Examining participatory sense-making frames: how autonomous patterns of being together emerge in recurrent social interaction.

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Abstract

This thesis investigates how recurrent face-to-face social interactions engender relatively invariant patterns of being together that cause those who instantiate them to act in ways that support their reproduction. Existing accounts within both cognitive science and sociology offer important insights into the consideration of patterns of being together. However, given their explanatory strategies, they struggle to integrate both 'social' and 'individual' levels of explanation. Herein a compatibilist account is developed, intended as a 'third way' that obviates the limitations of existing accounts. This compatibilist account — by integrating insights from across disciplines and theoretical frameworks — develops a philosophical vocabulary with which to maintain explanatory consistency when articulating patterns of being together and moving between individual and social levels of explanation. It relies heavily on an extension of the enactive notion of autonomous habits to the social domain, redescribing patterns of being together as habituated *participatory sense-making frames*. Participatory sense-making frames result from processes of coenhabiting, i.e. processes of ongoing social habit making implicit in the dynamics of recurrent social interactions. Such processes are one primary means by which we produce and reproduce the relatively stable forms that characterise our shared worlds. These habituated frames embed much of the normativity of social life, and can serve our felicitous coordinations therein, allowing us to feel well situated, particularly in contexts within which we have some history of interacting. However, when they are not well aligned, they lead to tensions that result in either the production of novel frames or breakdowns in social interaction. The account developed has implications for many domains of human action, from psychotherapy to epistemology, and from critical studies to the development of political and ecological praxes.

Statement of original authorship

I hereby certify that the submitted work is my own work, was completed while registered as a candidate for the degree stated on the Title Page, and I have not obtained a degree elsewhere on the basis of the research presented in this submitted work.

Collaborations

Short sections from Chaps. 8 and 10 (Coenhabiting and Conclusion) are paraphrased from sections originally written in collaboration with Juan Manuel Loaiza, during the authorship of James and Loaiza (2020). However, the core ideas there were developed by me as part of the work of this thesis.

Publications

Journal articles

James, M. M. (2020). Bringing forth within: enhabiting at the intersection between enaction and ecological psychology. *Front. Theor. Philos. Psychol,* 11, 1348. doi.org/10.3389/fpsyg.2020.01348

James, M. M., and Loaiza, J. M. (2020). Coenhabiting interpersonal inter-identities in recurrent social interaction. *Front. Psychol.* 11, 577. doi: 10.3389/fpsyg.2020.00577

Book chapters

James, M, M. (2020). Dissonance as a window into the autonomy of participatory sense-making frames. In A. Daly, F. Cummins, J. Jardine, and D. Moran (1st ed). *Perception and the Inhuman Gaze: Perspectives from Philosophy, Phenomenology, and the Sciences*. New York, NY: Routledge.

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Preface

I love repetition. Repetitions turn time into a place, turn the days into a house, where the repetitions form the walls, floor, and ceiling. Inside this building, this latticework of routines, it is as if time doesn't pass, since every act and movement repeats the preceding ones and in this way holds them fast.

Knausgaard (2018b, p.84)

If this didn't happen on its own, at least it occurred without planning, and through all the thousands of small daily adjustments that were made in order to make everything flow as easily and effortlessly as possible, patterns were created, eddies, ways of being …

Knausgaard (2018a, p.35)

Water and air, rain and clouds, they too have been here forever, but they are such an integral part of life that their ancientness is never apparent in our thoughts or emotions, contrary to lightning and thunder, which only occur now and then, during brief intervals which we are at once familiar with and foreign to, just as we are at once familiar with and foreign to ourselves and the world we are a part of.

Knausgaard (2017a, p.59)

I liked both of them … and I behaved in such different ways with each of them that I felt caught when they came together and I couldn't behave in one way or the other.

Knausgaard (2013, p.234)

1 Introduction and overview

On the materialistic theory, there is material— such as matter or electricity—
which endures. On the organic theory, the only endurances are structures of activity, and
the structures are evolved.

Whitehead (1967, p.107)

What attaches us to people are the countless roots, the innumerable threads
which are our memories of last night, our hopes for tomorrow morning, the continuous
weft of habit from which we can never free ourselves.

Proust (1981, p.92)

1.1 Introduction

This thesis investigates how recurrent social interactions produce relatively invariant patterns of being together, causing those who instantiate them to act towards their sociomaterial environments in ways that support their reproduction. These are described as *participatory sense-making frames*, or *participatory frames* (PFs) for short. PFs result largely from processes of coenhabiting, i.e. processes of social habit making implicit in recurrent social interactions. Such processes are one primary means by which we produce and reproduce the relatively stable forms that characterise our shared worlds. This account relies on an extension of the enactive notion of autonomous habits to the social domain. Habituated PFs embed much of the normativity of social life, and can serve our coordinations together towards shared ends, allowing us to feel well situated. However, when they are not well aligned, tensions result that can lead either to breakdowns in social interaction or the production of novel PFs.

1.1.1 Identifying the object of study

A couple having their respective sides of the bed. The routine with which guru and student dress their altar to prepare for a ceremony. The mode of running together that allows partners to maintain a dynamic flow across terrains. Falling into old ways of being when with old friends. These examples suggest a variety of domains of human social interaction. Besides this though, they appear to have little in common. They are collected here, however, under the suggestion that they do. To find it, one must look past their content and instead to their organisation, to the dynamics that inject into such examples the patternings of which they are exemplary, patternings which often seem to become more invariant, more obstinate, and indeed, more transparent, with each instance of their recurrence.

The initial stages of any philosophic effort require articulating something that is well enough delineated that we might agree that there is a 'there' there. This challenge is conspicuous in the present case, for it is in the object of study's nature to remain relatively concealed within everyday experience. As such, the investigation necessitates a performative alienation from our everyday experience, to, as Cummins puts it, "view ourselves from the outside, making the familiar strange, in full knowledge that such an exercise is impossible" (2019, p.7). Familiar examples will discipline the discussion, serving as empirical loci around which any theorizing turns. Consider the list of still informal examples in the table in **Figure 1** below. The table expands the above examples, highlighting other relational patterns in the same domains and at similar levels of complexity.

Such familiar, and hopefully uncontroversial, examples, can serve as mutually available specimens for observation to support the move towards understanding the phenomena that such a disparate group of exemplars reflect. However, enumerating examples is only helpful when also highlighting the common characteristics that motivate their being arranged as a set of observations that belong together. In other words, teasing out common characteristics from the above examples an object of study can be delineated, and thus the phenomena that interest this thesis can be distinguished from those that do not. This is a first step in being able to extend any derived considerations further, and being able to judge whether any additional example is within the explanatory remit of the vocabulary developed. Below are characteristics common to the patterns of being together that are the subject of this thesis. It is hoped that these common characteristics are relatively uncontroversial also. Having enumerated them, it will be possible to offer a provisional definition of the object of study.

Domains	Simple patterns	Routines	Modes	Complex patterns
Partners who share a bed	<u>Having sides of the bed</u>	Dressing the bed in the morning	Cuddling together	Being a couple — who share a bed and sometimes cuddle — together
Guru student relation	Mutual greetings	<u>Dressing an altar to prepare for ceremony</u>	Hosting together	Being student and guru — who sometimes host ceremonies — together
Training partners	Check-ins in the form of simple questions and responses e.g. "how are you going? Good!"	Practiced strategies in which teammates habitually adjust to accommodate the activities of the other on a specific terrain	<u>Running together</u>	Being husband and wife — who sometimes run — together
Adult friends	Idiosyncratic salutations	A basic structure to chats on the phone, or topics that might be talked about	Chatting together	<u>Being friends — who sometimes chat on the phone — together</u>

Figure 1. Table of examples of relatively invariant relational patterns

This table enumerates examples of relatively invariant relational patterns at multiple levels of complexity. The examples underlined are those mentioned at the outset of this section and highlight how each refers to a different scale of complex organisation. What is argued here is that patterns such as these share some underlying organisational dynamics.

1.1.2 Common features, and a definition

1.) One can recognise in each example **a relatively invariant pattern**, an identifiable configuration of elements with some continuity across instances, e.g. the sleeping arrangements of a couple might remain relatively stable for decades; running together with one's training partner, although more complex, seems to also have something about it that is recognisable, a quality or style that emerges and is sustained.

2.) Such patterns **constitutively depend upon the presence of at least two interactants** for their production and ongoing reproduction, even if they can be preserved in some form in the absence of one partner. The coordinated pattern that characterises the training partners routine is only manifest as *their routine* in the presence of both training partners, even if some of its invariance can be preserved in either partners' absence, e.g. when running the trail alone one might take the same route.

3.) Such patterns **constitutively depend upon the presence of certain environmental conditions** for their production and ongoing reproduction, even if they may be partially preserved in the absence of specific conditions. The couple who each have their own side need to be sharing a bed to maintain the pattern as such.

4.) **Recurrence or repetition seems to be important**, whereby **the more the event repeats, the more its features are experienced as stable**. The sense of one having *a side of the bed* is more pronounced on day two hundred than it is on day two, as is the structure of chatting on the phone, or running together. This feature appears to tie in closely with the two that follow: repetition reduces the need for deliberation and increases the sense of a decentering of agency.

5.) **Enacting any such pattern is to act**, at least towards the pattern itself, **in a pre-reflective fashion.** Interactions that have taken on the feature of recurrence flow skilfully within the situation in a manner that, unless confronted with some novelty, typically requires little deliberation, e.g. guru and student do not have to rehearse their actions prior to every greeting, nor do the training partners or the friends.

6.) In each instance there is a **decentering of intentionality or distributed sense of agency**. The student might have the sense of being led by the situation or the actions of the other. The old friends might have the sense of 'falling into' old ways of being, even despite their 'individual intentions' to do otherwise.

7.) Such **patterns are experienced as normative, entailing a sense of how the event *should* or *should not* unfold**, however subtle. If your partner comes to lay down in bed to find you tucked in where they normally lie, the sense of something not being *as it should be* will be palpable, a moment likely accompanied by an attendant urge to return things to

their *normal* configuration; if the guru does not greet the student as expected the student might interpret this as a sign of something being amiss, and so on. In any such case, one has the sense (not necessarily well articulated) that something like a boundary is being approached or has been crossed.

8.) The patterns also have a **normative temporal dimension**, organising the expectations and anticipations of those who instantiate them according to a kind of a situational rhythm. In the case of the simpler patterns and routines, one might even recognise a kind of ritualised beginning, middle, and end. Deviations from such structures and their rhythms might be experienced as deviations from an implicit norm: if the guru stays in the greeting gesture beyond its normal rhythm it might be experienced as particularly significant, or creepy. The sides of the bed example are an exception here, in that beginning, middle and end are more diffuse. Nevertheless, norms concerning sides of the bed may be less strictly enforced outside of typical bedtimes, for instance, when lying in bed to watch a movie together.

9.) Many such patterns **can be difficult to alter,** even if both parties want to, e.g. friends might be a 'bad influence' on each other; training partners might 'default' to their old strategy, despite having thought about adopting a more efficient one.

10.) **Even if difficult to alter, such patterns are ultimately plastic**. Boundaries are continually renegotiated, and patterns reorganised, even if difficult. As the training partners evolve, new procedures will be periodically required, proving first inefficient, but if repeated will eventually gain the fluency of previous patterns. The couple can commit to changing sides and the new sides will eventually come to feel like 'theirs' again.

11.) The above characteristics **remain mostly concealed to everyday consciousness** and that we are interacting according to relatively invariant patterns goes relatively undisclosed. These patterns function as the veritable backgrounds of our interactions, inconspicuous grooves within which we improvise.

The present account aims to make intelligible these features through elaborations on the enactive notion of autonomy. In the concluding chapter they are returned to explicitly, with suggestions about how the present account helps make sense of them. Acknowledging the shared characteristics of the above examples should have instilled at least some confidence that there is a 'there' there. Moreover, they provide some sense of what the 'there' is found amidst these examples. To make it explicit, the object of study in this thesis is

Relatively invariant though plastic patterns of being together that function at multiple timescales in recurrent social interaction and dispose those who instantiate them towards their

reproduction under recurring conditions.

It is important we understand such patterns, for they comprise the basic units of the social mind. Realtime reciprocal interactions, as many have suggested previously, are the archetypal form of social interaction (e.g. Jurgens and Kirchhoff 2019; Bolis and Schilbach 2020; Berger and Luckmann 1967). Recurrent dyadic interactions are the most basic form of social relationship. The emergence of a social mind is predicated on the availability of such relations. The patterns that comprise such relations might be understood as their basic units. In stabilizing such patterns, the social mind comes into being and our shared worlds are produced and reproduced.

With these patterns of being together in sight, a host of questions become apparent: what are the methods that will serve their uncovering? What conceptual tool kit will help make them intelligible? Where does the explanation for them lie, are they social patterns, or individual psychological patterns, or some combination of both? By what processes and under what conditions do these patterns emerge, stabilise, change? How does what takes place in social interaction shape subsequent interactions so that invariance becomes a feature? What is the significance of these patterns for understanding human social experience? How should we conceive of individual embodied subjects in light of them? This thesis develops a philosophical framework throughout the chapters ahead capable of responding to such questions. The first two questions — the methods of uncovering and the conceptual toolkit — are addressed in the remainder of this chapter[1].

1.2 Methods

The methods adopted include, 1) conceptual developments based upon the integration of existing concepts and insights from empirical work with careful reflection upon familiar examples from first, second, and third person perspectives; 2) insights derived during both ethnographic and autoethnographic observations; and 3) analysis of literary examples.

Alfred North Whitehead writes that, "The true method of discovery is like the flight of an aeroplane. It starts from the ground of particular observation; it makes a flight in the thin air of imaginative generalization; and it again lands for renewed observation rendered acute by rational interpretation" (1969, p.5). Herein, Whitehead captures the general mode of investigation of this thesis. Indeed, one such voyage has already been taken, beginning from the ground of the examples and the characteristics they share into the still very thin air in which a general claim has being made, that they are examples of patterns of being together that can be made intelligible through elaborations on the enactive notion of autonomy. This thesis will continue in this approach, eventually begetting a vocabulary that might be put to some use. By exploring common examples

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[1] Of course, they continue to be refined throughout.

from numerous domains of human living, and articulating them in ways that are relatively uncontroversial, in terms of both their phenomenological aspects, and their systemic third person structures, an integrated set of concepts that have some generalisability might be settled upon. "If we both observe something, such that we are happy to use the same words to describe it," writes Cummins, "then we have a starting point for a discussion about the significance of what we have observed" (2018, p.14). The methods employed reflect this aim and strive to provide a vocabulary that "we are happy to use" in accounting for the phenomena under investigation.

Several ethnographic and autoethnographic efforts were undergone as part of this project. Notably, observing rehearsals of the Irish, National Concert Hall, Gamelan Orchestra; observing electroacoustic composers and musicians Dr. Shane Byrne and Rory Conaty, at the National University of Ireland, Maynooth, composing and rehearsing the piece *Conatus* over an eight month period; and autoethnographic observations of some instances of behaviour change undergone by the author. However, for reasons of space and the final layout of chapters, none of these efforts are presented as case studies. Still, many of the insights inspiring the ideas herein stem directly from these efforts.

Finally, analysis of literary examples has been helpful for this project. Given their relative stasis, and the skills of the artists who create them, such examples provide rich specimens for consideration and make themselves available in ways that mere reflection cannot. The writings of Karl Ove Knausgaard have been particularly helpful in this regard and are found scattered throughout this text. Knausgaard is a controversial author for having written 'honestly' about the intimate details of his everyday life. Precisely because of this, however, he often captures subtleties of our everyday experience that reveal something about their underlying organisations. Thus, Knausgaard's writings often prove illustrative of the kinds of normally undisclosed dynamics that concern this thesis.

1.2.1 Interdisciplinarity

This thesis takes an interdisciplinary approach to the consideration of patterns of being together. Cognitive science is itself an interdisciplinary programme, it aims at what some refer to as a 'synoptic integration' (e.g. Vervaeke 2017), whereby the various sub-disciplines involved converge on shared concepts that work well together. Vocabularies, such as that of complex dynamical systems (e.g. Richardson and Chemero 2014) — which is employed throughout — are helpful here. They can supply researchers across sub-disciplines with a shared vocabulary with which to acknowledge and communicate continuities across domains, levels and scales of organisation that are relevant to the understanding of cognition. The present thesis is no exception to this interdisciplinarity, and thus employs and develops a vocabulary that makes the blurring of disciplinary boundaries part of its aims. Indeed, given the nature of patterns of being together, this

interdisciplinarity is unavoidable. The limitations of not adopting such an approach to understanding patterns of being together is apparent in the shortcomings of existing accounts (see Chap. 2).

1.3 Languages employed (the conceptual toolkit)

1.3.1 Radical embodied cognitive science

Within the theoretical landscape of cognitive science, the present account is closely aligned with a number of complementary frameworks: the Mind-in-Life (MIL) enactivist framework (e.g. Varela, Thompson and Rosch 1993; Thompson 2007; Di Paolo, Buhrmann, and Barandiaran 2017; Di Paolo, Cuffari, and De Jaegher 2018; Gallagher 2017a; Fuchs 2017); the Skilled Intentionality Framework (SIF) (e.g. Bruineberg and Rietveld 2014; Rietveld and Kiverstein 2014); and the Radical Embodied Cognitive Science (RECS) program (e.g. Chemero 2009; Baggs and Chemero 2018). All these approaches reject explanatory strategies that understand cognition as consisting in the manipulation of content-involving representations and emphasise the constitutive role of body-environment relationships in cognitive development. They all consider themselves progeny of the phenomenologists of the 20th century. As Käufer and Chemero write, "contemporary work on embodied cognitive science is a particularly clear and relevant continuation of the most central concerns that Husserl, Heidegger, and Merleau-Ponty were pursuing" (2016, p.2). The informing of cognitive science with insights from phenomenology is spoken about as 'front-loading phenomenology', whereby, as Gallagher writes, "the results of phenomenological investigations can be used in the design of empirical ones" (2003). Instances of this approach are to be found throughout the chapters ahead. There are, however, also important tensions between the accounts mentioned, given their various emphasis, origins, and concerns.

The MIL perspective builds upon concerns originally relevant to the discipline of philosophical biology (Maturana and Varela 1987; Maturana 1980) and uses an understanding of organismic individuation (or *autopoiesis*) as a background against which to consider the development of cognition. As such, it tends to emphasise how processes of autonomous self-production shape the activities of cognising in its most general sense, what is referred to in terms of *sense-making*. This perspective has important consequences for our understanding of, for instance, perception and normativity, helping us acknowledge why we are inclined to encounter the world in ways that are relevant to our biochemical instantiation. Thus, it allows us to understand how our embodiment centers a perspective on the world in a manner specific to its individual concerns.

The RECS programme (Chemero 2009), does not foreground processes of self-production. However, it recognises autopoiesis (self-production) as a basic characterisation of the biochemically instantiated embodied subject, and even seeks to subsume the MIL approach under the RECS umbrella (see Chemero 2009, p.184 - 5). RECS thus sets itself forth as a more general programme than MIL, one that encompasses a broader set of concerns: 1) 'representational and computational views of embodied cognition are mistaken', 2) 'embodied cognition is to be explained via a particular set of tools *T*, which includes dynamical systems theory', and 3) 'the explanatory tools in set *T* do not posit mental representations' (Chemero 2009, p.29)[2]. So articulated, it sets itself against traditional representational perspectives, and indeed, against 'embodied cognitive science', which although sympathetic to the demands to provide some account of the body in explaining cognition, still relies upon notions of internal mental models, e.g. Clark (2015). The RECS programme borrows heavily from Gibson's (1966; 1969; 1979) ecological psychology and the notion of affordances, the idea that we perceive our environments in terms of opportunities for action. These ideas were informative to the original MIL accounts (e.g. Varela et al. 1993) also. However, they were not systematically incorporated into it (see Chap. 6). The RECS program thus attempts to rethink ecological psychology in a way that integrates aspects of the MIL perspective also, e.g. its emphasis on self-production and the individuality of body-environment relations based upon a history of engagement. As Chemero himself writes, RECS is "explicitly formulated to make the natural, but largely unmade connections between ecological psychology and… the burgeoning enactivist movement in the cognitive sciences (Varela, Thompson, and Rosch 1993; Thompson 2007)." Continuing later in the same paragraph, "Combining Affordances 2.0 with enactivist studies of the organism makes radical embodied cognitive science a fully dynamic science of the entire brain-body-environment system…"[3], and that, "Combining them could make radical embodied cognitive science a much more significant force in the cognitive science community than either the ecological or enactive movements are separately" (2009, p.152 - 154). Such an account, in other words, might supply a genuine alternative to the more traditional cognitivist approaches.

The Skilled Intentionality Framework is a RECS account that has situated itself between enaction and ecological psychology. However, it develops an explanatory strategy that relies upon an understanding of the free energy principle (FEP) (Friston 2009; 2010). Here, self-maintenance is described in terms of the minimisation of 'free energy', whereby a biological system in relationship with its environment seeks to maintain order by limiting the amount of states it is likely

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[2] There is an evolving set of tools, methods, theories and so on. What is important about them is simply that they do not import Cartesian conceptions of mind back in.

[3] Affordances 2.0 is the name Chemero gives to his relational account of affordances. See Chap. 6 for details.

to visit. For some positions inspired by this principle, this entails constantly reducing the difference between internalised models (representations) of the world, sometimes called 'priors', and what the senses suggest is actually present (e.g. Clarke 2015; Seth 2014). The amount of difference is termed 'surprise'. Thus, the embodied subject is continuously reducing surprise, either by conforming the world to their prior expectations, or by updating their world models — a set of processes sometimes referred to in terms of *active inference* (e.g. Lindson, Clark, Ramamoorthy, and Friston 2018). Like the MIL approach, this also implies a process of self-maintenance. However, as Kirchoff (2016) explains the differences between these approaches, FEP approaches emphasise the self-preservation of an adaptive relationship to one's environment, more so than the self-production of a particular biochemical structure (see Chap 6. for details)

The SIF, to get away from representationalism but retain the emphasis on self-preservation, replaces the notion of active inference with the notion of tending towards optimal grip. Put simply, the agent is moved to improve its *grip* on its environment by negating or limiting tensions or 'dissatunments' between endogenous and exogenous dynamics, or negating 'deviations from an optimum' (Bruineberg & Rietveld 2014, p.3). As Bruineberg and Rietveld put it, "an organism self-organizes by reducing a disequilibrium in the brain-body-environment system" (2014, p.12). This does not posit a mental representational model 'in here' that accurately maps to features of an environment 'out there'. Rather, the organism and its 'sensorimotor body' are themselves the models, a statistical 'prediction' or anticipation of optimal behaviours in any situation. An intuitive example here is the ways in which the endogenous dynamics that reflect one's circadian rhythms model the cycles of light at their given location. Such a model is obviously not a content bearing representation, but can be thought to entail anticipations about what one's 'econiche' is likely to present them with, and ready them to act accordingly. Of course, these 'models' function at much longer timescales than, say, those responsible for second to second bodily adjustments in a sporting context.

The account developed herein sees itself as situated within the RECS programme, though arguing for a compatibilist approach, i.e. a plurality of compatible frameworks with some bridging concepts in between. As will become clear, such a perspective is unavoidable given the nature of the object of study. This approach centers intelligibility rather than systematicity. In doing so, it can approach the consideration of the emergence and stabilisation of patterns of being together in a manner that is — somewhat paradoxically — more complete than if it were to adopt one single framework, e.g. enaction or ecological psychology. Moreover, pursuing this understanding can help deepen our sense of the compatibilities between ecological and enactive approaches in line with the radical embodied cognitive science program, but without trying to collapse either into the other. Thus, alongside making intelligible patterns of being together, the account developed

provides a philosophical framing for ongoing discussions between the various frameworks brought into dialogue.

This pluralism entails a metatheoretical move. In the philosophy of science this is not without precedent. For instance, Roy Baskar's philosophy of critical realism advances a so-called 'four planar' theory in which any aspect of reality is to be understood as constituted by "four dialectically interdependent planes: of material transactions with nature, inter-personal action, social relations, and intra-subjectivity' (Archer, Bhaskar, Collier, Lawson & Norrie 2013, p.566). In Baskar's view, any plane can serve as a lens through which to make observations and conceptual distinctions, but any one lens is always only ever partial and in conversation with all others. This thesis is not positioned to endorse or reject Baskar's view, it is simply pointed to here as a precedent for compatibilism, and support for the idea that a plurality of 'perspectives' are available through which to make sense of any particular phenomena. This metatheoretical view can serve as a useful epistemological vista which one can pull back to when caught in the minutia, asking 'is this really a point of conflict, or is it simply an artifact of emphasis?". In the concluding chapter something is said about the need for such meta-perspectivalism in our current moment, and how the present account strives to be exemplary in responding to this need.

This thesis addresses familiar phenomena that are nevertheless poorly defined and do not resolve into a set neatly addressable by any single theory. The account developed borrows from all the cognitive scientific approaches above. That said, to this point, most of the author's own thinking has been done primarily in an enactive register. Thus, a slight bias for its concerns and vocabulary will be evident, e.g. the enactive language of autonomy ends up playing a central role, despite there being no principled reason why the language of free energy might not be emphasised instead.

1.3.2 The intersubjective turn and participatory sense-making

Within the theoretical and empirical investigation of cognition, Hanna De Jaegher (2017) has highlighted what she terms 'the intersubjective turn', i.e. a general recognition amongst researchers that understanding social dynamics is essential in understanding individual minds. The article advances an impressive array of literature to support her claim, from Reddy's (2000) developmental approach, which focuses on how meaningful interaction relates to individual development, such as how coyness in young children relates to the development of self-awareness; or work by Hobson (2004), who argues for how interpersonal connections in early life support thinking; to work on the importance of social interaction to psychiatric disorders like schizophrenia (e.g. Irarrázaval and Sharim 2014, or Fuchs 2015); and dementia (e.g. Colombetti and Torrance 2009). She also highlights a substantial literature on so-called 'social neuroscience', looking at everything from the interpersonal coordination of heartbeats (Konvalinka et al. 2011)

and respiration (Lande 2007), to hyperscanning the emergence of coupled interpersonal brain dynamics (e.g. Dumas et al. 2011). Looking for a comprehensive theoretical framework with which to integrate this stock of conceptual and empirical developments, De Jaegher suggests we need one that

- does justice to the role of social interaction but also individual subjectivity
- can synthesise levels of explanation (from the neuronal to the cultural)
- transcends disciplinary boundaries
- generates hypotheses and methodologies
- encourages applications and dialogue with field experts
- is aware of its sociocultural influences
- can say something about ethical issues

De Jaegher (2017) suggests that the framework of participatory sense-making (PSM) is adequate to the job (De Jaegher and Di Paolo 2007). Indeed, she suggests that "precisely for this purpose" it was developed, "to bring together such different elements and levels ... to better understand intersubjectivity in its various dimensions" (De Jaegher 2017, p.462) The present account is aligned with this framework (and much more is said about it throughout), even if at times critical of or in tension with certain aspects of it.

1.3.3   Sociology

The discipline of sociology also provides some orientation for the account developed. Two general approaches are relevant: the microsociology of Erving Goffman and colleagues, and the practice theory of Pierre Bourdieu and his progeny. Existing accounts of patterns of being together within cognitive science rely upon explanatory strategies that center processes inside individual brains, e.g. mental representations. Such accounts are referred to herein as individualist accounts (see Chap. 2). However, for the present account — grounded in an understanding of complex dynamical systems and critical of the methodological individualism typical of individualist accounts — the concerns of sociologists are sources of inspiration. By default, sociologists are critical of overly individualistic explanations, and typically take the 'the social' (or the various levels of it) as a legitimate level of explanation. This thesis gathers these sociological positions together as "interactionist" accounts. In emphasising the social level dynamics relevant to the emergence of patterns of being together, however, interactionist accounts often neglect to offer any satisfactory explanations of just how 'the social' finds purchase in 'the individual'. And when they attempt such explanations, they often fall back on individualist positions, leading to rather uncomfortable alliances (see Chap. 2 for discussion). This tension, between 'the social' and 'the individual', is something that is negotiated throughout this thesis. Again, what the present account offers is a

compatibilist perspective, whereby the dynamics that organise individual action are continuous and integrated with the dynamics that organise social interaction. Thus, there is no straight forward answer to the question of where to look for an explanation of patterns of being together, even if on its face it is a relatively easy one to provide, i.e. in the relations, between individuals and their shared environments. The enactive notion of autonomous habits, in combination with insights from sociology about the circular relations between social 'structure' and individual action, plays a central role in finding answers among these relations.

1.3.4 Simondon

The final theoretical contribution necessary to introduce here is Gilbert Simondon's (1992) philosophy of individuation. Simondon is a rather idiosyncratic thinker in the history of Western philosophy and remained hidden to non-French speaking readers until relatively recently. Given his penchant for systems thinking and his focus on processes of individuation, his insights have begun permeating radical embodied cognitive science (see Di Paolo 2020 for discussion). Although Simondon is not the original inspiration for the accounts of *enhabiting* and *coenhabiting* at the core of this thesis, there is a remarkable similarity between these ideas and his multi-scale account of individuation. And so, the contribution of Simondon's work to this thesis is one of orienting a conceptual inquiry, of refining certain insights, and of grounding a compatibilist approach in a more encompassing ontological view.

1.4 Thesis outline

1.4.1 Chap. 2 - Existing accounts

This chapter looks at patterns of being together through some existing disciplines and frameworks that have done work in this area. Those explored fall into two general categories. Individualist accounts, developed mostly within cognitivist approaches to cognitive science and social psychology; and interactionist accounts, which emerge primarily from the discipline of sociology. Highlighting their respective limitations, the need for a 'third way' becomes apparent. This is referred to as a compatibilist account. Such an account considers the invariant patterns that emerge in recurring interactions between two or more people and their environment as continuous with the invariant patterns that emerge in recurring interactions between an individual and their environment. In other words, explanations at either level are compatible with the other.

1.4.2 Chap. 3 - Precursors to a compatibilist account

This chapter highlights the theories, frameworks, and philosophical traditions relevant to the compatibilist account. It takes as central the notion of embodiment, exploring some ways it has been developed within cognitive science, ultimately situating the present account primarily within the strong embodiment of enactivism. Then, the philosophical precursor to this perspective,

phenomenology, is introduced and the notion of embodiment and its social relevance — particularly as it is developed in the work of Maurice Merleau-Ponty — is outlined in some detail, culminating in the notion of *intercorporeality*: the idea that social life is predicated on a very basic entwinement of our inter-bodily dynamics. This allows for the introduction of the work of Thomas Fuchs, who leverages this understanding, deepening it in important ways to develop an account of *inter-bodily memory*. Though he does not develop the insight, Fuchs suggests that the enactive notion of *autonomy* might be relevant to our inter-bodily memory. This becomes a new starting point for the compatibilist account.

1.4.3   Chap. 4 - Enactive autonomy: an introduction

This chapter looks directly at the notion of autonomy. It begins with some reflections on some common usages of the term. After that, a number of conceptual antecedents to the enactive account — notably the notion of *autopoiesis* — are developed in some detail, and some epistemic implications are drawn out. Then, the enactive usage is introduced at length. Here it is shown how enactive autonomy helps account for how emergent biochemical systems maintain some relative invariance over time. Finally, several supporting 'mechanisms' are suggested.

1.4.4   Chap. 5 - Enactive autonomy: from habits to societies

This chapter reviews some extensions of enactive autonomy beyond the biochemical domain. It comes in two parts. Part 1 considers these ideas as they relate to sensorimotor dynamics. This primarily concerns Barandiaran's (2008; 2017) work on the notion of habit. Therein, autonomous configurations are produced and reinforced as habitual organisations with varying degrees of complexity, from simple habits to personal identities. Part 2 explores the extension of enactive autonomy to the social domain. Here, leaning mostly on work by De Jaegher and DI Paolo (2007; 2017)the extension of enactive autonomy to embodied social interactions is considered at some length, i.e. how in face-to-face social interaction, interactants self-organise in ways that engender emergent forms of autonomous organisation proper to the interaction itself. After that, the sociological account of Niklas Luhmann (2007) is considered, alongside some of its critiques. It is the most comprehensive account of autonomy in the social domain and thus is necessary to engage. Ultimately, however, its insights are not adopted herein, and reasons are given for why not, notably, the lack of any sophisticated account of embodiment. Finally, the account of autonomy to be brought forward is clarified, and it is suggested that a combination of the extensions considered — seeing habits as autonomous, and extending these to the social domain — is the work that must be undertaken in the remaining chapters.

1.4.5   Chap. 6 - Enhabiting

This chapter continues in the compatibilist spirit, synthesizing insights from several approaches within the RECS programme. It comes in two parts also. Part 1 takes as a starting

point recent work by Baggs and Chemero (2018; 2019), in which they suggest that enaction and ecological psychology can be brought into closer relationship by recognising that each has a different emphasis when it speaks about the environment of a particular embodied subject. Holding this distinction in mind, this chapter highlights some potential compatibilities between the enactive perspective of Barandiaran, Di Paolo, De Jaegher and colleagues, and the ecological leaning Skilled Intentionality Framework of Rietveld, Kiverstein, Bruineberg and colleagues. Part 2, building on the compatibilities highlighted, and taking inspiration from Simondon, introduces the novel notion of *enhabiting,* i.e. the process by which autonomous habitual organisations at multiple timescales are produced and reinforced in the relations between the embodied subject and their environment.

1.4.6   Chap. 7 - Sense-making frames

This chapter is effectively an addendum to Chap. 6, reining in some of the ideas developed therein to make the chapters that follow more manageable. It suggests that the habitual organisations that shape our sense-making, regardless of timescale of operation, might be generically referred to as sense-making frames. It then highlights some important features of such frames, notably that they manifest functional boundaries that make our worlds what they are and serves as the normative but evolving backgrounds to our situated engagements.

1.4.7   Chap. 8 - Coenhabiting

This chapter reintroduces the object of study and synthesises the observation of patterns of being together in recurrent interaction with an understanding of autonomous habituation*,* suggesting that such patterns can be understood as examples of *participatory sense-making frames* (PFs). This is the final chapter to be offered again in two parts. Part 1 does some final framing, situating the present account in relationship with both the enactive account of *participatory sense-making* and the ecological leaning account of *sensorimotor empathy*. After that, given the centrality of the notion of habit, it details the existing accounts of social habits and some of their limitations. In particular, the lack of, and attendant need for, a well-developed 'propagation mechanism' that supports the spread and reproduction of social habits. Part 2 develops the account of *coenhabiting* proper. Introducing the notion of *tending towards co-optimal grip* as a kind of pervasive norm shaping the dynamics of social interaction, it argues that when tending towards co-optimal grip we rely upon mutually available constraints in our environment to coordinate towards compatible concerns, and in so doing *coenhabit* participatory frames at multiple timescales that support our ongoing interactions whilst also embedding the regularities and concerns wherein they came into being

1.4.8 Chap. 9 - Breakdowns and boundaries

This, the penultimate chapter, explores the autonomous dynamics of participatory frames through the method of breakdown, looking at instances in which the frames that normally serve our social interactions effectively malfunction, thus disclosing what is typically invisible though nevertheless organising our social relations. This chapter has a couple of functions: 1) by exploring the dynamics of 'social dissonance phenomena' it affirms the idea that participatory frames can be made intelligible as autonomously organised; and 2) it suggests that this understanding has explanatory potential for social phenomena that are of critical interest. In concluding this chapter a number of potential applications of the account of participatory frames are highlighted very briefly, namely, political praxes that might allow for the disruption of undesirable habitus, and psychotherapeutic developments that might support the individual in feeling well located.

1.4.9 Chap. 10 - Conclusion

In this concluding chapter, the previous chapters are recapitulated, and their main points summarised. Then, assisted by an autoethnographic investigation of a pair *running together* over the period of a few years*,* the findings of this work are synthesised to offer a statement on how participatory frames provide the basic units of our world. In winding down, some implications of this understanding and the compatibilist perspective developed are teased out, including some suggestions about how participatory frames shape individual sense-making beyond the dynamics of face-to-face interaction, some reflections on the status of the individual subject as *multiply animated*, and some speculations concerning the emergence of what might be called ecological identities. Finally, some concluding thoughts are offered on the potential significance of the compatibilist account developed herein.

1.5 Conclusion

In this chapter, considering multiple exemplary 'specimens', the object of study was delineated and defined, the basic methods and theoretical frameworks to be employed were outlined, and an overview of the chapters that follow was provided. In Chap. 2, some existing approaches to the consideration of patterns of being together are explored and critiqued, highlighting the need for a compatibilist account.

2 Existing accounts

> The individual and society are implied in each: individuals make up society by their grouping together; society shapes an entire side of individuals by being prefigured in each one of them. The individual and society thus condition each other, circle-wise.
>
> Bergson (1977, p.199)

2.1 Introduction

This chapter considers existing approaches that have worked on questions concerning patterns of being together. When inquiring into such patterns, the question of *where* to look for an explanation is a good starting point. Only after drawing some basic boundaries can further details of the territory be brought into focus. This might seem a peculiar question. As the chapter progresses precisely why it is asked should become clear. The existing approaches presented below fall into two general types of explanation, 'individualist' accounts and 'interactionist' accounts. Individualist explanations are typical within cognitive and social psychology, offering explanations in terms of individual level processes, particularly brain processes (e.g. Baldwin 1992; Hoyle et al. 2019). Interactionist explanations, are common within social sciences like sociology and anthropology, and typically develop accounts in purely social terms (e.g. Bourdieu 1977; Goffman 1967), with little elaboration of the relevant individual processes, even if the necessity of such processes is acknowledged (e.g. Schatzki 2002; Collins 2014). The present chapter articulates limitations with these approaches and highlights the need for a compatibilist (a 'third way') account.

Before exploring these maps to this less-than-well documented territory, it is necessary to preface this exploration with the recognition of a 'cartographic artefact', i.e. the various maps do not always appear to be referencing the same territory. The researchers considered do not outline their object of study in precisely the terms outlined in Chap. 1. Thus, care is taken to be as faithful as possible in deducing how they might conceive of patterns of being together. Likewise, care is taken to avoid setting up straw people to knock them down on conditions only this thesis includes in the 'debate'. Another point is that this chapter is substantially shorter than the rest. The present account has such a different starting point that engagement with these positions beyond what is included would be uneconomical.

The account begins by considering some of the more common individualist accounts and their limitations. After that, interactionist accounts are developed, and their shortcomings are made explicit. Finally, some reflections are offered on the need for a compatibilist 'third way'.

2.2 Individualist accounts

The primary defining feature of individualist accounts is that their basic explanatory unit is offered in terms of operations internal to individual interactants. One way of posing the question such accounts seek to address is, By what set of mechanisms (normally brain mechanisms) does one's experience within previous interactions influence ongoing interactions? There are many variants of such accounts. However, common amongst them is the understanding that patterns in social interaction are behavioural manifestations of what are in fact mediating cognitive structures. "It has long been one of the grand ideas in psychology", writes Baldwin, "that people internalize their relationships with significant others, which influences their experience of subsequent relationships and their sense of self" (1992, p. 46). Here, to 'internalise' means to construct internal cognitive structures. These are legion within individualist accounts, going by names such as 'working models' (Bowlby, 1969), 'representational worlds' (Sandler & Rosenblatt, 1962); 'self-with-other representations' (Ogilvie and Ashmore 1991), or 'relational schemas' (e.g. Baldwin 1992; Baldwin et al. 2003; Baldwin 2005). Naturally, any such account will have a different emphasis, though they share the idea that these internal cognitive structures are the means by which "information about one's interpersonal experiences is perceived, interpreted, stored, and recalled" (Baldwin 1992, p.461/2) within social interaction.

