference. Whereas the brain-in-a-vat scenario leaned on a thought experiment, this argument is based on a common everyday phenomenon, of which there is an abundance of empirical research available. I think that of all the counter-arguments presented in this chapter (also including the causal–constitution fallacy presented in chapter three) the dream argument is the most convincing – even though I do think the ECM supporter can answer it. However, it is striking how little literature there is about this topic, namely the relationship between 4E-theories and dreams. Antti Revonsuo (2015) has contributed a direct objection to ECM and sensorimotor enactivism based on the "dream argument". Enactivists have not given a proper reply. This section aims to fill that gap – or at least raise the central issues we need to take into consideration in order to respond to the challenge.

The dream argument is the following. If conscious experiences are (partly) realised by external elements as ECM claims, how are states such as dreams and hallucinations possible, as it seems that they are realised exclusively in the head? If dreams and hallucinations do not need any interaction with the environment, possibly other experiences do not either. And if the interaction with the environment is not a necessary feature for these certain experiences, how can it be part of the constitutive basis for

experiences in general?[139] We need to accept the situation described in the following passage that appears to be challenging the very core principle of the externalist view of consciousness. "The dreamer is highly conscious (she has vivid experiences), is disconnected from the environment (she is asleep), but somehow her brain is creating a story, filling it with actors and scenarios, and generating hallucinatory images" (Nir & Tononi 2010). This is the challenge that dreams and dream-like states posit for ECM and externalist views in general.[140]

There is one crucial methodological matter we need to take into account. Philosophers who are addressing the dream question very often tend to ignore all the empirical research there is about dreaming. Matthew Ratcliffe (2017) has made a sharp observation. He points out that philosophers are using their very own conception of hallucinations (he calls it *philosophers' hallucinations*) that has been in a dominant position through the history of philosophical thought experiments, as Descartes' evil demon and various more recent counterparts show. This kind of concept of hallucination, however, has barely any connection to another concept of hallucination, that is, *real hallucinations*, that are studied in psychiatry. This is a very important remark: we need to be aware in which sense the concept is used, because the meaning is very different. Ratcliffe's sharpness notwithstanding, he has a similar kind of blindspot himself when it comes to *dreams*. There is a similar discrepancy between *philosophers' dreams* that are used in thought experiments and *real dreams* that empirical dream research is investigating. Philosophers often use a notion of dreams that has no connection to empirical research.

Revonsuo (2015) has strongly criticised the way the results of empirical studies are often absent from philosophers' theories. I agree with him that when philosophers of mind and cognitive science define dreams, it is crucial that they take into account the empirical results from neurosciences and dream research. However, I disagree with him that these

[139] I will focus on dreams, since there is more literature about them, and because dreaming is a very familiar phenomenon, of which (almost) all of us have first-hand experience. Hallucinations, on the other hand, are considered to be something that is not so common (this might be a false belief, but still, it is fair to say that dreaming is a more mundane and commonplace phenomenon than hallucinating). However, the existence of hallucinations (whether due to schizophrenia, brain injury, psychedelic drugs, alcohol, sleep deprivation, etc.) would be an equally good example. I sometimes use the term *dream-like states*, by which I refer to dreams, hallucinations, illusions, imaginings and other non-veridical experiencing.

[140] At least externalist views that argue for the extension of experiential states. ECM is not the only one of this kind, for also e.g. sensorimotor enactivism (and perhaps enactivism in general) and the hypothesis of extended affectivity (see e.g. Colombetti 2014) are in the target. However, I think dispositional EM is in the clear when it comes to the dream challenge (though some might oppose this based on the fact that we do have beliefs in dreams).

empirical results would necessarily entail an internalist account of the mind or of phenomenal experience.

Another problem is that the writers who have addressed the dream challenge regarding ECM have a strong dissonance even about the very starting point, namely what the relation between dream experiences and veridical experiences is. The opinions vary from one end of the spectrum to the other. According to Revonsuo (2015), dreams are phenomenologically similar or even identical with veridical experiences – they simulate waking life. According to Pepper (2013), dreams are somewhat different phenomenologically – they are an impoverished version of veridical experiences and waking life. According to Noë (2009), dreams are completely different – they belong to a different *kind* than veridical experiences. This reveals that the question is complicated because this is only the starting point that does not even address externalism or internalism yet.

It is good to remember that of these three writers, only Revonsuo is a dream researcher. Considering this, it is surprising how strongly he appeals to the similarity or identity between veridical and dream experiences, when after all, besides the similarities, there is also plenty of empirical evidence of *dream bizarreness*, such as discontinuities, holding contradictory beliefs, sudden transformations and impossible scenes or activities, like pink elephants or flying (Nir & Tononi 2010; Hobson, Stickgold & Pace-Schott 1998). Moreover, as I will argue in section 5.5.2.4., Revonsuo's interpretation or understanding of *phenomenal experience* is different from the notion that sensorimotor enactivism and ECM deals with.