Baldwin's notion of 'relational schemas' is one of the more enduring internalist accounts, explaining everything from selfhood and self-esteem (e.g. Hoyle, Kernis, Leary and Baldwin 2019), to relationship satisfaction and social insecurity (e.g. Baldwin and Dandeneau 2005). For Baldwin, these are 'cognitive structures representing regularities in patterns of interpersonal relatedness' (1992, p.461/2). Theorised as an answer to the question of "how past social experiences affect current ones" Baldwin describes relational schemas as including: 1) "images (or schemas) of self and other"; and 2) a "script for an expected pattern of interaction, derived through generalization from repeated similar interpersonal experiences" (ibid). Relational schemas embed social contents, but they are entities confined to individual brains[4]. Consequently, when answering the question of where within such perspectives, the individualist places the explanatory load squarely on individual processes.

Although such approaches concern themselves with how previous interactions shape ongoing ones — they are mapping some appropriate territory, if you will — how they approach these ideas neglects features of social interaction others take to be primary. It is worth noting,

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[4] The explanatory units of other individualist positions are similarly constructed, for instance, Ogilvie and Ashmore's 'self-with-other representations' are defined as mental representations that include "the set of personal qualities (traits, feelings, and the like) that an individual believes characterizes his or her self when with a particular other person" (1991, p. 290).

these shortcomings reflect what are at this point generic critiques of accounts of cognition that employ notions of mental representation, e.g. Dretske (1995); or Metzinger (2003) (see Chemero [2009] Chap. 3 and 4 for a substantial critique of these positions; or Fuchs [2017] Chap. 1 and 2 for a critique of the 'neurobiological reductionism' characteristic of such accounts).

2.2.1 The limits of individualist accounts

Firstly, there is no mention of the body. Such oversight ignores a primordial and universal fact about human beings: we are watery, flesh and bone corporeal entities, something that prefigures all our social interactions. Whether it is your having a side of the bed, or the adaptive approaches that characterise your relationship with your running partner, within the individualist paradigm any such invariance is best understood in terms of 'cognitive structures representing regularities in patterns of interpersonal relatedness' (Baldwin 1992, p.461/2). But, excluding the body substantially underdetermines the explanatory account of social interaction, and thus, also the patterns arising therein (precisely why will become clearer from Chap.3).

Secondly, there is nothing properly social about these accounts, even though their focus is on social interaction. Within an individualist paradigm, the patterns that arise within social interactions are a kind of abstraction from the regularities that are apparent when interactants act according to their individual relational schemas. In other words, patterns of being together are, in fact, individual "patterns of interpersonal relatedness" (Baldwin 1992, p.461). Any relational regularities are epiphenomenal and only trivially constitutive of the ongoing interaction, the work being done for each individual interactant by "a cognitive structure representing a sequence of actions and events that defines a stereotyped relational pattern" (ibid, p.468). Unlike, for instance, sociological accounts, that attribute a genuine level of explanatory significance to the social interaction itself, within individualist accounts one struggles to find anything truly social, and in its place, the mere buffeting of atomistic agents acting according to internal models. Consequently, any talk of the "social" within such accounts is a misconstrual of individual processes. That such critiques can be made of individualist accounts is not surprising. They tend to start from the assumption of a pre-formed individual, one whose nature and being is specified long before any social interaction can play any constitutive role.

As already suggested, the starting point for such accounts is so different from the one under development, that critiquing them further without having the positive alternative in sight will not be helpful. Moreover, continued critique of such positions is implicit throughout the account ahead. That said, the intention is not to give the impression that the present account should replace these approaches. Multiple lines of inquiry need to be encouraged.

2.3 Interactionist accounts

Interactionist approaches occupy a different end of the explanatory spectrum than the individualist accounts just explored. Some qualifications are necessary before considering them. First, what the interactionist accounts have in common is a tendency to "start with the social structure and work back to individual experience" (Atkinson 2016, p. 13). Such accounts emphasise explanatory approaches at the right level to capture something 'truly social' in patterns of being together. Second, there is a massive body of work within sociology and anthropology that could be engaged here, but only a select number of cornerstone positions are considered. These emerge from two overlapping approaches within the social sciences: *practice theory*, as associated primarily with Pierre Bourdieu; and *symbolic interactionism*, as associated primarily with Erving Goffman.

2.3.1 Practice theory and its limits

Approaches to practice theory are many and are concerned with a whole spectrum of phenomena. They take as their basic unit of analysis patterned regimes of activities (*practices*) that individuals take part in, everything from pastimes and everyday social encounters, to interactions found within more formalised settings (Nicolini and Monteiro 2017)[5]. The aim of such approaches is to illuminate what they take to be the dialectical "relationship(s) that obtain between'', as anthropologist and practice theorist Sherry Ortner writes, "human action, on the one hand, and some global entity which we call 'the system' on the other." Within such investigations, Ortner continues, "Questions concerning these relationships may go in either direction — the impact of the system on the practice and the impact of the practice on the system" (Ortner 1984, p.154). Wilful human action and 'the systems', are typically seen to be reciprocally constitutive, whereby acting out a particular practice, engaging in its 'doings and sayings' (Schatzki 2002), reinforces the 'system', serving its reproduction. Importantly, although constituting a kind of normative "everyday background amid and through which social life unfolds" (Nicoli and Monteiro 2017, p.6), 'systems' do not fully determine the practices of the people they organise. As v. Wedelstaed and Meyer put it, "The logic of practice does not merely consist in the repeatability of routines, but in interpretive and methodological (practical) uncertainty and ambiguity, which requires context specific (re-)interpretations of practices. Practices allow and even require constant partial innovations rather than mere reproduction." (2017, p.60). Indeed, it is because of such plasticity that practices are subject to change. Nicoli and Monteiro, illustrating this point, write of "one of the greatest recent social changes in North American history" being "triggered in the back of an old bus by a small number of courageous women and men who refused to leave their

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[5] See Nicolini and Monteiro (2017) for a concise overview of practice theory and some insight into the variants therein.

seats and in so doing interrupted the reproduction of segregation — in practice" (2016; p.2). The focus within practice theory then, is on uncovering the grounding of practice within a sociomaterial medium, and which, in theory at least, rejects the methodological individualism common to the individualist accounts.

The most influential practice theorist is the French anthropologist and sociologist Pierre Bourdieu, and the most influential amongst his ideas is his notion of *habitus*. Despite no authoritative definition of habitus to be found within Bourdieu's work, it is generally agreed that habitus captures what Eriksen and Nielsen describe as, "the permanent internalisation of the social order in the human body" (2001, p.131). This is not a conscious effort of the individual actor, but reproduced unconsciously, 'without any deliberate pursuit of coherence… without any conscious concentration' (Bourdieu 1984; p.170). Still, one's habitus[6] shape many fundamental aspects of their being-in-the-world, from their posture and gait, to their cultural dispositions and tastes. In his work *Distinction*, Bourdieu (1984) empirically considers the distribution of various 'tastes' among the classes. As an example, Bourdieu specifies the tight-lippedness of French bourgeoisie common during conversation, eating and so on. This, suggests Bourdieu, contrasts with the 'slack-mouthed' style common among the working classes. A habitus is not a fixed reflex like entity (Bourdieu reserves the notion of habit for such forms — see Chap. 6 for a detailed account on these matters). Rather, it bequeaths its bearer with a capacity for responding adaptively to circumstances relevant to their position within the larger 'fields' or 'micro-fields' within which they act (e.g. families, clubs, workplaces). From a Bourdieusian perspective, patterns of being together like greeting routines between guru and student, or the ritualised dynamics between training partners, reflect their acting out habitus that meaningfully situate them within 'fields' of action.

There are, however, limitations within this account and its ability to make intelligible patterns of being together. First, habitus cannot account for the concrete particularities of particular social interactions, e.g. there is something specific to the sleeping arrangement between 'those two people in that room', even if its particular configuration is also a manifestation of particular class dynamics. Describing habitus, Bourdieu writes of them as 'structured structures predisposed to function as structuring structures (Bourdieu, 1977: p.72). Suggesting that they are 'structured structures' Bourdieu is acknowledging that they are constructed entities arising out of particular actions. Suggesting that they are 'structuring structures', he is acknowledging that they also shape the individual actions out of which they arise. However, when Bourdieu accounts for a particular habitus or other, he gives his explanation in terms of the material conditions of their arising. This critique of Bourdieu is popular with contemporary sociologists (notably from advocates of so-called

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[6] The notion of habitus is spelt just so in both its singular and plural uses.

actor network theory, e.g. Bernard Lahire 2011), who, as Atkinson puts it, "chide Bourdieu for neglecting, or outright dismissing, the intricate chains and webs of interaction, communication, and association between people and things situated in concrete time-space" (2016, p.8). Elements, which, continues Atkinson, "unquestionably feed into habitus in some way" (ibid).

The source of such shortcomings becomes apparent with the recognition that there is no account of how social interaction informs the production and reproduction of habitus. "[T]he formation of habitus at both the individual and collective levels", suggests Crossley, "is at best glossed over" (2013, p.147). Although Bourdieu insists habitus are inscribed into individual bodies, the process of enculturation is understood in terms of "claims regarding both the consistency that is evident across a range of a particular group's practices and the link of that pattern to the group's orientation towards and manner of being-in-the-world. (Crossley 2013, p.155). Thus, Bourdieu's account lacks a propagative mechanism. In summary, although Bourdieu acknowledges the necessity of an inscribable body in reciprocal relation with larger social structures, the link between the two remains underdeveloped. This makes it difficult to account for the habitus characteristic of a newly invented game or practice, for instance.

One contemporary practice theory position that goes some way to addressing some shortcomings of Bourdieu's account, is Schatzki's notion of *teleoaffective structures*. Schatzki describes teleoaffective structures as "a range of normativized hierarchically ordered ends, projects, and tasks, to varying degrees allied with normativized emotions" (2003, p.192), which are, "enjoyed or acceptable in a given practice" (2012, p.16). Clear examples of acting under such structures might be making a sale in a workplace, scoring a basket in basketball, or scoring a basket in basketball with a particular grace and style. However, for Schatzki, the goals guiding action within a particular domain are not always so explicit. They "need not be conscious goals … [or] ... states of affairs that people consciously seek to realise" (2002, p.81). These 'structured structuring structures', unlike Bourdieu's habitus, explicitly evolve within the interaction. As Schatzki writes, "Teleoaffective structures are recurring and evolving effects of what actors do together with what determines this" (2002, p.81).

Here the co-constitutive dialectic between 'structure' and 'practice' is apparent. Although shaping expectations and normativized emotions within a particular domain, teleoaffective structures continue to transform within interactions, as implicit ends and rhythms to which interactants attune, as outcomes they might realise to satisfy some implicitly desired affective state. With Schatzki then, there is some sense for how patterns emerge and evolve within social interaction. Take, for instance, the running partners. Within recurrent interactions certain activities better realise the goals of the domain, e.g. by motivating each other to keep a particular pace they improve their practice time across a particular distance. In realising this goal, it also engenders

some desired affective state. And so, the activity that helped realise that affective state might be reinforced to become an end in itself. Under such conditions, certain preferred rhythms, preferred outcomes, and so on, might stabilise as teleoaffective structures, such that interactants approach future interactions with particular anticipations which if not fulfilled may feel like the breaching of some implicit goal or norm.

The concreteness characteristic of patterns of being together is better accounted for by Schatzki than it is by Bourdieu, and the role of ongoing and recurrent interaction given due recognition. However, Schatzki unfortunately strips teleoaffective structures of their structuring capacities when he accounts for their relationship with individual actions. Schatzki writes, as already mentioned, "Teleoaffective structures are recurring and evolving effects of what actors do together with what determines this." But he continues, "They themselves, however, do not govern activity. Activity is governed by practical intelligibility, which is itself determined by mental conditions ... It follows that the normativity that characterises a practice's teleoaffective structure shapes what makes sense for people to do ... in the context of which certain mental conditions arise in these individuals" (2002, p.81). In other words, teleoaffective structures still depend upon individual mental models, reminiscent of the individualist accounts above (if they are not themselves understood to be mental models). The interaction between these elements in Schatzki's account is simply not very clear. v. Wedelstaedt and Meyer level the same critique when they write that "Schatzki says that, in the end, "practical intelligibility" governs the activities of those who are engaged in a practice. However, when he argues that practical intelligibility is "determined by mental conditions" (Schatzki 2002, p.81), we are once more confronted with the "information processing problem"" (v. Wedelstaedt and Meyer 2017, p.65). We are, in other words, returned to individualist explanatory strategies that center notions of mental representation. At worst, Schatzki strips teleoaffective structures of anything truly social, rendering them abstractions from observed regularities within interaction, residing only in the minds of individual actors. At best, his account still depends on mental models when describing the relationship of teleoaffective structures to action. Thus, Schatzki's account — although ostensibly interactionist and positioned within a tradition that strives to recognise a social reality — entails a kind of tacit and reluctant individualism.

2.3.2 Microsociology and its limits

Another position of interest here is the microsociological work by, and inspired by, Erving Goffman. Goffman's early work was within symbolic interactionism (a sociological approach pioneered by George Herbert Mead (see Stryker 2008). This approach, as Atkinson writes, "focuses on the social situational dynamics relevant to individual action" (2016, p.17). It centers around ethnographic investigations of face-to-face interactions, and is documented in books

including *The Presentation of Self in Everyday Life* (1956), and *Interaction Ritual* (1967). Goffman emphasised a 'dramaturgical approach'. This suggests that in social interaction we are constantly occupying a series of *roles*, contingent upon the context of our action. We are not unlike actors whose actions reflect a kind of social 'performance' when we are 'front stage' and present to others, and something else when we are 'back stage' and free from our dramaturgical demands, where, as Goffman writes, "the performer can relax; he can drop his front, forgo speaking in his lines, and step out of character" (1956, p.70). When in character we are in the business of maintaining what Goffman calls *face* (1967). Maintaining face, or undergoing 'face-work', means managing the coherent presentation of the character being performed, through expressive acts that either accord with it or recover it when deviations occur, e.g. you want to present to your boss the appearances of being competent and when you make some mistake you act in a way that offers reassurance that it will be resolved and not happen again. Any interaction takes place within what Goffman calls a 'region', a sociomaterial configuration that provides a spatio-temporally orchestrated focus for those involved in the interaction, e.g. a lecture hall, a workplace meeting room. Moreover, Goffman referred to the general domain of interaction — particularly face-to-face interactions — in terms of 'the interaction order' (Goffman 1983). Here, notions of social and individual get entangled in ways that make any distinction of one from the other difficult, for Goffman sees both individual actions and social structures as components in and products of this order. Speaking of how this relates to recurrent social interaction — in a manner relevant to the understanding of patterns of being together — Jenkins (2008, p.162) writes that, the interaction order

> does not have to be perpetually re-negotiated or re-invented anew every time face-to-face dealings take place. There is an established, and generally taken-for-granted, solidity to the human world as it is routinely encountered by participants in everyday life as normality, as 'how things are'. There is considerable stability, there is even order. Situations are generally likely to be framed by existing local — and supralocal — histories and staged within existing rules and conventions that are, at least in part, shared by other protagonists. Individual actors are also likely to develop their own routines, as they engage in recurrent interactions with the same people. Procedural forms — whether ... explicitly rule-governed or habitual — are not only unavoidable, but they are also actually necessary, if the face-to-face business of the interaction order is to be possible.

One can understand the "interaction order" then, as a web of social patterns that shapes and is shaped by the activity of the interactions it scaffolds. Above, Jenkins acknowledges routines between recurrently interacting performers as being included in this web. Thus, patterns of being together, as part of the interaction order, seem to hover above the individuals that comprise them, available to be occupied, like the role of a stage actor, when the scene demands it. Under this

reading such patterns can be understood as having a social component not easily reducible to the processes of individuals, or individual brains.

Goffman's descriptive accounts and the terms he employs capture aspects of our lived experience that are familiar but that we rarely voice. However, they also suffer some limitations. Goffman, like Schatzki, and Bourdieu too, offers no account of how these social dynamics effectively get into the individuals who provide the lived bodies necessary to keep the interaction order going. Talk of 'rules' or 'habits' remain merely heuristics. Much like with previous accounts, there is much about this perspective that can orient our understanding, but it remains an interactionist account and does little to assuage the tensions that plague the intersection between individual and social explanations when understanding patterns of being together (Chap. 3 considers some recent work that explicitly suggests a potentially fruitful dialogue between Goffmanian inspired microsociological accounts and enactive approaches within cognitive science).

A more contemporary approach, that builds upon Goffman's work, but also integrates insights from a Durkheimian perspective, is Randall Collins's (2004) *interaction ritual chains* (IRCs) framework. Collins's lists some 'basic ingredients' necessary for the making of interaction ritual chains that are some mix of social, symbolic, cognitive, behavioural, and affective components. According to Collins (2004, p.48), there are four such ingredients required.

1. Two or more people in co-presence: bodily assembled and, through neurological feedback loops, able to charge up a situation with excitement and significance.
2. A boundary that demarcates insiders from outsiders, lending participants a privileged sense of inclusiveness.
3. All parties to the encounter must "focus their attention upon a common object or activity, and by communicating this focus to each other become mutually aware of each other's focus of attention".
4. Participants must share "a common mood or emotional experience".

Although not included in this list, recurrence of such interactions might be another necessary ingredient, hence the language of 'chains'. Four outcomes are thought likely where these elements successfully combine: 1) feelings of solidarity aligned in accordance with some shared undertaking, 2) infusions of what Collins refers to in terms of 'emotional energy' (elaborated below), 3) the inculcation and sacralisation of 'collective symbols', and 4) sanctions against those who would violate those symbols. This "is the stuff", suggests Collins, "that holds society together in imbricated "pockets of solidarity" (2004, p.15). It is within IRCs that we become, "attuned and

synchronized in rhythms of voice, sight and gesture", and "it is precisely the chain, or rather a series of interconnected chains, which gives us a sense of living in a distinctive kind of society" (Collins 2005, p.4)

For Collins, IRC's are microscale mechanisms that serve two general purposes: 1) when aggregated together they produce macroscale societal orders; and 2) they are the crucibles within which individuals are forged. These "Situational dynamics," writes Baehr, speaking of Collins' work, "... shape not only our market behaviours and scientific traditions but also our sexual satisfactions, bodily ingestions and desultory market transactions" (Baehr 2005, p.1). For Collins, these localised, situated encounters have explanatory precedence because "they are", he suggests, "the foundation of social life and human experience" (2004 p. 259). "Everything depends on them" he claims (ibid). Regarding the claim that it is in IRCs that individuals are forged, Collins suggests that, his "... analytical strategy, is to start with the dynamics of situations", for "from this we can derive almost everything that we want to know about individuals, as a moving precipitate across situations" (ibid, p.4). Thus, for Collins, through the analysis of situational dynamics, we can derive most of what we might care to know about the actions of individual humans and the cultures they collectively comprise. It follows then, Collins would also explain the example patterns herein in terms of IRCs.

Think of the greeting routine between guru and student, and how in the precise attunements of voice (a call and response), sight (the student averts their eyes), and gesture (both participants take a slight bow, hands joined in prayer at the sternum), they engage a ritual that includes the above ingredients. The ritual is charged with 'emotional energy', for it is exhilarating for a student to be in direct engagement with their guru, and vice versa. There are meaningful boundaries present, manifest, for instance, in their dress. They share a common object of attention, the act of greeting itself in the context of a spiritual practice. And, both guru and student — presuming authenticity — share feelings of solemnity and reverence. With recurrence one can see how a pattern begins to emerge. In such examples, the four outcomes; solidarity, high emotional energy, the inculcation and sacralisation of 'collective symbols', and sanctions against those who would violate them, seem inevitable, and Collins analysis seems to capture accurately what might comprise a 'pocket of solidarity'. However, there are some troubling elements in Collins account that need addressing, not least Collin's notion of emotional energy[7].

This notion of emotional energy is both an intriguing and troubling one. For Collins, the emotional energy functions as something like a state that is both aimed at and through which actions, behaviours, styles, symbols, and so on, make their way into culture and psychology. The

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[7] This is an idea that is more general but nevertheless reminiscent of Durkheim's notion of collective effervescence (see Schilling and Mellor 1998 for an overview of this notion).

behaviours that generate emotional energy are more likely to become part of the individuals' common set, and one is always directed towards states of maximum emotional energy. This might motivate a quest for fame, for power, for success, for dominance and so on. However, for Collins, it does not imply that human beings are striving for experiences along a single dimension, always seeking thrills and maximising the intensity of affectual states. Maximum emotional energy, for Collins, might just as easily motivate a desire to relax, or to go to bed, as it might to make a parachute jump. It functions as a kind of primordial and ever-present norm orienting or luring human beings towards favourable affective states in any given situation.

For Collins, the same forces are operative within one's social networks too, in a couple of different ways. First, one is drawn towards interactions that promise states of high emotional energy. As Collins puts it, human beings are primarily "emotional energy seekers, thereby linked to those interactions and their derivative symbols that give the greatest emotional energy in the opportunities presented by each person's social networks" (2004, p.373). Groups, and collectives that promise high emotional energy solicit, and those that might frustrate it repel. Second, when individuals come together in ways that reciprocally support their movements towards emotional energy, not only do the interactants experience some cohesion with the larger collectives they help comprise, but also incorporate the patterns that reflect those collectives at an individual level. Crucially, any subject need not constitute a unitary perfectly integrated whole, and thus, only be attracted to groups that cohere with that whole. Rather, how one shows up in any interaction ritual will depend on how their emotional energy is excited by that ritual, and consequently may vary across situations, even if showing some invariance in recurrent social interactions. Here, then, in states of high emotional energy, both individual and social orders are produced and reproduced. This notion of emotional energy seems to be homing in on something important concerning how social interactions serve as furnaces for the emergence of both individual and social order. However, in Collins' account, it remains formally underdetermined, and thus can be employed as little other than a placeholder, and an unfortunately vague one at that.

Collins' account does highlight the importance of the dynamics of interaction and the role of recurrent interaction in shaping both individual and social order, and at least attempts to wed it to an understanding of individual processes. Still, Collins is guilty of some reductions that render his account untenable. Collins sets out advocating for the centrality of the interaction. Take, for instance, that in Collins' position, "It is no good invoking "culture" as the source of behaviour; culture in general does nothing. To explain how macro-structures actually work, the sociologist must specify in detail the localized mechanisms that constitute them" (Baehr 2005, p.1). Here the localised mechanisms referred to are social interactions. This kind of reductionism is surprising coming from Collins, who, at least ostensibly, is himself pushing back against other more common

forms. The concern with this kind of move is that it seems rather arbitrary. The individualist might just as easily substitute 'culture' for social interaction and make a similar move, saying 'interaction in general does nothing. To explain how interactions actually work, the psychologist must specify in detail the individual mechanisms that constitute them.' Undoubtedly, cultures and social interactions are very different things, but social interactions and brains are very different things also, and one would expect some push back from Collins if one tried to explain the phenomena captured in IRCs in a purely neuroreductive fashion.

That said, Collins is elsewhere guilty of neuroreductionism himself, and thus, potentially undermines the explanatory priorities of his own account. In an interview, when asked about the differences between interaction rituals in embodied face-to-face interactions and those conducted through digitized media, such as on social networks, Collins speculates about a future in which not only is social interaction not important, but even bodies are unimportant to the kinds of dynamics normally reserved for IRCs. He responds to the interviewer, "We could design a device to directly stimulate the part of your brain involved in sexual arousal. You would not actually have to meet your lover, but just turn on a part of your brain ... Why would you need another person when all you need to do is turn on a device …?" (van der Zeeuw 2018, p.249). In responding in this way, Collins, much like Schatzki, betrays a kind of tacit individualism. By extension of Collins' reasoning here, if one could stimulate the brain properly, one would have all needed for the formation of both social and individual order, the former being really an illusion derived from purely individual processes. But this is confused, and ultimately runs counter to the claim that the mechanism of IRCs is central to understanding both social and individual order. It also embeds the assumption central to individualist accounts, i.e. embodied human subjects come basically fully formed and social interaction is a game of switch flipping.

2.4 A compatibilist account

In Collins' account — as with the others mentioned — the various levels of explanation are ultimately incompatible. What is needed, in accounting for patterns of being together in a way that avoids the pitfalls encountered, is what from here will be referred to as a compatibilist account. One covert aim of the present chapter was to make explicit two related methodological concerns: 1) that a cognitive science concerned with explaining patterns of being together can and should draw from social sciences, such as sociology and anthropology; and 2) that these sciences will remain partial and confused without a cognitive science capable of supporting their insights. Many of the traditional shortcomings of these various disciplines stem from a neglect of the inexorable though often unrecognised relationships that exist between them. Writing about the resulting tensions, Hutchins suggests that, "early researchers in cognitive science placed a bet that the

modularity of human cognition would be such that culture, context, and history could be safely ignored at the outset and then integrated in later. The bet did not pay off. These things are fundamental aspects of human cognition and cannot be comfortably integrated into a perspective that privileges abstract properties of isolated individual minds" (1995, p. 354). There is a large body of research that now informs our understanding of the sociality of cognition. Still, cognitive science has yet to take seriously many insights that are common in sociological traditions. Increased dialogue between these disciplines should be encouraged (see Sect. 3.7 for some emerging work in this regard). Symbolic interactionism and practice theory (and their progeny), for instance, seem like potentially fruitful interlocutors for a cognitive science of the emergent, embodied, embedded, and enacted nature of cognition (e.g. Menary 2010). Two of the interactionist accounts above have been criticised for their tacit individualism, but being fair to these theorists, they should not take all the blame. When they turn to psychology and cognitive science for support, they have been met with accounts that their insights, as Hutchins puts it, "cannot be comfortably integrated into" (1995, p. 354). And so, when forced into alliances with them, they are simultaneously forced into a kind of unavoidable reduction. By developing a vocabulary that blurs the boundaries between these domains and disciplines, this compatibilist account endeavours to offer a cognitive scientific perspective that not only offers a positive account of patterns of being together, but adds to a language that may be helpful going forward in facilitating ongoing conversations between these disciplines. This is done by considering the patterns that emerge in recurring interactions between two or more people and their environments as morphologically continuous — both in terms of their organisation and their development — with the patterns that emerge in recurring interactions between an individual embodied subject and their environments.

2.5 Conclusions

In this chapter, several features that are relevant to the account of patterns of being together have been observed. From the individualist perspectives, the recognition that ongoing interactions are informed by our previous ones in ways that create expectations about both our own actions and the actions of others therein. From the interactionist accounts, the notion of habitus fosters an appreciation that what takes hold in the body includes everything right down to the tastes of class. Schatzki's account of teleoaffective structures imparts a feel for the implicit goal directedness of our being together and some appreciation for how those dynamics evolve in interaction. In face-to-face interaction we help constitute what Goffman calls 'the interaction order', a structured though effectively invisible domain that need not be "perpetually re-negotiated or re-invented anew every time". Collins promotes a view that in interaction we manifest boundaries of

inclusion and exclusion that are both the boundaries of the groups we help comprise and of our individual personalities. All these interactionist accounts include a recognition of the reciprocal dependencies between action/social interaction and social order, a dynamic captured by the memorable, if ungainly, notion of a "structured structuring structures" (Bourdieu 1977).

These features enumerated above will resurface throughout the remainder of this thesis under various forms. However, the account argued here is neither individualist nor interactionist. Rather, it is a compatibilist account. The answer to the question of where to look for an explanation in the account provided then, will be to say that no simple account of where is in fact possible. Patterns of being together manifest as they do within conditions that are bio-psycho-socio-materially (i.e. ecologically) mediated. The next chapter introduces some theoretical background to the present account, and a novel starting point is located.

3   Precursors to an Compatibilist Account

But … we cannot determine with what molecule the brain begins and the rest of the body ends. Further we cannot tell with what molecules the body ends and the external world begins. The truth is that the brain is continuous with the body and the body is continuous with the rest of the natural world.

Whitehead (1967, p.289)

… the experience of being embodied is never a private affair but is always mediated by our continual interactions with other human and nonhuman bodies.

Weiss (1999, p. 5)

Each one of us [is] pregnant with the others and confirmed by them in his body.

Merleau-Ponty (1964b, p. 181)

3.1 Introduction

Having made the basic case for the need for a compatibilist account of patterns of being together, this chapter explores several frameworks that serve as important conceptual forerunners to the present account. As will become clear, much work has already been done that makes space for the compatibilist account under development.

This begins by considering the notion of embodiment, a notion emphatically absent within the individualist accounts, and insufficiently developed in the interactionist accounts in the previous chapter. The notion is first considered under some of its guises within the contemporary cognitive science landscape. Then, the enactive account of strong embodiment is articulated in some detail. Having done that, it traces some philosophical roots of this perspective back to the phenomenological perspective of thinkers like Edmund Husserl and Maurice Merleau-Ponty. Here, several central notions are considered, especially the phenomenological account of embodied sociality captured in the notion of *intercorporeality*. Having introduced this notion, several of its more recent conceptual refinements are elaborated. Some sociological work on the interactional study of sports is informative here, as is work by Thomas Fuchs and colleagues who have fleshed out this notion for a contemporary cognitive scientific audience. After this, some additional work by Thomas Fuchs is considered, extending the notion of intercorporeality to address the topic of patterns of being together head on, within the framework of *inter-body memory*. It is here that a new starting point for the present account is uncovered. Fuchs points to the centrality of the enactive notion of autonomy for understanding how characteristic patterns emerge in recurrent social interaction, but he does not elaborate upon this insight. This elaboration thus becomes the

primary concern for the rest of this thesis. To wrap up, this chapter reflects on a recent collaboration between an enactivist cognitive scientist and a group of interactional sociologists. Therein, they express a shared concern with questions of autonomy when thinking about the production and reproduction of social order in face-to-face interaction, and they make the case for the necessity of an account along the lines of the one developed herein.

3.2 Embodiment

3.2.1 The many faces of embodiment

In the past thirty years or so, there has been an 'embodied turn' within cognitive science: a growing sense that not enough emphasis has been given to the constitutive role of the body in cognitive systems. Of course, this emphasis did not arise ex nihilo, but finds theoretical antecedents right back to the early part of the 20th century. The biosemiotics of Jacob von Uexküll (1992), for instance, conceives of the environment, or *umwelt,* that any living subject perceives, to be largely specified by its biological makeup. The pragmatism of John Dewey (1925) — building on insights from his pragmatist mentor and colleague William James — argues for a unified 'body-mind', with mind emerging from more basic physical functions. Other theoretical positions have also played substantial roles in inspiring this turn, notably the phenomenology of Maurice Merleau-Ponty, spoken about at length below, and the ecological psychology of J.J. Gibson, aspects of which are also considered below and throughout the rest of this thesis. Broadly speaking, the contemporary approaches emblematic of this turn, suggest — to varying degrees — that[8]:

1. The body and its sensorimotor processes play some role in constituting cognition
2. Cognition can be understood in the context of it supporting the activities of the body
3. Cognition is predominantly a real-time situated activity interwoven with perception and action

Despite these shared concerns, however, and despite often drawing upon insights from the shared precursors mentioned, there is little consensus on what the term *embodiment* designates. As Gallagher writes, "A variety of approaches to the study of cognition have been closely associated with the notion of embodiment … The alternatives range from conservative models that remain close to cognitivist conceptions of the mind, to more moderate and radical camps that argue that we need to rethink our basic assumptions about the way the brain and the mind work" (2017a, p.26). Researchers investigating embodiment ask questions concerning the degree to which bodies, and body-environment relations, play a constitutive role in the structuring of cognition and the extent to which the body and its processes should be invoked when explaining

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[8] These features equate to dimensions highlighted by Chrisley & Zimke (2002) as emblematic of this turn.

various cognitive functions. For instance, must we talk about the body when speaking about mathematising, or languaging, or reasoning; or is it only necessary when speaking about skilled engagement in a motor task? The landscape of responses to such questions is wide and varied, with many peaks and valleys, and dissensus reigns throughout. This turn, then, captures a loosely cognate spectrum of philosophical frameworks and scientific methodologies attempting to give the body its proper place in the study of mind (Gallagher 2018, p.27).

Outlined below is little more than a smattering of some variants of embodiment, and given that the intention of this chapter is to provide some foundations for the compatibilist account under development, the focus is primarily on approaches that best align with these ambitions (for extended discussions on topics concerning embodiment see Chrisley and Ziemke 2003; Wilson 2002; Newen, De Bruin and Gallagher 2018; Sahpiro 2014; and Cappuccio 2018).

3.2.2   Scientific roots

Much of the work comprising the embodied turn was inspired by the ecological psychologist J.J. Gibson, who centred the role of the body and its capacities for action in his thinking about cognition (1979). Gibson was focused on a theory of vision that was intended as a counter to the dominant computational theories of his day. In such theories — reflected in the previous chapter in terms of the individualist accounts — thinking, perceiving, remembering, and so on, entails the rule-governed manipulation of internal mental representations. The ecological approach is different, according to what Chemero calls Gibson's "three major tenants": 1) perception is direct and not a matter of adding mental information to raw sensations; 2) perception is primarily for guiding action and not for the mere gathering of 'action-neutral information'; and 3) because perception is not concerned with adding information to raw sensations, *a la* 1, and because perception is able to guide adaptive behaviours, *a la* 2, the information necessary to guide adaptive behaviour must be available to be perceived in the environment (paraphrased from Chemero 2009, p.23). This latter tenet amounts to the recognition that perception is of *affordances,* i.e. opportunities for action provided by features of the environment. A chair is perceived not as a neutral collection of shapes and materials to which stability is later added by the machinery of mind, but it is perceived directly as a place to sit when one is in need of sitting. Thus, empirical questions for ecological psychologists concern the nature of the information that conveys affordances: the lawful structures in light, for instance, that convey the catchability of a baseball (e.g. Michaels and Oudejans 1992), or the jumpability of a gap (e.g. Jongeneel et al. 2015) (there are complications with this notion of affordances, some of which are explored later in Chap. 6). In such a view 'cognising' is quite obviously an embodied process, or, at the very least, bodily related.

Another significant empirical approach to questions of embodied cognition, inspired largely by Gibson's ecological psychology, is the situated robotics of Rodney Brooks and colleagues at MIT's *Computer Science and Artificial Intelligence Laboratory*. Brooks (1991) realised that many of the problems robots were tasked with solving were better solved by the design of robot bodies than by complex computational architectures and centralised command models. What was different about the Brooksian robots from their algorithmically controlled peers, was that there was "no central locus of control, no separate planner, and no central model of the world that all processes must write to and read from to act appropriately" (Chrisley & Zimke 2002, p.1106), features endemic to most cognitive scientific accounts done in an individualist register. Instead, the bodily components were able to self-organise under constraints and in so doing display what appears to be intelligent behaviour. Central to the Brooksian perspective, and its role in the embodied turn, is Brooks' "insistence", as Chemero writes, "that intelligence is necessarily embodied" (2009, p.25). "Brooks argues ", Chemero continues, "that it is real interaction with the real world, not mental gymnastics, that is the mark of intelligence" (*ibid*). Here then, it is not just the structure of the environment that is important to understanding intelligent action, but also the physical constitution of the acting agent.

One of the most striking examples of seemingly intelligent behaviour being incorporated into bodily design are the Brooksian inspired passive walking robots (see **Figure 2** below). Without any computational control, and despite being comprised of mechanical parts only, when placed upon a particular incline (within a particular set of constraints) these robots demonstrate behaviours that look to the observer to be controlled. This behaviour, however, is quite obviously an emergent property of the whole robot-environment system, and not the execution of a central computational command. One of the primary questions for researchers inspired by such approaches is to what degree the same can be said about human behaviours and activities, i.e. that they are self-organised emergent properties of an organism-environment system under particular conditions, and not executions of a top-down instruction from the brain (or mind).

Another example of some empirical work that has remained influential to embodiment theorists, is work done by Kirsh and Maglio (1994), in which they studied techniques Tetris players use to organise and place their variously shaped digital bricks (or 'zoids') into a relentlessly ascending digital wall. Kirsh and Maglio observed that experienced players rotated the bricks as they descended the screen, effectively swapping out what would be a more difficult 'mental task' for a less difficult 'embodied' or perceptuo-motor task; not unlike how one might shuffle their bricks

when playing scrabble in the hope of stumbling upon a sequence of letters that inspires a word[9]. However, in the work of Kirsh and Maglio (1994), although embodied activities play some role in the goings on of cognition, there remains a commitment to a computational theory of mind. As Chemero remarks, when making the same critique, for Kirsh and Maglio "zoid rotation is a matter of off-loading computational complexity onto the environment, so that the rotation is part of the computation" (Chemero 2009, p.27). This kind of perspective thus continues to inform approaches to embodied cognitive science (e.g. Clark 2015) which, "despite the influence of Gibson and Brooks … [still offer] ... a computational theory of mind" (Käufer and Chemero 2015, p.205).

The above approaches represent a few peaks on the landscape of embodied cognitive science, from strong accounts in which intelligence is a distributed function of particular bodies in particular environments, to accounts in which some idea of internally centralised control is preserved, even if we can at times momentarily offload some function onto the body or environment. The following section will consider one of the more prominent accounts of strong embodiment.

Figure 2. A Brooksian inspired passive walking robot

The distribution of weight throughout the body of the robot and the bodily mechanics alone allow the robot to demonstrate walking like behaviour under the proper environmental conditions (i.e. when standing on a sloped surface with the proper gradient) without any executive control. The walking behaviour effectively emerges from the relations between bodily and environment structures (see Collins et al. 2001 for more details, including on the robot pictured). Adapted from Collins et al. (2001).

3.2.3 Enactive embodiment

Presently, one of the most well-developed theories of what might be called a strong embodiment thesis is the so-called Mind-in-Life enactive perspective. As suggested in Chap. 1,

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[9] This type of work is also often closely associated with work on the so-called 'extended mind hypothesis'. See Clark and Chalmers (1998) for the original discussion of this idea, or Menary (2010) for an edited collection on the topic with critiques, extensions, refinements, and so on.

the MIL perspective is a biological approach to understanding cognition with its roots in work in the philosophy of life (Maturana and Varela 1980, 1987) more so than theoretical psychology. As such, it represents a principled alternative to computational theories of mind. Rather than starting with a set of assumptions concerning cognitive functions and trying to fit them to a biological substrate, it starts with an understanding of biological processes in engagement with a physicochemical milieu and tries to derive an understanding of how 'cognition' might function relevant to those processes. Central to this understanding is the notion of autopoiesis, a process of autonomous self-production that shapes the activities of the embodied subject and its relationship to its environment. It describes a set of biochemical processes that relate to each other in a network such that they recursively depend upon each other for their reproduction, whilst also establishing a boundary between processes endogenous to the system and processes exogenous to the system, e.g. a cell that creates a membrane and thus establishes itself as an identity distinct from its environment (these processes are considered in much greater detail in Chap. 4).

This perspective has important consequences for our understanding of, for instance, perception and normativity. Within enaction, the autopoietic biochemical body serves as a kind of basic background against which encounters with the world are appraised in ways that are relevant to its ongoing self-production. As such, any individual autopoietic entity will perceive the world around it in a manner specific to its individual concerns. Their environment is, thus, always-already value laden, and the cognitive dynamics that emerge are specific to that individual embodied subject and its needs. The activity of the embodied subject that supports the reproduction of this autopoietic network is termed *sense-making*, a term that effectively displaces talk of 'cognition' in the enactive account. Highlighting the relationship between embodiment and cognition/sense-making within this perspective, Di Paolo and Thompson (2014, p.76) write that,

> Cognition, in its most general form is sense-making — the adaptive regulation of states and interactions by an agent with respect to the consequences for the agent's own viability ... Without a body, there cannot be sense-making. Moreover, sense-making is a bodily process of adaptive self-regulation. The link between the body and cognition is accordingly constitutive and not merely causal. To be a sense-maker is … to be a body ... The body is not just the means but also an end of being a cognitive system … [and it is] … central to the production of knowledge.

In other words, cognition in this account just is the regulation of bodily states towards bodily ends, and this fact prefigures any knowledge making or perspective on the world. Cognising within enaction is thus a relational notion, a feature not only of the brain but of the body-environment adaptive system. Thompson (2007) often uses the metaphor of the flight of the bird to make this point. One should not say that cognition exists in the brain in the same way that one would not say that flight exists in the wings of a bird. Flight is quite obviously in the relationship between bird

with wings and its environment. So too with cognition. In this view, 'embodiment' is sometimes a synonym for speaking about something body-environment systems do, both in terms of the processes of sustaining a bodily organisation at the level of its biochemistry, and in terms of taking features of the environment into the dynamics of the body so as to achieve a felicitous coupling between body and umwelt (the environment particular to any particular embodied subject - see Chap. 6).

An ongoing task for enactive cognitive science is to delineate the processes involved in whatever aspect of cognising is under consideration in ways that do not do violence to the body-environment system by ignoring the constituent and interdependent roles of body and environment in those processes, whilst still proposing hypotheses that are scientifically testable. It is the view of such thinkers that when we draw lines too close to the lump of fatty tissue that sits between our ears, we draw it in a fashion that blinds us to many of the elements that are central to the emergence of cognition and its various organisations and flows, potentially blinding us to the very phenomena we have set out to study: people, not brains (see Fuchs 2017, Chap. 1 for discussion). Later chapters will elaborate work that embeds such aims whilst simultaneously striving for empirical rigour. However, it will be helpful here now to introduce some basics of one of the primary formal vocabularies that allow enactive cognitive scientists to study cognition as a feature of body-environment systems, i.e. the science of complex dynamical systems

3.2.4 Complex dynamical systems

A complex dynamical system is[10], according to Richardson and Chemero, any system that demonstrates the three following fundamental characteristics[11]: 1) it is made up of numerous interacting components, or agents; 2) it manifests emergent behaviours whereby the behavior of the system demonstrates coherent patterns that could not be predicted from the behavior of the individual components taken separately; and 3) this emergent behavior is self-organised (2014 p. 39). Some clarifications will be helpful. Self-organised behavior is behaviour that arises between components (agents etc.) in a system under certain environmental conditions and serves to fasten those components into a unified entity, but it does not result from executive, top-down control. Rather, the conditions in the environment and the other components constrain the activity of the various components involved such that certain patterns of coordinated action between parts become more probable. When self-organizing processes engender larger systems that have

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[10] Thelen and Smith (1994, 2006) suggest that to think in dynamical systems terms with respect to cognition is to think about development, cognition and behavior in terms of systems of elements that change over time. For Kelso, any time-based system that can be described using differential equations can be considered a dynamical system (Kelso and Schöner 1988; Tschacher & Dauwalder 2003).

[11] Definitions of complex dynamical systems differ slightly from account to account. Langsing (2003), for instance, describes them as systems exhibiting organisational unity and composed of multiple diverse, connected, and interdependent parts capable of adapting to changing environmental conditions.

properties that their component parts do not, we speak of emergence, and attribute to the emergent system a causal reality onto itself. Life, for instance, is an emergent property of certain types of self-organising chemical interactions. What results is turtles all the way down - emergent systems within emergent systems, or nested systems. Think of the behaviour of the embodied organism that requires coordination between activities of the cells, and the various micro-lifeforms and the other subsystems that comprise it, but that also arises from these coordinative processes. In such systems there is no module or executive component controlling all others. Rather, the apparently 'intelligent' behavior of the complex dynamical system is self-organised from local relations between the various sub-components of the system in their particular milieus.

Some argue that such an understanding demands a substantially different conceptualisation of cause than the purely bottom up accounts common in much contemporary scientific and philosophical discourse. Alicia Juarrero (2000) outlines how an understanding of self-organising dynamical systems challenges received understandings of causal relations. She writes (2000, p.25), for instance, that

> … when parts interact to produce wholes, and the resulting distributed wholes in turn affect the behavior of their parts, inter-level causality is at work. Interactions among certain dynamical processes can create a systems-level organization with new properties that are not the simple sum of the components that constitute the higher level. In turn, the overall dynamics of the emergent distributed system not only determine which parts will be allowed into the system: the global dynamics also regulate and constrain the behavior of the lower-level components.

and that,

> ... far from being the inert epiphenomenon that modern science claims all wholes are, complex dynamical wholes clearly—and in a distributed manner—exert active power on their parts such that the overall system is maintained and enhanced … Since the active power that wholes exert on their components is clearly not the go-cart-like collisions of a mechanical universe, the causal mechanism at work between levels of hierarchical organization can better be understood as the operations of constraint.

It is beyond the limits of the present work to weigh in on debates concerning the nature of causal relations, as such. What is of interest here, rather, is the notion of constraint that Juarrero leans upon. Given the complex inter-level relations characteristic of such systems, whereby the outcomes of processes are constantly feeding back on the processes themselves — which are themselves informed by other adjacent processes, and so on — it is very difficult to say what is actually causing what in any perfectly deterministic sense. That said, one can speak of certain conditions within or acting upon the system as enabling or limiting certain outcomes. Such conditions, which include the components in the system as well as features of the environment, can be referred to as *enabling* or *limiting constraints*. Speaking about how the emergent whole constrains the activity of the components, Thompson writes that constraints, "can be understood

as relational properties that the parts [of a complex dynamical system] possess in virtue of their being integrated or unified into a systemic network. Constraint", he goes on, referencing both Deacon and Juarrero, "is therefore a formal or topological notion (Deacon 2003). The form, configuration, or topology of a system limits or prevents certain possible behaviours the parts could have on their own, while simultaneously opening up new possibilities for them in virtue of the states the system as a whole can access (Juarrero 1999, p.132-133)" (Thompson 2007, p.424). In other words, how the various components in a system are configured in relationship to each other and their environment, provides the possibilities for how the components in the system can act, supporting the emergence of certain patterns of behaviour and negating others. There is much discussion concerning the various types of constraints operative within any given system (for extended discussions see Juarrero 1999, or Deacon 2011). However, for the purposes herein it is enough to acknowledge that components in a system, their relations, or environmental features relevant to that system, should not be said to cause certain outcomes, as such, but understood as enabling or limiting certain outcomes. They can, in other words, be understood as enabling or limiting constraints.

An illustrative example of an emergent system self-organising under constraints is a shoal of fish. The emergent behavior of a shoal is the result of behavioural coordinations in the interactions of individual agents under certain enabling constraints, e.g. water, the presence of other fish of the same species, the threat of predators. There is no controller here as such, nevertheless the shoal can act as something like a unified agent due to local interactions between its parts. At the level of the self-organised emergent system, a shoal is a temporary functional union of structural elements wherein the behavior of any element — e.g. the individual fish — is constrained to act according to the dynamics of the larger unit — the shoal. The embodied human subject too can be profitably viewed as such a system[12]. Most of these systems, be they fish or embodied human subjects, can be further defined as *holonic* systems (Koestler 1967), meaning that they can be simultaneously both whole system, comprised of many smaller systems, from individual cells to the myriad living organisms that occupy its mouth, skin, GI tract, etc., and part of a larger, or indeed, multiple larger systems, e.g. its social relationships, its friend groups, the clubs it is a member of, the city it lives in, the bio-regional ecologies it inhabits, and so on. Everything from individual cells and whole organisms, to corporations and even entire cities can be formally characterized as complex dynamical systems whose activities depend upon multiple interacting levels of constraint.

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[12] Though some additional qualifications are necessary when describing living systems, see Chap. 4 and the notions of *autopoiesis* and *enactive autonomy.*

One benefit of this framework is that it allows for a continuity of language across levels of systemic organisation. Although any particular system will have a specific instantiation depending upon its domain, and thus require a particular vocabulary for its articulation, the language of complex dynamical systems pertains to the patterns of organisation such systems are capable of, regardless of domain. As such, central concepts such as emergence, self-organisation, constraints, and so on, can help make intelligible processes at multiple levels and scales of living organisation. As will be observed later, this scalability is central to a compatibilist understanding of patterns of being together.

A useful heuristic is that when two or more complex dynamical systems with related properties reciprocally interact, they self-organise to engender larger more complex emergent systems, wherein the activity of the parts, the component systems, becomes constrained by the behaviour of the whole, the larger system. There are some hints in the above sections that being in dynamical entanglement with one's environment does not imply being entangled merely with a space of dead matter, but one that includes other living bodies also. The enactive account of embodiment, then, which borrows heavily from the language of complex dynamical systems, may be valuable in our efforts to transcend the limitations of the individualist and interactionist paradigms outlined previously, no longer positing the individual and social as entirely distinct domains, or awkward allies, but integrating them by acknowledging the significance of embodiment, recognising that patterns of being together are patterns of bodily being together. A question then surfaces: how, exactly, are patterns of bodily being together embedded in the bodies of those who help comprise them? The philosophical framework of phenomenology has been at the forefront of such enquiries for some time.

3.3 Phenomenology and the body

Phenomenology is an ongoing project within the contemporary philosophical landscape, one that over the course of the 20th century, and now well into this one, has had profound effects on our understanding of what it is to be human. Its insights continue to inform all subdomains of philosophical discourse, but particularly philosophy of mind, philosophy of action, and increasingly the philosophy of cognitive science (Käufer and Chemero 2015; Gallagher 2017a; Fuchs 2017). One of the primary objectives of phenomenology has been to "provide an account of the structures that make a shared, objective world intelligible", with the role of the enskilled body being recognised as "fundamental for this intelligibility" (Käufer and Chemero 2015, p.2). Although diverse in its articulations, and not always centering such a perspective, phenomenology has had some role for the dynamics of bodies almost from its beginnings (see e.g. Moran 2017a, 2017b for extended discussions). Husserl (1910; taken from Moran 2017b), its founder, in a quote taken

from his college lectures, asks, "How would it be possible to think the reality of the mind, of the I-subject, without a lived body?". In practice, however, questions of embodiment in phenomenology are most often associated with the work of Maurice Merleau-Ponty (1945)[13]. Indeed, as will be observed below, so too are questions of embodied sociality. As Merleau-Ponty writes — reflecting these concerns — "the very first of all cultural objects which enables all the rest to exist, is the body of the other person as a vehicle of behavior" (1945, p.364). A formative influence on Varela, Thompson and Rosch, in their pioneering text *The Embodied Mind* (1993), his work continues to inform much present work within embodied cognitive science of all stripes

The phenomenological tradition, although a precursor to many approaches to embodiment already presented, represents something of a theoretical departure, and thus, its explication requires elaborating several of its core ideas.

3.3.1 Embodiment in phenomenology

"The phenomenological movement," writes Moran, "... was the first philosophical tendency of the 20th century to really insist on the centrality of embodiment and to make it thematic in their analyses of consciousness and subjectivity" (2017b, p.269). Presently, the role of the body is centred in most phenomenological discourse. The credit for its initial centering is typically given to Merleau-Ponty. Its founder, Edmund Husserl, practiced what he called *transcendental phenomenology*, in which he was primarily concerned with studying the "essential content of our experiences … the content that makes experiences into experiences of a certain kind" (Käufer and Chemero, p.25). The project of phenomenology for Husserl, as commonly understood, was to describe experience in careful and elaborate detail to unveil its essential mental contents. Recent scholarship, however, suggests that Husserl was, in fact, concerned with embodiment, and that Merleau-Ponty would have had access to Husserl's writings on embodiment, and thus, was likely inspired by him (Moran 2017a).[14] There is not space to wade with exegetical considerations into the waters of phenomenological scholarship here. Rather, Moran's authoritative view on the matter is simply taken, and both Husserl and Merleau-Ponty are drawn from in what follows.

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[13] The phenomenological work of Hans Jonas (1966) has also been influential on theories of enaction. There simply is not the space to report on his contribution here. For an account of some of the influence of Jonas see De Jesus (2016a).

[14] Speaking of this state of affairs, Moran writes, "the centrality of embodiment in his phenomenology is … not yet fully appreciated, primarily because these reflections were carried out in Ideas II (Husserl 1952), the draft manuscript of which Husserl felt unable to complete and publish in his lifetime … As a result, Maurice Merleau-Ponty, who had access to the Ideas II manuscript from as early as his visit to Leuven in 1939, is usually credited with inaugurating the phenomenology of embodiment in his Phenomenology of Perception (Merleau-Ponty 1945) and in subsequent publications. Despite Merleau-Ponty's popularization of embodiment, especially perceptual and motor embodiment, Husserl's own phenomenology is, in many ways, almost totally and even exclusively a "phenomenology of embodiment" (2017). Moran goes on to explain that for Husserl embodiment is central to questions of perception and agency and to existential questions concerning being-in-the-world, suffering, and so on.

3.3.2 Leib and Körper

The starting point for the phenomenological account of embodiment is a distinction originally formulated by the German idealists, between the animate "lived body" or *Leib*, which is "experienced first-personally", and the physical "body" or *Körper,* which is the material body "subject to the laws of physics, causation, gravity, and so on" (Moran 2017a, p.28). One's lived body, according to Husserl, is comprised of a host of interpenetrating experiences as "a center of orientation, sensations, movement, action and affection", what Husserl refers to as "I cans": I can feel, I can hear, I can walk, I can see etc[15]. The lived body and the corporeal body are not distinct entities, but rather, they exist as an "intertwining" (Verflechtung; see Moran 2013), whereby, for instance, when the hand touches the other hand it engenders a "double sensation". For Husserl, this phenomena of self-touching — something that was also of concern for 19th century Gestalt psychologists — was, "indicative of the very essence of embodiment." (Moran 2017a, p.29). Here, the 'I cans' take on dual aspects. Touching one part of the body with another it shows up as both 'I can sense', 'I can feel', and 'I can poke', 'I can rub', etc. In other words, it shows up as both object (physical body or Körper) and subject (lived body or Leib). Within this conception, "The body", as Hamrick and Van Der Veken nicely summarise it, "becomes both subjectivised object and objectivised subject …" (2011, p.27).

Merleau-Ponty further develops these ideas of double sensation or touching-touched relations through his concept of 'the flesh' (*la chair*), which is also, for him, central to the experience of embodiment. He speaks about this in *The Visible and the Invisible*, in terms of what he calls "reversibility" (réversibilité), "the finger of the glove that is turned inside out" (1968, p.263) and "the doubling up of my body into inside and outside" (ibid, p.264). The flesh is "understood", as Moran puts it, "as the living membrane of our bodies that is our constant point of contact and exchange with the surrounding sensible and intersubjective world." (2017b, p.270). Being embodied beings then, we are always-already *of* the world, not standing at an abstract distance from it.

Crucially, for Merleau-Ponty, it is this reversibility that allows us to not only experience ourselves as embodied minds, but to experience others as minded bodies also, forming the basis for the phenomenological account of our intersubjective nature. Indeed, for the phenomenologists, the worlds we are in contact with are always socially constituted. There are, as Husserl puts it, no "first" humans, rather humans are always-already members of community. Even the foetus is encultured, being entrained to the rhythms of its long-cultured mother.

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[15] Interestingly, Husserl's 'I cans' can be seen as a precursor to Gibson's notion of affordances, elaborated upon in some detail in Chap. 6.

3.3.3 Embodied sociality

It was Merleau-Ponty who emphasised that the phenomenon of touching-touched (and thus embodiment) can be expanded to an understanding of intersubjectivity. As Moran writes, "the apprehension of the other in its various forms (from the other of my body to other bodies) is itself based on the understanding of incarnation, whose very essence is revealed through the touching-touched relation. The touch opens up one's own body, and that of the other, as a living presence." (2017a, p.31) The body of the other, so long as there is life in it, is more than a mere object. It is a living presence that instantiates an ego subject. It is an embodied subject. Thus, in social interactions, body, world, and other become intertwined. This state phenomenologists describe in terms of the *Ineinander,* wherein, as Chemero (2019)[16] puts it, "the self is in the world and the world is in the self, the self is in the other and the other is in the self".

When one embodied subject encounters another, and not a mere object, they are capable of *empathy*[17]. Empathy, within this view, is a direct experience, it is a 'bodily mediated relation, not, normally, dependent upon processes of inference making. When you encounter another, you attune to their lived body through the expression manifest to your perception. What is experienced of the lived body of the other is what is in phenomenology referred to as the 'intentional situation'; a meaningful whole reflected by some actions or constellation of expressions within a particular context. In an other's tears you do not empathise with their tears, but their sadness, in their grin, their excitement, and so on. Such apprehensions are not normally dependent upon 'cognitive' mediations, but rather, emerge due to a kind of resonant attunement between lived bodies[18]. The primary state of lived bodies resonating with and attuning to other lived bodies (that empathy depends upon), Merleau-Ponty calls our *intercorporeality*. As Gail Weiss puts it, "To describe embodiment as intercorporeality is to emphasize that the experience of being embodied is never a private affair, but is always already mediated by our continual interactions with other human and nonhuman bodies" (1999, p.5). This is a central notion throughout the remainder of this thesis.

3.3.4 Intercorporeality

With the notions of *double sensation*, the *flesh*, the *ineinander,* and *empathy,* in mind, one can get a sense for what is implied with the notion of intercorporeality. Merleau-Ponty (1964, p.168) writes,

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[16] This citation refers to a personally observed and noted instance at a conference in San Sebastian in 2019 at which Chemero spoke about his account of 'sensorimotor empathy' (see later chapters). To the best of my knowledge it has not yet appeared in publication, and so it is here reproduced from my notes.

[17] Of course, this capacity may be limited in some for whom their capacities for empathy have been disrupted or have not been developed.

[18] Such attunements are also, of course, culturally mediated. Looking through the window of the bar you do not simply observe a group of people with similar coloured outfits on, staring into the corner, shouting, and throwing their hands in the air. You see a group of fans cheering their team on at some critical point in the sports game.

The reason why I have evidence of the other man's being there when I shake his hand is that his hand is substituted for my left hand, and my body annexes the body of another person in that "sort of reflection" it is paradoxically the seat of. My two hands "coexist" or are "compresent because they are one single body's hands. The other person appears through an extension of that compresence; he and I are like organs of one single intercorporeality.

For Merleau-Ponty, when in such bodily relations, any clear boundaries that might establish two completely distinct entities become blurred. This is not limited to tightly coupled body-body interactions like handshakes but is manifest to varying degrees any time two embodied subjects are present to each other. Reflecting upon such a position, phenomenological scholar Anya Daly writes that, "through the potentialities and actualities of interaction, our bodies form a system" (2016 p.20). Here the language of the phenomenologists and the ideas from complexity that were elaborated earlier begin to line up, such that one might speak of the self-organisation of an emergent intercorporeal system.

Other phenomenological thinkers have included other aspects in their accounts of intercorporeality. Max Scheler, for instance, includes in his description of intercorporeality being oriented emotionally toward the same shared values (Davis 2019); Behnke (2008) emphasises the interkinaesthetic aspects (see below); Fuchs (2013a) the interaffective components (see below also). At its most basic, however, intercorporeality describes a form of embodied organisation in which there are reciprocal constraints between at least two bodies. As bodily expressions, your actions, utterances, gestures, and so on, serve as impressions on another, constraining their experience in particular ways. Equally and simultaneously, however, their expressions make impressions in you, constraining your experience. Fuchs describe this as a "pre-reflective intertwining of lived and living bodies, in which my own is affected by the other's body as much as his by mine, leading to an embodied communication" (2017, p.9).

Any number of social activities can be understood through this lens. As Moran writes, "There is a vast field of intercorporeal activities, from shaking hands (discussed by Merleau-Ponty), kissing, massaging, to having sex, dancing, wrestling, and so on. In each, the other's body comes to appear and is experienced in a particular way by my body." Of course, one does not have to be in direct physical contact with another, merely perceptually present. We can manifest an intercorporeal relationship over the phone or a video call, even if not with the same richness that is available in face-to-face interaction. Still, our capacity for resonating with somebody on a video or in a movie is a capacity that is derived from our primary intercorporeality. Of course, this suggests such capacities do not come preformed. As Moran writes, continuing the above passage, "One learns to anticipate the other, to respond to the other's timing, distance, speed, and so on"

(Moran 2017b, p.287). This intercorporeal 'learning' is central to this thesis. The following sections highlight several recent accounts that have begun to take it seriously.

3.4 Interactional studies of sports

Theorists working within the emerging sociological field of interactional studies of sports (which takes as its object of study moving bodies in interaction) bring many frameworks to bear. Therein, one can expect to find some combination of practice theory, symbolic interactionism, gestalt psychology, and even enactive cognitive science[19]. However, the phenomenological notion of intercorporeality has been adopted as central (Meyer and v. Wedelstaedt 2017). The development of this perspective emerges in part out of a recognition of the limitations of the individualist and interactionist accounts spoken about in the previous chapter, e.g. the awkward alliances between accounts that, for instance, speak of social structures but still depend upon explanations in terms of individual mental conditions. This section considers an account from within this emerging field that makes positive strides towards a compatibilist account of patterns of being together, though, as will be seen, falls somewhat short of being able to account for the full spectrum of examples that are of concern to this thesis.

3.4.1 Intercorporeality and interkinesthesia

Meyer and v. Wedelstaedt speak about intercorporeality as emphasising the capacity of human beings to "merge their bodies to a perceptual whole" (2017, p.3). This language might be a little strong for a cognitive scientist. However, given their tendency to focus on examples from team sports, the sense of bodies merging into a perceptual whole might, in fact, be a useful heuristic. Often the timings involved in the coordination of multiple bodies responding together towards shared challenges in the context of a sports game, particularly at a professional level, can mirror those of a more materially integrated structure. Whatever the case, the notion of intercorporeality, as is read by Meyer and v. Wedelstaedt at least, is typically more concerned with states and has less to say about interbodily entanglements as they apply to moving bodies engaged in practice. Given the emphasis here on movement, normally at speed, the notion of interkinesthesia is introduced to emphasise the kinaesthetic components of intercorporeality.

The notion of kinaesthesia refers to one's sense of their movement in space, derived from both one's sensory organs and also their proprioceptors: sensory receptors which allow for

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[19] See Meyer and v. Wedelstaedt 2017 for an edited collection dedicated to these matters, compiled from contributors who have hands-on experience in the practices written about. The following is a quote taken from the mentioned collection, highlighting the novelty of this approach. "The present book is the first document of the insights that are gained when the two fields are brought together, when interaction is investigated in micro-analytic fashion by researchers who are not only informed be a non-dualist philosophical conception of the living human body, but also intense familiarity with bodies moving, perceiving, and acting under constantly changing contingencies within complex, shifting frameworks of participation" (Meyer and v. Wedelstaedt 2017, p.348). Several examples throughout this thesis are adapted from this rich collection.

awareness of activity endogenous to the body concerning movement and bodily position. Extending the notion of kinaesthesia to the social sphere, Behnke developed the idea of interkinesthesia to refer to "specifically kinaesthetic modes of interbodily relationality" (2008, p.14). One can become so bodily attuned to another, that actions and reactions in one body are experienced in the other as if felt from the inside, as if they were part of one's own body. Meyer and v. Wedelstaedt write that "During the performance of some activities (sports is exemplary here) there is no major difference between parts of my body experiencing other parts of the same body and parts of another body; and accordingly, in these contexts both must be viewed as an extension of the same sensation" (2017, p.3). The sedimentation of bodily skills and their attendant kinaesthetic awareness also entails an ability to anticipate action possibilities in real-time and respond skilfully to the demands of a given situation. As such, when generalised to the social domain, our extended bodily sensations, our interkinaesthetic awareness, allows for the maintenance of smooth dynamic couplings as bodies both anticipate and move together across time and within a given action space. Such flows are self-organising emergent properties of the interactive system, not under the control of any individual participant.

3.4.2 Interkinaesthetic gestalts

Given their reliance upon drilling practices, team sporting situations are hotbeds of learnt patterns of socially coordinated action. Building on the above notions of intercorporeality and interkinesthesia, v. Wedelstaedt and Meyer account for the "small well-coordinated joint practices" that are characteristic of sporting situations by reviving, and further extending, the concept of *kinaesthetic gestalts*. The idea of a kinaesthetic gestalt was originally introduced by a group of psychologists working in the lab of Felix Krueger, a German gestalt psychologist working in Leipzig in the early part of the 20th century. These gestalts comprise "well-structured units of movement to which the parts naturally assemble and adjust to one another due to an overall attitude …" (Voigt 1933; quoted in v. Wedelstaedt and Meyer 2017, p.62)[20]. 'Attitude' here is taken to mean having a particular goal or task in mind.

v. Wedelstaedt and Meyer extend the notion of the kinaesthetic gestalt beyond its historical development, wherein it remained individual centred and did not include an account of socially coordinated activities. They do so by developing the idea of *interkinaesthetic gestalts*. As these authors write, they extend the concepts of kinaesthetic gestalts "to situations in which they are co-dependent with other kinaesthetic gestalts, forming what we call "interkinaesthetic gestalts"" (v. Wedelstaedt and Meyer 2017, p.66). This basically entails the recognition that the kinaesthetic gestalts of multiple interactors can self-organise into larger multi-person wholes.

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[20] Such gestalts are reminiscent of the synergies considered in the above sections, self-organising coordinative structures that emerge under certain conditions and shape action therein. Indeed, one might struggle to tell them apart.

When "a second subject comes into play", it is suggested, "ego's expectations ... become co-dependent upon alter's expectations, [and] expectations of expectations emerge" (ibid). When these are accurate, a tight coupling results. This accuracy depends upon what v. Wedelstaedt and Meyer describe as, "a form of mental-bodily arousal and attention specific to sports and other forms of highly fast-paced and perilous activity", what they label with the commonly used term "tunnel vision" (ibid). Tunnel vision, it is claimed, allows for the detailed apprehension of events that might normally go unnoticed, a slowing down of time, and sensitivity to the meaning of very fine details in a particular pattern as it unfolds[21]. For the batter, this might be observing the arc the baseball is to take, just as, or even before, it leaves the pitcher's hand.

When multiple players on a team are acting under the pressurized conditions of a sporting event, their 'tunnel visions' working together can allow for accurate and mutual expectations of expectations, and, thus, forms of coupled coordination wherein familiar patterns emerge, the self-organised bodies of multiple interactants acting toward mutual ends. These familiar interkinaesthetic patterns[22] are typically learned and rehearsed in similar situations during group practice, e.g. drills of plays[23]. v. Wedelstaedt and Meyer use detailed examples taken from the ethnographic observation of a handball game to make their case (see v. Wedelstaedt and Meyer 2017, p.67-90 for an account that is too detailed to include in summary here). Ultimately, they suggest that both embodying interkinaesthetic gestalts and recognising interkinaesthetic gestalts in others is central to group sporting performance, that such gestalts are "sedimented in embodied knowledge", and that an appreciation for such an account helps make intelligible how "decision-making and intention sharing are possible under the condition of great time pressure and pressure to act" (v. Wedelstaedt and Meyer 2017, p.89/90).

Given the sporting focus of these researchers, which tends to focus on fast paced interactions, the need for 'tunnel vision', and so on, their analysis does not extend to all of the example patterns of being together that are important to this thesis. For instance, it makes little sense to speak about friends who fall into particular ways of being when in each other's company in terms of the manifestation of interkinaesthetic gestalts (at least not primarily), nor partners who have their own sides of the bed. The kinaesthetic gestalt is a more fragile entity than the

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[21] For an impressive illustration of this kind of skilful perception, see the following YouTube video of the Portuguese footballer Christiano Ronaldo intercepting a ball in complete darkness to score a goal. The feat is impressive because the kinaesthetic gestalt he deploys to score the goal is based only upon his observation of the kinaesthetic gestalt of the kicker of the ball. The lights are turned off just as the kicker strikes the ball, and so he does not even require seeing the trajectory of the ball. https://www.youtube.com/watch?v=aoScYO2osb0

[22] Such gestalts are not unlike Schatzki's "teleoaffective structures" that were considered in the previous chapter. However, they are taken to be alternatives that are not themselves the manifestation of a practical intelligibility i.e. one "determined by mental conditions" (Schatzki, 2002, 81). However, they are limited only to the coordination of sensorimotor dynamics and thus will not suffice in accounting for patterns of being together.

[23] Reflecting ethnographic data of the sport of handball, v. Wedelstaedt and Meyer describe how intercorporeal momentums, aided by gazes, gestures and movements, coalesce into an interkinaesthetic gestalt that results in the scoring of a goal (See v. Wedelstaedt and Meyer 2017, Chap. 3, p.57 - 93 for details).

invariances present there suggest. As v. Wedelstaedt and Meyer put it, "When dissonance occur, the kinaesthetic unit is destroyed" (2017, p.62/3). And so, one might conclude, although an important contribution to the study of interaction in sport — offering what could be called a compatibilist account by extending the notion of kinaesthetic gestalts to interkinaesthetic gestalts, and, providing some appreciation for how learning (e.g. in the form of situational drilling) informs intercorporeal relations — the notion of an interkinaesthetic gestalt does not ultimately offer a satisfactory account of the processes involved in the production and reproduction of patterns of being together beyond tightly coupled kinaesthetic relations. Moreover, it offers no real purchase on many of the features (e.g. the sense of normativity, reinforcement through recurrence) that are characteristic of patterns of being together.

These authors have not set out to address such questions, and thus, cannot be faulted on these terms. There are certainly patterns of being together that entail interkinaesthetic gestalts (e.g. the greeting routines between guru and student that necessitate a highly choreographed transient configuration), but interkinaesthetic gestalts are not sufficient to account for patterns of being together. Something more encompassing seems to be at play that will not be accounted for here, even if the developments here help orient the inquiry. In the following sections, perhaps the most well developed intercorporeal framework is elaborated, and therein a novel starting point for the compatibilist account under development is found, a suggestion about what this 'something more encompassing' might be. Given that such an account provides probably the most important and proximal forerunner to the present account, it is introduced in detail below before any critique is offered.

3.5   Fuchs on intercorporeality

Much recent and ongoing work within cognitive science on the dynamics of embodied interaction has begun to take the characteristics of our intercorporeal organisation seriously. Thomas Fuchs, and colleagues — still working mostly within the phenomenological tradition, though having made substantial efforts to bring phenomenology into conversation with enactive cognitive science and psychotherapeutic practice — have laid out an entire conceptual scheme relating to questions of intersubjectivity building upon on the notion of intercorporeality, even developing a sophisticated account of intercorporeal learning and memory.

3.5.1   Interaffectivity and intra-bodily resonance

There are several concepts that need consideration in the Fuchsian elaboration of intercorporeality, starting with what he calls interaffectivity. However, to grasp what is meant here, it will be helpful to first briefly consider Fuchs's account of emotion. Emotions, according to Fuchs, are what he calls "ways of perceiving" and "attending to salient features of a situation, giving them

a significance and weight they would not have without the emotion" (2017b, p.5). Extending the Gibsonian notion of *affordance* (as perceived opportunities for action), Fuchs and Koch (2014) introduce the notion of *affective affordances,* i.e. things show up for the embodied subject not just as opportunities for actions, but as attractive, as repulsive, as intriguing, as annoying, and so on. The emotion of fear, for example, entails a way of perceiving the environment as threatening and affording retreat. Importantly, emotions are not understood in individualist terms as "inner mental states residing within individuals (even less their brains)" (Fuchs 2017b, p.4). Rather, he argues for an extended conception of emotions, whereby emotions are taken as "encompassing spatial phenomena that connect the embodied subject and the situation" (ibid) The emotion, in other words, like the flight of the bird, is something that emerges from the whole body-environment system under some set of constraints.

Our experience of emotion is grounded in what Fuchs terms bodily resonances, or, more particularly, *intra-bodily resonances* (Fuchs 2013b). These include all manner of bodily sensations, e.g. heat or cold, constriction or expansion, stinging, numbness, quickening, etc. In step with the classic Jamesian' position on emotion — who wrote that "The body is a 'resonance body', a most sensitive 'sounding board' in which every emotion reverberates" (James 1884 p.197) — Fuchs (2016, p.196) writes,

> There is no emotion without at least the slightest bodily sensations and movement tendencies … being afraid, for instance, is not possible without feeling a bodily tension or trembling, a beating of the heart or a shortness of breath, and a tendency to withdraw. It is through these sensations that we are anxiously directed towards a frightening situation, even if we do not notice them. Therefore, bodily feelings and action tendencies should not be conceived as a mere by-product or add-on, distinct from the emotion as such, but as the very medium of affective intentionality.

Such resonances are so primary that we, in a sense, interpret the situations we encounter through them. The affective affordances move us towards or away from the various elements that comprise a given situation prior to any conscious deliberation upon them. Fuchs recognises a circularity built into these relations. Being affected by some feature of a given situation results in a particular kind of bodily resonance which further valences one's interpretation, and so on[24]. In other words, the intra-bodily resonance that is part of any emotion and arises in a particular situation, also frames the situation of its arising, shaping the kind of sense likely to be made of it. This circularity is, according to Fuchs and Koch, predicated on a couple of related characteristics

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[24] Interestingly, this kind of circularity is used by some to explain the narrowing of the field of affordances that characterises that experience of the addict. See Lewis (2018) for an account of addiction as a learned response that teases out this perspective, although from within a different theoretical lineage than the one being advocated herein.

of emotions. The first is an affective component, what they call the 'centripetal' (meaning tending to move towards a centre) component, i.e. "being affected, 'moved' or 'touched' by an event through various forms of bodily sensation (e.g. the blushing and 'burning' of shame)" (2014, p.4). The second is an 'emotive' component, what they refer to as the 'centrifugal' (meaning tending to move away from a centre) component, i.e. "a bodily action readiness, implying specific tendencies of movement (e.g. hiding, avoiding the others gaze, 'sinking into the floor' for shame)" (ibid). When "Taken together," writes Fuchs elsewhere, "emotions may be regarded as circular interactions or feedback cycles between the embodied subject and the situation it is confronted with" (2017, p.6). "Being affected" he surmises "by the affective affordances or value features of the situation ('affection', impression) triggers a specific bodily resonance which in turn influences the emotional perception of the situation and implies a corresponding expression and action readiness ('e-motion')" (ibid). One is thus coupled with the environment in such a way that the bodily resonance of that coupling is always mediated by both 'inward' and 'outward' flows, the inward flow always-already arising in the context of an outward flow, and the outward flow always subject to modulation by what is encountered.

This notion of bodily resonance and the circularities it entails becomes more interesting when scaled up to the sphere of the social. There, intra-bodily resonances manifest as expressions that can show up for others who witness them as affective affordances. As Fuchs puts it "The facial, gestural and postural expression of a feeling is part of the bodily resonance that feeds back into the feeling itself, but also induces processes of interaffectivity: Our body is affected by the other's expression, and we experience the kinetics and intensity of his emotions through our own bodily kinaesthesia and sensation" (2017b, p.7). And so, in social interaction, there is an additional extension of emotion, and a kind of inexorable entangling of the emotions present. Emotions, thus, are not simply extended across body and environment, but even multiple bodies and environments. Fuchs continues the previous statement, suggesting that "Our body schemas and feelings expand and 'incorporate' the perceived body of the other. This creates a dynamic interplay which forms the basis of social understanding and empathy, and which I will describe as mutual incorporation" (ibid).

3.5.2   Mutual incorporation

The idea of mutual incorporation, first introduced by Fuchs and De Jaegher (2009), builds upon the earlier phenomenological notion of incorporation. Incorporation is classically taken to describe the transformation that is undergone when one goes, for instance, from being incompetent with a given tool, to being able to wield that tool without deliberation upon its wielding. Incorporation, thus, is a ubiquitous feature of the lived body (Leib), which "always transcends itself

and connects with the environment" (Fuchs 2017b, p.7). Some illustrative examples of incorporation developed by Merleau-Ponty (2002, p.165-166; see Smith 1964 for discussion), are the blind man and his cane, or the woman with the feathered hat. Having incorporated the cane, the blind man is sensitive not to his cane, but to the world at the end of it. Equally, as the woman with the feather hat approaches the door she will dip so as not to catch the feather on the header of the door. In phenomenological terms, the "instrument is integrated into the body motor schema like an extension of the body, subjectively felt as 'melting' or being at one with the instrument." (Fuchs 2017b, p.7).

The additional claim that Fuchs and De Jaegher (2009) make is that such incorporation also occurs with other people, a form of what might be termed *intercorporeal incorporation*. For instance, if I see someone wincing in pain having fallen from their bike, or watch as a YouTube daredevil transverses some narrow girder 100 meters high upon a bridge, my lived body extends in an act of communion, incorporating them to the degree that I might even grab the injured body part or avert my eyes from the floor so as not to encounter the potential drop. Following from this, but within the domain of real-time reciprocal interaction between two people, such intercorporeal incorporation can become mutual incorporation. Not only do I incorporate you, but simultaneously you incorporate me also. Here, the experiencing agent has no easily specifiable centre. Perturbations or fluctuations anywhere in the bodies of the interactants can ripple across the gap and resonate within the body of the other, giving rise to embodied displays and significations there also.

3.5.3 Inter-bodily resonance

Taken together, such dynamics — i.e. intra-bodily resonance and mutual incorporation — add up to what Froese and Fuchs refer to as an "inter-bodily resonance" (2012), which they depict with the graphic shown in **Figure 3**.
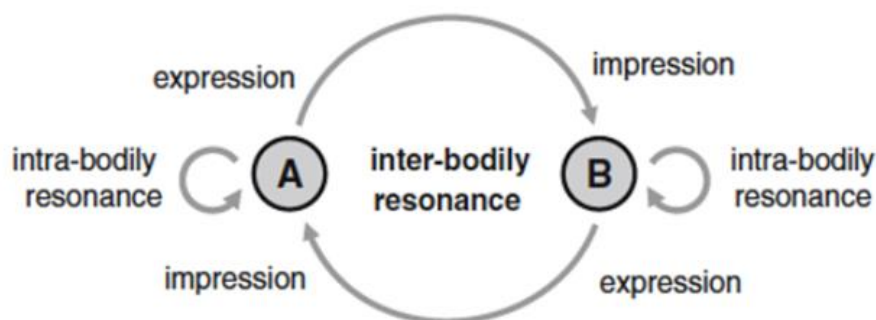
Figure 3. Mutual incorporation and inter-bodily memory

Taken together, mutual incorporation and intra-bodily resonance allow for an inter-bodily resonance in which perturbations or fluctuations centred in the dynamics of one body resonate across the whole intercorporeal system. Figure adapted from Froese and Fuchs (2012).

When manifesting processes of inter-bodily resonance, agents are connected through what is described as a "circular interplay of expressions and reactions running in split seconds and constantly modifying each partner's bodily state" (Froese and Fuchs 2012, p.13). Froese and Fuchs write, speaking of such a coupled pair, "They have become parts of a dynamic sensorimotor and inter-affective system that connects both bodies by reciprocal movements and reactions, that means, by inter-bodily resonance" (2012, p.6). This system is sometimes referred to as an 'extended body'. Most of the expressions and impressions involved proceed far too quickly to stand out discreetly and become conscious as such. Instead, both partners experience a specific feeling of being bodily connected with one another, holistic impressions of both one's own and one's partner's state, and a general feeling for the atmosphere of the situation. This is not some rare and precious event. Rather, it is a redescription of what happens in even the most everyday mundane social interactions.