Even though this dissonance has complicated the discussion, I claim that the nature of dream experiences and their level of similarity with veridical experiences is not actually of the essence concerning the question we want to address here. For the dream argument to work, it is enough that *some* dreams are similar *enough*. Kristjan Loorits (2017, 123) calls this "sufficient similarity": a dream is sufficiently similar to veridical experience when the dream experience contains the phenomenological features that are explanatorily relevant for veridical experiences. And there is a consensus amongst the dream researchers that there are dreams that belong to this group (see e.g. Revonsuo & Salmivalli 1995; Domhoff 2007).

Further, even though for the sake of the (opponent's) argument I will treat dream experiences as fully internally constituted processes, this in fact is not necessarily true. The material realisation of dream experiences is perhaps not restricted to neural processes only, for it might also depend on bodily functions. As Metzinger (2013) states, the *functional disembodiment hypothesis*, according to which dream states are disconnected from the sleeping body (see Windt 2014), has been refuted by empirical studies. Instead, there is evidence that some minimal forms of embodiment are preserved during REM-sleep dreams. Inputs from the real sleeping body can enter dreams, and vice versa, dream movements may be enacted by the sleeping body. According to Metzinger, the most evident case is the "reliable directional correspondence between dream-eye movements and real-eye movements". Moreover, studies in lucid dreaming indicate that dream movements are in accordance with muscle twitches in the same limbs as in the dream, and also correspond with heart and respiration rates. External, real-body stimuli, such as spraying water on the skin, electric stimulation, etc., has also been shown to be mirrored in our dream bodies. (Metzinger 2013.)

These results show quite unquestionably that dreams are not completely disembodied. However, the embodiment question would require a more thorough investigation, which I am not going to pursue here. I settle for the modest claim that it is not necessary that dream experiences are entirely disembodied. Moreover, even though the evidence speaks for some amount of embodiment, it doesn't indicate *extension* outside the body. The potential minimal embodied nature notwithstanding, I will treat dream experiences as purely brain-bound events. A proponent of ECM can answer the dream challenge either way.

In what follows, my aim is to show that empirical dream research doesn't contain anything that would necessarily lead to an internalist account of the mind. First, I will introduce the most straightforward dream argument against ECM that has been presented in the literature, and discuss some of its merits and deficiencies. I will then discuss four different options how a proponent of ECM can defend herself from the dream challenge in general.

5.5.1. Revonsuo's dream argument

Revonsuo (2006; 2015) has set up the most elaborate version of the dream argument against ECM and sensorimotor enactivism.[141] According to him, if the following two statements are true, internalism of consciousness follows, and he claims that "all the available evidence from empirical dream research" supports them. *First*, experiences are phenomenally highly similar and in most cases identical to the veridical waking life experiences – they have equally rich and complex experiential contents, and this is manifested especially during REM sleep. *Second*, if the first clause is true, and dream experiences are as rich and complex as the waking experiences, it follows that the only minimal necessary constitutive conditions for experiential states are the ones that are active in the brain during dreaming in REM sleep.[142] (Revonsuo 2015, 57–58.)

I am hesitant to accept even the first premise. It is undeniably true that waking and dreaming experiences are phenomenally similar to a great extent, but empirical dream research doesn't back up the claim that they would have equally rich and complex experiential contents (Hobson, Stickgold & Pace-Schott 1998). Further, I disagree with the second premise and the conclusion (the brain-boundedness of dream experiences leads to the general brain-boundedness of *all* experiences, and therefore an internalist theory of consciousness follows). The jump from dream experiences to all experiences cannot be taken in as straightforward a manner as Revonsuo assumes. I will discuss the reasons for this below, and my suggestions for answers to the dream argument (presented in following sections) deal with this very same question.

Even though I disagree with Revonsuo's conclusion, and find his argumentation wanting in various ways, I do agree that he addresses an important matter – a challenge that is pressing for ECM, and deserves an answer. It is valuable as such to open the discussion, and by so doing demand an answer from the enactivists. The core of the challenge is perhaps best captured in Revonsuo's (2015, 58) elaboration. Compare a sleeping person in dreamless sleep at T1 with a person at T2 in REM sleep and vivid dreaming. In the first

[141] Revonsuo's paper targets sensorimotor enactivism in particular. However, the same argument can be used against ECM. There are some differences how a proponent of sensorimotor enactivism and a proponent of ECM can answer the challenge, though. I will elaborate these differences in the following sections.

[142] As a technical matter, we might ask how empirical dream research could offer even in principle any support or resistance for the second statement, which aims to be a deductive inference, and not something that could be verified or falsified by empirical means.

case the explanandum is completely absent, whereas in the second case it is present – while everything in the dreamer's environmental relations (or the lack of them) stays constant. Therefore, Revonsuo continues, as the only material differences are the neural differences between T1 and T2, they have to be constitutively responsible for the explanandum.