Some points about inter-bodily resonance worth noting are, firstly, inter-bodily resonances need not be direct mirrors of each other. Your anger might well evoke anger in other and feedback through a series of amplificatory effects into an inter-bodily storm of anger. However, other may have learned to respond to any signs of anger with detachment, and thus expressions of anger on your behalf resonate to produce in other feelings of detachment[25]. In such instances, the inter-bodily resonance is "complementary and does not mirror the other's expression" (2017b, p.9). Here, inter-bodily resonances still have amplificatory effects without the same bodily sensations being distributed equally across both interactants. Thus, despite the primary locus of one or another emotion (anger or detachment) being situated primarily in one agent or another, either emotion is still best thought about as being distributed across both agents and their given situation. Secondly, in any given perception of another, one's own intra-bodily resonance is always-already implicated, as what Froese and Fuchs (2012) refer to as its 'proximal, tacit component'. Such resonances provide part of the initial context for what happens once the interaction begins, part of the evaluative 'frames' through which actions, interactions, expressions, and impressions are interpreted. In other words, one always brings something to the interaction, some relative autonomy is preserved at the individual level, which, at the very least, colours the inter-bodily

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[25] Interestingly, this challenges the account of interaction ritual chains necessitating shared emotional states for the stabilisation of personal or cultural order (see Chap. 2).

dynamics that emerge (see Section 8.2.1 on *participatory sense-making* for some discussion of the preservation of individual autonomy during social interaction).

Returning here to the notion of intercorporeality, and the relation between the living, objective, material body (*Körper*), and the lived, subjective, experiential body (*Leib*). In dyadic interaction, the living bodies of the participants are the carriers of expression, whilst their lived bodies represent the capacity for experiential impression. Such a dual-aspect configuration allows for the kinds of inter-bodily resonances spoken about. As such, Fuchs and colleagues have merely refined Merleau-Ponty's prescient concept of intercorporeality. Consider that more than half a century ago he wrote,

> The communication or comprehension of gestures comes about through the reciprocity of my intentions and the gestures of others, of my gestures and the intentions discernible in the conduct of other people. It is as if the other person's intentions inhabited my body and mine his.

(Merleau-Ponty 1962, p.215)

This account of embodied sociality provides the basis for a very recent account of inter-bodily memory formation also (Fuchs 2017a). Here again, work by Thomas Fuchs is central, in which he argues that within recurrent interactions dyadic and group structures learn inter-bodily dynamics that "preordain" the "coordinated behaviour of ... members" (2017a, p.334). This account is considered now in some detail, as it is the primary precursor to the account under development here, and indeed, it is within it that a novel starting point is found.

3.6 The body memories

3.6.1 Individual body memory

Fuchs develops his account of inter-body memory by progressing through several steps, beginning with the notion of the *individual body memory*. Body memory at the individual level is defined by Fuchs as "the entirety of established dispositions and skills … that become current through the medium of the lived body without the need to remember earlier situations … It thus comprises all those habits, manners, skills, or practices that are performed pre-reflectively or "as a matter of course" (2017a, p.335). Typical of such activities are patterns of motion, such as walking, running, cycling, typing, and so on, or using tools and instruments, e.g. the welder and her welding gun making a run of the mill weld, the guitarist and his guitar strumming a familiar pattern. When acting according to such a form of memory we are re-enacting the past. Such actions constitute what Fuchs describes as a 'lived past' (ibid, p.335).

But what exactly is the locus of body memory? Fuchs makes it explicit that it is not merely the brain. "The brain", he writes, "provides only the open loops of potential interaction. These loops are only closed to full functional cycles by suitable counterparts in the environment that the body currently connects with…" (2017a, p.336). Fuchs illustrates this ongoing dynamic character of memory with the example of typing on a keyboard, an example Merleau-Ponty also liked to employ. Even an expert typer, claims Fuchs, would not be able to point to the letter keys where the letters had been removed without placing their hands on the keyboard. But where knowledge resides 'in the hands' for Merleau-Ponty, it resides in the 'hands-on-the-keyboard' for Fuchs, an "emergent dispositional property of the whole system of organism and keyboard connected to each other" (ibid, p.337). It is important to emphasise, the notion of a bodily memory is not a mere metaphor, but is meant quite literally: bodily memory, it is asserted, "precisely describes the body in connection with the environment as the carrier of habit or skill memory" (ibid)[26]. If one were to ask, where is the memory? The answer, in the Fuchsian account, is in the body-environment system, even if dependent upon plastic modifications within the brain.

3.6.2 Intercorporeal memory

Fuchs develops another type of individual body memory, what he calls intercorporeal memory, which, he says, follows from Merleau-Ponty's notion of intercorporeality as a "sphere of pre-reflective mutual bodily attunement." (2017a, p.337) This form of memory is thought to support the formation of patterns of activity that support social interaction. "Repeated patterns of interaction", writes Fuchs, "soon become familiar and result in pre-reflective, practical knowledge of how to get along with others — how to share pleasure, elicit attention, avoid rejection, reestablish contact, and so on" (ibid, p.338) This form of memory Fuchs describes as a kind of musical memory for the rhythm and dynamics of interacting with others. Particular attention is paid to the formation of such memories in early childhood, "enabled by", as Fuchs writes "implicit or procedural learning which the infant is capable of from birth on"; contrasting this with "explicit and autobiographical memory", which only develops "in the course of further brain maturation, i.e. from the 2nd year of life on" (2017b, p.11). Across his work, Fuchs has gone into some detail in providing support from the developmental literature for such a claim, referencing, for instance, studies by Valenza et al. (1996) and Turati et al. (2002) and their work on infant attunement to facial expressions; imitation of facial gestures in the work of Meltzoff and Moore (1989); work on infant proto-conversation (Trevarthen 1979, 1993), movement coordination (Gopnik & Meltzoff

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[26] Anticipating criticisms of determinism, Fuchs is careful to point out that he is not speaking about some "subpersonal motion program realised by a body machine without a subject", as per some uncharitable interpretations of behaviourism. "When I am dancing,", he writes, "the rhythmic movements originate from my body without a need to steer them deliberately – and yet I am living in my movements, I sense them in advance, and I can modulate them according to the rhythm that I feel: I myself am dancing, and not a ghost in a body machine." (2017b, p.11). The body memory thus provides something like a background for ongoing improvisations by the person.

1997), and turn taking (Jasnow and Feldstein 1986), and work on emotional discernment (Hobson 2004).

Taken together, this body of work suggests that a significant foundation of the dynamics of memory pertaining to embodied interaction is necessarily pre-inferential. As such, these memories are not mere conventions to be deployed in interactions and then set aside until the next instance. Rather, our 'early interactions", says Fuchs, "turn into implicit relational styles that form one's personality. As a result of learning processes, which are in principle comparable to acquiring motor skills, we later shape and enact our relationships according to the patterns extracted from our primary experiences" (2017a, p.338) Given that such processes are occurring even in utero, the patterns of personality reflecting any individual are always-already the reflection of a deep entanglement with others, and much of what we observe in the personalities of adults are the diffused tails of patterns that spiral all the way back early childhood. Of course, such patterns are ever evolving too, they are subject to reorganisations.

Emphasising the enculturation of the intercorporeal memory, Fuchs writes that "through repeated and typical interactions with others an individual habitus is formed, and with it the norms and rules of culture are inscribed into the body" (ibid, p.333). Fuchs does not do much to elaborate upon the notion of an individual habitus, per se. Nevertheless, unlike with the Bourdieusian accounts, embodied interaction is obviously a central mechanism to its production and reproduction. For Fuchs, it is in social interaction and the dynamics therein — e.g. mutual coordination towards a shared goal — that culturally infused patterns of behaviour sediment as bodily comportments. At this point, an additional question is posed, one central to the objective of this thesis also. Fuchs writes, "since such habitual or ritualised forms of interaction are possible only in dyads or groups, the question arises whether we can also posit a super-individual level of memory formation, resulting in what may be termed collective body memory" (ibid, p.334). Fuchs ultimately responds to this in the positive.

3.6.3 Dyadic body memory

The first step in considering whether collective forms of bodily memory are possible is to consider memory in the basic social unit, the dyad. To answer affirmatively, suggests Fuchs, "we just have to shift our focus somewhat, namely from a view on the individual to a view on the interactive history of a dyad or a group. For," he continues, "just as the intercorporeal experiences of an individual are transformed into body memory, the interactions between two persons also develop their own history. It manifests in shared patterns of interaction which are actualised every time the two persons meet again" (ibid, p.339). What emerges is a 'joint procedural field' that preordains certain interactional dynamics, e.g. particular postures, gestures, accents, dialects and so on. Fuchs includes in such procedural fields examples of patterns of being together that have

been taken as exemplary in this thesis, for instance, 'rituals of welcoming and joint repertoires of gestures', or "falling into" particular modes of being when in the company of old friends[27]. Under the right conditions, these comprise intercorporeal patterns that self-organise by way of what Fuchs refers to as a kind of "unintentional entrainment" (2017a, p.339). Here, the set of interactional patterns has been fashioned diachronically, through recurrent interactions, and properly belongs to the dyad itself, i.e. they are not reducible to the activities of individual persons. Much like how the memory of typing is distributed across bodies and environments, a learnt ritual of altar preparation specific to a particular dyad, for instance, is also so distributed, only now across multiple inter-bodily resonating bodies and their particular environment.

Fuchs employs the example of a pair of dancers to illustrate the supra-individuality of these patterns. When the music comes on and the dancers engage, they enact, suggests Fuchs, the "spatiotemporal gestalt of the dance, which in turn draws them into its dynamics" (ibid). In the Fuchsian account, this depends upon the intercorporeal dynamics previously explored, a mutual incorporation wherein each dancer incorporates the body of the other and body schemes extend and connect to form an overarching dynamic system (Fuchs and De Jaegher 2009). Over time there emerges, from acts in which each partner learns to compensate for irregularities within their partner's bodily comportments as directed towards the dance, what Fuchs calls a "harmonic, sinusoidal coordination of movements" (2017a, p.339). "Modifying Merleau-Ponty's notion", Fuchs continues, "we might speak of an operative we-intentionality, since for the skilled agents, the goal of the joint action is achieved through such habitual and largely pre-reflective bodily attunement" (ibid). And so, much as one's ongoing action is constrained by a habituated background that has taken shape throughout one's history of relating to one's environment, the dyad, in interaction with its environment — made possible by capacities for intra and inter-bodily resonance and mutual incorporation — accrues a similar structuring, such that its actions proceed with the same habitual attunements. One might envision patterns, such as those characterising the rehearsed dance, being accounted for with the notion of interkinaesthetic gestalts spoken about earlier. Despite using the example of the dance, however, Fuchs does not intend to limit the understanding of dyadic body memory merely to kinaesthetic patterns[28], but rather any bodily elements that might be socially attuned, including interkinaesthetic elements, but also, for instance, interaffective elements.

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[27] Notably, Stern et al. talk about 'schemes' of 'being-with-another' as implicit relational modes of knowing that have much in common with the Fuchsian account outlined. That account has not been reproduced herein, however, due mostly to a lack of space, but also due to the comprehensiveness of the Fuchsian position. That said, they do offer some explicit suggestions about how these schemes relate to psychotherapeutic relationships, and consequently, potentially point to interesting avenues for the application and further development of the ideas developed herein.

[28] Fuchs speaks about the basic notion of body memory as denoting "all forms of implicit memory that are mediated by the body and actualised without explicit intention or recollection in our everyday conduct" (2008, 2012).

When it comes to the question of where we should look to localise a dyadic or collective memory, Fuchs suggests that, "On the one hand, the superordinate system or "extended body" of course has no natural substrate for forming a memory", but that, "on the other hand, the "open loops" of these dispositions are especially preattuned to the corresponding loops of specific others. Only together are the individuals in a position to actualise and interact their reciprocally related memories, which", Fuchs finally asserts, "justifies attributing the memory as an emergent dispositional property to the dyadic system or the dyad itself." (2017a, p.340) And so, individual brains and bodies of the interactants are only part of the structure necessary for the enactment of the memory. Much like emotions in the Fuchsian account, memory is distributed across the entire multiple-body-environment system. Summarising his account, Fuchs writes that "intercorporeality means more than inter-bodily resonance and mutual incorporation: it may also be regarded as an overarching system which over time gains its own pattern, autonomous dynamics and peculiar history" (205). As will be detailed below, recognition of the autonomous dynamics of such systems proves to be important.

3.6.4 Collective body memory

Finally, Fuchs moves from articulating the dyadic body memory involving just two people in recurrent interaction, to the *collective body memory* involving more than two people. The conceptual development here is straight forward. Insights accrued in consideration of dyadic interactions are simply repositioned for consideration of interactions of more than two people. Thus, they need not be elaborated again. Fuchs defines the collective body memory as "an ensemble of behavioural and interactive dispositions characterising the members of a social group, which have developed in the course of earlier shared experience and now prefigure similar interactions of the group" (2017a, p.341). For Fuchs, the concept that comes closest to the collective body memory is the notion of habitus. In line with criticisms mentioned numerously already, Fuchs is also critical of the traditional notion of habitus for its inability to account for some obvious facts about collective group patterns, i.e., in the Bourdieusian account, habitus, although inscribed on the body, are not theorised as emergent within embodied interaction. In summary, Fuchs's explanation for patterns of being together, be they dyadic or collective, is predicated upon possibilities afforded by our status as intercorporeal entities. Processes of interaffectivity, mutual incorporation, and intra/inter-bodily resonance (one might also add empathy and interkinesthesia to this) allow for inter-bodily attunements which over time can stabilise as a kind of supra-individual memory that preserves the traces of previous interactions and can be re-enacted under the proper conditions.

3.7 Moving beyond dyadic body memory

The account in the coming chapters builds primarily from the Fuchsian position outlined above, whilst also attempting to move past some of its limitations. The conceptualisation of dyadic/collective body memory provides a very well-articulated recognition of widely distributed dynamics not exhausted through methodological individualism, but without excluding individuals either, i.e. it provides the conceptual background with which to begin developing a compatibilist account of patterns of being together. Moving past the Fuchsian account actually relies upon a couple of related ideas that are implicit in the Fuchsian account, but not elaborated in any detail, i.e. the notion of autonomy, and the idea that the pre-reflective patterns that organise recurrent interaction depend upon processes of habituation. Fuchs does talk about both ideas, but they remain underdeveloped within his account. For instance, Fuchs speaks of the — quoted above — intercorporeal system in recurrent interaction gaining its own 'autonomous dynamic'. Or elsewhere he writes that the "patterns that go beyond the behavioral dispositions of isolated individuals" may be attributed to "a memory of the intercorporeal system and its partially autonomous dynamics ... " (2017b, p.16). Here, Fuchs is referring to the notion of autonomy as it is deployed within enactive cognitive science (see Chap. 4). In characterising the notion of body and interbodily memory, Fuchs refers to the notions of habit on numerous occasions. For instance, he speaks of the "goal of the joint action", as being achieved through a "habitual and largely prereflective bodily attunement" (2017a, p.339); or he writes about "habitual or ritualised forms of embodied interaction", that "are possible only in dyads or groups" (ibid, p.334). Fuchs, however, does little to elaborate upon what is captured with the notion of habit in his work, and it is taken as almost self-explanatory.

As will be observed in the following chapter, the notions of autonomy and habit are very closely related within enaction; habits being, effectively, autonomously organised entities[29]. Thus, the work of the chapters that follow is to move past the account of dyadic body memory in accounting for patterns of being together through an understanding of these related ideas. In doing so, the claim is that the characteristics of the featured examples outlined in the first chapter can be accounted for in a manner that is more satisfactory than is possible under existing accounts. Moreover, this position reveals levels of cultural complexity — embodied in, for instance, a moment of dancing — that are not adequately accounted for with the notion of dyadic body memory, e.g. how the patterns that comprise these interactive dynamics at shorter timescales simultaneously borrow from and transform patterns that function at longer timescales within the

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[29] Of course, this is not to say that all autonomously organised entities are habits. The relationship between these ideas will become clearer in later chapters.

socio-material niche; how many of the norms of social interaction are embedded in trans-individual structures that work to sustain themselves as such; how the structural modifications that take place in social interaction continue to shape the experience of the individuals who comprise those interactions even when apart from them. The enactive notion of autonomy, thus, becomes the new 'starting point' for the compatibilist approach under development, the primary guiding heuristic for what remains of this thesis. The chapters that follow are thus a sustained attempt to make sense of the idea that patterns of being together can be made intelligible as autonomous habitual social organisations.

3.8 Micro-sociology, enaction, and autonomy

Some very recent work by De Jaegher, Peräkylä and Stevanovic (2016) — in expressing a shared interest in making intelligible the emergence of social order — has begun establishing links between micro-sociological accounts in the tradition of Goffman's interactional sociology, and enactive accounts that are sensitive to the dynamics of social interaction, in particular through a shared interest in notions of autonomy[30]. To quote the authors, "Both research schools investigate social interactions as such, and conceptualize their organization in terms of autonomy." Continuing, "We ask what it could mean for an interaction to be autonomous, and discuss the structures and processes that contribute to and are maintained in the so-called interaction order" (De Jaegher et al. 2016, p.1). Both these perspectives are concerned with how meaning arises within, and even particularly within, interactional situations. However, this paper aims only at making the case that there is a relationship to be fostered here (it does not apply the concepts, develop methods etc.), and there has been little in the way of follow up since.

Interestingly, De Jaegher et al. (2016, p. 1 - 2) diagnose the problem with existing accounts — that awkwardly bring together both interactional and individualist explanatory strategies — much in line with the critique offered in Chap 2.

> The co-creation of action or meaning—part of intersubjectivity described in its broadest sense as social understanding—has fallen somewhat into the cracks between mainstream sociology and cognitive science because, traditionally (and putting it bluntly), the one has mainly been interested in socio-cultural norms and organization, and the other mainly in individual cognition. Two elements have largely been missing from both fields. Firstly, face-to-face interactions—the central and primary locus of the co-creation of meaningful action. And secondly, action and meaning, in both fields, have been taken for granted, either as

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[30] Making links between cognitive science and sociology is not an altogether new endeavour (as has been observed in a number of examples in Chap 2). The framework of so-called 'Cognitive Sociology' which theorises this relationship quite specifically, has been around since at least early in this century, wherein they focus on how "the locus of meaning within culture is connected to the development of mental schema" (Raphael 2017). This perspective queries the social and cultural factors that shape and guide the processes of human thought, how they "effect the sensation and attention to stimuli, the discrimination and classification of such input, the representation and integration of information, and the storage and retrieval of data" (Cerulo 2005, p.1). The position of this thesis with respect to such individualist frameworks will be evident at this stage, but it bears repeating: such frameworks underappreciate the richness of social life and its dependence upon more primordial embodied processes, many of which are explored above.

culturally given (e.g. shared norms), or determined by individual predispositions (e.g. in terms of internal representations). Therefore, the generation of meaningful action has fallen out of focus. There is no answer to the questions: What makes possible the co-creation of action and meaning? In which ways do the interplays (including tensions) between face-to-face interactions and the individual, and between face-to-face interactions and the historico-socio-cultural context contribute to that process?

As soon as these questions are articulated, the importance of answering them is obvious, and that they have been neglected for so long is unveiled as a blind spot. What is at stake here is one of the primary "mechanisms" facilitating the emergence and stabilisation of some of the primary boundaries and norms of meaningful human experience, the shared social worlds we bring forth together and thereafter live within. This line of inquiry represents a novel domain of academic practice that can make significant strides in overcoming the longstanding and artificial divides between disciplines such as psychology and sociology. Moreover, grounded within an enactive cognitive science, it can help make better sense of the inexorable entanglements that obtain in the relationship between biological being and social being, another step towards a truly ecological science of human being and being together.

Interactional sociology brings to this study an ability to specify the kinds of structures that emerge in the dynamics of interaction, many of which have already being considered; enaction brings a formal language with which to begin making sense of the dynamics underlying these structures and how they are dependent upon, derivative of, and continuous with, forms of organisation already present in the biology of the beings that comprise them. As De Jaegher et al. write "interactional sociology's emphasis on structures is a demand for enaction to further clarify questions about the stability of modes of interaction, the settling of conventions, etc." (2016, p.7-8). In other words, the task for an enactive account at this time is to understand how, within the dynamics of interaction, stable patterns come into being, and how those patterns entail norms of action, affect, perception and so on. Focusing on the emergence of relatively invariant patterns of being together at multiple timescales, such inquiries are the direct concerns of what remains in this thesis. Building on much of what has gone here, a compatibilist framework is unfolded through which to think about patterns of being together that shape and are shaped by the dynamics of everyday interactions, holonic patterns constraining the lived bodies of the subjects that comprise them, but also geared in to the larger social orders of which they are a part.

3.9 Conclusion

This chapter set out by introducing the notion of embodiment, positioning the account being developed as primarily aligned with the strongly embodied Mind in Life account of enaction. Having done that, the formal vocabulary of complex dynamical systems was considered as a means by which to theorise certain aspects of embodiment and acknowledge continuities across levels of

the organisation of life. Then, the notion of embodiment was traced back to its phenomenological origins, whereafter it as also extended to the social domain, with the notion of intercorporeality. The notion of intercorporeality was then elaborated according to some contemporary positions that address emergent patterns in recurrent interactions, most notably forming the basis for Fuchs's account of inter-body memory. Herein, the notions of autonomy and habit were found to play central explanatory roles but remain underdeveloped. Thus, it was argued the notion of autonomy might provide a novel starting point for a compatibilist cognitive science of patterns of being together. The following chapters explicate the enactive notion of autonomy under its various deployments — from, as Froese and Di Paolo (2014) put it, "cell to society" — and outline how it is to be employed in the positive account that follows.

4 Autonomy: an introduction

The art of progress is to preserve order amid change, and to preserve change amid order.

Whitehead (1929, p.339)

The distinctive thing about life, what distinguishes it radically from non-life, living matter from dead matter, is will. A stone wants nothing, a blade of grass wants something. And what life wants, which separates it from non-life by an abyss, is more life.

Knausgaard (2017b, p.149)

It is the pattern maintained by this homeostasis, which is the touchstone of our personal identity. Our tissues change as we live: the food we eat and the air we breathe become flesh of our flesh and bone of our bone … We are but whirlpools in a river of ever flowing water. We are not stuff that abides, but patterns that perpetuate themselves.

Weiner (1954, p.96)

In the arithmetic of life, One is always many.

Margulis (1991, p.51)

4.1 Introduction

Previous chapters argued the need for a sociologically informed, enactive cognitive science, to account for the emergence and stabilisation of patterns of being together from a compatibilist perspective. A few accounts that come right to the edge of this position have been considered, some of which highlight the notion of autonomy as being potentially helpful in articulating such patterns. In short, an autonomous system is one that maintains some pattern of organisation as invariant in the face of changing conditions. As will be observed, this can serve as a useful categorisation of the forms of organisation characteristic of life when referring to material self-production in the biochemical domain. Equally, however, it can serve to illuminate our ways-of-life, invariant patterns in the sociomaterial domain. Given the centrality of this notion to the positive account herein, this chapter and the next focus on clarifying the notion of autonomy as it has been developed within theoretical biology and the enactive perspective. What will ultimately be suggested, although not without some important caveats, is that the patterns of being together that are the object of this thesis can be made intelligible through the framing that the notion of autonomy provides.

This chapter begins with some brief reflections on the notion of autonomy as it shows up within philosophical discourse. Then, some of the backdrop motivating the development of the notion of autonomy as it is developed here is outlined, and some conceptual precursors to the

present account are articulated. After that, the most thorough development of the notion as it has been deployed within theoretical biology, captured with the notion of autopoiesis, is reviewed. Following this, some important epistemic implications of this perspective that will inform the rest of this thesis (and indeed, have already informed much of it up to this point) are teased out. Then, the more general notion of autonomy is defined, and the elements of its definition are elaborated. Finally, some "mechanisms" from the fields of complex systems science and coordination dynamics are considered, as formal descriptions of processes that help account for the invariance and adaptability that is characteristic of autonomous systems[31]. The next chapter then considers some extensions of the notion of autonomy beyond autopoiesis, to the sensorimotor domain in the forms of habits and bundles of habits, and to the social domain with the enactive account of social interaction.

4.2 Background

4.2.1 Not that kind of autonomy

The notion of autonomy as it is understood within the present discourse is quite idiosyncratic. It relates to patterns of systemic organisation that can be said to maintain themselves as invariant in the face of changing conditions. There are, of course, many more familiar uses of the term both within philosophical and everyday discourse. Some of the more common ones are mentioned here in the hope of better situating the present account.

One such use is the idea of "political autonomy", which can refer to a kind of 'recognition' within a given political context, "the property of having one's decisions respected, honoured, and heeded" (Dryden 2020). This notion can apply to individual persons, but it can also be extended beyond the individual to a nation state, or a region within a nation state. The notion of political autonomy is very often tied in to ideas concerning 'rights', and discussions on the nature of this often concern the extent to which either an individual's or collective's right to pursue their own interests without interference or restriction are compatible with the needs of the larger ecologies of individuals or collectives with whom they are in relationship with (ibid). Within the context of state governance an autonomous region might, for instance, have certain exemptions on taxes or laws typical in the broader province. For example, in the USA many Indian nations are autonomous in the sense that sales on goods are not subject to provincial sales taxes and laws on gambling are not applicable (Foldvary 2011). Such nations, in other words, have the right to

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[31] The language of 'systems' plays a significant role from here forward. To clarify, a system, in the sense implied, is any set of interdependent variables that change together over time in a manner that is consistent with the 'laws of nature', i.e. one could not pick out the activities of an illustrated spaceship that zooms — in defiance of gravity and the laws of mechanics — through its skyscape faster than the speed of light, and refer to it as a system in the sense implied. One could, however, refer to the bodily process of the illustrator in such terms. An autonomous organisation, then, describes a particular set of dynamics found in systems of this sort.

determine their own taxes and laws in such instances, and thus operate with more autonomy on such matters than surrounding regions.

This relates closely to another usage of the term — possibly the most frequent in everyday folk psychological discourse — which refers to an individual or groups capacity to make decisions unto themselves, free from coercion. Such an understanding is most typical in discourses around romantic or workplace relations, where one might speak about having more or less autonomy, referring to their ability to 'do their own thing', or take on projects that are self-directed or at one's own pace. Within philosophical discourse this form of autonomy is typically spoken about in terms of personal autonomy, the "capacity to decide for oneself and pursue a course of action in one's life … "(Dryden 2020). Comparable uses of the term are found about organisations or institutions too, that, for instance, act with a high degree of independence from parent companies, or governmental or regulatory oversight.

Other more relational understandings of autonomy are also common, wherein the autonomy of the individual is recognised as a kind of social achievement. These accounts tend to be sceptical of ideas about perfectly self-governing individual selves that are abstracted from their "place in a metaphysical order" or their roles "in social structures and political institutions" (Christman 2018). Here, the autonomous 'individual' is even considered something of a potentially pernicious ideal, one that is "very much the product of ... modernist humanism ..." (Christman 2018). Discourses concerning such uses of the term intersect with questions relating to everything from free will to capitalism. As such, these and the above uses of the term are sites of significant contestation. Many of these uses and debates will ultimately have some overlap with the concept as it is developed here and may ultimately be informed by such developments. However, the present account is concerned with a particular aspect of autonomy that should, at least for the time being, be taken at some distance from these debates. What the use of the term employed here does share with the above accounts, and that is of concern herein, is an interest in self-governance.

Part of the role of a governor is to produce the norms by which that being governed should be organised. To say that something is self-governing is thus to suggest that the articulation of norms by which it organises is intrinsic to some feature of the organisation itself or some set of entities within it. The account of autonomy below is aligned with the above uses in this sense. However, when attributing autonomy in the sense implied it refers not to a centralised executive or internal governor, but to forms of self-governance that arise from processes of self-organisation, wherein a suite of interdependent processes emerge under particular constraints that act to maintain themselves as such (i.e. maintain some invariant pattern) in the face of changing conditions.

4.2.2   This kind of autonomy

Autonomy here refers to a form of self-producing organisation, an entity capable of preserving its identity as a form of invariant organisation, despite changing conditions and its supporting structures — be they biochemical or sociomaterial — being in constant flux. This entity, what Francisco Varela referred to as the "selfless-self" (Varela 1991b), is a peculiar one. It is a virtual entity that cannot be bound to any location in space or time and cannot be reduced to the individual components of the ever-changing structures that comprise its (socio-)material basis. This selfless-self functions as an integrated whole, coordinating (constraining, but not controlling) the flow of structural interactions that support its reproduction. As such it demands explanation at the level of the coordinated whole. As will be observed in this chapter and the next, given the instantiation of any such autonomous entity — be it biochemical, sensorimotor, or social — certain caveats apply.

This enactive notion of autonomy, as an account of organisational forms that maintain their organisational coherence as distinct from their background — their identity — whilst engaging with an ever-changing environment, has not arrived ex nihilo. It is the progeny of a raft of interlocking developments in philosophy and science that are concerned with the principles of systemic organisation and the coordination of interactions among material processes. Such developments relate to questions of systemic persistence and self-regulation, and the recognition of flexible and adaptive capacities within living systems. This is a meshwork of ideas that specify basic governing processes that support the maintenance of a particular variable (e.g. 'homeostatic systems', 'negative feedback loops'); to more flexible processes in which system components reorganise to maintain some variable (e.g. 'ultrastable systems'); to more adaptive processes still, in which a system, through engaging with its environment, can continually act and exchange material resources so as to self-produce its adaptive organisation (autonomy as 'autopoiesis'). The account of autonomy developed below aims to be self-explanatory, explicating the more directly relevant notions as it goes. However, it begins with a cursory look at some notions that will have heuristic value going forward and thus offer some helpful framing.

The first notion is *homeostasis.* The notion of homeostasis was coined by the American physiologist Walter Cannon in the late 1920s, building upon work by the French physiologist Claude Bernard. It describes a living entity's ability to maintain a certain dynamic stability. Cannon (1929) conceived of the living organism as necessarily open to its environment. As such, any changes therein might result in changes internal to the system. Given that the maintenance of the system is dependent upon maintaining certain essential variables as stable, the organism needs to be able to compensate for changes in the environment that might otherwise knock it out of viability. Homeostasis, thus, describes the ability of the system to maintain some set of variables

within equilibrium in the face of disturbances from the environment, and thus, maintain viability. For Cannon this relates to processes at multiple levels, such as resourcing cells with water, minerals, oxygen, etc., but also at a more whole body level, such as motivating the quest for food, water, shelter, and so on. In the former case, such processes can go largely undetected. In the latter case, however, they involve the activity of the whole embodied subject, manifesting as tensions that organise their dynamic relations to their environment. Reducing these tensions is how the homeostatic equilibrium is maintained.

The second related notion stems from the field of cybernetics, the idea of *negative feedback*. Cybernetics was founded primarily on work by Norbert Wiener (1948), carried out during World War II, which had to do with the development of anti-aircraft artillery. What emerged from this work was a new approach to understanding systemic control. Cyberneticians are primarily concerned with questions of control and how systems (both living and no-living) communicate between their various parts to regulate their action to act in relationship to their goals. Central to these investigations is the understanding of what are sometimes called closed signalling loops, i.e. where action by the system engenders some change in system-environment relations that is registered with respect to some goal, leading to some action, e.g. maintain course, or adjust course. This process, by which the output is returned to the system as an input is referred to as *feedback*. There are various types of feedback dynamics comprising closed signalling loops. Particularly important to the study of purposeful behaviour are negative feedback dynamics. This notion of negative feedback was taken by cyberneticians as a "general description of how … biological systems can generate persistent or homeostatic-like behaviour" (Aguilera 2015, p.34). Indeed, for Wiener such processes were seen to be "absolutely essential for the continuation of life" (1948, p.114). There are numerous examples of such negative feedback loops within biological systems, with viability conditions serving as implicit goals. The two most obvious ones are temperature regulation and hunger regulation. When, for instance, one enters a cold environment and the temperature drops, the body shivers to return it to its ideal; or when food proves scarce, the metabolism slows, conserving energy. Effectively, any activities that function with respect to some systemic goal, helping maintain a course of action, or a particular set of viability conditions, can be thought to be operating according to the dynamics of negative feedback.

Another related idea here is Ashby's (1946) cybernetic notion of the *ultrastable system*. Ashby went beyond the mere feedback cycles by introducing a capacity for adaptive change within the system. Striving to maintain some variable of the system within viability limits, if being pushed beyond those limits and lacking an existing adequate response, the system can cycle through alternative configurations until it lands on some approach that returns the system-environment

relations to viability. As such, the ultrastable system modelled a form of learning or adaptation (see Froese and Stewart 2010 for extended discussion of these ideas), a means by which the system could move from unadapted conditions to adapted conditions. Ashby's model ultimately supports the idea that the an agent's purpose does not lie in its mechanisms as such, but in the interactions between the components that allow for the adaptive rearranging of its organisation (Aguilera 2015, p.38)[32]. In other words, it supports the idea that there is a level of organisation that shapes the dynamics of the adaptation over and above a particular set of material components.

A final important idea, also introduced by Ashby, is the notion of *operational closure.* To say that a system is operationally closed suggests that each process in the system is dependent upon other processes in the system for their constitution. Ashby (1956, p. 11; quoted from Froese and Stewart 2010, p.29) defined closure in the following way.

> When an operator acts on a set of operands it may happen that the set of transforms obtained contains no element that is not already present in the set of operands, i.e. the transformation creates no new element … When this occurs, the set of operands is closed under the transformation.

Froese and Stewart use what they call, "The set of all Boolean states (i.e., true and false)", to illustrate this idea. This set, 'true and false', is closed under the transformation of negation: "The negation of true is false and the negation of false is true. The operation of negation never results in any element other than true or false and is therefore always applicable again to the operands it produces" (Froese and Stewart 2010, p.29). Such operations can be iterated endlessly, always turning back on themselves, thus maintaining a stable set. For Ashby, this concept was also applicable to living systems, whereby the set of states characteristic of being alive is closed under any transformation of living. And so, as Froese and Stewart put it, "The property of operational closure guarantees that the identity (organization) of the living system is well defined and that it will persist throughout its operation." (2010, p23). In the case of a living organism what is maintained corresponds to states in which certain essential variables are maintained within their limits of viability.

Taken together the above notions highlight many of the important aspects that were later included in the notion of autonomy, emphasizing both qualities of persistence and adaptation. When the theoretical biologist Humberto Maturana began trying to answer the question, "What is proper to living systems that had its origin when they originated, and has remained invariant since then in the succession of their generations?" (or, What is the organisation of the living?")

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[32] Such a description sounds a lot like the idea of self-organization that was introduced in the previous chapter. In fact, it was Ashby who brought the notion of self-organisation into contemporary scientific discourse to describe such ideas, borrowing it from the philosophy of Immanuel Kant.

(Maturana and Varela 1980, p.xii), he had the above notions firmly in mind. Bringing these ideas, and others, together, he developed what he initially referred to as the 'circular organization of the living'. Therein, he defined a living system as a "homeostatic system whose homeostatic organization has its own organization as the variable that it maintains constant through the production and functioning of the components that specify it, and is defined as a unit of interactions by this very organization' (Maturana 1970, p.48). What this adds to the above developments is the idea of production, whereby the processes of material interaction also serve the reproduction of the material components and the integrated organisational whole as an entity distinct from its environment. Maturana later spoke about these ideas in terms of *autonomy*, and when understood in relation to the biochemical organisation of the living organism, *autopoiesis* (see the preface to Maturana and Varela 1980 for a thorough introduction to the term). In the sections that follow these notions are of direct concern, beginning with the later.

4.3 Autopoiesis

For Maturana and Varela, autopoiesis is a very particular instance of the general organisational form autonomy. Speaking of the genesis of the term autopoiesis, Maturana writes that, unhappy with the expression 'circular organisation' he wanted a word that would "convey the central feature of the organisation of the living, which is autonomy" (Maturana and Varela 1980, p.xvi/xvii). The term draws from the Greek, αὐτο- (auto-), meaning *'self'*, and ποίησις- (poiesis), meaning *'creation'* or *'production'*. When speaking about self-production in this domain, one is speaking about the self-production of material constituents and their organisation.

As something of an aside, although the notions are sometimes used interchangeably (and have already been in this thesis), Maturana and Varela distinguish between notions of *organisation* and *structure*. They write (1980, p.xix/xx) that

> The relations between components that define a composite unity (system) as a composite unity of a particular kind, constitutes its organisation … The actual components (all their properties included) and the actual relations holding between them that concretely realize a system as a particular member of the class (kind) of composite unities to which it belongs by its organisation, constitute its structure. Therefore, the organisation of a system as the set of relations between its components that define it as a system of a particular class, is a subset of the relations included in its structure.

Going forward this thesis works to preserve these distinctions.

Interestingly, autopoiesis is sometimes understood as a formal characterisation of the fundamental dynamics constituting living systems. As Maturana and Varela write, "the notion of autopoiesis is necessary and sufficient to characterize the organization of living systems" (1980, p. 82). Whether true or not (some reflections are offered on this in Chap. 5), for Maturana, "this was a word without a history, a word that could directly mean what takes place in the dynamics of

the autonomy proper to living systems" (Maturana and Varela 1980, p.xvii). In their canonical definition of the term, Maturana and Varela (1980, p. 78-79) speak about an 'autopoietic machine', writing that

> An autopoietic machine is a machine organized (defined as a unity) as a network of processes of production (transformation and destruction) of components that produces the components which:
> (i) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them; and
> (ii) constitute it (the machine) as a concrete unity in the space in which they (the components) exist by specifying the topological domain of its realization as a network.

In short, an autopoietic system is a biochemical unity that is easily distinguished from its environment and contains components that interact to maintain both themselves and the unity. Maturana and Varela use the language of 'machines' here to refer to the system in terms of its organisation rather than in terms of its structural components, thus imbuing the definition with a generalisability that holds across living systems, regardless of their particular biochemical composition.

The canonical example of an autopoietic system in the literature is the cell. The cell distinguishes itself as a distinct entity, it "stands out of a molecular soup" by continually reproducing the boundaries that "set it apart from that which it is not" (Thompson 2007, p.99). The boundaries of the cell, the 'cell membrane' are determined by interactions between metabolic processes within the cell and its environment. The membrane is partially open to its environment, and thus capable of transferring resources across its membrane and metabolising those resources so as to sustain the network of processes that allow it to maintain its organisational invariance, including the reproduction of its membrane. Thus, membrane and metabolism maintain reciprocal interdependencies, and in so doing the "cell emerges as a figure out of a chemical background" (ibid).

The 'components' in their 'machine' account map to the molecules of the cell; the 'processes of production' map to the chemical reactions that characterise it. As Thompson puts it, a "molecular autopoietic system is one in which chemical reactions produce molecules that (i) both participate in and catalyse those reactions, and (ii) spatially individuate the system by producing a membrane that houses those reactions" (2007, p.143). By regulating its behaviour, exchanging matter and energy with its environment, and metabolising them as necessary, the autopoietic system is capable of continuously regenerating its own organisation as such. Any activity that preserves this organisation is thus self-referential, reflecting the closed nature of the organisational whole. This kind of organisational form is not limited to single cells but extends to multicellular organisms also (including human organisms), where the structural elements are different

(ultimately being more complicated), but the organisational form is preserved. The graphic in **Figure 4** is sometimes used to symbolize the autopoietic system as a self-producing biochemical network in reciprocal exchange with its environment. The circle turning back on itself designates the circular closure of the generating processes, the wavy line its milieu, and the contrasting arrows that join the two, the reciprocal exchange of material and energetic resources that serve the ongoing reproduction of the autopoietic entity.
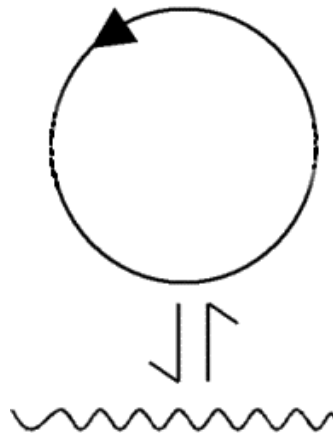
Figure 4. A self-producing biochemical network in reciprocal exchange with its environment
Here the circle closing back on itself is taken to represent the operationally closed biochemical network, the arrows the reciprocal exchange, and the wavy line the environment. Figure adapted from Maturana and Varela (1980).

These processes, although obviously dependent upon environmental conditions, enact a distinction between the living system and the wider systems within which it is embedded. Autopoiesis thus undergirds the individuation of the cell as a distinct entity, a living system. In sum, within an autopoietic system, a set of processes self-assemble to produce an interdependent network such that a boundary, though permeable, is erected between the biochemical entity and its milieu. This establishes an identity, which although transient and dynamic, comprises a self-individuating whole which is the self-referential target of ongoing exchanges with the environment.

The existence of such entities is continuously being challenged by both endogenous and exogenous perturbations, to which it must respond to maintain organisational invariance. For instance, given the dependence of such systems on a continuous supply of biochemical resources, it needs to work — e.g. move, eat, process — to maintain its organisational whole. Think of a single cell bacteria swimming in a glucose gradient[33]. If the bacterium stops moving, in the absence of any glucose, it will die. Given its tendency to maintain its identity as a bacterium, it moves about in a way that improves its chances of acquiring the glucose that supports its

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[33] An example deployed often with the enactive literature as a 'myth' by which to make sense of many concepts central to the enactive paradigm. See Cummins and De Jesus 2016 for an interesting discussion pertaining to this notion.

reproduction. Thus, the movements of the cell, and the flow of endogenous perturbations, generate distinctions whereby its relations to its environment are valanced, either serving the cells continued existence, and thus good, or frustrating it, and thus bad. And so, acknowledging the autopoietic organisation allows for making intelligible at least some of the normativity of lived experience.

Within autopoietic networks of this type, certain processes or sets of processes constitute "essential variables" (Egbert and Cañamero 2014). The metabolic requirement for the organism to maintain its blood sugar levels within viability limits comprises just such a set. Thus, maintenance of the essential variable *blood sugar levels* within the limits of viability becomes a regulatory dynamic of systemic behaviour, and the degree to which behaviours maintain or deviate from viability limits valences certain behaviours as good, bad, better, worse, etc. For most living systems, including human beings, many such essential variables must be maintained over various timescales if the self-constituted identity is to persist. Nutrient levels, hydration, sleep, temperature, oxygen intake, etc. all comprise essential variables that must be maintained within some limits, contributing to a bionormative backdrop that, as Di Paolo writes, provides a "perspective from which encounters in the world are intrinsically meaningful for the organism following the norm established by the continuing process of self-production" (2005, p. 429–430).

This understanding of the relationship between biological identity, behaviour, and experience, furnishes the autopoietic approach with a means to account for value in a limited sense. The organism does not merely represent a world of meaning imported by the senses, rather it enacts or brings forth a meaningful world dependent upon the conditions it requires to maintain its autopoietic identity. The ongoing relevance of this position today is reflected by Kiverstein and Rietveld (2018, p.150), who write,

> The individual's meaningful or intentional relation to the environment is therefore established on the basis of its autonomy [referring here to its autopoiesis][34]. The autonomous system acts with the aim of sustaining its own existence. Exchanges with the world are meaningful insofar as they affect either positively or negatively the viability of a self-sustaining and precarious network of processes (Di Paolo et al., 2010, p. 48). The source of the individual's meaningful relation to the environment is deviations and departures from its optimal relation to the environment. Such deviations present a threat to its ongoing integrity, which the individual stands ready to take action to correct.

Within enactive theory, which leans heavily on this understanding of biochemical autonomy, the value laden activities of the organism that have the results that Kiverstein and Rietveld refer to, are spoken about very generally as processes of *sense-making*. In other words, sense-making, within enaction, concerns the regulation of an adaptive autonomous organic system, and describes the activity of that system directed at its ongoing viability. It, in short, describes a "bodily

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[34] Brackets are my addition.

process of adaptive self-regulation" (Di Paolo and Thompson 2014, p.9). So understood, the primary job of sense-making is the *maintenance* of the identity of the organic body as an integrated whole, i.e. the maintenance of life. However, as will be observed in Chap. 6, this account of sense-making needs some refinements.

4.4 Epistemic implications

There is an important caveat to this account that is often neglected within its contemporary retelling and adoption. Indeed, it was more than a simple caveat for Maturana. Besides the question concerning the organisation of life, the second primary concern for Maturana was what he described as, "the participation of the retina (or nervous system) in the generation of the colour space of the observer" (Maturana and Varela 1980, p.xii). Here, the 'observer' referred to the frogs that he was investigating at the time. However, in investigating them he gained insights that would ultimately be relevant to all observers, including those doing the investigations. In other words, Maturana came to realise that what he was inquiring into was the role of the observer in the specification of that observed. Such questions are normally under the remit of the psychologist. Here, however, Maturana was inquiring into this question from within the domain of theoretical biology. Maturana's answer entails the recognition that any distinction drawn by an observer necessarily implicates the observer in making it. As he puts it, "Everything said is said by an observer" (Maturana and Varela 1980, p.xxii).

For Maturana, the basic 'cognitive operation' of any observer is one of distinction. And it is by means of such operations that we specify unities as entities distinct from their background (Maturana and Varela 1980, p.xix). For instance, any distinction drawn by an observer within a domain of discourse (e.g. theoretical biology), such as the specification of a particular autopoietic entity as something distinct from its background, is firstly and inescapably that: a distinction drawn by an observer in a domain of discourse. This position is grounded in the recognition that the kind of closure present in the above account is also the primary organising dynamic of perception. What Maturana recognised, in studying the colour vision of frogs, was that the nervous system demonstrated a comparable form of closed operation. Reporting on such efforts, Maturana writes that the approach they took required them to, "treat seriously the nervous system and treat the report of the colour experience as if it represented the state of the nervous system as a whole … to treat seriously the activity of the nervous system as determined by the nervous system itself, and not by the external world; thus the external world would only ever have a triggering role in the release of the internally-determined activity of the nervous system" (Maturana and Varela 1980, p.xv). The indubitable implications of this, for Maturana, are that perception is not the "grasping of an external reality, but … the specification of one" (Maturana and Varela 1980, p.xv). What

Maturana realised is a principally grounded hard limit on our epistemic access to the world beyond given our biological constitution.

There is a second, finer point, here too. For Maturana, we can still achieve a kind of objectivity, but it is, as he calls it, an "objectivity in parenthesis" (see Maturana and Poerksen 2004). What the parenthesis denotes is that any distinction foregrounded has been done so within a domain of description and necessitates as its background just such a domain, what he refers to as a 'metadomain'. Maturana (1980, p.xxii) puts it as follows

> The fundamental cognitive operation that an observer performs is the operation of distinction. By means of this operation, the observer specifies a unity as an entity distinct from a background and a background as the domain in which an entity is distinguished ... although a distinction performed by an observer is a cognitive distinction and, strictly, the unity thus specified exists in his cognitive domain as a description, the observer in his discourse specifies a metadomain of descriptions from the perspective of which he establishes a reference that allows him to speak as if a unity, simple or composite, existed as a separate entity that he can characterise by denoting or connoting the operations that must be performed to distinguish it.

For Maturana, this is not an idealism, nor a negation of science and its ability to generate knowledge, but simply the recognition that as soon as some distinction of experience enters language it is always-already prefigured by a vast history of contextualising relations. Knowledge, then, is a form of intelligibility in which the basis for explanation is not reference to the "objects themselves", but rather a form of coherence of experience with other experiences of those who share in the production and transformation of a particular domain of discourse. Herein, all realities are brought into being through the observer's operations of distinction. "By speaking of objectivity in parentheses", suggests Maturana — in an interview with Bernard Poerksen in 2004 — "I want to keep everybody aware of the fact that it is impossible to establish an observer-independent point of reference" (2004, p.42).

We can have a sufficiently well bounded discourse, wherein we can act as if the whole world is held as if stable, such that we can extract certain variables and ask how they interact, but we should be at least aware that we are doing that. Recognition of this fact does not, for Maturana at least, invalidate the operational effectiveness of the distinctions within the metadomain in which they are drawn. It may be a 'cognitive entity', as Maturana puts it, but it will still be subject to the other distinctions that are taken to be valid and the various possible "contextual descriptions" within the relevant metadomain (Maturana and Varela 1980, p.xxiii). The autopoietic cell for instance, is really a kind of myth, as Cummins and De Jesus (2016) have previously argued. Myth here does not denote a fable, but rather a structure that underlies the construction of elements in a domain of discourse. By acting as if we can hold the universe still, and extracting a particular entity with a particular organisational form, it allows a community of researchers to coordinate their

action in relationship to a specific domain of investigation, serving the purposes of generating intelligibility and allowing for newer and ever greater distinctions within that domain. For Maturana, the value in reminding oneself of such an epistemic injunction, is straight forward and quite practical. It warns one off excessive theoretical hubris, reminds one that they are responsible for picking out the systems they seek to characterise and thus responsible for drawing their own distinctions, and it provides a basis for cooperation, for when convictions are held lightly, the emergence of more consensual, more broadly applicable positions is more likely. The work ahead is approached in this spirit, with the recognition that any distinctions drawn, no matter how satisfying or illuminating, remain, ultimately, distinctions drawn within a domain of discourse. That said, however, the stance of objectivity in brackets is adopted. Importantly, the insights offered, and concepts developed are not accompanied at each turn by reminders of this fact, it should simply be taken as a given.

4.5 Sympoiesis

A recent interesting move here, one that reaffirms the methodological move that is necessarily made every time we specify an autopoietic entity as such, is Donna Haraway's development of the notion of *sympoiesis,* meaning 'making-with' (Haraway 2016). Following evolutionary biologist Lynn Margulis, Haraway adopts the term *holobiont* to speak of a particular symbiotic assemblage, stressing that, also like Margulis, her use of the term does not designate "host + symbiont because all of the players are symbionts to each other" (Haraway 2016, p.60). When we specify a living organisation as autopoietic, we often treat it as if we have now said something interesting about a particular entity, but we have not, really. If one takes the epistemic injunction that Maturana offers seriously, one must acknowledge that what is said is something interesting about a cell *as if* the entire rest of the world has been held constant, and that it has been said within a domain of discourse that forms the background within which the kinds of distinctions drawn are sensible or even possible. Haraway's account of sympoiesis is effectively capturing this awareness in a useful term. Any self-producing holobiont is more accurately and necessarily a *production-with* an endless stream of others, themselves also symbiotic holobionts. That these distinctions are not easily contestable should be indicative of the kind of extractive epistemic move that is made when we specify a given entity as autopoietic, the rhetorical freezing of context necessary to specify the cell as such.

Interestingly, the term sympoiesis was also introduced, separately, by Dempster (2000). Dempster (2000, p.4) defines sympoietic systems more formally than Haraway, as systems that

> … recurringly produce a self-similar pattern of relations through continued complex interactions among their many different components. Rather than delineating boundaries, interactions among components and the self-organizing capabilities of a system are

recognized as the defining qualities. 'Systemhood' does not depend on production of boundaries, but on the continuing complex and dynamic relations among components and other influences. The concept emphasizes linkages, feedback, cooperation, and synergistic behaviour rather than boundaries.

Dempster intended the notion as a compliment to autopoiesis, the differences between them primarily concerning the degree of organisational closure present, and the attendant degree of self-produced boundaries (ibid, p.2). For Dempster, who was studying the organization of ecosystems, the organisational closure of the autopoietic metaphor did not quite capture the messiness apparent within ecosystems, nor on their boundaries. Thus, she introduced the notion of sympoiesis to occupy the other end of a spectrum characterising organisationally closed systems.

Occupying varying ends of this spectrum, Dempster distinguishes between these system types according to differences in degree along three central characteristics: "1) autopoietic systems have self-defined boundaries, sympoietic systems do not; 2) autopoietic systems are self-produced, sympoietic systems are collectively produced; and, 3) autopoietic systems are organizationally closed, sympoietic systems are organizationally ajar" (2000, p.1). Crucially, for Dempster, these notions are meant as a pair of heuristics, and, as she writes, "must be recognized as caricatures … No 'real' system will fit either description, but will rather sit at some position on a continuum in between the two ideal descriptions" (2000, p.4). Dempster was happy to maintain the notion of autopoiesis for biologically individuated entities, such as cells, animals, or biological humans, even suggesting that the typical sympoietic system was composed of many autopoietic entities. Haraway, however, as she puts it in her own words, argues "on biological grounds, that we can no longer think like that" (2016, p189). For Haraway, even the self-individuating biological entity is in fact a holobiont, and thus, also a sympoietic system. Dempster would likely agree with this rendering in principle, but possibly still wish to retain the heuristic distinction, to be better able to classify a particular system, for the purposes of investigation, for instance. Indeed, Haraway herself seems to support a comparable position when she writes that "As long as autopoiesis does not mean self-sufficient "self-making," autopoiesis and sympoiesis, foregrounding and backgrounding different aspects of systemic complexity, are in generative friction, or generative enfolding, rather than opposition" (Haraway 2016, p.61).

An important shortcoming in Dempster's account, despite her acknowledgment of the caricatured nature of autopoiesis and sympoiesis, is her failure to acknowledge the epistemic implications of autopoietic theory. Dempster, in other words, is not committed to the "objectivity in brackets" stance. The sense here, however, is that doing so, acknowledging this stance as it applies to this spectrum, might make the spectrum she articulates, and the distinctions it supports,

even more helpful. When it comes to thinking about the organisation of ways of life (the subject of the chapters that follow), and the various types of systems that are characteristic of the psychological and social domains, acknowledging a spectrum of systems, with varying degrees of closure, types of boundaries, and so on, becomes all the more important, for it encourages us to remember that we are responsible for the distinctions we draw, and thus we must also be cautious of any negative externalities that might be engendered by our theorising. Towards the end of the following chapter, an argument is put forth for a spectrum of organisation that aligns with the continuum Dempster has articulated, but might be applied beyond the biochemical domain.

4.6 Enactive autonomy

The notion of autonomy as it functions within enactive cognitive science today was thoroughly inspired by the above developments, and in particular the notion of autopoiesis (see Di Paolo and Thompson 2014 for extended discussion). Indeed, it is often tricky to see the light between them, a situation that has led to some amount of confusion and, some would suggest, improper application of the terms elsewhere (e.g. Sec. 5.5 on Luhmann). The generally accepted distinction between the terms is that autopoiesis is a particular instantiation of the more general organisational form, autonomy. Both describe networks that produce processes that reproduce the networks of which they are part, but when autopoiesis speaks of production it refers to the actual production of biochemical components and a material boundary. Varela recognised that the organisational logic characteristic of autopoietic systems was also applicable elsewhere, but need not rely on the self-production of biochemical components as such. In support of this position, others have also begun to argue that the boundary need not be a material one but can be functional (e.g. Moreno and Mossio 2015; Bourgine and Stewart 2004). This section aims to clarify the more general notion of autonomy. The notion was originally outlined by the theoretical biologist and neuroscientist Francisco Varela (1979) but has been added to since. Given the above developments, these ideas will already seem somewhat familiar.

4.6.1 Operational closure and precariousness

For a system to be considered autonomous, it needs to satisfy a couple of related conditions: 1) it must demonstrate organisational closure; and 2) it must be precarious (Di Paolo and Thompson 2014). Both have been mentioned above in the context of autopoiesis to some extent. However, they are worth developing here in detail. Regarding the former, Varela (1979, p.55) writes,

> We shall say that autonomous systems are organisationally closed. That is, their organisation is characterised by processes such that (1) the processes are related as a network, so that they recursively depend on each other in the generation and realisation of the processes themselves, and (2) they constitute a unity recognisable in the space (domain) in which the processes exist.

Above, the cell, and the relations between membrane and metabolic processes, was characterised in such terms. Here, a more abstract description will be helpful, so that it might be applied more broadly hereafter. A recursive network describes a network of processes that enable each other in a circular fashion. If a network is comprised of processes *A*, *B* and *C*, and *A* enables *B*, *B* enables *C*, and *C* enables *A* in a circular fashion, the network can be said to be closed. See **Figure 5** below for a schematic illustration of these ideas. The circles inclusively represent some set of observed processes. Enabling relations are represented by the arrows. An arrow going from one circle to another indicates that the first circle is an enabling condition for the second. Within this set of processes there is a subset, represented by the black circles, that relate to each other such that any black circle has some arrow arriving at it from another enabling black circle, suggesting an enabling relation, but also playing an enabling role for another black circle. The processes in black, then, represent an operationally closed network. Given the spatiotemporal coupling of such processes, one can recognise these interdependencies as giving rise to an individuated entity, an identity, within a given medium.
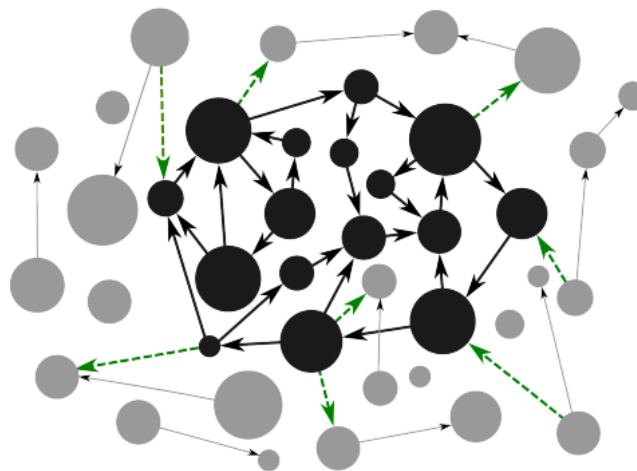
Figure 5. A schematic illustration of the concept of operational closure

Taken together the circles represent a set of observed processes. An arrow going from one circle to another indicates that the first circle is an enabling condition for the second. Within this set there is a subset represented by the black circles. These relate to one another such that any black circle has some arrow arriving at it from another enabling black circle, suggesting an enabling relation, but also plays an enabling role for another black circle. This subset of processes represents an operationally closed network. Adapted from Di Paolo and Thompson (2014).

Importantly, this kind of 'closure' does not imply a network that is independent from other processes that are not part of the network. Indeed, the network will be dependent upon a host of external enabling processes which are not themselves enabled by the network, and thus not part of its operational closure (grey circles enabling black in **Figure 5**). In the case of an organic

network, such as a tree, for instance, the tree is enabled by the presence of sunlight, but the processes generating sunlight are not enabled by the presence of the tree. Similarly, the network, or processes within it, may enable processes outside of it that are not part of the network (black circles enabling grey). The tree, for instance, may enable climbing for an adventurous child, but climbing does not enable the tree. In sum, although operationally closed, the network, "should not", as Di Paolo and Thompson 2014 put it, "be conceived as isolated from dependencies or from interactions" (2014, p.71).

It is suggested, however, that if autonomy is limited to being defined in terms of operational closure, trivial examples can be highlighted, such as mutually dependent equilibrium states within cells in a network, and thus, another feature is required as part of a more robust operational definition, i.e. *precariousness* (Di Paolo and Thompson 2014). The condition of precariousness captures the idea that individual constituent processes tend to decay if left alone and are not propped up by other processes within the network. Without the enabling conditions provided by other processes in the organisationally closed network, any process will simply run down. When a process is enabled by both external processes (grey circles) and the operationally closed network, this process is said to be precarious if the network is removed and the process also stops. If it continues, enabled only by the external processes, then it is not precarious in the sense implied here.

This entropic tendency of interdependent systemic processes poses a threat to the viability of the system. Thus, the decaying processes are continually propped up by other processes in the network, according to their needs and the needs of the network. As such, their relationship to the network allows them to maintain their status. As Di Paolo writes, these processes "depend for their continuation on the organisational network they sustain" (Di Paolo 2009, p.16). Here, the relationship between closure and precariousness becomes apparent. The processes within the system are disposed towards the sustenance of a network that also sustains them. Maturana and Varela reflect this when they characterise autonomy as "the condition of subordinating all changes to the maintenance of the organization" (Maturana and Varela, 1980).

Given the nature of such systems — that they comprise a self-producing identity that must work against its spontaneous tendencies towards disorder — what emerges within the system is an intrinsic concern, or care, for the states and trajectories of the system, i.e. within such systems self-derived norms aimed at the maintenance of systemic identity emerge. These dynamics serve as a kind of backdrop, such that all fluctuations within and perturbations to the system are appraised according to their relevance for the ongoing viability of the system, the maintenance of a particular invariant identity. The next chapter explores various domains in which autonomous systems have been theorised, emphasising accounts that have some relevance to considerations

of patterns of being together. It also introduces some novel distinctions that are helpful to the positive account that follows. In what is left of this chapter, however, a review of some ideas from complex systems science that help undergird a scientific account of autonomy will be considered.

4.7 Supporting mechanisms

Autonomous systems, it has been suggested, are those capable of demonstrating self-individuating forms of organisational coherence that allow for the coordination of systemic components in such a way as to be able to absorb perturbations without losing organisational coherence, and respond adaptively as necessary. Given this rather abstract holistic account, the degree to which such forms of organisation can be accounted for in more tractable, scientific, mechanistic terms is a concern.

A number of functions will need to be addressed for anything approaching a satisfactory mechanistic account: those that facilitate a diversity of interacting parts organising into relatively stable transient wholes, those that support the adaptation of those wholes to changing conditions both internal and external to the system, and those that integrate these tendencies of persistence and adaptation throughout the various levels of the system[35]. In what remains of this chapter several 'mechanisms' that respond to this task are considered, emerging primarily from complex systems theory and the field of coordination dynamics. Grounded in the concepts of self-organisation and the tools of nonlinear dynamics, coordination dynamics aims to understand the coordinated functioning of a variety of different systems at multiple levels of description to account for the variety of patterns observed in the behaviour of living systems (Kelso 1995; Jirsa and Kelso 2004). For starters, some of the mechanisms that allow for the coupling of multiple systems/components into modes of relatively stable interaction will be considered. The focus here is on how the material properties of systems lend themselves to spontaneous forms of coordination.

4.7.1 Coherent patterns

The first idea to elaborate here is the notion of *coordination* itself. Coordination describes a non-accidental correlation between two or more systems, or components within a system, that are in sustained coupling. To speak of a 'non-accidental correlation' is to speak of an expressive unity of two or more systems/components beyond what is supposed of them. To say that two

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[35] Of course, the language of 'mechanism' is vexed within these discussions. Mechanistic understandings are sometimes held up as the only properly scientific accounts, as if mechanisms were the very fabric of nature and their discovery the primary job of scientific inquiry. However, the non-linearity inherent in complex systems often puts anything approaching a mechanistic explanation out of reach. In this work the term 'mechanism' describes a set of relatively reliable inter-related processes that have some relevance to the object of concern. Through the Maturanian lens, any specified mechanism is something that functions within a domain of discourse to help make intelligible some relative invariance observed. In reality there are no mechanisms as such.

systems/components are 'coupled' is simply to say that some variables in each system/component play some causal role in modulating the dynamics in the other. An illustrative example of spontaneous coordinated coupling from a non-living dynamical system is found in the oscillations of swinging pendulums. If the swing of each is allowed to affect the swing of the other through some kind of medium, such as the vibrations that pass through the wall upon which they both hang, they will come into synchronisation after a period (Huygens et al.,1888). In this fashion each swinging pendulum acts as a control parameter modulating the behavior of the other. The behaviours of innumerable mechanical and biological systems have the tendency to spontaneously enter states of coupled coordination in this way, including the coordination of limbs in the body, and, as will be relevant to the account later on, interactions between people (e.g. Kelso 1995; Schmidt, Carello and Turvey 1990).

In such instances, neuroreductive explanations will not do, for there is no one responsible element as such, but rather a host of coordinated elements. This is not to say that you can subtract any element you wish and expect the same dynamics to obtain. The emergent dynamic relies upon a host of interrelated enabling conditions, whereby the various elements in the system work together to enable the emergence of some coherent pattern under some constraints. Comparable spontaneous coordination dynamics are observed at all levels of systemic organisation, from the neural, to the sensorimotor, to the social, and thus, serve as good candidates for accounting for how multiple systems/components can organise into relatively stable, transient, patterns of coherent coordination.

When elements spontaneously coordinate and establish mutual non-independence, their overall degrees of freedom are reduced, and the elements are entrained to a shared pattern, which is expressed as a relative stability within the system. Often this relatively stable dynamic is quantifiable. In such instances, it is referred to in terms of an *order parameter*, and can be offered in mathematical terms, a single variable that is in fact a complex index of many lower level components, a kind of coarse graining intended to capture the collective coherence of the system. However, even if not quantifiable, as is the case in many overly complex systems, the notion of *order parameter* is still used heuristically to speak about the emergent whole that functions as a 'top-down constraint' or 'virtual governor' (Juarrero 1999) on the interactions that give rise to it.

Importantly, coordinations need not be absolute, but tend to demonstrate some degree of flexibility. Kelso argues for different levels or degrees of coordination: *absolute* and *relative* (1995). In coordinations that are absolute, the coupled system will either move from one stable state to another (e.g. in-phase to anti-phase; see Kelso 1995, p.45-7 for a by now famous example of how this applies in the coupling of oscillating finger taps), or out of coordination altogether. Relative coordination, on the other hand, a notion originally introduced by von Holst (1938/73), affords a

greater range of possibilities and there are no sharp transitions between stable states. Analysing locomotion and the coordination of movement in animals, fish in particular, van Host distilled a couple of principle characteristics of their coordinative properties. One was a *maintenance tendency,* which reflected a tendency to maintain a relatively steady rhythm, whereby each fin on a fish demonstrated a preferred frequency oscillation. The second was a *magnet effect,* reflecting the tendency towards synchrony whereby oscillators tend to oscillate in synchrony together. Kelso (1995) illustrates these notions with the more intuitive example of an adult and a small child walking along a beach together. Given the difference in leg length between the adult and child, the adults' longer legs having a lower preferred frequency — or maintenance tendency in von Holst's language — there will be a tendency for the coordination to slip, and their movements to be out of phase. However, given their coupling — in Kelso's example they are 'informationally coupled' through their ongoing conversation and their hearing and seeing one another — they will also make continuous adjustments to their behaviour, adjusting the frequency or length of their strides, thus demonstrating the magnet effect. Resulting from these opposing tendencies are an infinite number of coupling relations that nevertheless maintain a coherent interaction pattern. As Kelso writes, "This form of coordination is far more variable, plastic, and fluid than pure phase locking. Certainly, tendencies toward phase and frequency synchronization are still present, but sometimes the phase slips before it is reset again to some regular rhythm" (1995, p.98). This has to do with the differences in the components themselves, such that, even if an attraction to certain phase relations is present, other properties intrinsic to the components also act within the situation, and so the primary enablers of interactional dynamics in any particular instant are constantly shifting around. See **Figure 6** for a graphic illustration of some of these ideas.
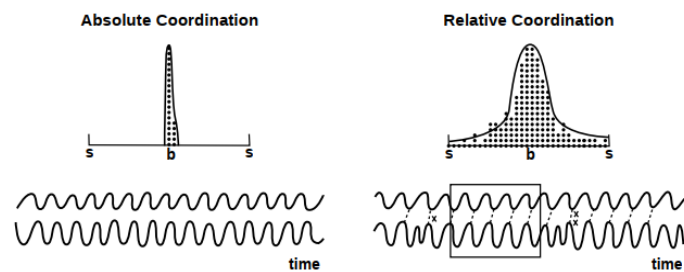
Figure 6. Relative and absolute coordination

These graphics represent recordings of the oscillatory dynamics of the fins of lip fish under two different conditions. The signals are derived from pectoral (upper time series) and dorsal (lower time series) fin movements of a fish. The top plots illustrate the distribution of possible phase relations between the two signals, the distance from S to S reflecting the phase intervals measured. The bottom plots illustrate the corresponding time series from which the phase relation is extracted. The left-hand plots denote the absolute coordination condition, in which the magnet effects are pronounced. The right-hand plots denote the relative coordination condition, wherein magnet effects and maintenance

Under the dynamics of relative coordination the system is in a state of high potential, "poised near critical points", writes Kelso, "where it can spontaneously switch in and out" of patterns of greater or less degrees of coordination (1995, p.99). An advantage to this relative coordination dynamic, to "living near but not in phase-locked states" is that the system is, as Kelso writes, "(meta)stable and flexible at the same time" (ibid). It can, in other words, rapidly shift between protostable states. This is an important notion to the account developed here when thinking about how emergent coherent patterns can demonstrate adaptive capacities.

4.7.2 Adaptive patterns

Having suggested some mechanisms by which autonomous systems might organise into coherent patterns, it is now necessary to suggest some potential 'mechanisms' by which such organisations are capable of maintaining coherence under changing conditions, adapting and reconfiguring as necessary. Here the notions of *metastability*, *soft-assembly,* and *synergies* are relevant and will be considered in turn.

The term metastability, as it is typically deployed today, comes from dynamical systems theory, and describes systems that are relatively stable but not occupying any one stable state deeply. It is, in effect, an operationalisation of the notion of relative coordination. Engstrøm and Kelso describe a metastable system as one in which "no stable or unstable fixed points remain, yet dynamical remnants of attractor~repellors linger, giving rise to a dynamical flow" (2008, p.4). The modes of coordination characteristic of such systems are flexible (relative coordination) allowing the system to fluidly enter and exit regions of transient stability. An illustrative example of a basic system in a metastable state is a wobbling bowling pin, which although transiently stable, might just as likely tip over as come back to standing, depending on the slightest change in conditions. The attractor landscape of a metastable system is one of relatively shallow basins of attraction. In **Figure 7** this is highlighted using rudimentary images in which marbles are resting on various curved surfaces.
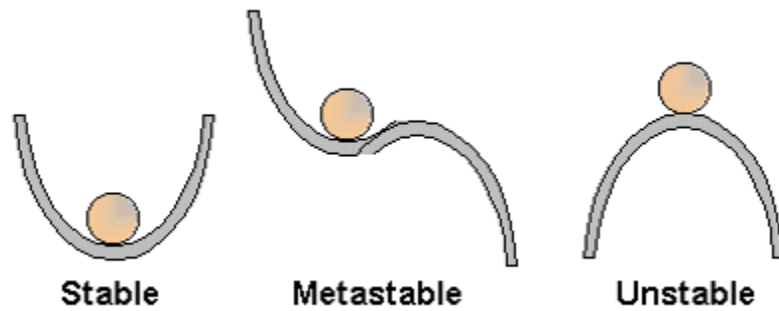
Figure 7. Three system stabilities

The leftmost image depicts a stable system with a deep basin of attraction; the rightmost image depicts a highly unstable system with the marble resting precariously on a repeller; and the image in the middle illustrates the metastable system with the marble poised somewhere between stable and unstable.

Metastable systems occupy transiently attractive states, transitioning between states flexibly and rapidly, with the components necessary for any given state fluidly coordinating and segregating according to the demands put on the system. Such dynamics are vital to the adaptive capacities of the system, supporting its ability to maintain coherent patterns of action whilst also retaining a necessary amount of flexibility. Metastability, as Kelso puts it, when referring to the qualities of neurobehavioral dynamics, "is essential for flexibly entering and exiting coherent neural patterns and avoiding resonant mode-locked states". Perception and action systems seem to reside mostly in metastable regimes. "There," Kelso goes on, "attraction (stabilizing) and repulsion (destabilizing) influences coexist in a finely balanced way … This is necessary if the mind is not to get stuck, or worse still, fly apart' (1995, p.225).

Another important notion here, that follows from those above, is that of *soft-assembly*. A softly assembled system is a temporary coalition of coordinated entities or components that establish a transient coalition under task constraints whereby they function as a single coherent unit (Richardson and Chemero 2014, p.2). A prime example of such a system is a murmuration of starlings. Any bird in the murmuration can fluidly take up many different positions within the flock as it coheres and decoheres. This contrasts with so-called 'hard assembled' or 'hard-moulded' systems, a car engine for instance, in which any component plays a very particular role predetermined in the system.

Softly assembled systems depend upon interaction-dominant dynamics (Anderson, Richardson, and Chemero, 2012), whereby the behavior of the system emerges from interactions between situational factors and the various components and entities comprising the system. This is contrasted with the so-called component dominant dynamics of 'hard-assembled' systems, wherein "system behaviour is the product of a rigidly delineated architecture of system modules

… each with predetermined functions" (Richardson and Chemero 2014, p...)[36]. In such linear systems, the behaviour of the system is relatively predictable. In interaction-dominant systems, on the other hand, effects run both ways. Here, the behaviours that emerge from interactions between constituent parts feedback and modulate their constituting elements (Van Orden, Kloos & Wallot 2011). Speaking of such 'non-linear' behavioural dynamics, Richardson and Chemero (2014, p.40) write that "system behavior is the result of interactions between system components, agents, and situational factors, with these intercomponent or interagent interactions altering the dynamics of the component elements, situational factors and agents themselves (Anderson, Richardson, and Chemero, 2012; Van Orden, Kloos, & Wallot, 2011)". The flight of any bird within the murmuration is primarily constrained by the behaviour of the whole, despite the murmuration being nothing but the collection of individual birds that comprise it. In such systems, activities at the lower level microscopic order structure the activity of the macroscopic order of the higher level but are also structured by that macroscopic order. The behavior of such systems is not additive, it is not equal to the sum of the behavior of constituent parts, as it would be in a system that depended upon component dominant dynamics, such as a combustion engine (Van Orden, Holden, & Turvey, 2003). As such, the behaviour of these systems is often very difficult to predict from their isolated components.

Importantly, such dynamics apply at multiple scales within systems. For instance, metastable, soft-assembling ensembles have been acknowledged within neuroscience for some time. Donald Hebb (1952), for example, developed the notion of 'cell assemblies. Such assemblies comprise a diffuse neuronal structure "capable of acting briefly as a closed system, delivering facilitation to other such systems and usually having a specific motor facilitation" (Hebb, 1952, p.xix). Not unlike the starling in the murmuration, for Hebb, the activity of the neuron needs to be understood within the context of the larger assembly or assemblies of which it is part, playing a variety of roles depending upon the function of the whole assembly. More recently, Varela (1995) has similarly proposed that cognitive states are mediated by neural ensembles, which, as Aguilera puts it "emerge through transient phase locking of distributed neural regions" (2015, p.58). As such, there is a correspondence between any cognitive act and a transient ensemble that depends upon the softly assembled coordination of brain regions, subregions, and so on. Such processes have come to be referred to in terms of the 'dynamic core' in neuroscience, and now enjoy widespread use (Tononi and Edelman 1998).

As will be observed in later chapters, methods have been devised for observing interaction-dominant dynamics even across social systems. De Jaegher et al. have recently written that the

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[36] The distinction between systems functioning according to component dominant dynamics versus interaction dominant dynamics is sometimes expressed as a distinction between complicated and complex systems.

techniques of dynamical systems theory "can reveal aspects of the deep structure of social interactions *as* organised systems. They can indicate the presence of interaction-dominant dynamics (i.e. situations where the system components cannot be said to function as independent units but show activity correlation across many timescales)" (2016, p.8). One might already intuit a sense for how such dynamics will be relevant to any formal characterisation of patterns of being together.

Softly-assembled metastable systems that display such interaction dominant dynamics are often referred to in terms of *synergies* (or *coordinative structures*)[37]. The idea of a synergy is important when considering how many parts of the body coordinate together in service of a particular purpose. The notion of a synergy was brought to prominence by the soviet physiologist Nikoli Bernstein (1967), who developed the idea in response to the so-called *degrees of freedom problem,* regarding the coordination of observable behaviour. This problem states that the amount of degrees of freedom in the living human system are so great that were they to be taken individually, each under the control of some central executive, they would present an overwhelming processing burden to the central nervous system. But, of course, the central nervous system seems to manage just fine. Bernstein's (1967) central insight was that control for each degree of freedom need not stem from a central processor, but rather, they may regulate each other's behaviour in a distributed fashion, allowing for 'compensation for variability in one component of the synergy by another' (Riley et al. 2014, p.1). Bernstein employed the observations of a blacksmith hammering to make his case. See **Figure 8** for the kind of photographs that were used by Bernstein and his team of a blacksmith performing a striking action.

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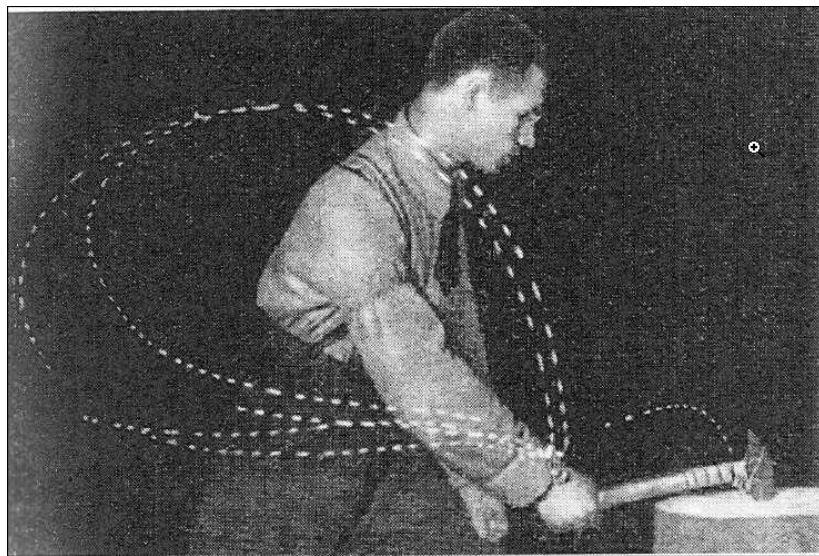
[37] The notion of synergy seems like a more formal mapping of the notion of kinaesthetic gestalts that was explored in the previous chapter. Indeed, as will be observed later, the notion of synergies is extended to include interpersonal synergies in embodied interaction, paralleling the extension of the notion of kinaesthetic gestalts to inter-kinaesthetic gestalts.

Figure 8. A blacksmith hammering in Bernstein's labs

The white marks here appear to be drawn over the photo. However, when observing subjects, Bernstein and his team would often attach lights to the articulation points in the body and photograph their subjects performing their tasks in darkened out rooms. In this way they were able to accurately trace the trajectories of the bodily components throughout a particular task and observe their interdependencies. Adapted from Cit (1924)

Bernstein observed that when the blacksmith performed a hammering action, striking a chisel or anvil with the face of the hammer, from strike to strike, there was typically more variance in the positioning in the joints along the arms than there was at the hammer face. In other words, regardless of the variability in the limbs, variability was minimised at the point of contact. As Cummins writes about these findings, "This seems appropriate for skilled action, as the behavioural goal that finds expression here is best expressed at that point, while there are many potential configurations of the limb segments that can give rise to equally accurate hammer blows" (2010, p.2). Such an account raises significant principled challenges for any account suggesting that such skilled action is determined by the workings of a central executive. If this were the case, error at the shoulder joint would be additive, leading to even greater error at the elbow, and multiplied again by the time it reaches the wrist and strike point. Distal errors, in a multi-link system, would be expected to be more pronounced than proximal errors. In other words, it is inconceivable that variation should be minimised at the point of contact between the hammer and chisel under a brain based executive control paradigm, for here, as Cummins writes, "direct intervention by the brain is impossible in principle" (2010, p.3).

The alternative account, advocated by Bernstein, entails the recognition that when the more global system is pursuing a particular purpose it behaves *as if* it were a substantially simpler system. This is referred to in terms of *dimensional compression* (Kay et al. 1987). Under the pursuit of a particular goal (when organised according to particular task constraints), constraints across the body-tool-environment system that support a great many degrees of freedom enable the organisation of coordinated assemblies that reflect a dimensional compression of the degrees of freedom available to the system. Dimensional compression basically describes how when degrees of freedom that might act interdependently become coupled, so as to form a synergy, the synergy has fewer degrees of freedom (or lower dimensionality) than the set of components that comprise it. If this kind of compression sounds familiar, it is because it is effectively the same thing described earlier when referring to emergent patterns in terms of the order parameters that characterise the macroscopic order of the softly-assembled system. Interactions between system components give rise to the macroscopic pattern, the synergy, which then constrains the behavior of the components in a way that supports a particular outcome at which the synergy is aimed. See **Figure 9** for a graphic illustration of some of these ideas.
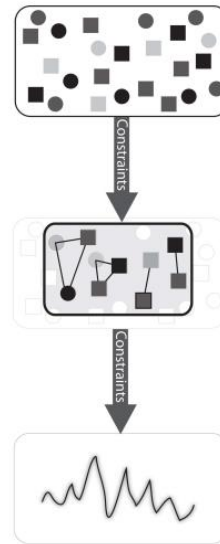
Figure 9. Dimensional compression necessary for a synergy

Components across the body-tool-environment system that support a great many degrees of freedom organize under task constraints into coordinated assemblies that necessitate a dimensional compression of the degrees of freedom available to the system. Adapted from Riley et al. (2011).