This shows why a *prima facie* obvious answer that is sometimes heard from 4E-minded people (see e.g. Noë 2009, 180) is problematic. It would seem natural to suggest that dreaming might as well happen completely in the head, but it wouldn't be possible without all the previous environmental interactions we have had during our lives and over hundreds of thousands of years of evolution. Even though this "obvious" answer is not a straightforward solution, it is in line with the "explanatory strategies", such as *weak enactivism*, which I will present later as one possible solution to the dream argument. However, this answer does not address the issue Revonsuo is posing with the dream argument. Internalists (such as Revonsuo) would probably accept the etiological role of external relations in (causal) explanation of dreams. As I will show soon, there are also ways to answer the argument that are based on constitutive strategy.[143]

Revonsuo's aim is to criticise sensorimotor enactivism in general, but he only refers to one writer's one book (i.e. Noë 2009).[144] Moreover, the section where Noë discusses dreams is a short one. I mainly agree with Revonsuo's critique regarding Noë's view (I will discuss Noë's view in section 5.5.2.1.) However, a few pages from one book (which also happens to qualify more as popular science than cognitive science) from one author is not a comprehensive sample of sensorimotor enactivism. Loorits (2017) has elaborated Revonsuo's arguments, and stressed that sensorimotor enactivism contains different positions and facets regarding dreams, such as Hurley's (2010) *explanatory* strategy, according to which dreams require a brain-bound explanation, even though with veridical experiences, a sensorimotor explanation is more apt. Another example is a skill-based view, supported e.g. by Myin (2016), that stresses the counterfactual element – skills, capabilities and dispositions to act, rather than online action – in the constitution of

[143] This said, my aim is not to undermine the causal, etiological relation that past waking life experiences and actions have on dreams, or their evolutive role.
[144] Revonsuo himself criticises Noë for referring vaguely to only one dream researcher (Stephen LaBerge), and not even to his published research. I agree wholeheartedly with Revonsuo's criticism.

perceptual experiences.[145] Hence, Revonsuo's refutation of Noë's view is not enough to prove the whole of sensorimotor enactivism wrong.

Loorits (2017) agrees with the conclusion Revonsuo draws: the existence of internally constituted dream experiences offers us reasons to believe that veridical experiences are also constituted internally. However, he also criticises Revonsuo's straightforward argumentation in the two statements presented above. Revonsuo claims in his second premise that the brain-bound nature of dream experiences leads to the brain-bound nature of all experiences, including veridical waking-life perceptual experiences. This is too hasty a conclusion, and dream research does not offer any support for it. As Loorits (2017, 111) notes, the empirical evidence Revonsuo refers to only shows that dream experiences and veridical experiences are phenomenologically similar. The conclusion Revonsuo draws is not the only possible consequence from this empirical fact. For example, one could equally well say that dream experiences and waking experiences are realised in a different manner.

Even though the straightforward critique Revonsuo is using is not possible, it is true that dreaming shows that sensorimotor enactivism cannot pass the *general theory of consciousness* (Loorits 2017, 107), that is, a theory that comprises all areas of consciousness. Revonsuo's argumentation rests on passing the general theory. According to him, if a theory "cannot explain dreaming in particular, then it cannot explain consciousness in general" (2015, 53). He seems to be under the impression that any kind of experience without the environmental relation will refute the externalist theory. However, this is not a necessity, and there is no principled reason why a theory of consciousness should be applicable to all cases of consciousness. To sum up, I agree with Revonsuo that dream experiences are brain-bound states that are phenomenologically sufficiently similar to veridical experiences. However, I disagree that this would lead to an internalist account of veridical (perceptual) experiences. In the next sections, I discuss different options to argue for this view.

[145] I will call this view *weak enactivism*, and discuss whether it is of any help with the dream challenge in section 5.5.2.3. See also the discussion about *weak* vs. *strong enactivism* in chapter 2.

5.5.2. Answering the dream challenge

A proponent of ECM can try to answer the dream challenge in at least four ways. *First*, it is possible to deny the connection between dream experiences and veridical experiences altogether. If dream experiences are not real experiences (or don't belong to the same *kind* with veridical experiences), obviously their existence doesn't pose any threat to externalist theories. *Second*, we can look at the definition of experience itself. If it is understood in an enactivist way rather than as static *what-it-is-likeness*, the question changes. *Third,* we can appeal to a narrower interpretation of sensorimotor enactivism that stresses mastery of skills, and knowledge or understanding of sensorimotor contingencies rather than actual interactions between the subject and her environment. The skills may stay intact during dream experiences, and the core of enactivism prevail. *Fourth*, we can accept that experiences don't have to extend in all cases. In the spirit of *multiple realizability*, it is possible to hold a view that certain veridical waking-life perceptual experiences have an extended base, whereas some other instances of experiences, such as in dreams, hallucinations and imaginations, are brain-based.[146]

In the following sections, I elaborate on the benefits and deficits of these different options. I will argue that the first option is problematic, mainly because it contradicts current dream research. Further, I admit that the second option might not make an opponent of externalism satisfied, because it presumes a conception of experience that is already extended. Perhaps this option should be read more as a descriptive statement than as an argument against the dream challenge. However, I think it still deserves its place because it reveals the significance of the conceptual background, as well as fundamental differences between the externalists and internalists. However, the third and fourth options are the best ways to surmount the challenge.

[146] Of course, another obvious (but highly implausible) attempt to answer would be to claim that dream states are also extended. For example, perhaps the above-mentioned *not total disembodiment* would lead to extension, too. However, this line of argumentation is certainly not my strategy here. I have only seen one argument of this kind in the literature, namely by Riccardo Manzotti.

5.5.2.1. Noë's disjunctive enactivism

One option is to deny that veridical and dream experiences share the same phenomenological status. If dreams are not real experiences (because their phenomenality is different or lacking), the way they are constituted (internally or externally) is irrelevant for ECM. Alva Noë (2009)[147] supports this kind of *disjunctivist*[148] view in order to promote his sensorimotor approach. He admits that unlike veridical experiences, the seemingly similar states we have during dreaming are not extended. This is not, however, a problem, since he holds that dream experiences are not real experiences to start with. Dreams and dream-like states only *seem to be* similar with veridical perceptual experiences, but in fact they belong to different *kinds*. Going through what appears as "an experience of red" during a dream is phenomenologically different from a veridical waking-life experience of red, and only the latter is a real instance of an experience of red. Dreaming is less rich in details, "dream seeing" is not "real seeing", and all dream experiences are based on earlier veridical experiences.

I call Noë's view disjunctivist enactivism. His view is disjunctivist because what we call 'experiences' are either 1) real, veridical perceptual experiences or 2) quasi-perceptual experiences that belong to a different kind. His view is enactivist because real experiences are based on an agent's online actions in the real environment.[149] Thus, Noë can hold a view according to which all (real) experiences are extended without needing to pursue the somewhat wild claim that experiences would be extended during dreams.

Noë's view is problematic for many reasons. Part of the problem might be Noë's vague language and argumentation rather than a general problem of sensorimotor enactivism. For example, he talks about *perception* when he refers to veridical perception, and also when he refers to dreams (that dreams are *not* perception). However, it makes no sense to declare that dream experiences are not perceptual experiences – it is a trivial fact.

[147] Noë's 2009 book is meant for a more general audience, and hence the argumentation is not always particularly meticulous. He has also discussed the dream question briefly elsewhere (see e.g. 2004; 2005; 2008).
[148] Disjunctivism rejects the view that experiences have a common nature: veridical, dream, hallucination, etc. experiences belong to different kinds. They might appear similar, but the similarity is only ostensible. For disjunctivism in epistemology of perception, see e.g. Martin 2002; Fish 2008.
[149] Disjunctivist enactivism is my term, neither Noë nor Revonsuo call it a disjunctivist view.

The main problem is the core claim that dream experiences are not real experiences. This claim is not only unintuitive but also contradicts dream research – especially experiments with lucid dreamers indicate that dreams really are conscious experiences (see e.g. LaBerge et al. 1981; Windt 2015; Revonsuo 2015; Domhoff 2007). Even though dream experiences are not identical in every sense, they clearly fulfil the definition of experiential states. They are *sufficiently similar*, as was stated in earlier sections. Noë also claims that dreams merely consist of experiences we have experienced previously (in waking-life). This claim is not supported by empirical studies (Revonsuo 2015), and even if was true, it wouldn't back up the externalist account, since the causal background conditions are not what the dream argument is referring to anyway. Hence, the concessions we would need to take with Noë's view are too serious to accept, and we can conclude that disjunctive enactivism cannot answer the dream challenge in a satisfying way.[150]

5.5.2.2. Experience as sense-making

Even though I found Noë's view wanting, I think this underlying statement is valid: dreams are not experiences *if* we understand and define experiences as enactivists do. Let us observe what kind of concept of experience the dream challenge is dealing with. It seems that when Revonsuo speaks about experiences, he refers to static states of *what-it-is-likeness* (reminiscent of qualia). However, if we understand experiencing as process-like *sense-making* that is partly constituted by the very interactions the experiencer has with her environment, the setting changes. The enactivist notion of experience contains

[150] Apart from Noë's account, there have been earlier attempts to claim that dreams are not experiences (Malcolm 1959; Dennett 1976). Their argument was that all we know about dream experiences derives from the moment of waking up, so perhaps we never had the experiences but instead only false later memories of them. However, this view has been proved wrong by empirical dream research (see e.g. Revonsuo 2006).

extension to start with: the organism–environment system that brings about conscious experience is decomposable. When experience is defined in this way, dreaming is obviously ruled out. Dream experiences don't fulfil the definition of experience that enactivism is endorsing, and hence the challenge is solved.[151]

This kind of enactivist line drawing is of course a rather controversial way to answer the dream challenge, because it depends on our previous definition of the explanandum. Thus, it is a question-begging claim – when the question is whether dream experiences are experiences. Thus, an opponent of ECM probably would not be convinced with this option to answer the challenge. Of course, we can take this option as a descriptive rather than an argumentative point.