The second critical characteristic of synergies is *reciprocal compensation*, which describes the capacity of one element in a synergy to react to changes in other elements, in support of the realisation of some systemic goal. It is this reciprocal compensation that serves as an alternative to the centralised control account criticised above. Deviations along the chain of softly-assembled components are compensated for by other components in the chain to ensure the efficient completion of the task, e.g. striking the chisel with the hammer face (see Latash 2008, p. 32 for extended discussion). There are numerous examples from the literature on coordination dynamics, a famous one being the ability of the articulators to produce coherent speech sounds even when being perturbed (Kelso et al. 1984). In these experiments participants were asked to produce particular speech sounds. Mid speech, their lower jaw received a downwards tug (i.e. a deviation was induced along the chain of softly-assembled components). They found that, depending upon the timing of the tug, the other articulators (the other components in the synergy) in the mouth were able to reciprocally compensate for the 'failings' in the jaw so as to produce the intended sound, e.g. the lower lip extended upwards and thus enabled the proper production of the utterance.

Reciprocal compensation is a central notion in the so-called uncontrolled manifold approach (UCM) described by Schloz and Schoner (1999). Within this approach, coordinated

movement is contingent upon the stabilisation of the value of some performance variable (i.e. some order parameter), e.g. particular frequency in the oscillation of limbs. In stabilising this variable, a manifold (a subspace) arises within the state space composed by the coordinated elements (e.g. limbs, tools, and environmental features). Activities within this subspace that maintain the value of the performance variable as constant are permitted, those that do not are limited. As Riley et al. put it, "component values that do not lead to desired values of the performance variable (values outside the UCM) are restricted, whereas values that do not affect the performance variable (those within the UCM) are allowed" (2011, p.2.) When analysing UCMs the stability of performance variables is considered in light of two measures. The first is a measure of variance in the UCM: this takes stock of the degree to which variations among degrees of freedom manifest reciprocal compensations to maintain the performance variable. If compensated variance is greater than deviance, this is some evidence for a synergy, suggesting that that the performance variable is being maintained as stable through reciprocal compensations in the degrees of freedom. The second is a measure of variance perpendicular to the UCM: this considers uncompensated variability, and to what extent it has caused the performance variable to stray or deviate from its target. If the compensated variance is less than the deviance, this suggests no synergy is present. Taking a ratio of the two measures provides evidence of synergies and their strength. A ratio greater than 1 suggests that a synergy exists; less than one suggests otherwise.

These ideas will not find such formal application herein. Nevertheless, they do serve to ground some of the claims later, pointing towards mathematically tractable mechanisms that support the plausibility of the entities posited. What the notions of metastability, softly-assembled systems, synergies and uncontrolled manifolds add to the account of autonomy is some sense for how autonomous relatively invariant organisations can be adaptive, responding to perturbations that might threaten the viability of a given pattern, even fluidly switching between different patterns when the conditions demand it. A final element that demands specification, although implicit in much of the above account, is how the tendencies towards preservation and adaptation can be integrated across multiple levels of a complex system, and particularly living systems. Here the notion of *self-organised criticality* it introduced.

4.7.3 Integrated patterns

Self-organised criticality (SOC) is put forth by some as something of a unifying theory within complexity sciences, a "paradigm for the explanation of complex phenomena or even to instruct us on how nature works"[38] (Frigg 2003; see for a lucid and critical discussion on this often

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[38] Per Bak, the outspoken theorist responsible for formally developing the notion of SOC, rather brashly entitled his book *How Nature Works* (1999), implying the central claim of the book that has been substantially critiqued since.

rather opaque theoretical position). A thorough formal articulation is far too cumbersome for the purposes here, and unnecessary. An intuitive understanding will suffice. What the notion of self-organised criticality gets at is how transient patterns of coordination are reflected through the multiple scales comprising systemic structure, in an integrated fashion. Here, the metastable dynamics considered above function at multiple scales simultaneously in an integrated way. There are a couple of groups of SOC models at this point (see Vespignani & Zapperi 1998) The focus here is on so-called stochastic models: those demonstrating random probability distributions whose behaviour is hard to predict. Traditionally such stochastic models are introduced with the example of grains of sand being added to a sand pile. Rank will not be broken with tradition here[39].

Consider grains of sand being added to a dinner plate in a slow but steady stream of grains. As the pile grows, periodically the addition of an extra grain triggers a local motion in the sand and the pile rearranges itself slightly. This continues until the pile covers the whole plate. As grains are continually added the pile grows in height and its slopes become progressively steeper, with minor avalanches occurring within the pile, some of which spill over the edges of the plate. Eventually the sand pile reaches a 'critical size' (a particular angle in its slope) from which it will grow no more. Now large avalanches may occur that span the entire pile, and the sand that spills off the plate is equal to the sand added over a given timescale. This is referred to as the self-organised critical state; the system can be said to have a critical point attractor. Now, everything from small 'local' landslides to large avalanches are common and tend to maintain the critical state.

The state is referred to as critical, for minor local events such as a couple of grains landing somewhere on the pile, can produce effects that affect the entire system. There is no way to tell at this point whether another single grain will cause an avalanche or not. It is self-organised in the sense that this is normally understood, there is no executive controller apart from the local interactions between the system components. At this point the emergent dynamic is global, and it is through these avalanches of various sizes that the system maintains its overall stability. When one measures the number of grains that comprise an avalanche and its duration, and measures how many avalanches of a particular size and duration have occurred, the relationship between these quantities is shown to obey a power law distribution, such that smaller avalanches occur more frequently than larger ones. The same law has been shown to hold across a variety of other systems also, e.g. the crust of the earth and its producing earthquakes. Effectively, this suggests the pile is functioning as a coherent whole integrating metastable dynamics across the whole system. As Aguilera puts it "A system permanently poised in a state of critical phase transition suggests a configuration of a system where the local states depend upon (are correlated to) the global situation" (2015, p.61).

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[39] The example that follows is largely adapted from Frigg's (2003) very lucid account.

But such dynamics are not confined to non-living systems only. Numerous researchers (e.g. Beggs and Plenz 2003; Haimovici, Tagliazucchi, Balenzuela, Dante, and Chialvo 2013) have, for instance, observed the same avalanche patterns in the electrical activity of the brain. By occupying critical states, these systems can easily undergo the kinds of phase transitions that are needed for adaptation to occur. At criticality, the system is poised in a kind of sweet spot between order and disorder. The avalanches are effectively the mechanisms by which the systems avoid becoming too rigid (no avalanches occurring), such as is the case during an epileptic seizure (Meisel, Storch, Hallmeyer-Elgner, Bullmore, and Gross 2012), or too fluid and random (small avalanches occurring all the time), such as the dynamics of being totally sleep deprived (Meisel, Olbrich, Shriki, and Achermann 2013). The SOC system is self-organised to maintain its critical state. Thus, criticality serves as a kind of order parameter, and allows for the efficient movement of energy and information through the system, by conferring the order necessary to function with some consistency, but also the flexibility to respond to changing conditions, both endogenous and exogenous. Unlike sand piles, which are effectively homogeneous systems with no real differentiation between levels of organisation, living systems maintain criticality across a myriad of integrated subsystems. Longo and Montevil refer to living systems as ""coherent structures" in a continual (extended) critical transition ... [in which] ... The permanent state of transition is maintained, at each level of organization, by the integration/regulation activities of the organism, that is by its global coherent structure" (2014, p.19). They propose that living matter needs to be analysed in terms of so-called, *extended critical transitions.* Under this view, phase transitions are extended in space-time whilst ensuring a globally coherent critically organized structure. These "coherent critical structures" cannot be reduced to the kinds of dynamics observed in the case of the sand pile, for these are effectively "singular events", maintaining one critical point. In the case of living systems, multiple coherent critical transitions are always underway, maintaining coherent structures that persist in a multidimensional space. As Longo and Montevil put it, "a living object is understood not only as a dynamic or a process, in the various possible senses analysed by physical theories, but it is a permanent critical transition: it is always going through changes" (2014, p.19).

Such a framework suggests a potential unifying frame within which to understand the mechanics of autonomous systems coordinating activities across different timescales and between levels and subsystems. Living autonomous systems can be conceptualised as nested organisations of metastable dynamics, both preserving order and adapting to challenges in service of the maintenance of some global coherence, an emergent identity that maintains itself as distinct from its environment, but is in ongoing exchange with it. Given the above insights and qualifications, what is maintained might is better described as a *homeorhetic* stability, which refers

to the maintenance of a particular trajectory or flow, rather than a homeostatic one, which refers to the maintenance of a particular state. This language will be adopted going forward.

4.8 Conclusion

This chapter began with some background of the notion of autonomy and some conceptual precursors. Then it focused in some detail on the account of autopoiesis and some important epistemic implications that stem from it, suggesting that the present account is offered in the Maturanian spirit of objectivity in brackets. After that, the more general notion of autonomy was developed in some detail, and finally some "mechanisms" from the fields of complex systems science and coordination dynamics were considered to help make intelligible how autonomous entities might be maintained as relatively stable in the face of changing conditions.

In the following chapter, the notion of autonomy is extended firstly to the sensorimotor domain, in particular accounting for habits and bundles of habits, and then, to the social domain, before finally some suggestions are made about the account of autonomy that is to be brought forward.

5 Autonomy: from habits to societies

> The same organising forces that have shaped nature in all of her forms are also responsible for the structure of our minds.

> Heisenberg (1971, p.101)

> Breathing is habit. Life is habit. Or rather life is a succession of habits, since the individual is a succession of individuals ... The creation of the world did not take place once and for all time, but takes place every day. Habit then is the generic term for the countless treaties concluded between the countless subjects that constitute the individual and their countless correlative objects.

> Beckett (1978, p.8)

> Personality is the extreme example of the sustained realisation of a type of value. The coordination of a social system is the vaguer form.

> Whitehead (1941, IX)

> And identity is so fundamental to our being, so closely linked to our emotions and drives and so far beyond the reach of reason that it can neither be thought up or thought away.

> Knausgaard (2017a, p.96)

5.1 Introduction

A growing number of theorists inspired by the ideas of autopoiesis are asking whether autonomous forms of norm generating systemic organisation are operative within domains other than the biochemical, from communication systems (e.g. Kincaid 1987) and sensorimotor systems (Barandiaran 2017; Di Paolo et al. 2017, 2018); to corporate organisations (e.g. Kickert 1993; Morgan 1986; Zeleny 2001) and everyday social interactions (Di Jaegher & Di Paolo 2007, Monterde et al. 2015); to social systems writ large (e.g. Luhmann 1989; 2007). Here the interest is not just with the invariants observed in life, but with the relatively stable but adaptable orders that comprise our ways-of-life also. Within the accounts mentioned, some prefer to retain the language of autopoiesis — although, as will be observed, not without their critics — whilst others adopt the language of autonomy. In this chapter, the positions most relevant to the account being developed are considered in detail.

This chapter is structured in two primary parts. In part one, the need for extending the notion of autonomy beyond autopoiesis is articulated and its elaboration within the sensorimotor domain is developed in detail, culminating in the enactive account of habits and habit ecologies. Then, in the second part, some extensions of autonomy to the social domain are considered. Firstly, the basic autonomy of the social interaction is explained, with some supporting insights from complexity science and coordination dynamics. After that, the Luhmannian sociological

account is reviewed in some detail, ultimately presenting the case for why it is not adopted more wholeheartedly herein. The chapter closes by bringing together insights from this chapter and the previous one to outline the account that is to be carried forward into the chapters ahead.

Part 1

5.2 An ambiguous inheritance

By now, there are many schools of, and schools informed by, enactivism (e.g. Hutto and Myin 2014; Cummins and De Jesus 2016; Villalobos 2013; Di Paolo, Buhrmann, and Barandiaran 2017; Noë 2004; O'Regan and Noë 2001; Chemero 2009; Rietveld and Kiverstein 2014). Some eschew notions of autonomy altogether and focus on developing an alternative to representationalism (e.g. Hutto and Myin 2014), some on clarifying how experience, skills, knowledge, and so on, are dependent upon sensorimotor contingencies (Noe 2004; O'Regan and Noe 2001). Others employ the notion, but do not center it (e.g. Chemero 2009; Rietveld and Kiverstein 2014). And others still see themselves more directly in the lineage of Maturana and Varela, centering the notion of autonomy, but often having different takes on its deployment (e.g. Villalobos 2013; Thompson 2007; Cummins and De Jesus 2016, Barandiaran 2017; Di Paolo, Buhrmann, and Barandiaran 2017). A thorough cross comparison of these positions is not necessary here. The diversity of opinions, however — as pointed out by Barandiaran (2017) — might be taken as indicative of several ambiguities in the foundational account. The sections that follow address some of these ambiguities.

5.2.1 The limits of autopoiesis

The progeny of the original enactive approach that most explicitly center the notion of autonomy sometimes refer to their project in terms of 'Mind-in-Life' (MIL) (Thompson 2007). The sentiments underlying this construction can be traced all the way back to Maturana's early work in this area, who wrote that, "living systems are cognitive systems, and living as a process is a process of cognition. This statement is valid for all organisms, with and without a nervous system" (Maturana 1970, p.13); or Maturana and Varela, who wrote that, "The domain of all the interactions in which an autopoietic system [a living system] can enter without loss of identity is its cognitive domain" (Maturana and Varela 1980, p.119). Barandiaran refers to this as the 'life-cognition identity thesis' (Barandiaran 2016, p.6). Others (e.g. Hutto and Myin 2013) have referred to this school as "autopoietic enactivism"[40]. This position, at least in its caricatured form, takes biochemical autonomy (i.e. autopoiesis) and makes it a sufficient condition for the predication of all cognitive capacities, including sense-making, intentionality, phenomenological experience, and

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[40] This is an inappropriate label for such accounts, for autopoiesis is not the central organising notion therein, autonomy is. As such, they might be more accurately referred to as *autonomist enactive* accounts.

so on (Barandiaran 2017). The primary idea underwriting this account — one intended to rescue an understanding of cognition from the Cartesian implications of the perspectives it was critiquing — is that the categories we use to describe living organisation will be sufficient for the specification of cognitive organisation also. However, a number of thinkers (e.g. Barandiaran 2008, 2017; Di Paolo, Burmann & Barandiaran 2017) — interestingly many from within the school called by others "autopoietic enactivism" — now suggest that such a position is limited in accounting for the dynamics of cognition: cognition is underdetermined by autopoiesis; or, autopoiesis provides necessary but not sufficient conditions for the specification of cognition.

This underdetermination comes in two distinct forms. Firstly, if life = mind and mind = life, then one must include "epileptic attacks, or human vegetative life, breathing, digestion or falling down a cliff (right until the bottom is reached)" in their cognitive taxonomy, for they all meet the desiderata necessary to qualify as such under the so-called MIL thesis, i.e. in so far as the system stays living, they are all instances of ''structural coupling of a living system without loss of autopoiesis'' (Barandiaran 2017, p.6). For Barandiaran, if we include such processes in our account of cognition, an overextension of the term has occurred, and it has been stripped of its descriptive value. Secondly, within this position, the normativity of cognitive activity that has no obvious adaptive biological relevance is not accounted for. How should one account for combat sports, or board games, or, at the extreme end, learning how to kill oneself? All are cognitively demanding tasks with significant normative dimensions that contribute little, if anything at all, to biochemical autopoiesis. Taken together, one might say that the bionormativity that governs life is not equivalent to the psychonormativity that governs cognition (ways-of-life) in all its realisations. As Barandiaran and Moreno write, "Failure to satisfy a cognitive purpose does not necessarily imply failure of material self-maintenance. The opposite of cognition and cognitive success is not death or biological illness but ... some kind of coma, 'madness' or loss of behavioral coherence." (2006, p. 175). Cognition, then, is certainly instantiated in life, but the continuities are more complex than some enactive accounts conceive. This fact has been acknowledged since the outset of enactive cognitive science, but it has not been addressed in any satisfactory way until very recently. "The solution to this problem" writes Kiverstein and Rietveld (2018), — summarising the work of Barandiaran et al. — "lies in recognising that each living system produces and sustains multiple identities over the course of its life. Cognition is not best understood at the basic level of biological autonomy associated with metabolism. We should instead look for an explanation of cognition at higher levels of autonomy (Barandiaran 2017; Barandiaran & Moreno 2006)" (2018, p.152). These 'higher levels' of autonomy are the subject of the sections that follow.

5.2.2　A plurality of autonomies

In the previous chapter, Varela's very general account of autonomy was outlined in terms of operational closure and precariousness. In *The Embodied Mind* (hereafter TEM) — the foundational text of enaction — Varela, Thompson and Rosch (1993) leveraged this understanding, to develop the enactive cognitive scientific perspective. For Varela et al., the enactment of a world on the basis of the biochemical constitution of a living organism, and its "viable history of structural coupling" (detailed below) is tantamount to what they refer to as "cognition in its most encompassing sense" (1993, p.205). Varela at al. (1993) were advocates of what might be called a pluralistic approach to autonomy. A surprising fact about the original document outlining the enactive approach is the omission of any mention of the notion of autopoiesis. This does not suggest that they would deny the role of autopoiesis. Rather, for Varela at al., another level of biological autonomous organisation takes precedence when specifying cognition, i.e. the autonomy of the nervous system. This goes beyond biochemical autopoiesis in attempting to account for the organising dynamics of cognition, but, as will be observed, it is not without its issues. This pluralistic account is often depicted using a second circle closing back on itself, as in **Figure 10**. Here, the operationally closed autopoietic system in reciprocal exchange with its milieu embeds, or enables, another level of organisational closure.
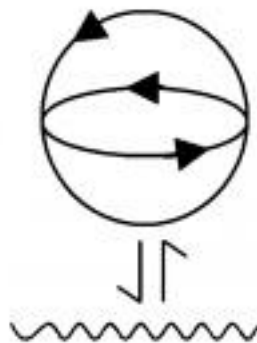
Figure 10. A second level of operational closure

This figure expands the basic autopoietic relation observed in the previous chapter, representing a second form of closure, i.e. the closure of the nervous system, nested within the more primary dynamics of autopoiesis. Adapted from Maturana and Varela (1987).

That the nervous system might be specified as an autonomously closed system is something that was suggested already in the previous chapter, when referring to Maturana's 'second question', concerning the role of the observer in that which is observed. Any operation of the nervous system is enabled by and enabling of other operations within the nervous system, and thus comprises an operationally closed network. As was suggested in Chap. 4, for Maturana and Varela, one is not in the business of perceiving the raw external world and then representing

it within some inner compartment so that it may be processed to thereafter control action, rather the "external world" only ever has a "triggering role in the release of the internally-determined activity of the nervous system" (Maturana and Varela 1980, p.xv). In Varela et al., they use the example of colour vision to make their point, arguing for how colour is a "form of experience that is constituted through emergent patterns of neuronal activity" (1993, p.166). Colour, in other words, is not a property of the external world, but reflects some set of nervous system dynamics that have been perturbed by some feature of the external world. Similar assertions can be made about other sensory modalities (e.g. see Freeman and Schnieder 1982 for some pioneering neuroscientific work in support of this position).

The colour any perceiver experiences of a scene is, according to the enactive perspective, a result of their *structural coupling.* Varela et al. write that, "The colors we see must not be located in a pregiven world but rather in the perceived world brought forth from our structural coupling" (1993, p.165). As outlined in the embodied mind, one of the two defining characteristics of the enactive perspective is that "cognitive structures emerge from the recurrent sensorimotor patterns that enable action to be perceptually guided" (Varela et al. 1993, p.173)[41]. The idea here is that the situated dynamics of the agent-environment coupling are constitutive of the cognitive structures characteristic of such couplings, such that ongoing couplings reflect a developmental history of couplings. Structural coupling describes the historical contingencies of the living system in its relations to its environment, whereby structures in the environment and structures in the organisation of the body of the living entity co-emerge. This is true at both phylogenetic and ontogenetic scales of development (only the latter are of concern herein).

But here another ambiguity surfaces. Can it be simultaneously true, that 1) the nervous system is operationally closed, such that "the changes that the nervous systems structure can undergo … are fully specified by its connectivity and the perturbing agent only constitutes a historical determinant for the concurrence of those changes" (Varela 1979, p.242); and, that 2) "cognitive structures emerge from … recurrent sensorimotor patterns" such that one's particular structural coupling reflects a particular developmental trajectory of situated sensorimotor engagements? If the former is true, one might ask, is the ability of sensorimotor engagement with the environment to shape anything at all not precluded? In other words, can the nervous system be both operationally closed and only triggered by the external world *and* be dependent upon a history of structural coupling? For Barandiaran (2017), these tensions represent what he terms an 'irreconcilable marriage', claiming either the coupling between the environment and the nervous system does integrate environmental regularities into the nervous system's activity (as sensorimotor coordination patterns), or it does not. We cannot have both. Given such ambiguity,

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[41] The other tenet is that "perception consists in perceptually guided action" (Varela et al. 1993, p.173).

it is not surprising that some enactive perspectives have forgone the notion altogether (e.g. Hutto and Myin 2013; Noe 2004; O'Regan and Noe 2001). Recent enactive accounts, however, suggest that some reconciliation is possible, though only with significant clarifications (Barandiaran 2017; Di Paolo et al. 2017).

5.2.3   Sensorimotor autonomist enactivism

The reconciliation of these tensions is brought about through refining the account of the autonomy of the nervous system. This expanded account sees autonomy as an organisational form encompassing both bodily dynamics and sensorimotor coordinations, recognising circular dependencies between both. As such it argues for a constitutive role for sensorimotor dynamics in the production and reproduction of the autonomous organisations that reflect a developmental history of structural coupling. The interest here, as Barandiaran puts it, is in "how the subject of experience emerges from sensorimotor interactions and how it operates according to the norms such interactions bring forth" (2017, p.19).

Of course, this position presents some challenges. In the case of autopoiesis, one can rely quite comfortably on the specification of a material boundary, and the regulation of material and energetic flows between the autopoietic organisation and the environment are easily observable. In the case of cognitive (or sensorimotor) autonomy, the elements comprising a given autonomous organisation are somewhat more controversial, and their boundaries more inconspicuous. These are issues that will continue to be clarified and distilled throughout the rest of this thesis, but a first pass at the basics, and how they find operationalisation in the notion of habit will be undertaken now. The basic claim is this. The relatively invariant patterns that comprise our cognitive life can be understood as autonomously organised, and, in the same way that biochemical autonomy is constitutively dependent upon the flow of certain material and energetic resources for its organisational reproduction, patterns of cognitive autonomy are constitutively dependent upon sensorimotor coordinations and the flow of certain sociomaterial resources for their organisational reproduction. As such, cognitive autonomy does not exist prior to engagements between the living system and its environment but is produced and reproduced within these relations.

As a prefatory clarification, sensorimotor coordinations are the tight couplings that obtain between perception and action, whereby, for instance, motor activity drives, through changes in the environment, sensory activities, which open up new possibilities for motor activity, and so on, ad infinitum. Many such coordinations come to be reasonably reliable and thus bring some coherence and predictability to our experience. Indeed, it is precisely this coherence that is at stake in the notion of autonomy.

There is, suggests Barandiaran — quoting Varela at length — some precedent in early enactive accounts for arguing for the sensorimotor constitution of autonomous forms[42]. Varela (1992, p.10) writes

I speak of "closure" to highlight the self-referential quality of the interneuron network and of the perceptuo-motor surfaces whose correlations it subsumes. The qualification "operational" emphasises that closure is used in its mathematical sense of recursivity, and not in the sense of closedness, or isolation from interaction, which would be, of course, nonsense. More specifically, the nervous system is organised by the operational closure of a network of reciprocally related modular sub-networks giving rise to ensembles of coherent activity such that: (I) they continuously mediate invariant patterns of sensory-motor correlation of the sensory and effector surfaces; (ii) give rise to a behaviour for the total organism as a mobile unit in space. The operational closure of the nervous system then brings forth a specific mode of coherence, which is embedded in the organism. This coherence is a cognitive self: a unit of perception/motion in space, sensory-motor invariances mediated through the interneuron network.

Despite Varela's obvious conviction in the above statement, he did not pursue this line in any detail in later works. Thus, although appearing sympathetic to the idea of an autonomous organisation bound up with patterns of sensorimotor activity, he never goes quite so far as to say that such autonomy could be constitutively sensorimotor. Barandiaran, as has already been stated, does.

Barandiaran claims that forms of operational closure within the nervous system (cognitive autonomy) are constitutively sensorimotor, wherein "the nervous system achieves its closure … through embodied interaction: i.e. through fine grained coordinations between neurodynamic and sensorimotor correlations" (2017, p.11). To put this in more concrete terms, Barandiaran is effectively suggesting that the bodily structures (e.g. certain neurodynamic patterns) that enable particular forms of action under certain conditions, can be stabilised and reproduced by the actions they support — because the results of those actions feedback on the nervous system in particular ways — and thus, actions and supporting structures are mutually bound up in an operationally closed self-producing whole. What is autonomous here is not merely the activity of the nervous system alone, but the whole ensemble of sensorimotor coordinations in combination with the structures that support them. Importantly, the environment is not some mere source of perturbation here, but, as Barandiaran puts it, "a necessary condition for generating and sustaining (through sensorimotor coupling) the neurodynamic patterns that are characteristic of a certain behavioural

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[42] Varela also spoke about the autonomy of the immune system (Varela and Coutinho 1991). There the immune system is characterized in terms of fluctuating patterns of antibodies that support the ongoing individuation of the organism's cellular identity.

capacity ..." (2017, p.12). And so, the closure of the nervous system should not be understood as predicated on pre-existing states within a network that are there to be triggered, but on patterns that can "only take place when the right sensorimotor correlations are enacted" (ibid). The autonomous organisation exists in the relationship between the neurodynamics and the sensory and effector surfaces, and is mediated by structures in the environment. Barandiaran (2016, p.11) summarizes this position as follows.

> …this approach distinguishes itself from the more traditional notion of operational closure of the nervous system by assuming that cognitive autonomy is constitutively sensorimotor; i.e. that the neurodynamic patterns that are characteristic of our lived experience depend upon a strong sense of sensorimotor coupling. Mental life's specificity lies in the fact that the environment is not simply a source of perturbations (or a source of energy and matter) for an otherwise operationally closed network. On the contrary, the nervous systems' activity achieves its closure, its large-scale coherence, through embodied interaction: i.e. through fine grained coordinations between neurodynamic and sensorimotor correlations.

One way Barandiaran and colleagues (e.g. Aguilera et al. 2013; Santos et al. 2012) substantiate this account of the sensorimotor constitution of cognitive autonomy, is through the development of computer models of simple robots interacting with their environments. Such models are taken as illustrating the role of fine-grained sensorimotor coordination in constituting functionally distinct neural signatures, something they claim was notably absent from previous models of the autonomy of the nervous system (see Barandiaran 2017 for a critique of Varela et al's. 1993 work on the Bittorio model). Barandiaran (2017) refers to one such model as the Situated HKB Model (see also Aguilera et al. 2013; Santos et al. 2012). This model is a simulated two wheel robot moving towards a light gradient (demonstrating phototaxis), and controlled by an extended HKB equation (Haken et al. 1985), representing the phase difference between a pair of oscillatory components interpreted as reflecting the motor and sensory cortices of a very simple brain. The experiment involved recording the sensory input of a freely behaving robot A that was sensorimotor coupled, such that its input was dependent upon its motor activity, and playing it back as input for a robot B, who was only partially coupled (but was otherwise identical), such that the input was the same as A but not coupled to its motor activity. They then compared the resulting neurodynamic patterns to see if they could distinguish the constitutive role of sensorimotor coordinations from the merely causal role of the input.

For A, sensory stimulation results from the effects of motor variations, which affect its position relative to the light source, producing further motor activity and correlated sensory stimulation in a closed loop. Even though the partially coupled robot receives the same sensory stream, slight fluctuations and small variations in the initial conditions engender neurodynamic

patterns that are qualitatively different. The coupled robot carves out a distinct pattern in the state space; the partially-coupled robot, on the other hand, makes a relatively homogenous exploration of the entire space. See **Figure 11** below for a graphic illustration of these results. Barandiaran et al. claim that the 'distinct pattern', constituted by the situated robot's coupled sensorimotor dynamics, comprises a neurodynamic signature of phototaxis, a functionally distinct "form" within the space of possible oscillatory relationships, one which is functionally relevant to the generation of phototactic behaviour, and one which only the fine coordinations between sensorimotor contingencies and oscillatory 'brain' activity can engender and sustain.
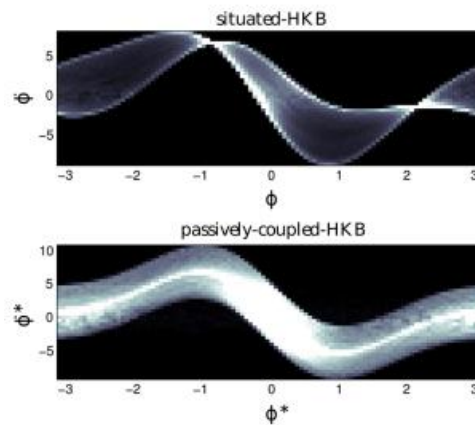
Figure 11. Neurodynamic signature from simulated robots

Signature of the Situated HKB and the corresponding passively-coupled HKB. It represents the difference between the density distribution of the effective phase space of the HKB equation when coupled with the actual environment and light source, or the recorded activity. Adapted from Aguilera et al. (2013).

The model is taken to illustrate the necessity of fine-grained sensorimotor coordination in constituting functionally distinct neural signatures, i.e. the sensorimotor constitution of neurodynamic patterns.[43] As Barandiaran puts it ,"the way in which motor neurones drive, through the environment, the activity of sensors is part of the pattern formation process (as much as the influence of other "internal" parameters or variables)" (Barandiaran 2016, p.12). What qualifies these patterns as sensorimotor constituted is that they cannot exist without their sensorimotor enactment. Interestingly, but maybe not surprisingly, the situated robot also displayed more robust

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[43] This parallels the classic experiments by Held and Hein (1963) — reported in a paper entitled *Movement-produced stimulation in the development of visually guided behaviour* — in which they strapped pairs of kittens into an enclosed carousel contraption with striped walls. Under the experimental conditions, one kitten, who was able to use their legs to walk, propelled the carousel into which they were both fastened. The other kitten was contained to a box though could move its head. In other words, one kitten passively received the stimulus of the striped walls (not unlike the passive robot), while for the other, its sensory experience was substantially more coupled to its motor activity. After exposure to these conditions several tests were undertaken and it was shown that the passive kittens had critically impaired visual capacities, whereas the active kittens did not. The conclusion drawn was that concurrent visual stimulation accompanied by self-produced movement is essential to the development of visually guided behaviour. This is comparable to Barandiaran et al's. findings that the strongly coupled dynamic is essential to the emergence of distinct 'neurodynamic patterns'.

behavioural dynamics. Introducing noise into the situated robot did not alter its behaviour significantly, and it was able to adapt easily to maintain behavioural coherence. In the partially coupled robot on the other hand, noise provoked wildly divergent incoherent dynamics (see Aguilera et al. 2013). For Barandiaran, such forms of autonomous organisation are taken as support for establishing forms of autonomous organisation with their own normative dimensions, largely embedded in the nervous system, but not reducible to the bionormativity of 'life'.

This work represents a significant development concerning the relations between operational closure and structural coupling. The environment is no mere source of perturbation to a closed network, but a requisite condition for engendering and maintaining patterns of neurodynamic activity characteristic of behavioural capacities. Closure is not describing a configuration of pre-existing network states, but relations between nervous system dynamics and their temporal unfolding, only brought about and thereafter maintained when certain sensorimotor correlations are enacted. This helps make intelligible how endogenous and exogenous structures co-emerge as coupled and thereby embed a developmental trajectory within a particular body-environment configuration. In sum, the closed network is brought into being and maintained when the agent acts in particular ways within its environment, and it acts in those ways largely because of this network. All of this sounds rather abstract. A more intuitive grasp on such autonomous organisations is available in the concept of habit.

Before exploring that, some quick relevant points. One is that Barandiaran says very little about the boundaries of such systems. However, for an autonomous system to be considered as such it must instantiate some boundary, though it need not be a spatial one. This is an interesting challenge and one that will be returned to throughout the remainder of this thesis. Secondly, Barandiaran focus on "neurodynamic patterns" might be a little troubling to those of us concerned with questions of embodiment. One senses that he employs and emphasises this language for he values the plasticity of such bodily structures and wishes to make some distinctions between those biological processes relevant to life, as such, and those that are not. One also feels, however, that the plastic bodily structures that are part of the autonomous networks that support and are supported by sensorimotor coordinations extended beyond neurodynamic patterns, and include hormones, muscles, and so on. And so, where this account is leaned on throughout the remainder of this thesis, to save from confusion, it does not refer to neurodynamics, but to plastic bodily structures.

5.3 Habits

Considerations concerning habit as a central concept within enaction have been growing steadily over the past number of years (e.g. Di Paolo 2005; Barandiaran 2008; Barandiaran and Di Paolo 2014; Di Paolo, Buhrmann and Barandiaran 2017; Ramirez-Vizcaya and Froese 2019).

In what he calls a first approximation, Barandiaran defines a habit as a "self-sustaining pattern of sensorimotor coordination that is formed when the stability of a particular mode of sensorimotor engagement is dynamically coupled with the stability of the mechanisms generating it" (Barandiaran 2008, p.281). Habit, then, becomes the shorthand for the kinds of autonomous sensorimotor organisations explored above, though with some caveats.

In a habit, sensorimotor coordinations and some network of processes enable each other. Acting in a certain way in a certain situation can organise your dispositions towards acting in similar fashion in future similar situations. Consider an example. You join a website that requires you set up a password to access it, and you use some generic password. Coming back to the website for a second, third, fourth time, etc., you move more fluidly upon each iteration, until what emerges is a relatively stable coordinative coupling in the relationship between the task constraints, particular environmental structures (environmental constraints), and the structures organised in the body during previous interactions (bodily constraints). Thus, the activity of entering the letters reinforces the interdependencies between bodily and environmental structures, and thus the disposition towards similar forms of action under similar conditions. There is, then, a self-maintaining circularity of processes (why any habit emerges will be considered in detail in Chap 6).

This analogy between habits and biochemical autopoiesis may at first seem surprising, even specious. However, such domain invariant organisational dynamics are common within complex adaptive systems. Ramirez-Vizcaya and Froese summarise this relation between the biological and the sensorimotor well, when they write that "habits resemble such autopoietic biological processes in that both are "self-maintaining, precarious, dissipative structures that rely upon cyclic processes to persist" and whose "processes of self-maintenance are contingent upon the existence of an appropriate environment" (2019, p.10; quoting Egbert and Barandiaran 2014). What emerges within such a dynamical organisation, within the habit, is a very minimal sense of identity in the sensorimotor domain, a focal point concerned with its own maintenance, an implicit goal or norm. A single habit, writes Barandiaran, provides "a first analogy with life and a first approximation to a sensorimotor conception of identity and normativity", whereby "through repetition … a habit can take on a life of its own: it is both the cause and the consequence of its own enactment". (2017, p.13). Given that the maintenance of the habit relies on certain conditions — rate of repetition, particular environmental constraints, etc., — boundaries of viability are enacted, stipulating certain actions as necessary if the habit is to be kept alive, i.e. the norms of its own self-regulation.

But habits introduce an additional component also. In habit, the autonomous dynamics we have observed elsewhere are developed further by introducing the dynamics of plasticity and

sedimentation: repeating a particular sensorimotor correlation reinforces (under the right conditions) the organisation that supports it, which in turn reinforces the probability of that correlation being enacted in similar circumstances the next time around (Barandiaran 2017). Thus, one might contend — and as is congruent with experience — any habit during any time of its life cycle can be interpreted as having more or less autonomy, more or less normative force.

Habit, thus, offers an intuitive grasp on the relations between what are otherwise abstract concepts, opening us onto a formally grounded account of cognitive identity and normativity. It also extends the notion of sensorimotor constituted neurodynamic patterns to include plasticity. Egbert and Barandiaran (2014) have referred to habits within enactive accounts as the primary "building blocks of mental life" and as holding the potential to "become a blending category between the biological and the psychological" (2014, p.2). Such entities comprise the building blocks of mental life in that it is through their production, reinforcement, concatenation and inter-regulation that mental life emerges, comprising "an increasingly complex ecology of self-sustaining sensorimotor life-forms" (ibid, p.13). The cognitive ontogenesis of the embodied subject entails the construction, maintenance, and inter-regulation of a myriad of intersecting habits; a habit ecology, wherein habits compete, cooperate, nest, sequence, etc. The norms that shape our action then concern the maintenance and regulation not only of our *life*, but our *ways-of-life* also (Froese and Di Paolo 2011), embedded in habitual structures.

Before moving on to speak of the habit ecology, there are a couple of things worth including here, neither of which are spoken about at any length in the work of Barandiaran, Di Paolo et al. Firstly, *sensorimotor life* is taken, so far as one can tell, to include patterns of affect also, and not simply the coordination of limbs, sensors and such (Di Paolo et al. 2017). However, this remains an underdeveloped aspect of the autonomist enactive account, though some elaborations on this theme are included in the following chapters. And secondly, habits may include synergies (spoken about at length in Chap. 4) but will not be reducible to them. The habit implies not just a transient adaptive organisation, but a precarious one also that necessitates a certain rate of repetition to maintain its capacities for synergistic integration. The habit is thus an explicitly historical/developmental entity, and any account of habit is also an account of the historicity of cognition.

5.3.1   The habit ecology

For Barandiaran the habit ecology is partly meshed within the brain, where much of the plasticity and selection lies, and, within a relatively complex brain the self-maintenance of habits needn't be reduced to mere recurrent self-reinforcement of individual habits, but might rely on more "relationally complex, interdependent architectures" (Barandiaran 2017, p.14). The general contention is this, if the ecology's plastic interconnectedness is complex enough sensorimotor

regulations will engender large scale equilibrating tensions within the ecology, and, a sense of autonomous sensorimotor agency[44] comes into being when the "sensorimotor compensations … take place to maintain the capacity of the agent to keep behaving coherently" (ibid). In other words, when the bundle has gained sufficient complexity, its self-conservation becomes its basic operational norm and it is organised to give rise to actions that sustain it as coherent. We are left with a view of a sensorimotor constituted operational closure primarily instantiated at the level of the nervous system, and which despite being resistant to perturbation is nevertheless open, pursuing a general dynamic of coherence. For Barandiaran, this position is framed as a 'non-representational dynamic sensorimotor coherence' (2017, p.15). However, he suggests, this is not an entirely new claim. For instance, developmental theorists Smith and Thelen (2003; quoted from Barandiaran 2017, p.15) have put forth a similar account previously.

> Through learning, a complex schema network arises that can mediate first the child's, and then the adult's, reality. Through being rooted in such a network, schemas are interdependent, so that each find meaning only in relation to others. (…) Each schema enriches and is defined by the others (…). Though processes of schema change may affect only a few schemas at any time, such changes may ''cohere'' to yield dramatic changes in the overall pattern of mental organization (Arbib et al. 1998, p. 44). At multiple levels of analysis at multiple timescales, many components open to influence from the external world interact and in so doing yield coherent higher order behavioural forms that then feedback on the system and change that system.