After all, as I have shown in other parts of this thesis, we have other, independent reasons to support the enactivist account of (some) experiences. As I have argued, experience is (partly) constituted by the skilful active relation with the environment. Especially sensorimotor enactivism that was presented in the second chapter stresses these features. Qualitative differences are explained by *sensorimotor contingencies* – the understanding of how our movements and actions affect our surroundings and objects in lawful ways. Our sensorimotor understanding of the world and the sense-making relationship created in that interaction constitutes the perceptual experience – it simply *is* the experience. When that relationship is absent – as in dreaming – experiences are absent. Admittedly, when dreaming, we certainly undergo processes that resemble sensorimotor experiences, but because the necessary constitutive element is missing, dreams cannot belong to the phenomenon that sensorimotor enactivism is describing. They are experiential states, but not those dynamic processes we have with our environment. Noë (2009, 179–180) writes:

> [D]ream seeing is not really seeing at all. […] [W]e ought to think of perceiving as an activity of exploring the environment. It is not a process whereby a picture of the world is built up in your brain; rather, it is the activity whereby you achieve access to what is around you by making use of various different skills (of movement, of understanding, etc.). […] The content of our experience – what we experience – is the world; in the world's absence, we are deprived of content. For this reason, whatever we

[151] Perhaps this was what Noë had in mind in his 2009 book, but he doesn't explicitly state this, so I don't claim that this is Noë's view.

> think and feel and say, when we dream, we are not seeing.

Revonsuo (2015, 61) criticises Noë for question-begging in his argumentation. It is true that Noë *presupposes* an externalist account of experiences, and does not truly face the challenge the dream argument poses. His opponent is no better when it comes to presuppositions. Revonsuo (2015, 56) writes: "I am here assuming an *internalist* theory of consciousness: consciousness is located inside the brain, and thus if there is any constitutive mechanism for consciousness, it must also reside in the brain". How could a dialogue be possible between two completely opposite views that are based on strong presuppositions? It seems that neither of these writers can step out of their own background assumptions, where dream experiences are concerned. The following two options for answers (viz. weak enactivism and multiple realizability of experiences) are not based on presuppositions about conscious experience. In the next section, I will argue that enactivists can also answer the dream challenge without begging the question.

5.5.2.3. Weak enactivism

As it has now become clear, the dream argument shows that the online active explorative relationship with the environment is not necessary for there to be (some kind of) conscious experience. Environmental interactions are simply absent during dreams – we don't probe, explore, touch, reach or move with our sleeping bodies[152] – and hence a sensorimotor theory that depends on these relations cannot be applied to dreams. What does this mean for sensorimotor enactivists? Do we have to either commit to sensorimotor

[152] Of course sleepwalking, talking and various other activities (*somnanbulism*) sometimes occur, but they are connected with low conscious, non-rapid eye movement (NREM) sleep stages. However, usually during dreaming, the body is in a sort of paralysed state called REM muscle atonia. (Szelenberger et al. 2005.)

enactivism and deny that dreams belong to its scope, or embrace internalism and deny sensorimotor enactivism? Fortunately, there is a third option. Sensorimotor enactivism can also be understood in a way that doesn't require that the online relation is active in order to explain experiences. I am talking about *weak enactivism*, which was already briefly discussed in the second chapter (see section 2.3.3. and Aizawa 2010).[153]

According to weak enactivism, our *knowledge* of how we can access the world and how our actions affect it (namely knowledge of sensorimotor contingencies) is all that is needed for constituting experiences. As opposed to *strong enactivism*, the weak version abandons the requirement for an actual online bodily movement – the disposition to act is enough. In order to perceive a coffee cup as three-dimensional, we don't have to walk around it, because we possess a knowledge (which of course originates from earlier online interactions) what it would very probably look like from the other sides, and how its appearance would change were we to observe it from different positions. For weak enactivism, possessing this knowledge is sufficient.

Of course, these skills and understanding of sensorimotor contingencies are already embedded in the actual interactions – the features described by weak enactivism are embedded in strong enactivism, but the feature specific to strong enactivism (i.e. online action) is not necessary. Strong enactivism explains not only (waking life) actions, such as reaching for a coffee cup, but also perceptual experience without action, such as looking at a coffee cup. Nevertheless, even in the latter case (looking at a coffee cup in a wakeful state), there is undoubtedly an online relation and access to the world – the cup is really there, there is real visual information coming from it to the retina, and perceivers know how their potential actions would affect the cup. With veridical perceptual experiences, I think strong enactivism is the best explanation, and there is no need to apply the weaker version, not even with apparently more "passive" experiences, such as having a perceptual experience of a blue coffee cup (i.e. colour perception).

However, the situation might be different with dream experiences. Looking at a coffee cup in a dream is different. It cannot be explained by our *actions*, as was the case in reaching for the coffee cup in waking life. Neither can it be explained by an online access to the coffee cup, because there is no coffee cup. Hence, strong enactivism clearly cannot

[153] Loorits (2017) describes a somewhat similar account (which he then attempts to refute). He refers to Myin (2016) and Beaton (2013) as advocates of this kind of view.

explain dream experiences. In the absence of actions and online access to the world, what is left? Even during dreaming, some of our capacities and skills remain intact. The understanding of sensorimotor contingencies that we have gained through our lives in the actual interactions with our environment doesn't disappear altogether. We can reach for a dream coffee cup (and manage to get it in our dream hand or not) or walk around a dream house. We use the same skills in the dream environment as we use in waking life. The actions might have different and unexpected results, but our mastery of certain basic sensorimotor contingencies remains to a certain extent similar. Moreover, we don't even have to move the dream cup (in the dream situation) because the possibility or disposition to move it is enough to count as mastering a skill. Thus, I suggest that weak enactivism could offer a way to *explain* dream experiences.

This should be taken as an explanatory strategy, rather than as an ontological or constitutive statement. The skilful understanding of sensorimotor contingencies plays an explanatory role in dream experiences. On the one hand, it explains the *similarities* with veridical experiences by appealing to the same skills we use in online perception. On the other hand, it explains the *differences* from veridical experiences by appealing to the lack of actions and online access to the world. I think this is the closest we can get to an enactivist explanation of dreams. In the next section, I will discuss an even more straightforward explanation that is not dependent on enactivism.

5.5.2.4. Multiple realizability of experiences

All the options so far were dependent on committing ourselves to stronger or weaker versions of enactivism. We have yet another option that is independent of the previous views, and independent of enactivism. This answer is to simply admit that experiences are not extended during dreams, but that this is not a problem for ECM, since for ECM to be a sound theory, it is not necessary that all experiences are always extended. As

opposed to Noë's view, this option is not to claim that dream experiences belong to a different kind than veridical experiences. Rather, it appeals to the possibility of the *multiple realizability* of experiences. Hence, internally constructed dreams don't necessarily entail internally constructed veridical experiences, because veridical perceptual experiences can be constituted in one way and dream experiences in another. They can be very similar, maybe they can even be phenomenally indistinguishable from each other but still have a different material basis.

For example, Hurley appoints dream-like states in the brain-bound sphere, and veridical perceptual experiences in the sphere of environmental interaction loops. (She calls the phenomenon *variable neural correlates* rather that multiple realizability, but the idea is the same.) According to her "neural correlates can vary despite sameness of quality", and this happens across veridical experiences as well as between veridical and non-veridical experiences (Hurley 2010, 119).

For this option, it is irrelevant whether the dream experiences and veridical experiences are phenomenally identical, somewhat similar or entirely different from each other. The crux is that their material realisation can differ either way – even if they are phenomenologically identical – if we accept the possibility of multiple realizability. This is obviously at least a logical possibility, but would it be possible to solve empirically? Can we show empirically that somewhat similar experiences can have a different material realisation? There is plenty of evidence that veridical experiences can be constituted in different ways. One example is *neural plasticity*. It provides an empirical example of how different brain areas can produce similar phenomenological states. The use of inverted goggles is also an example where different material realisations produce the same phenomenal experience before and after adaptation to the distortive lenses (Hurley 2010, 119–120). Psychiatric disorders could be another example. For example, according to some philosophers of psychiatry, depression can be constituted in various different ways (see e.g. Borsboom, Cramer & Kalis 2019).

Unfortunately, dream research doesn't provide unambiguous results because the studies have found both similarities and differences at phenomenological and neurophysiological levels of explanation when comparing dreams and veridical experiences (for an overview, see Nir & Tononi 2010). It is uncontroversial that waking-life cognition enables and delimits dreams. On the other hand, some phenomenological differences (the ways in

which dreaming experiences differ from waking-life experiences) are accompanied by neurophysiological differences. Subjects' cognitive and neural organisations are in accordance to an important degree in waking-life and dreaming. For example, children's dreams develop consistently with their (waking-life) cognitive capacities: small children's dreams are mostly simple and static. Patients with brain lesions have similar deficiencies in their dream experiences as in their waking-life experiences, e.g. patients with impaired face recognition do not dream of faces. (Nir & Tononi 2010; Domhoff 2003; Foulkes 1999.)

All in all, empirical questions regarding dreams are far from settled. Nir and Tononi (2010) note that not even all dreams are constructed in the same way neurophysiologically, and thus researchers should treat "different kinds of dreams and their neural correlates separately". However, it seems that empirical neuroscience cannot use multiple realizability as a general methodological tool – otherwise it would be impossible to make generalisations across species (see e.g. Bechtel & Mundale 1999). The multiple realizability argument is far from unproblematic, and my aim is not to claim that we need to commit to a strong metaphysical version of it in order to save ECM from the dream challenge.