What 'coheres', to put it in everyday terms, are bundles of habits that organise action at different timescales[45]. For instance, the simple *habit* of picking up the soap in one's right hand establishes a coherent integration at timescales relevant to the coordination of finger and arm joints. This, in turn, is nested in a *routine* (a habit scheme) of hand washing that reflects a flow of coordinative dynamics that has previously cohered, more or less; which is itself embedded in the *micro identity* of preparing for bed; all of which reflects a *personal identity* of 'being hygienic', and so on. It is only at these latter levels of integration that something approximating a style, or a mode of being emerges. At each level of organisation autonomous dynamics will be present to varying degrees, each reflecting a timescale in which the notion of autonomy 'centres a perspective and co-defines a world that is constitutively sensorimotor' (Barandiaran 2017, p.15). Much more will be said about such details in the chapters ahead.

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[44] I do not focus on questions of agency in this work, and so, beyond mentioning here that Barandiaran et al. extend their account to provide some account of agency, this notion of autonomous sensorimotor agency is not developed any further. See Barandiaran (2017), or Di Paolo, Buhrmann and Barandiaran (2017) for extended discussions. Also, see Cummins (2014) for a critical discussion of the relationship between these ideas.

[45] One might carve up the appropriate timescales in several different ways. Those included here are those that seem most relevant to the various normative dimensions of situated everyday experience.

Barandiaran and colleagues (Aguilera et al. 2015) have illustrated this account using another simulated robot model, where they modelled not only sensorimotor patterns, but transitions between different patterns also. Given the limited space available, these models are not recounted here in any detail. Suffice it to say that they help articulate the idea that operational closure is not specifiable as merely interconnected neurons, but as a network of habits and their transitions, i.e. transitions between neurodynamic patterns, in which both transitions and patterns are constituted by sensorimotor dynamics. This network's homeostatic robustness, and the possibilities to regulate and recast the network through its interactions (its plasticity), provide what Barandiaran calls "formal (unambiguous and operational) criteria to depict coherency and the emergence of norms as the equilibrating conditions of an ecology of patterns (or habits)" (2017, p.16). For instance, if the network were to lose its organisation such that patterns and transitions perish and are lost, so too is its capacity to behave lost. And so, one can operationalise for the ecology of habits a specific normative dimension, the limits of viability outside of which the system's autonomous organisation is disrupted. As Barandiaran puts it, "A norm emerges, taking the form of a ... regulatory principle: behave so as to sustain your capacity to behave". (2017, p.16). Norms thus function as implicit goals of systemic self-regulation that organise action at various timescales, specifying the rightness or wrongness of specific sensorimotor correlations for maintaining some habit, or bundle of habits that has cohered into a closed organisation.

5.3.2 Multiple scales

The embodied subject, within this account, is something like a topology of bundles of habits, or what Di Paolo refers to as "a topology of regional identities" (Di Paolo 2009, p. 20). Accounting for selves in terms of a bundle of habits, or a topology of regional identities, or a bunching of what Varela previously referred to as 'micro-identities' (1991; 1999), aims at providing an account of self that is neither a perfectly integrated whole, nor a perfectly compartmentalised conglomeration. As Ramirez-Vizcaya and Froese put it, "The general idea is that agents do not hold monolithic identities that remain constant independently of the activities they perform. On the other hand, this notion does not imply a complete fragmentation of the self, either: it is not that a completely different person will emerge from each interaction, but that particular sets of habits will be regularly displayed by an agent depending on his current activities and context performance" (2019, p.6). The micro-identity describes an autonomous cycle of perception and action that emerges with the context of some skilled engagement with a familiar everyday situation. What such configurations confer is what Varela described as a 'readiness-for-action proper to ... [a] specific lived situation' (1999, p.9). A kind of metastable whole from which one is positioned to respond to a host of contingencies common to a particular situation. The feature of recurrence,

and thus the habitual grounding of such structure, is apparent in the following quote from Kiverstein and Rietveld, in which they reference Varela. They write (2018, p.153)

> As the individual aims for the continuity of each of its micro-identities in its coupling with the environment, it 'brings forth' or 'enacts' what Varela described as a 'microworld' – a recurrent pattern of interaction with the environment. Varela gives the example of sitting down to eat dinner with the family as an example of such a recurrent situation. As we prepare to take a seat around the table, we are ready to perform multiple actions: we are ready to sit in the chairs that are placed around the table, take hold of the cutlery we use to eat, make conversation with the other members of the family present for dinner and so on. The growth in the complexity of agency can thus be understood in terms of the complexity in the patterns of an agent's behavior – the recurrent patterns of interaction with the environment the agent sustains over time.

In other words, under situational and/or task constraints with which an embodied subject has some history of interacting, said subject will self-organise such that a particular identity emerges along with a host of concerns (which reflect the norms of its own self-regulation) and anticipations about what that situation might/should entail. Such dynamics tend towards the reproduction of the existing identity and of the situation as such. Ramirez-Vizcaya and Froese (2019, p.283) argue for the same position when they write that

> Importantly, this new level of identity generation grounds a new level of normativity for agents, since preserving the conditions of viability of their habitual identities becomes a norm that guides their perceptions and actions. In this regard, operational closure and adaptivity can be identified not only in single self-reinforcing habits, but also at the level of an ecology of habits, which "are nested in hierarchical, sequential, and ultimately networked relations in a kind of ecosystem" (Di Paolo et al., 2017, p. 147). According to Barandiaran (2008), while a single isolated habit would take control of "the behavior generating mechanisms of the agent for its own perpetuation" (282), bundles of habits integrating an autonomous system would self-organize and sustain themselves through their dynamics, establishing a set of viability conditions for the whole system, as well as a milieu of viable interactions that allows it to preserve its overall self-generated identity.

In sum, what are theorised are nested and ultimately plastic inter-regulating structures, each of which has some degree of individual autonomy but are nevertheless capable of fluid integrations. The enactment of such identities is situational and intermeshed with the environmental structures wherein they are reproduced. These identities signify additional levels of normativity, value and so on, engendering concerns and anticipations, and animating activities over and above those animated by biochemical autopoiesis. Given the nature of such structures, as nested, plastic and typically undisclosed entities operating at multiple timescales, the language used to describe them is often vexed, and at times, approximative. For the purposes here, four different scales of autonomous norm generating order have been specified: simple habits, routines

(or habit schemes), regional or micro-identities, and *personal identities*[46]. The latter refers to trans-situational patterns reflecting a general tendency or value, e.g. the tendency to be hygienic across a host of microworlds. Di Paolo et al. (2017), and Di Paolo et al. (2018), refer to patterns with this kind of trans-situational quality as having acquired a degree of *portability*[47]. That said, any of the above configurations can acquire the property of portability. The micro-identity that is going to a restaurant and sitting for dinner will be applicable in a variety of different locations, even if requiring some adaptation to the specifics of a given situation (more is said about these dynamics in later chapters). Thus, habits, bundles of habits, and so on, are adaptive and responsive, and should not be understood as limited to the precise configurations of their initial sedimentation (although some may be more limited than others). Operationally, they seem to function with a 'near enough, good enough' spirit. Such distinctions provide a set of valuable heuristics that can help tease apart bundles of habits that unfold at varying timescales. Comparable distinctions are articulated in later chapters to account for patterns of being together, though not without some developments in between. Chap. 6 suggests that although necessary to account for the normativity of our ways-of-life, the basic account runs into some trouble, and thus requires some amendments.

Part 2

5.4 Autonomy in the social domain

In the second part of this chapter some extensions of the notion of autonomy to the social domain are considered. Firstly, the enactive development of the notion within the context of embodied social interactions, with some notes on some possible supporting mechanisms. After that, the sociological account of Niklas Luhmann is considered in some detail, before wrapping up with some considerations as to the account of autonomy that will be brought forward.

5.4.1 The autonomy of social interactions

De Jaegher & Di Paolo (2007) argue that a very general form of autonomous organisation emerges in face-to-face social interaction. The social interaction engenders a precarious transient entity, an emergent form of organisational closure wherein endogenous processes within the emergent system establish mutually sustaining relationships with other processes within the system. De Jaegher and Di Paolo characterise this entity, what they call the 'social interaction', in terms of "the regulated coupling between at least two autonomous agents, where the regulation is aimed at aspects of the coupling itself so that it constitutes an emergent autonomous organisation in the domain of relational dynamics" (2007, p.493). As implied here, it is central to

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[46] The *self* might be included as a fifth level of cohering organisation, though it is not developed in any substantial sense herein. Moreover, it would need significant qualification if it were to be introduced in any meaningful way.
[47] Merleau-Ponty makes a similar point in *The Phenomenology of Perception* (2002) when he speaks about the habits of the organist having some transferability from one organ to another without having to start completely anew.

this account that some degree of autonomy is retained also at the level of the individual[48]. However, recognising that such systems often sustain themselves beyond the concerns of their individual components is a basic acknowledgement of an emergent autonomy that supervenes upon the individual autonomous dynamic, even partially limiting it. This is not altogether different than some of the configurations that have already been looked at, i.e. how autonomous habits are nested within autonomous micro-identities, etc.

To illustrate this, think of a conversation that persists despite neither party really desiring for it to continue. Or, to use De Jaegher and Di Paolo's (2007) example, the dynamics of the familiar situation where two people bump into each other when walking in opposite directions through a narrow corridor. The interaction that ensues sometimes takes on a life of its own, whereby rather than adopting complementary movements and simply walking past one another, coordinations lead to the mirroring of each other's movement, which in turn increases the likelihood that the next action will be similar. Thus, the dynamics of the interaction promote individual actions that sustain the mirroring coordination, and, consequently, the maintenance of the emergent autonomous social interaction. Of course, eventually the interaction will be disrupted when both individuals co-regulate their coordination for a complementary outcome, so that they can walk past each other. Such interactions cannot be reduced to the actions or intentions of individual interactants. Rather, they install, as De Jaegher and Di Paolo put it, a "relational domain with its own properties that constrains and modulates individual behavior" (2007, p. 494). Nowak et al. (2017, p.10) offer a helpful summary of the multi-scale dynamics involved here when they write that,

> The bottom-up and top-down processes interact with each other in reciprocal feedback fashion, which creates a synchronizing dynamical system that can promote continual modification and adjustment within and between levels. Synchronizing elements on the lower level self-organize into wholes with emergent properties on the higher levels. These emergent wholes, in turn, influence patterns of synchronization of lower level elements. Two individuals interacting in a dialog, for example, form a dyad with properties that cannot be reduced to minds of the interacting individuals. The dyad, as an emergent whole, influences individual's movements, language, cognitions, and emotions, which in turn influences the properties of the dyad (Fusaroli et al., 2014).

Importantly, for an account of autonomy, a kind of implicit goal of the emergent dynamic of the whole, reflected in the way it influences lower level synchronisations, is the sustenance of the whole itself. From a phenomenological perspective, such organisations can be thought to be

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[48] In many enactive accounts, much hangs on the tension that arises in this context between individual and interactional forms of autonomy. Indeed, the book *Linguistic Bodies,* the most substantial enactive account thus far of language (or languaging), argues for a position that centers this tension in the emergence of languaging capacities. Or see Gallagher (2017) for an account of how these ideas might be extended in support of a critical theory that addresses social and political issues relating to agency, autonomy, and recognition.

supported by the dynamics of intercorporeality spoken about in Chap. 3: the interactants capacities for inter-bodily resonance, mutual incorporation, empathy and so on.

5.4.2 Empirical support

These accounts are supported by a growing body of empirical work which has in common the recognition of a tendency for individuals in interaction to couple through their spontaneous coordination, self-organising into larger systems that constrain the activity of their individual components. Shockley et al. (2003), for instance, looking at interpostural dynamics, observed that people in interaction tend to become entrained, rocking and swaying in rhythm together. Or Schmidt and O'Brien (1997), who asked pairs of subjects to avoid coordinating behaviour while swinging a pendulum, found that participants could maintain independent swings when not looking at one another. However, when subjects were asked to look at each other, their tendency was to coordinate swings (coming into phase lock) even when being instructed not to. In other words, with the proper conditions there is a tendency towards coordination that may occur even despite apparent individual 'intentions' to do otherwise, suggesting something basic about the dynamics of bodily interaction to social engagements (something that has been suggested throughout this thesis). Cummins (2009), investigating the tight coupling of speakers during synchronous speech tasks, in which pairs of speakers read aloud the same piece of text at the same time, has found that breakdowns in the speaking of one speaker (e.g. in the form of mistakes) can significantly disrupt the activity of the other speaker also, suggesting that the intercorporeal couplings are so tight that the pair need to be understood as giving rise to a self-organised emergent whole. The types of coordination characteristic of these observations are not thought to be under the control of any dedicated module or mechanism but is self-organised. It is, as De Jaegher & Di Paolo put it, a "phenomenon to be expected under a variety of conditions if the systems possess broadly similar properties" (2007, p. 6).

Chemero (2016) describes these forms of coupled coordination with other people, or objects, in terms of 'sensorimotor empathy', a basic form of knowing that is "key to understanding our conscious experience" (2016, p.1). Drawing upon the original definition of empathy as *einfühlung,* or feeling-into, Chemero contends that in engagement with tools or others, our lived bodies ('leib' from Chap. 3) expand to temporarily include aspects of the non-bodily environment or the bodies of others (2016, p.8). He also uses the notion of synergy (see Chap. 4) to operationalise such couplings, though within the social domain the notion is extended to "interpersonal synergies" (Riley, Richardson, Shockley and Ramenzoni 2011)[49].

Although work on this notion goes back as far as Schmidt et al. (1990), the most definitive presentation of interpersonal synergies comes from Riley et al. (2011). Therein they present the

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[49] This notion if very similar to the idea of interkinaesthetic gestalts explored in Chap. 3.

case that the coordination of interpersonal movement results — particularly in the context of some shared goal — from the establishment of "higher-order control systems formed by coupling movement system degrees of freedom of two (or more) actors." (Riley et al. 2011, p.1). They offer up a wealth of empirical evidence (e.g. Ramenzoni 2008, and Black et al. 2007) in support of the idea that the characteristic features of synergies found in intrapersonal coordination — i.e. *dimensional compression* and *reciprocal compensation* — are also present in interpersonal situations, such as the coordination of limbs in the context of a particular shared task, and thus synergies, or interpersonal synergies, are present in multi-agent social systems. See **Figure 12** for a graphic illustration. Much experimental work has gone on to support such a view (see Nowak, Vallacher, Zochowski and Rychwalska 2017 for extended discussion).
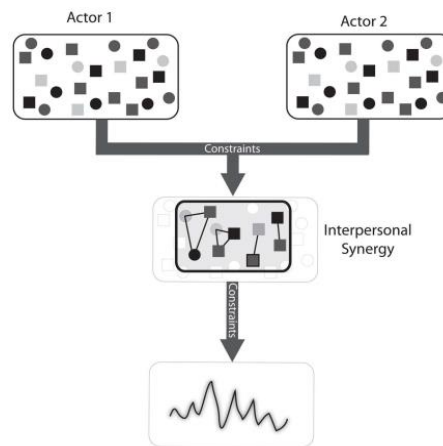
Figure 12. Dimensional compression necessary for an interpersonal synergy

Depicts the interpersonal synergy as a potential 'mechanism' for interpersonal coordination that involves a synchronised interpersonal structure composed of elements of multiple actors' movement systems (e.g. coordinated limbs) and which arises under particular task constraints. Adapted from Riley et al. (2011).

In Chemero's account of sensorimotor empathy he recounts some particularly illustrative experimental work in support of this view (i.e. Nalepka, Riehm, Bou Mansour, Chemero, and Richardson 2015). Nalepka et al. (2015), researching collective problem solving, had pairs of experimental participants engage in a joint virtual sheep herding task. Participants were tasked with controlling 'sheep dogs' that corral sheep in an arena into a virtual containment region over multiple 60-second trials. See **Figure 13** for some graphic representations.
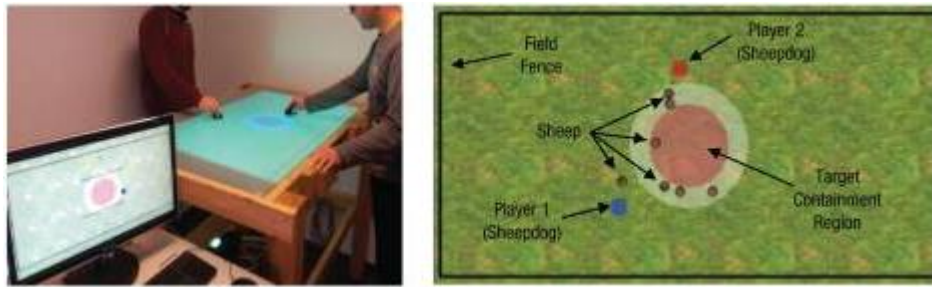
Figure 13. Picture and illustration from virtual sheep herding experiment

In the left picture is the playroom in which participants engage the task. One can see the tabletop with the projected containment ring and the participants sliding their 'sheep dogs' over the surface to corral the sheep. The right picture depicts a graphic representation of the tabletop, with containment rings, sheep, sheepdogs, and the arena. Adapted from Nalepka et al. (2015).

The game is played on a table top onto which a number of circles are projected representing the containment ring, the sheep are projected as dots who progressively stray from the center of the table, and the sheepdogs are hand held widgets that have the effect of pushing the sheep back towards the pen when placed near them. For a trial to be successful, the pairs must keep all the sheep within the inner containment ring for at least 70% of the last 45 seconds of a trial. Pairs were not allowed to speak to each other. Nevertheless, nearly all the pairs managed to succeed at the task, and nearly all of them had the same development of strategies. They began with 'search and rescue strategies', each player attempting to round up as many individual sheep as they could, starting with the sheep on their side and furthest from the centre. But such strategies are ultimately unworkable. Realising this, the pairs transition to strategy in which they coordinate their activity in an oscillatory in-phase or anti-phase pattern, each making a steady semi-circular loop around the containment ring on their half of the table. At this point, they effectively stop coordinating with the sheep as such and are coordinating with each other, and in doing so form a task relevant interpersonal synergy (see Nalepka et al. 2015 and 2017 for detailed discussion) that can successfully respond to the task at hand.

It is worth noting that interpersonal synergies are not limited to strict in-phase or anti-phase synchronization, such as those observed in coupled pendulum swings, two postural coordinations, or corralling sheep together. Behaviours such as mirroring, anticipation, imitation, call and response, and so on, might also be categorised as such. Of course, as has been suggested previously, synergies are not necessarily autonomously organised entities, and so the presence of such does not by itself prove conclusively that social interactions can support autonomous dynamics, even if it does offer some insight into 'mechanisms' that might support the kinds of coordinative dynamics necessary for a interactional system to develop such dynamics. There are, however, another class of experiments that explicitly suggest that autonomous dynamics emerge

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in social interaction, those involving the so-called perceptual crossing paradigm (Auvray et al. 2009).

Auvray et al. (2009) originally conceived this experimental approach to investigate the minimal conditions necessary for the recognition of other people (as opposed to mere objects) during perceptual interaction. Their hypothesis was that something about the dynamics of interaction itself that entails the recognition of the other. Or, "the recognition of the intentionality of another person is intrinsic to a shared perceptual activity" (Auvray et al. 2009, p.33). To investigate, they created a small network of two minimalist devices and asked whether participants were able to differentiate the perception of another person from that of a fixed or mobile object, even when the pattern of sensory stimulation was reduced to the bare minimum.

Pairs of participants were placed into a common virtual environment using a network of two basic devices — an adapted version of the minimalist sensory substitution system Tactos (Lenay, Hanneton, Gapenne, Marque, & Vanhoutte, 2003). See **Figure 14** below for a graphic representation. The system comprises a Braille cell matrix connected to a computer mouse via some software. Participants explored graphic information by means of the mouse and received tactile stimulation on the index pad of their other hand. Within the virtual environment each participant moves an avatar (the mouse cursor) and can encounter three other objects: the other participant's mobile avatar, a fixed object, and a mobile 'lure' which trails the other participant's avatar. Crossing any of these objects produces a tactile stimulation on the index pad of each participant. However, only when crossing the other participants avatar does it produce a stimulation for them also, i.e. if A crosses B's lure only A feels it, but if A crosses B's avatar both A and B feel it. In the trials, participants were blindfolded, seated in different rooms from the Tactos device, and free to explore the one-dimensional space. Their task was to register (by way of a mouse click) instances in which the stimulus was produced from having crossed the other's avatar.
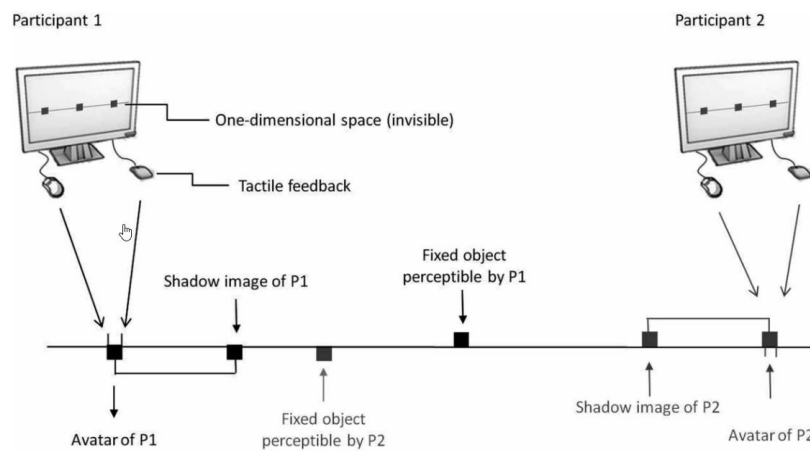
Figure 14. **Perceptual crossing set-up**

Depicts the mini-network in Auvray et al.'s (2009) experimental set-up. Adapted from Auvray and Rohde (2012).

Analysing the data showed that the participants clicked "significantly more often on the other participant's avatar than on the fixed object or the mobile lure" (2009, p.40). The small proportion of clicks on the fixed object was put down to the participants capacity to distinguish between a moving object and a fixed object by simply revisiting the same area, i.e. if it is still in the same spot it is probably fixed. However, participants did not do well in discriminating between the lure and the avatar, the probability of clicks for either demonstrating no significant difference. Thus, the substantial difference (23% vs 65.9%) between the lure and the avatar was put down to the fact that the "frequency of stimulation associated with the avatar was higher than the frequency of stimulation associated with the mobile lure (52.2% vs. 15.2%)" (ibid, p.40). In other words, although one was just as likely to register a lure crossing with a click than an avatar crossing, avatar crossings were much more frequent and thus led to substantially more clicks.   In congruence with previous studies using the Tactos, perception relies upon a 'active and reversible exploration' strategy: each time a sensory stimulation is encountered participants turn back, successful perceptions are then contingent upon additional stimulus in the right place at the right time (Lenay et al. 2003). Calculating the frequency distributions for distances between two avatars Auvray et al. found that "there was an attraction of the two avatars for the situations of perceptual interaction" (2009, p.43). They describe this mutual attraction using the dynamic systems concept of an "attractor" and hypothesise the "strongest attraction around the site of the perceptual interaction" results from the simultaneous strategy whereby, "When the trajectories of the avatars cross, both participants receive a stimulation … each participant then turns back, then they will meet again, and this pattern forms a relatively stable dynamic attractor" (ibid, p.43).

Auvray et al. conclude that recognition of an intentional subject cannot be resulting from some cognitive inference to categorise the stimuli, for participants registered both lure and avatars to the same degree. Thus, only a more primary sensorimotor dynamic emergent between the two participants can suffice as an explanation, i.e. "the higher proportion of clicks on the partner's avatar than on the mobile lure can be accounted for by the sensorimotor dynamics of the interaction which favoured an attraction for the situations in which the two avatars are located in front of each other" (ibid, p.44). And so, in accounting for the recognition of intentionality in others, processes intrinsic to the interactional dynamics are at least partially responsible, the social dimension is constituted collectively by the dynamics inherent to the interactions themselves. This is empirical support for the autonomy of social interaction in that what emerges is a self-sustaining dynamic, not necessarily under the control of the interactants. Since this original research,

numerous studies have employed the perceptual crossing paradigm and continued to observe dynamics that can only be made sense of through the lens of an emergent social autonomy that is effectively preconscious (e.g. Froese and Di Paolo 2010; Froese, Lizuka, and Ikegami 2015).

Studies such as those in the above sections, and many others (some of which will be addressed in Chap. 8), underwrite an emerging consensus around the need to account for self-organising body-body dynamics when thinking about the nature of cognition. The growing interest in approaches such as two-body neuroscience (see Dumas 2011), attendant novel methods such as hyperscanning (see Barraza et al. 2019), and supporting philosophical positions like the "interactive brain hypothesis" (Di Paolo and De Jaegher 2012) that theorise the brain as relational entity or 'mediating organ' (Fuchs 2017), also reflect this emerging consensus. Moreover, in line with the multiscale account that was outlined as important to a robust notion of autonomy, such positions have provided much empirical support suggesting that such coordinative dynamics need to be understood in terms of a 'multiscale coordination' (e.g. Dumas et al. 2014), emphasising how social interaction entails body-body coordination at multiple organisational dimensions, levels and timescales simultaneously, e.g. bodily movements and posture (e.g. Richardson et al. 2007; Shockley et al. 2009; Varlet et al. 2011; Walton et al. 2018), heart rate and patterns of breathing (e.g. McFarland 2001; Müller and Lindenberger 2011), electrical activity in the brain (Lindenberger et al. 2009; Dumas et al. 2010; Naeem et al. 2012; Duan et al. 2015; Lu and Hao 2019; Kingsbury and Hong 2020). These ideas will be returned to in later chapters as necessary.

5.4.3   Participatory sense-making

As suggested previously, in regulating its coupling with its environment an autonomous living organism maintains the "self-generated identity or identities that initiate the regulation" (De Jaegher & Di Paolo 2007, p. 488). This activity establishes a normative perspective (Varela 1991a; Weber and Varela 2002), wherein any interaction or exchange with the environment is implicitly meaningful for the subject at its center. It is this active generation of meaning that is termed sense-making. However, as suggested above, the enacting of such a world is not confined solely to the autonomous activity of the individual embodied subject, for in the case of the social interaction such activity can be seen as properly a function of the interaction itself. This is actually quite a straightforward proposition.

Individuals are constantly engaged in the activities of sense-making, but within social interaction, given their self-organising intercorporeal dynamics and their general tendency towards coupled coordinations, the sense-making activities of any interactant are constrained by the presence of others. Now, whatever sense is made, whether pertaining to some individual concern or to the regulation of the interaction itself, it is always-already modulated by the presence of the other and has some relevance within the interaction itself. De Jaegher and Di Paolo speak of such

forms of sense-making in terms of *participatory sense-making*, and characterise them in terms of "the coordination of intentional activity in interaction, whereby individual sense-making processes are affected and new domains of social sense-making can be generated that were not available to each individual on their own" (2007, p.497). In social interaction, then, the emergent autonomous dynamics can provide a socionormative backdrop that is not available outside of the interaction in the same way, against which activities are appraised and interpreted, and from within which novel meanings can emerge, meanings that have relevance both for the interaction itself and for the individuals that comprise it. See **Figure 15** for a graphic representation of the kind of couplings that are involved in such processes.
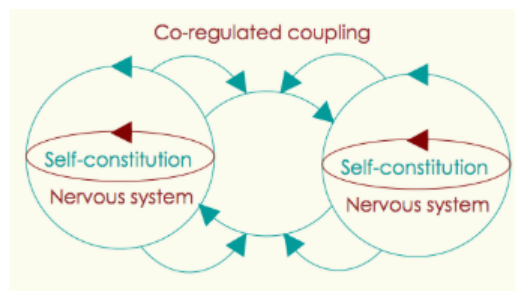
Figure 15. Autonomous dynamics characteristic of participatory sense-making

Looking at this graphic one gets a sense of the complex couplings that are at play in the relationship between an interacting pair. Multiple autonomous forms are present in the interaction, and co-regulations negotiate between them. Adapted from Di Paolo (2008).

For De Jaegher and Di Paolo, such activities exist along a spectrum, from mere modulation of individual sense-making whilst coordinating with the other, to full on joint sense-making, wherein new meaning is created within the interaction. In the latter case, meaning and significance is engendered through the "stabilisation of patterns of joint activity", whereby, "when such patterns lawfully stabilise some invariant relation the perceptual result is jointly constructed, and novel meanings may be established in interaction" (ibid, p. 500). This co-stabilisation of the invariant relation is said to constitute the highest degree of participation in sense-making, relating primarily to patterns of behavior that help make sense of some co-available perceptual entity. They use the example of a game of charades, wherein the players converge on a meaning through co-regulations of breakdowns and recoveries, and how once a meaning is agreed upon, it might then factor in their ongoing sense-making, or participatory sense-making. The point is that such meanings could not have been arrived at alone, nor make the sense that they do to any individual within the interaction apart from the interaction. Later chapters extend these insights around the stabilisation of invariant patterns in interaction, by combining them with insights from the previous

section, suggesting that social interactants stabilise 'invariant relations' through the habituation of patterns of being together at various timescales.

Sustained or recurring interactions take on a historical dimension. As they do, they are fashioned according to the coordinations, breakdowns and recoveries that constitute their history. It was suggested previously, in the dyadic body memory account, that such histories empower interactants to fluently coordinate ongoing interactions and recover from breakdowns. De Jaegher and Di Paolo make a similar point, noting that "we often perceive some interactions as improving over time, and recovery from a break down as a sort of learning ..." (ibid, p.496); and that, a "history of coordination demarcates the interaction as an identifiable pattern with its own internal structure ..." (ibid, p.492). This "identifiable pattern" can be considered an autonomous entity in the relational domain, a transient and precarious identity manifest each time the historical system is enacted, an instance of the same genus of organisational form that has been explored up to this point. However, how best to characterize the 'internal structure' of the historical system, and how best to account for the learning that inheres within interaction is left underdeveloped in these accounts, issues De Jaegher herself acknowledges (e.g. De Jaegher et al. 2016). Such issues are the primary target in the present account when speaking about the stabilisation of patterns of being together.

5.4.4 Leaning-on, or borrowing-from?

In cases of face-to-face social interaction, as with the sensorimotor account earlier too, the autonomy of the organisation has decoupled somewhat from the biological autonomy that helps instantiate it. One can envision the interactional dynamics as supporting the emergence of practices that are even antithetical to the ongoing individuation of the biochemical organisation that supports them, e.g. a mass suicide plot. This, however, is not a completely new idea, even if a new articulation. In the work of Cornelius Castoriadas, for instance, he uses the notion of 'leaning-on' to describe this multilevel autonomy. As told by Mark Hensen (2009, p.132), Castoriadas employs this notion to 'describe the capacity of the psyche to break from the natural stratum whilst continuing to find anchoring in it … [the] … operation of splitting through leaning-on … [being] … repeated at subsequent levels of organisation, up to and including the societal' (ref). The emergence of 'the societal' is, thus, "constrained by not determined by the biological stratum" (ibid). In Castoriadas (1975, p.234) own words,

> To say that the institution of society leans on the organization of the first natural stratum means that it does not reproduce or reflect this organization, is not determined by it in any way. Instead, society finds in it a series of conditions, supports and stimuli, stops and obstacles.

From Castoriadas writings, however, it sometimes feels like he is suggesting two distinct layers, the biological layer being the more primary and the social layer simply leaning-on it, but not 'reproducing' it or 'reflecting' it in any way. But the compatibilist account here aims at something of messier integration than this, whereby the social is not only enabled by (leaning-on) but also enables certain aspects of the biological[50] and any clear distinctions between the two becomes difficult. That said, one can recognise some heuristic value in referring to either domain and adopting the language of leaning-on. Thus, inspired by Castoriadas, but also sensitive to such shortcomings, the language of *leaning-on* is swapped out for *borrowing-from,* with any organisation specified in any domain actually borrowing-from organisations that might be best specified in other domains. This shift in language is intended to emphasis the reciprocal nature of the relation here. In other words, the autonomy we find in the sensorimotor domain and the social domain borrow-from the autonomy (autopoiesis) of the biochemical domain but are not determined by it, and vice versa. Likewise, the autonomy of the social domain borrows-from forms of autonomy in the sensorimotor domain, and vice versa. This is important when moving away from excessively reductive, genetically deterministic, and overly simplistic accounts of human social behaviour, whilst also recognising that any account of such behaviour is inexorably constrained by the 'biological stratum'. One might envision — though no such thing will be attempted here — how such an understanding might allow for productive conversations between, for instance, intersectional theorists or critical gender theorists within the humanities and theoretical biologists or evolutionary theorists. As far as the present account is concerned, one can already observe the blurring of distinctions that is necessary for a compatibilist approach and the emergence of a continuity of language that has descriptive power across domains.

5.5 Luhmann's social autopoiesis

The section explores an approach to social autonomy that has received very little attention within enactive cognitive science, possibly having to do with Maturana and Varela's general antipathy towards it. Namely, the sociology of Niklas Luhmann (1986). Despite its criticisms and some of its shortcomings, it is deserving of attention. Luhmann does not feature much in the compatibilist account developed later. However, one could not develop a sociologically informed enactive account that centers the notion of autonomy without some conversation as to why not, given that the sociology of Luhmann and those inspired by him is the most throughgoing attempt we have at applying the theory of autopoiesis to social systems and seems well positioned to account for patterns of being together. Interestingly, Luhmann generally uses the term *autopoiesis,*

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[50] This will become obvious in later chapters when notions of inter-regulatory dynamics are introduced.

and not autonomy, a fact that has caused much consternation, as will be explored towards the end of this section.

According to Cadenas and Arnold (2015), *social autopoiesis* refers to the "ability of a self-referential system to produce itself through communication (Luhmann 2012, p.42), which implies not only the differentiation of its elements and relations, but also that the unit of the system is obtained by means of its own operations" (2015, p.170). In other words, the social system, much like the biological system, enacts through the recursive activity of its components, a structure that includes a boundary of a sort and thus allows it to distinguish itself from its environment. Luhmann's primary unit of analysis was, in fact, "the single world society, defined as all communication", however, he also recognised the differentiation of such a global system into "self-referential functional subsystems which operate according to their own particular logic without being subordinated to any central unit", and which are "interdependent and open for exchange with each other, but at the same time operationally closed, which means that they can (re)produce their own constitutive elements and, consequently, (re)produce themselves." (Makarovic 2001, p.60). In other words, social entities such as a political party, a family, a dyadic partnership, or a corporation, might constitute a relatively autonomous social organisation capable of maintaining some organisational invariant through the activities it manifests. Luhmann's work makes for rather challenging reading, and any thorough explication of it is well beyond the scope of the present work. Hence, the intention here is simply to highlight its basic constituents, prominent critiques (particularly from the founders of autopoietic theory themselves), some potential responses, and some reasons for not adopting it more comprehensively.

The first thing to recognise about Luhmann's account is that the basic constituent elements of any social system are not its individual human actors, but rather, 'communications' themselves. Communications result in further communications, and it is this continued reproduction and continuity of the communicative social system that warrants it (them) the status of being autopoietic. Luhmann (1988, p. 174) writes,

> Social systems use communications as their particular mode of autopoietic reproduction. Their elements are communication which are recursively produced and reproduced by a network of communications and which cannot exist outside such a network.

By communication Luhmann is not referring to the passing of messages based on symbolic representations, but rather, a kind of coordinating of, or within, a symbolic domain. Each communication results in distinctions and contrasts within this domain that ultimately fold into each other in ways that become self-maintaining.

Any communication involves three, so-called, 'selections of meaning': *information*, *utterance*, and *understanding* (Luhmann 1992). If you say to your friend, 'my energy is off today',

whatever it is that you are referring to within the context of speaking constitutes 'information'; that which is said constitutes the 'utterance'; and however your friend interprets your utterance in the context of it being spoken constitutes the 'understanding'. But this is not, as Cadenas and Arnold put it (2014, p.171), "a transmission of meaning between persons", but rather, "an operation of distinction by a self-referential system" This is easier to see when considering the domain in which Luhmann considers this activity to be ongoing.

Luhmann is adopting the notion of autopoiesis from the biochemical domain but suggesting that it is also operative in what he calls the domain of 'meaning'. Communication functions a bit like the reactions in the biochemical domain that result in contrasts and differentiations, lead to the production and reproduction of certain boundaries, and so on. However, when communicating, such contrasts and differentiations are being realised within the domain of meaning, even producing functional boundaries therein, and/or reproducing existing ones. Drawing distinctions in this domain — i.e. communicating — is necessarily self-referential. Anyone wishing to engage with another must effectively capitulate to participation in the existing dynamics of the system. As Cadenas and Arnold write, "Social systems belong neither to alter nor ego, they are systems that define positions in the communication for alter and ego" (2014, p.172).

It is interesting to consider how social structures within this domain can emerge as self-differentiating wholes. Lanartowicz and Weinbaum (2016, p.10) speak about the dynamics of communication bringing forth fluid identities, what they characterise as "metastable entities in the course of individuation whose defining characteristics change over time but without losing their longer term intrinsic coherence and distinctiveness from their milieu." In other words, a communicative social system, such as a family system, emerges as an identifiable unit within the space of meaning that manifests some sort of self-regulatory dynamic that reflects a sensitivity to the ongoing cohesion of the whole. Under such a view, everyone comprising it works more like a sensor-actor for the cohesion of the system than an individual agent within it. Continuing the previous quote, Lanartowicz and Weinbaum (2016, p.10) write that "For a social system to persist as an individuating entity … not everything goes ... a certain critical mass of recurrence, and coherence grounded in the historical record of communications is necessary." And elsewhere, in the same vein, colleagues Heylighen, Kingsbury, Lenartowicz. Hamsen, and Beigi (2018, p.2) write that "The process that stabilizes certain rules but not others is a form of distributed self-organization in which the distinctions and actions made by different individuals adapt the one to the other, until they form a closed system of coordinated, mutually aligned symbols, categories and rules." What results is not some rigid social structure that is perfectly invariant on every iteration of its coming forth; not a 'constant pattern', but a 'metastable entity' whose 'emergent dynamics' results in 'adaptability' (Lenartowicz and Weinbaum 2016, p.10). In other words, the

social systems that manifest for those that comprise them as familiar patterns of communication are also capable of adjusting to changing conditions both internal and external to the system itself. For Luhmann, these social systems, these metastable, fluid, adaptive entities, pulse into and out of being in communication, organising the activities of their components in the process, but also being reorganised by them.

5.5.1 Critics and responses

There are numerous criticisms of Luhmann's expansion of the notion of autopoiesis to the social domain, not least from Varela, Maturana, and progeny. For starters, they suggest that it is simply a misappropriation of the concept. Varela declares that, "These ideas are based, in my opinion, on an abuse of language. In autopoiesis, the notion of boundary has a precise meaning. When, however, the net of processes is transformed into one 'interaction among people', and the cellular membrane is transformed into the limit of a human group, one falls into an abuse" (Varela 2000: see also Luisi 2003). Aguilera (2015, p.9), speaking of the same concern, writes, "When the relations with the environment are not based in material self-production but in sensorimotor interaction between agential beings and their surroundings, it is not clear how autonomous organizations are constructed and what are their boundaries." This closely relates to another criticism, i.e. there is no real sense in which something is self-producing. Communications do not produce anything in the sense the term is deployed within biological autopoiesis, in terms of producing elements or components in a system. Rather they 'operationalise' relations (Cadenas and Arnold 2015, p.172). In sum, under such conditions, the notion of autopoiesis, for Varela at least, "becomes a metaphor and loses its power" (Varela 1981, p.38).