Rather than committing to strong metaphysical claims, my intention with multiple realizability and the empirical cases supporting it has simply been to show that experiences don't have to be realised in the same way, but instead their material constitutive basis can vary significantly. Dream research provides evidence for this. "In REM, the brain […] becomes activated but processes its internally generated data in a manner quite different from that of waking" (Hobson, Stickgold & Pace-Schott 1998, 1). During waking, brain activity is modulated by aminergic systems, while in REM sleep it is modulated by cholinergic systems (Hobson, Stickgold & Pace-Schott 1998; Pace-Schott & Hobson 2002). Thus, it seems that the constitutive material basis differs (or at least it is not identical) between waking experiences and dream experiences.

A visual experience of a red apple can be constituted (partly) externally, and a dream experience of a dreamed red apple can be constituted entirely internally – and this is not a problem for my position. Most of the proponents of externalist views tend to agree that an all-encompassing extension is not necessary. Chemero and Silberstein (2008, 130) have phrased it clearly.

> Extended cognitive scientists need not claim that all of cognition is extended, just that some of it is. There is no *a priori* reason why some phenomenon might be given wholly brain internal explanations (e.g., dreams, certain kinds of pain), some given embodied accounts, while others will require explanations that span brain-body-environment systems (e.g., motor control, long division). Indeed, we all ought to embrace causal and explanatory pluralism about cognition.

5.5.2.5. Conclusions from the dream argument

I claim that the reason why the dream challenge cannot refute ECM is a combination of the last three options I described above. The most important reason is simply the following: for ECM to be a sound theory, it is not necessary that all kinds of experiences are extended. A supporter of ECM doesn't need to deny that dreams are real experiences (as Noë does), for empirical dream research has shown quite undeniably that they are genuine experiences. However, this is not a problem for ECM, as I have shown.

It is clear that a strong version of sensorimotor enactivism cannot explain dream experiences. A proponent of that view can justify this in two ways. On the one hand, it is possible to say that dream "experiences" are not experiences at all (as Noë does), or state that the enactivist concept of experience doesn't include dream experiences by definition. On the other hand, if we are ready to accept the weaker version of enactivism, dream experiences can also be explained within the theory.

The dream argument would certainly work against a theory that claims that all experiences are always extended. However, I don't think many people would commit themselves to this even amongst the strongest of enactivists. Even if they did, the same would not apply to ECM, because ECM is *not* a theory about all experiences, but about a

limited group of perceptual experiences. Ward has put into words the principal answer to the dream challenge and criticisms of similar kind (even though he is not talking about dreams). “What is required to rule out ECM is a reason to believe that neural states alone are *always sufficient* for the subpersonal basis of experience” (Ward 2012, 743).

Of course, yet one more straightforward (or simplifying) answer would be to say that because ECM is a theory about *perceptual* experience, and dreams are not perceptual experiences, their existence has nothing to do with ECM. However, this answer would bypass the challenge altogether, because its gist is to bring up that there are experiences that are very similar to the experiences that externalist theories are trying to explain, but which are constituted entirely internally. I think the proponents of ECM and other externalist views should rather welcome this kind of testing and trying out of their theory – for it offers a fine opportunity to improve and elaborate some questions that might otherwise have gone unnoticed.

5.6. Summarising the counter-arguments

This chapter presented the most important arguments against extended experience, and offered suggestions how the challenges can be responded to. First, I showed that Clark’s two arguments against ECM (based on high-bandwidth and predictive processing) are unable to refute ECM. Interestingly, they share the same problem: were they true, they would not only refute ECM, but also Clark’s own theory of EM. This observation supports one of my main claims in this thesis: it is very difficult to argue for EM and deny ECM at the same time.

The last two counter-arguments (brain-in-a-vat and dreams and hallucinations) rest on the same idea: if we can show that there are some cases of internally constituted experiences, it follows that ECM is wrong. I showed especially with the dream argument that this

argumentation is not sound. The same reasons can be applied to the brain-in-a-vat objection, too. However, I stressed different aspects in my answers. With the brain-in-a-vat argument, I focused on the general implausibility of the whole scenario, whereas with the dream argument I did not challenge the internal nature of dream experiences, but rather the internalist conclusion that the opponent of ECM can draw from it.

6. Concluding Remarks

In this study I have argued that one cannot consistently hold an externalist view about the material basis of cognition while denying it regarding consciousness. If one endorses EM, one has to endorse ECM as well. However, many philosophers have tended to overlook this. I presented several reasons why phenomenal experience cannot be omitted. In the beginning, I introduced the current externalist framework in philosophy of mind and cognitive sciences, and placed my own position at the top of third-wave externalism. I also outlined the central concepts, accounts and differentiations that were used and developed in the later chapters.

In the second chapter, I argued that if we accept the general 4E-framework, we have to accept ECM as well. The arguments included bridges from the hypothesis of extended cognition (i.e. Clark & Chalmers's EM) to ECM, from sensorimotor enactivism to ECM, and finally from the embodiment thesis to ECM. There is a way to understand the first (EM) and third (embodiment) premise theories without endorsing ECM. However, if this is done, it requires that the premise theories be significantly restricted. I argued that sensorimotor enactivism differs in this sense: it cannot be accepted without endorsing ECM as well.

In the third chapter, I tackled a subject matter that has gained a lot of attention in recent research in both philosophy of mind and philosophy of science, namely the *causal–constitution* debate. I labelled "the constitution-turn" the immense interest in the ontology of constitution as a determining question whether EM and other externalist views are true. The abundance of literature started from Adams and Aizawa's early critique of Clark and Chalmers's EM, and later it spread to and got mingled with accounts in philosophy of science. Whilst using the *new mechanist approach* as a starting point, I argued that rather than in mechanist terms, the causal–constitution separation should be interpreted in *diachronic–dynamical* terms when we are dealing with mental phenomena. When understood in this way, the extension relation in ECM counts as *constitutive*. The discussion in this chapter was also a way of responding to two central critiques against ECM, namely the objections based on *the causal–constitution fallacy*, and *the cognitive bloat argument*.

In the fourth chapter, I set the preconditions and limits for my position of ECM. I started by distinguishing between four degrees of extension: *short-term extension*, *integration*, *prosthetic incorporation* and *functional incorporation*. The last one is required for ECM: the external tool has to be part of the transparent bodily point of view and under the sensorimotor control of the subject. Based on the notion of functional incorporation, I formulated the *glue & trust* criteria for ECM. They include: *quasi-transparency*, *sensorimotor control*, *ownership*, *sense of agency* and *sense-making attitude*. Finally, I discussed a phenomenon that fulfils my glue & trust conditions, and of which there is a great deal of empirical research available, namely *sensory substitution* technology.

Finally, in the fifth chapter, I discussed four counter-arguments that have been set forth against ECM: 1) *the argument from high-bandwidth*, 2) *the argument from predictive processing*, 3) *the brain-in-a-vat thought experiment*, and 4) *the dream challenge*. The last two concern the same theme: if we can have phenomenal experiences without online interactions with the environment, does that show that internalism also prevails with perceptual experiences? With the former objection, I concentrated on showing how the brain-in-a-vat thought experiment is not on a firm ground to start with, because it is based on a highly dubious science-fiction scenario. With the latter objection, I presented different ways to answer the dream challenge, and concluded that a strong version of (sensorimotor) enactivism cannot explain dream experiences. My main solution to the dream argument was simply that it is not necessary that all kinds of experiences are always extended for ECM to be a valid theory about certain perceptual experiences. Internally constructed dreams do not lead to internalism in the case of veridical experiences. Veridical perceptual experiences can be constituted in one way and dream experiences in another.

This study is exceptional within the 4E framework because it combines the analytic view (of Clark and Chalmers) with the enactivist view. This kind of unifying contribution has been lacking from both analytic accounts of the extended mind, and from enactivist accounts of the mind. As I wrote in the first chapter, there has been an appeal for this kind of broader account, since a comprehensive analysis of ECM has not been written before. One of this study's assets is that it combines the empirical sciences with philosophy of mind, which is not always done in philosophy.

However, the work is not over. This study raised several questions for future research, for example regarding the relationship of the predictive processing framework and ECM, the status of dream experiences, and the role of developmental robotics in testing the sensorimotor accounts of the mind. It also encourages asking more wide-ranging pragmatic and ethical questions, for example about psychiatric disorders: should we give a more significant role to environmental and social relations when deciding on the diagnosis and treatment? Or how should we interpret the legal status of a device that functions as part of the mental system: is harming a smartphone or laptop an assault on one's *property* or on one's *person*? Furthermore, this research might provide tools for related areas that were not directly addressed in it. Even though this study focused on extended perceptual experience, I think some of the results can be applied in questions regarding the potential extension of *affectivity*, *self* and *social interactions*. After all, they all share the experiential side, although the accounts otherwise differ.

Clark & Chalmers's opening question was "*where* does the mind stop and the rest of the world begin?" However, as we have seen throughout this thesis, the *where*-question is not as straightforward as some might think. It should not be interpreted as a question about the *fixed location* of the mind. On the contrary, the focus on location is downplayed within the 4E-framework. Instead, the boundaries, and hence the location, are negotiable and changing. What counts as boundaries of the mind varies depending on what kind of environment we are in, and what kind of opportunities and affordances that environment offers. What matters is what we do and how we exploit the resources. Whether a blind person's cane, a mass murderer's smartphone, or a forgetful person's diary are part of their minds depends on how the devices are used and whether they are integrated or incorporated into their users.

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