There are a few potential responses to this, from weak to strong. The weak response is simply to suggest that maybe the use of the term autopoiesis is misplaced, for it refers solely to a particular realisation of the dynamics of self-production in the biochemical domain. But nevertheless, one is still talking about a form of autonomy, one wherein the self-production of a relatively coherent structure can be observed, even if it has no apparent boundaries; one that, as Aguilera puts it, "demands a different conception of closure and self-nonself distinction" (2015, p.216). A second stronger response includes what is suggested in the weaker response, but transcends it also, responding that, in fact, something is produced and it is an operational boundary perfectly analogous to the cell or organism membrane (which, not incidentally, is itself not a perfect boundary, as Haraway suggested earlier). Here, however, the boundary only needs to be functional in the context of its given domain or subdomain (i.e. it may be a symbolic boundary). Such boundaries may have more or less permeability, and thus, cause any social system to be more or less open. Think of the difference between the communication dynamics that constitute a fundamentalist cult as opposed to those that organise an explicitly pluralistic

institution. Of course, even the latter example will have symbolic boundaries, the notion of institution itself connotes such characteristics, but the language that preserves them will likely be more fluid and less 'policed'. What is produced in communication, and the differentiations that are engendered therein, are inter-regulating processes as necessary to the cohesion of the communicative structure as the membrane is to the cohesion of the autopoietic cell. A third response might simply be to put this question back on Varela and Maturana, and ask, what is meant by the 'production' of an 'element' in their account? Held too tightly, does this not presuppose the Aristotelian ontology of substance that they are attempting to get away from? Isn't even the production of a biological 'element' not itself the operationalisation of some set of relations but at rather different timescales?

The second substantial critique of Luhmann's position, one also put forth by Varela and Maturana, is that he does away with conceptions of human agency altogether. As mentioned previously, not individual agents, but communications, are the constituent components in such systems. Humans work as mere sensor-actuators by which this larger social agency maintains itself as such. Maturana is particularly vocal in his criticisms here. For him, such a deployment of the notion of autopoiesis is theoretically unsound, for it presumes the autonomy of communications can be distinct from actual persons. For Maturana, communications do not reproduce themselves (which would be necessary if to be recognised as self-producing) but are reproduced by the humans that enact them. Luhmann (2012) was not deterred by Maturana's critiques however, making the explicit case that he is not referring to a "society without humans", but rather pointing out that regardless of the participation of humans in communication, communication itself remains operationally closed: to participate in its structures one must be capable of expressing one's experience in the 'elements' the communication system furnishes, no one individual can get in there and change the operational dynamics. In Maturana and Varela's account of social systems, only biological systems of the first order (e.g. cells) and second order (e.g. whole organisms) are autopoietic. Social systems, on the other hand, are merely third order aggregations of those systems (1987)[51]. As Cadenas and Arnold put it, speaking about Maturana and Varela's position, "With regard to human beings, their social systems would be composed of individuals and their communicative and linguistic recursions". Continuing, "For them, social systems are "both a social and biological phenomenon" (2015, p.173).

These are debates over where the agency of human communication lies. As such, it is easy for them to fall into individualist or interactionist traps pertaining to where the *real agency* is

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[51] There are other Luhmannian inspired positions that argue for views within which humans are in fact the components of social autopoiesis, and what is being self-produced is the 'unity of human actors and social structures, i.e. human sociality, in society' (Fuchs and Hofkirchner, 2010).

during any social interaction. The view taken here is that the forms of relative closure that characterise social interactions need to be understood as corporeally grounded and integrating forms of autonomous organisation operative at multiple levels and scales of human organisation simultaneously. Thus, any clean attributions of agency become untenable, and, following Cummins (2014), come to be seen more an artifact of those making the attributions than anything being attributed to (see Cummins 2014 *Agency is Distinct from Autonomy,* for a discussion of this perspective). This is, really, a Maturanian type perspective. As such, it is surprising that Maturana does not simply bracket the distinction and give it its proper place within the relevant domain of discourse.

There are other interesting criticisms of Luhmann's position, such as the fact that his theory is nonnormative: it does not offer tools for the analysis of societal problems (Fuchs and Hofkirchner, 2010). Although, for Luhmann himself this was indeed the case, it is not clear this is necessarily so. Heylighen et al. (2018) have been applying Luhmannian insights concerning the reproduction of social systems to understanding, for instance, how our behavioural and emotional systems can be co-opted for social control. Such social critique might not proceed in the normal sense of the term, in which a particular social structure is singled out and analysed for its deleterious effects, but rather constitute something more akin to a metacritique, in which the self-organising dynamics and the control parameters that undergird a host of interrelated unwanted effects can be simultaneously articulated, potentially leading to social interventions with significant leverage.

Another critique, put forth by Varela, is that there is potential for authoritarian adoptions of these ideas and their totalising implications. If there are no individual agents, as such, what of democracy, individual responsibility, and so on. This may indeed be the case if one adopts a totalising approach to the theory, but if it sits within a larger meta-theoretical position, such as the compatibilist one under development here that acknowledges a multiscale account of autonomy, its insights can be wielded in the opposite direction, supporting efforts towards social and ecological justice, and so on. The conclusion of this thesis says something more about these potentials through a compatibilist frame.

One last critique is that — at least according to Maturana, for he claims that it was communicated to him in person — Luhmann was aiming at a predictive science of the social. If this is so, Luhmann appears to have misunderstood one of the basic principles of the complex systems framework he was so creatively applying, i.e. that complex systems, especially those as open to their environments as social systems, are inherently unpredictable. It is difficult to believe that Luhmann would make such a mistake. Nevertheless, we have no reason to mistrust Maturana

(2015, p.17), who writes, responding to Luhmann's supposed claim, embedding in it some of his authoritarian concerns also

> It is because new sensory, operational and relational domains appear in our living from our doings, from the independent happenings that occur in our ecological niche unity, and from the new domains that arise in our reflections in a manner that cannot be deduced from what was happening to us before, that it is intrinsically impossible to create a predictive theory in relation to what will happen in the course of our social living as we operate in it according to our desires. If we want predictive behavior in a human domain, we must agree on a common project, or submit, either unwillingly or willingly, to some tyranny.

Perhaps a simple miscommunication lies at the heart of this ambiguity. Whatever the case, it is worth giving Luhmann or his representatives the floor momentarily, to provide some counter critiques.

5.5.2 Luhmannian counter critiques

The first counter is one we have encountered some version of previously, which is to say that all autopoietic/autonomous systems are social. This is a response most notably promoted by economist and systems theorist Milan Zeleny. The following quotes from Zeleny (2015, p.186 - 7) speak for themselves.

> All self-producing biological organisms are essentially societies of interacting components and therefore notions of autopoiesis and social systems are fundamentally, if not definitionally, interrelated (ibid, p.186).

> There can be no autopoiesis without actively interacting components. In order to interact, such components must communicate. Communication is not just the passive exchange of information, but mutual stimulation and induction to real action, in time and space. Components must act, i.e., respond in direct or chained reciprocity and mutual cohesiveness of their action. Such engendered action connects the components into networks. Such networks become stronger, predictable and autonomous under the influence of repetition. Such repeated action brings forth the rules of behavioral patterns and is itself affected by the same rules it has generated. The continuous making, degrading and remaking of such patterns is the very foundation of life – cellular, individual or social. Perpetuating the network of such interactions can be referred to as a social system. Its components are not separate or randomly interacting entities – they form a society (ibid, p.186).

> Autopoiesis of an entity (or component) cannot be separated from the autopoiesis of the entire sustaining network/system. Therefore, pointing to the autopoiesis of individuals cannot be fully comprehended and completed while denying the autopoiesis of their interacting networks, i.e., societies. There is not a single living organism that exists outside its requisite social system ... Autopoiesis of individuals is naturally interconnected with the autopoiesis of their social system (ibid, p.187).

For Zeleny then, autopoietic systems are always-already social, though they become more differentiated with repetition, and they are always embedded in larger autopoietic systems of which

they are components. This is subtly reminiscent of the Dempster position (see Chap. 4) in which various degrees of closure are present in multiple overlapping systems. The approach taken here is inclined to sympathise with Zeleny, but with the caveat that what autonomy provides is a useful heuristic for pointing towards sets of interdependencies that seem to have acquired a certain degree of closure. Zelany has also suggested that Varela and Maturana's antipathy to the sociality of autopoiesis might come from a particular prior conviction. Namely, that autopoiesis under their account is taken as stipulating the necessary and sufficient conditions for life. The problem is this, if they were to accept the social autopoiesis of Luhmann et al. then they must also accept either, a) social systems are alive in the strong sense of the term, in the same way that biological organisms are alive; or b) autopoiesis does designate a set of necessary conditions for life, but not a sufficient set. Neither of these claims, Zeleny contends, would be agreeable to Varela and Maturana. And so, maybe, their hesitancy, as Zeleny puts it, to "write about the nature and adaptation of social institutions and the evolution of society itself" (2015, p.189).

5.5.3 Positioning Luhmann

Before concluding this section, it is necessary to position Luhmann with respect to the present account. Given the centrality of the body to this account, this seems like a good place from which to enter this discussion. Luhmann, in what seems like an outright dismissal of the role of individual autonomy in any account of social systems, famously wrote that "Only communication can communicate" (2005, p.38). For Luhmann, in other words, it seems the body was not of great concern. Recently several theorists have looked at the role of the body in Luhmann more specifically, with varying interpretations. Cesaratto (2015, p.23), (reviewing Moeller 2012), writes that "Luhmann insists that the conscious and physical components of the human are of no interest to sociology because they are unobservable.", and that "Luhmann's solution to Cartesian mind-body dualism is not to reconcile the body and mind nor to advocate the managerial function of one over the other, but rather to introduce a third component of the human condition: the communicative." Of course, this makes some sense within a Luhmannian perspective, which ultimately aimed at a post or even anti-humanism, in which any embodied human has relatively little influence over the evolution of a society. Indeed, for Luhmann, even the political system of a society has relatively little influence over the society (see Moeller 2012 for detailed discussion of these ideas). Under such a conception, it is not surprising that Luhmann has been accused of reproducing the Cartesian dualism between *res cogitans* and *res extensa* (Hahn and Jacop 1993). Others, however, have suggested this is not entirely fair, and that "even if Luhmann continues to defend a clear differentiation between the psychic and the organic, it is unfair to maintain that his theory repurposes ... the "official doctrine" (Calise 2015, p.105).

Luhmann does suggest that social systems, psychic systems, and bodily systems are 'interpenetrating', whereby, as Calise puts it, "the systems enable each other by introducing their own already-constituted complexity into each other" (2015, p.108). Each system, in other words, is part of the environment for others, and as such is interpenetrated by them (Halsall 2012). Given the closedness of such systems, Luhmann speaks of systems *irritating* (the German word is *irritieren,* which can also be translated as "perturbation") one another. This allows Luhmann to speak of a process of socialisation, in which social systems irritate psychic systems, which, in turn, irritate bodily action systems. This, however, leads to a situation in which only bodily behaviour that is being irritated by the psychic system can be thought about as socialised. In other words, any bodily behaviour that is not thought under direct influence of the psychic system cannot be thought as socialised, and the body is not, as Calise puts it, "thought capable of incorporating social meaning beyond what consciousness can observe" (2015, p.110).

Such a position is in sharp contrast to the work of thinkers that provide the foundation for the present account like Merleau-Ponty, and sociologists inspired by him, such as Bourdieu, for whom bodily relating to the world is always-already meaningful, and indeed, as has been considered in previous chapters, always-already social without necessarily being accompanied by, or irritated by, prior psychic states. Taking this some steps further, recalling the notions of intercorporeality and participatory sense-making, one can see that in face-to-face interaction there are properly social dynamics more basic than anything that might properly be called communication in a Luhmannian sense[52]. Many of the interpersonal synergies (or inter-kinaesthetic gestalts) characteristic of sensorimotor empathy, or the self-sustaining dynamics observed in the perceptual crossing paradigms, reflect such dynamics. And so, the position adopted herein, given the focus on embodiment, is that although stimulating, the Luhmannian position is not ultimately going to be helpful in accounting for the patterns of being together that are the object of study herein. As will be observed in later chapters, by instead centering the body and the notions of habit and participatory sense-making that have been featured in this chapter, one can articulate an account of the autonomy of differentiated social systems without some of the more drastic assertions that Luhmann makes. It may, in fact, be possible for these positions to establish some common ground, particularly when scaling to larger social systems, such as multi-person groups, collectives, institutions, cultures, and so on. If Luhmann is on to something, his account still demands greater articulation of how communicative social systems are grounded in the bodies of those they animate, and the notion of habit seems to be well positioned to take up

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[52] For some contemporary enactive cognitive scientists, it is out of the need for the regulation of various forms of autonomous organisation, both bodily, and social, that communication and even language emerges (see Di Paolo, Cuffari, and De Jaegher 2018 for extended discussions).

such a brief. No attempt at such unification is to be made in the present work, but it does point the way towards some potential future developments. A recent convincing account argues for the necessity of understanding the dynamics of languaging through the notion of habit (Kee 2020; see Sec. 8.5.2), lending support to the idea that such developments might be fruitful.

5.6 Dialectics and spectrums

What has been observed in this chapter is some of the descriptive power of the notion of autonomy, as it scales from the operations of an individual cell all the way up to those of a society, a promising notion for a compatibilist account. However, the accounts of autonomy considered thus far tend to be, 1) rather cumbersome, in that there are too many working parts to think through in each instance when considering if a system is autonomous or not, and 2) rather blunt, in that the binary of whether a system is autonomously organised or not does not capture the full range of systemic organisation to which such notions might be relevant. Thus, this final section is dedicated to outlining a more parsimonious account of autonomy that can be carried forward in a way that helps do justice to an understanding of the richness and complexity of our ways of life.

To address the first point, the unwieldiness of the notion of autonomy as it has been so far articulated, it is necessary to introduce a recent enactive rendering of the notion. This rendering applies another layer of abstraction, making it much more streamlined and wieldable in a way that highlights the kinds of dynamics that are relevant to the emergence and reproduction of patterns of being together from a compatibilist approach. In an attempt to simplify the understanding of the dynamics characterising autonomous systems (and certainly not negating anything about prior accounts), Di Paolo et al. (2017, 2018) have conceived of autonomy in terms of a temporally distributed dialectic between processes of self-production and processes of self-distinction. See **Figure 16** below for graphic representations of these dynamics. Self-production — represented in the top right-hand corner of **Figure 16** — describes the openness of a given entity to the flows of energy and matter constituting its various environments. Maximizing this dynamic means being totally open to all flows. As Di Paolo et al. write, "the ideal condition for self-production would be one of total openness … [wherein] … every possible flow of matter and energy is taken advantage of" (2017, p.133). But such dynamics on their own cannot facilitate individuation of a given entity, for there is no distinction of entity from environment. Self-distinction, on the other hand, — represented by the graphic in the top left-hand corner of **Figure 16** — entails distinguishing oneself from one's environment. An ideal realisation of self-distinction would demand a relation of "total robustness to any environmental influence" (ibid). But again, if this were the only operative dynamic individuation would be impossible, for self-production in any form ceases to be a possibility. Thus, in isolation neither dynamic is sufficient for individuation for each in principle

negates the other. However, when held in dialectical tension over time — a dynamic represented by the graphic in the bottom of **Figure 16** — adaptively opening oneself up to or closing oneself off from this or that environmental condition (e.g. material flows, flows of energy, flows of information) provides the basis for the ongoing individuation of a given entity.
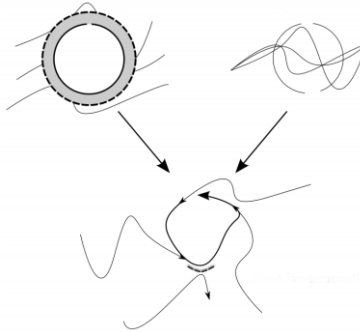
Figure 16. The dialectics of autonomy

Self-production, represented by the graphic in the top right-hand corner, entails the effort to make oneself up from stuff available in one's environment. Self-distinction, represented by the graphic in the top left-hand corner, entails closing oneself off from one's environment. Held in dialectical tension over time, a dynamic represented by the graphic in the bottom, these dynamics provide the basis for the ongoing individuation of a given entity. Adapted from Di Paolo 2015 as appears in Di Paolo (2018).

Self-individuating autonomous entities demonstrate conservation tendencies, enabling activities that preserve their individuation as such, both by continuing to be open to the necessary flows that support their reproduction, and inhibiting any inward flow that might disrupt or threaten them. This language of a dialectic between self-production and self-distinction will later be shown to be helpful when articulating the patterns of being together that are the object of concern for this thesis. Regarding the point that the account of autonomy as it is deployed above is too blunt, in that a system is either autonomous or it is not. Dempster (2000), Haraway (2016), and Zelany (2015) have all called for some socialisation of the notion of autopoiesis, each in their own ways. The point is well taken. In the biological domain, a growing body of work is forcibly making apparent our constitutive entanglement with other individuated organisms. We are more symbiotic than not. In a recent influential paper by Gilbert, Sapp, and Tauber (2012), subtitled *We have never been individuals,* they argue this position, drawing insights from anatomy, physiology, immunology, evolution, and genetics[53]. Such insights need to be taken seriously and

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[53] See also the paper *Animals in a Bacterial World: A New Imperative for the Life Sciences* (2013), for a twenty six author review of the now vast amount of evidence acknowledging the importance of animal-bacterial interactions at multiple scales; or the book *I Contain Multitudes,* by science writer Ed Yong (2016) for a popular overview of similar ideas, particularly how they relate to human beings in interaction with the microbiome.

accommodated by our theories. Moreover, they might be used to inform our understanding of patterns of individuation outside of the biochemical domain also.

As has been observed, many have suggested that the notion autopoiesis should be reserved for the biochemical domain. Dempster (2000) wished to retain the notion of autopoiesis for 'individual' organisms and reserved the notion of sympoiesis for systems of interaction between multiple organisms, i.e. ecosystems. She contends that autopoiesis and sympoiesis should be understood as heuristics at opposite ends of a continuum of organisational closure, somewhere along which any actual system will be found. Haraway (2016), on the other hand, applies the idea of sympoiesis to the biologically individuated entity (the holobiont). But she extends it into other domains too, to do away with the idea that any 'individual' is easily bounded. Zelany has suggested that autopoietic networks (communication networks, at least) grow stronger "under the influence of repetition", such that, "repeated action brings forth the rules of behavioural patterns and is itself affected by the same rules it has generated" (2015, p.186). Finally, this latter sentiment is one also observed in the context of the sedimentation of autonomous organisations in the sensorimotor domain (i.e. habits, micro-identities), whereby recurring sensorimotor coordinations reinforce their own likelihood and the rate of repetition is a condition of their ongoing individuation.

Borrowing from these accounts, and in the hope of maintaining some conceptual clarity, the position adopted here is that the notions of autopoiesis and sympoiesis be reserved as heuristics for the biological domain[54]. On the other hand, when accounting for patterns of being (or patterns of being together), such as habits, the language of autonomy (and not auto/sympoiesis) is appropriate. Autonomy, however, needs to be understood heuristically too, describing systems on a spectrum of individuation. Hensen writes that "justice to the fundamental continuity between the biological and the social domain will thus require a certain de-specification of autonomy ..." (2007 p.129). One means by which to make this despecification — over and above reserving autopoiesis for the biochemical domain — might be to specify the ends of the spectrum of autonomy in terms of either minimally autonomous or maximally autonomous systems. The minimally autonomous system is to the way-of-life what the sympoietic system is to life. It speaks of a form of organisational closure that is relatively boundaryless, organisationally ajar, and largely dependent upon support from other *more* autonomous structures. The attendant claim is that, as ways-of-life repeat (under the right conditions) they move along a gradient of organisational closure, becoming more autonomous (under this account this is effectively what is meant by reinforcement), gathering together more interdependencies (or strengthening existing ones) in service of the organisational whole, but they are nevertheless precarious and always subject to dissipation. Any concrete system will neither be maximally nor minimally autonomous

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[54] Importantly, these are used here within an objectivity in brackets framing.

but will — in line with Dempster's position — sit somewhere along this continuum. See **Figure 17** below for a graphic representation of these ideas.

Of course, there is some sense in which an organisation can be recognised through the binary distinction of autonomous or not. If, as was observed in the previous chapter, processes within the network both enable and are enabled by other processes within the network, they can be thought to comprise a closed network. What the degree of closure refers to then is the strength of coupling between the components, the adaptive capacities of the system enacted, and the degree of distinction drawn (this might relate to a density or clarity of enabling relations). As is obvious from experience, with repetition our habits become more stable, more distinct, and more obdurate. In the language employed here, this implies a progression along a spectrum of individuation, from minimally autonomous patterns at the outset that are little more than barely decipherable invariances in our coordinated activity, to maximally autonomous personal identities that we would protect with our lives. The necessity of making these distinctions will become more apparent throughout the chapters that remain in this thesis.
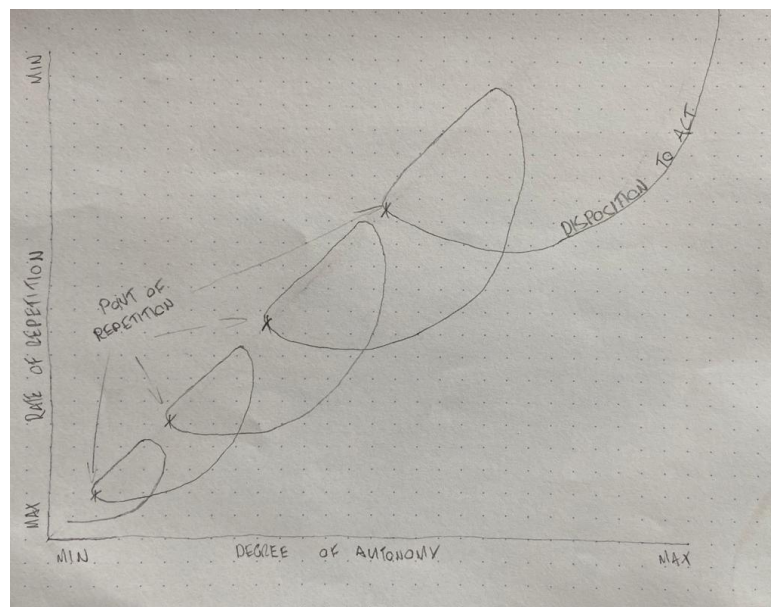
Figure 17. The reinforcement of autonomy

The graph Illustrates the transformation with repetition from minimally autonomous systems to progressively more autonomous systems with greater degrees of organisational closure. It also highlights the precariousness of the system and its dependence upon the presence of certain conditions, and how those conditions (e.g. rate of repetition) can change as the level of autonomy increases.

5.7 Conclusion

This chapter has considered the notion of autonomy in some depth, emphasising a number of domains of its use within, and relevant to, enactive cognitive science, particularly the sensorimotor domain (as embodied in the notion of habit) and the social domain. Moreover, it built towards the idea that autonomy needs to be understood as a heuristic for categorising certain kinds of systems, and that it needs to be understood as capturing a spectrum of closure. The task over the chapters that remain is to argue for a kind of amalgamation of the insights developed in this chapter as a means of accounting for patterns of being together, i.e. they can be made intelligible as habituated self-individuating entities within the social domain, maintained according to the dialectics of self-production and self-distinction, and existing as systems somewhere on a spectrum between minimally and maximally autonomous at any given point in their life cycle.

What the notion of autonomy provides, by explicating how adaptive systemic order is instantiated and integrated at multiple levels, is a means to transcend the limitations of the individualist and interactionist paradigms outlined in early chapters, no longer positing the individual and social as entirely distinct domains, or awkward allies, but integrating them, recognising that patterns of being together are patterns of bodily being together. A question that was asked previously can now be refined further: how do habituated autonomous patterns of bodily being and bodily being together come to be embedded in the bodies of those who help comprise them? In answering these questions, much as it has been necessary herein to loosen the grip on the notion of autonomy employed, in the following chapter, the grip is also loosened on the theoretical frameworks employed. Continuing in the spirit of the compatibilist approach already underway, the account that begins taking shape in the next chapter is a sociologically informed eco-enactive account, that takes significant inspiration from some recent work by Baggs and Chemero (2018; 2019) and the work of Gilbert Simondon. Therein, the notion of *enhabiting* is introduced as an account of the propagation and perpetuation of habitual organisations (*enhabitings*) at the level of the individual, a necessary step towards a compatibilist understanding of patterns of being together.

6 Enhabiting

> Habit is the ballast that chains the dog to his vomit.
>
> Beckett (1978, p.8)

> It seems as though the last delicacies of feeling require some element of novelty to relieve their massive inheritance from bygone system. Order is not sufficient. What is required, is something much more complex. It is order entering upon novelty; so that the massiveness of order does not degenerate into mere repetition; and so that the novelty is always reflected upon a background of system.
>
> Whitehead (1978, p.339)

> Still, what happens if a breakdown is so severe that the agent is not, so to speak, "caught" within any particular activity or genre? There is likely at this stage a hiatus of deep disorientation, of simultaneous partial abandonment and retention of the old frame of significance. We may find ourselves still involved in some of the previous schemes, only that they do not seem to make much sense now. In fact, until the situation is resolved and a new microworld emerges, we are world-less.
>
> Di Paolo et al. (2017, p.167)

6.1 Introduction

Our individual patterns of being are undergirded by autonomous forms of organisation. The central claim of this thesis is that our patterns of being together are similarly organised. Essential to any satisfactory account of such patterns will be the details of how they emerge as stable. However, not only is this social account not presently available from a radical embodied cognitive scientific perspective, but it is not available at the level of the individual either. And so, in developing the social account of the emergence of patterns of being together as autonomously organised habitual structures, it will be first helpful to articulate their equivalents at an individual level, where some of the complexity is reduced but many of the same notions apply. As will be observed, when taken individually, the existing approaches that are best suited to address these questions — the autonomist enactivism of Di Paolo et al. (2017), and the more ecological leaning Skilled Intentionality Framework (e.g. Bruineberg and Rietveld 2014) — suffer some shortcomings. However, these shortcomings can be transcended by teasing out what is compatible between them. With some inspiration from the philosophy of Gilbert Simondon, these compatibilities can then be leveraged to introduce the notion of *enhabiting*; a set of interrelated processes that describe the emergence of the individual habit structures that shape our ongoing sense-making at multiple timescales. Only having done this work can the following chapters go on to develop the notion of coenhabiting, which effectively scales the understanding developed herein to the individuation of patterns of being together as social habit structures at multiple timescales.

Like the previous chapter, this chapter is divided into two primary parts. The first part begins by setting the stage, whereby a host of tensions are teased out between the existing radically embodied accounts that are to be brought to bear on this question. There are, nowadays, enactivisms (e.g. Hutto and Myin 2014; Cummins and De Jesus 2016; Villalobos and Ward 2015; Di Paolo, Buhrmann, and Barandiaran 2017) and ecological psychologies (e.g. Wilson 2018; Chemero 2011; Gibson 1977; Rietveld and Kiverstein 2014) all of which inform a radical embodied cognitive science. The focus here is on teasing out compatibilities between the autonomist enactivism associated with Di Paolo et al. (hereafter enactivism) and the Skilled Intentionality Framework associated with Rietveld et al., which has its foundations primarily within ecological psychology. The primary reason for focusing on these accounts is that both already acknowledge the importance of insights from ecological and enactive perspectives, and both have some central role for the notion of autonomy, and thus compatibilities are already present that can be further refined[55]. The suggestion here is that by maintaining a certain distinction introduced by Baggs and Chemero (2018, 2019) — between the umwelt and habitat of an acting agent — some of the existing 'tensions' between these accounts can instead be understood as reflecting underlying compatibilities.

Starting from the shared concern with the idea of self-maintenance, a path is woven through a host of related notions, highlighting compatibilities along the way. Firstly, the central notions of *sense-making* and *tending towards optimal grip*. From there, through related concepts concerning the abilities of agents, the timescales that organise action, the role of the 'environment', and questions around identity and normativity. In working through these comparisons, the method is to present the enactive take first at each juncture, responding with the ecological perspective, and following with a summary of the compatibilities observed[56]. Concluding this section, it is suggested that the compatibilities highlighted can be brought into a more enduring relationship through the necessity of their mutual deployment in accounting for the individuation of novel habit structures. Within this account, this process is termed *enhabiting*.

Developing the notion of enhabiting is the focus of Part 2 of this chapter. Inspired by the philosophy of Gilbert Simondon, and borrowing from the compatibilities outlined in Part 1, it offers an account of a set of ongoing processes by which autonomously organised habitual entities emerge from and are reproduced within the relationship between an embodied subject and their

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[55] The SIF is something of an idiosyncratic view within the ecology of ecological psychology. The developments herein do aim to be informative within that ecology. However, given available space, discussion is limited to comparisons between the perspectives mentioned. That said, future developments will benefit from engagements with more classically articulated ecological perspectives.

[56] This is done primarily because within the literature, the SIF perspective, being the more recent development of the two, tends to take this approach itself. Also, however, the majority of the present authors' thinking to this point has been done in an enactive register, and so displays a slight bias for the language of enaction over the SIF or the language of ecological psychology.

habitat. This then provides the foundation for the development of the notion of coenhabiting in later chapters.

Part 1

6.2 Setting the stage

6.2.1 Enaction and ecological psychology as compatible frameworks

Developing a compatibilist cognitive science means getting some existing post-cognitive approaches — i.e. enaction and ecological psychology — to play a bit more nicely together. Convergences between enaction and ecological psychology are "many and strong" according to Di Paolo (2016, p. 327). Both reject explanatory strategies understanding cognition as consisting in the manipulation of content-involving representations. Both emphasise contextuality over reductionism, foreground particularity and process, and stress the constitutive role of body-environment relationships in the development of cognition (Szokolszky, Read, Palatinus and Palatinus 2019). Given such convergences, others suggest they are ripe for integration (e.g. Kiverstein and Rietveld 2018). An integrated perspective might offer "a systematized and consistent post-cognitivist approach to cognition" (Heras-Escribano 2019, p.1). Elsewhere, there is less certainty unification is possible, and, as Di Paolo also puts it, enactivists and ecological psychologists "stare at each other across an uncanny valley" (2016, p. 327).

Segundo-Ortin, Heras-Escribano, and Raja (2019), for instance, suggest that when offering an anti-representationalist alternative, ecological psychology can get along well without enaction. Chemero contends that the theory of autopoiesis informing many enactive perspectives is "a troublingly idealistic theory" (Chemero 2012, p. 54). And Fultot, Nie and Carello (2016), argue that enaction retains an implicit representationalism, lacks principled grounding, embeds an animal-environment dualism, and is a purely constructivist position despite protestations otherwise.

Enactivism, although often relying on ecological psychology for empirical support, tends to be sceptical of the realism entailed by traditional approaches and implications about a 'pre-given' environment, and dissatisfied by the apparent inability to provide any substantive account of value, or the individuality of action. Reflecting these concerns in a comparison between approaches, Varela, Thompson and Rosch (1993, p204) write,

> Gibsonians treat perception in largely optical (albeit ecological) terms and so attempt to build up the theory of perception almost entirely from the environment. Our approach, however, proceeds by specifying the sensorimotor patterns that enable action to be perceptually guided, and so we build up the theory of perception from the structural coupling of the animal.

This chapter will not attempt to synthesis the approaches into a "systematized and consistent" whole. Instead, building upon some recent work by Baggs and Chemero (2018, 2019), and in keeping with the spirit of this thesis thus far, a compatibilist approach is advocated in which a plurality of complementary frameworks are presented together and the compatibilities highlighted[57]. The compatibilist approach centers intelligibility rather than systematicity and consistency. It can address phenomena that concern embodied cognitive science more completely and more sensitive to the 'externalities' of theoretical application[58]. A compatibilist approach is a pragmatic metatheoretical one. Within such an approach, application of any framework is already a partial answer to the question "What is the job at hand?". Traditionally, the various approaches borrowed from have different emphasises and often provide consistent accounts of the phenomena they interrogate. There are, however, some phenomena that demand contributions from both approaches. The emergence of habits is one explored here.

6.2.2 What's all the confusion?

Baggs and Chemero (2018, 2019) argue the confusion between enaction and ecological psychology can be circumvented by acknowledging the different explanatory strategies each adopts in accounting for situated human action. Each has a different starting point, pertaining to how they conceive of 'the environment' of an acting agent. The ecological approach has an ontological strategy, focused on characterising the 'environmental' structure that affords adaptive possibilities. The enactive approach has an epistemological strategy, focused on how a history of acting structures one's 'environment' so it calls forth existing skills (Baggs and Chemero 2018). Such differences are revealed in how they employ the notion of affordance. There are three primary camps.

The first, the more traditional ecological perspective, is the *affordances as dispositions* camp (e.g. Turvey 1992; Turvey, Shaw, Reed, and Mace 1981; Wilson 2018). Here, affordances are lawlike and enduring environmental 'dispositions. They are enduring even in the absence of any who would make use of them, and thus capable of applying selection pressures. As Wilson writes, affordances have "to be 'out there' and made of things that light can bounce off" (2016). Given the lawful relationship between the structure in light and the structure in that which it reflects

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[57] Baggs and Chemero do speak, at different points, of the "complementarity" of these approaches and their "unification". Thus, it is not clear whether the compatibilist account developed here is perfectly aligned with their ambitions or not. Nevertheless, their account does provide a stable mooring from which a compatibilist account might venture.

[58] The language of 'externalities' comes from economic theory and pertains to the cost of an action on a third party who did not choose to incur it. Pollution is the customary example. It is used metaphorically here to speak about what is 'left out' or negatively affected by adoption of one framework or another. For instance, in the context of 'mental' healthcare, the externalities of a reductive framework might be a failure to address underlying social conditions of disorder (see Alexander 2008). The perpetrator is typically in denial of such effects and would likely rather them be otherwise if given the opportunity. It is simply presumed here that any theoretical framework will have some externalities, and thus they demand sensitive application.

off, it can carry directly meaningful "information about" the available affordances. As the organism moves about its environment it 'picks up' this information and can thus act on the available affordances. Such affordances, as dispositions of the environment, are paired with dispositions in the organism, so-called *effectivities*, and whenever the two meet a certain course of action follows (Turvey et al. 1981).

This dispositional account has its critics. Because any individual in a species can, in theory, occupy the same point of observation relative to the surfaces around them, they are thought to have access to the same 'information about'. This supposition allows Gibson to claim that, "The basis for agreement among men exists in the available stimulus information" (1966, p.321). However, by focusing on the environmental structure there to be found, it deemphasises learning in shaping what any individual actually finds. In Baggs and Chemero's language, it "fails to account for the fact that a newspaper that is written in a particular language affords reading only for a certain subset of the world's population, namely the set of people that are literate in that language" (2018, p.6). A corollary of this is that if information is directly meaningful and available in the structure of the light (sound etc.), then there is nothing to be learned (Adolph and Kretch 2015). A final critique often levelled at this account, is that it struggles to make sense of individual variability. It "leaves obscure", as Chemero and Baggs put it, "the conditions under which a given affordance is actualised" (Baggs and Chemero 2018, p.8). If affordances are dispositional properties of environments acted upon in the presence of a related 'effectivity', any time affordance and effectivity are present to one another the affordance should be acted upon (Chemero 2009). But this is quite obviously not the case.

The second position is the enactive leaning *affordances as relations* camp (e.g. Chemero 2003, 2009; Stoffregen 2003). Here affordances are relational entities that arise only under certain organism-environment configurations. This perspective was originally posed by Chemero (2003, 2009) to integrate insights concerning the role of environmental information with insights from enaction concerning the sources of value and the particularities of individual perception. There are prominent critiques here also. Wilson (2016) highlights the most troubling of them: it is not clear how one perceives a relation of which they are part, and any capacity for affordances to apply selection pressures is negated, for they arise with the ability but do not precede it. Consequently, learning novel relational affordances is impossible. In the relational account "organisms co-create affordances by their causal interactions with the environment. This means that I can only create affordances using abilities I already have; so how do I learn new affordances? It can't be by being in the presence of those new affordances, because I cannot create them yet …" (Wilson 2018). In other words, within the account of affordances more

agreeable to a typically enactive perspective, it is difficult to account for the emergence of novel relational affordances.

A third position is the *affordances as practices* camp of the skilled intentionality framework (hereafter SIF) (e.g. Rietveld & Kiverstein 2014; Bruineberg & Rietveld 2014). They develop a relational account too but expanded from the purely "material" to the "sociomaterial" (van Dijk and Rietveld 2017, p.6). Here, affordances are defined as "relations between aspects of the sociomaterial environment in flux and abilities available in a form of life" (van Dijk and Rietveld 2017, p.10). A 'form of life' relates to the practices common within a given species, their "relatively stable and regular ways of doing things" (Rietveld and Kiverstein 2014, p. 328). We are not just sensitive to the material affordances of the hammer, but its role within its larger context. Such insights were inspired most recently by Dreyfus responding to the so-called 'frame-problem' (1992). However, they can be originally traced to Heidegger (1927/1962). Heidegger, for instance, spoke about comprehending the tool against a background or network of other tools and uses that gave the tool its meaning, what he called a 'totality of equipment' (1927/1962, p.97)[59]. van Dijk and Rietveld (2017) use the example of climbing stairs to highlight the sociomaterial nature of affordances, describing how one's steps might reflect an awareness that people are sleeping nearby. The stairs afford not just climbing but climbing-quietly-so-as-not-to-wake-the-others-in-the-house-who-are-up-early-in-the-morning-for-work.

The SIF makes important contributions by recognising affordances as being contextualised by larger fields and landscapes of affordances, i.e. the sociomaterial contexts that shape action at multiple timescales. By allowing attention to be oriented by more experienced individuals, through observation or training, learners can attune to the available affordances within a form of life. This account makes room for individual variation, whilst also not defining affordances in terms of individual abilities (van Dijk and Rietveld 2018), allowing for affordances to drive selection and accommodate learning within a form of life. However, it is not clear how without an account of affordances also tied to individual abilities radically novel practices can emerge, or how an individual within a given practice might innovate beyond the boundaries of its present configuration.

All these accounts make important contributions to questions of learning, but also harbour limitations[60]. The dispositional account argues for the kinds of structures necessary in the environment to guide learning but does not address the historicity of learning and the particularities of a given organism-environment relation. The relational account, although highlighting how a

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[59] See Kiverstein and Wheeler (2012) for an edited collection on the influence of Heidegger on contemporary cognitive science. Or Käufer and Chemero (2015) for a more concise account, alongside the account of phenomenology more generally.
[60] One might refer to such limitations as 'theoretical externalities'.

history of learning determines the affordances one is likely to make use of, is closed to the emergence of novel affordances at an individual level. And the practice account, although allowing for a relational account in which affordances still apply selection pressures, seems to come up short in its ability to account for the emergence of radically novel practices or innovations beyond the boundaries of existing ones. One suggestion about the nature of these shortcomings is the idea that these accounts are focused on the *what*, rather than the *how* of learning. As Cariani puts it, "Both constructivist and ecological psychology theories need to explicitly incorporate concrete processes of learning alongside what is or can be learned" (Cariani 2016, p.324). But there are frameworks right across the valley that speak about the how of learning.

On the ecological side, the *perceptual learning* of Eleanor Gibson, which focused on processes of selection and differentiation of a sufficiently rich stimulus (1969, 1994). Or, contemporary progeny of such accounts, such as the *direct perceptual learning* theory of Jacobs and Michaels (2007), which is centrally concerned with how the acting agent comes to "identify useful, complex information-environment specificities at the level of ambient energy arrays, under universal constraints captured by natural laws and local constraints given by a specific task situation" (Szokolsky et al. 2019). Here, learning is an information-guided process in which attention becomes progressively more attuned to optimally useful information (see Szokolsky et al. 2019 for discussion). On the relational enactive side, the most comprehensive account of learning is the equilibration account put forth by DI Paolo, Buhrmann and Barandiaran (2017). Here the focus is on how stable sensorimotor correlations evolve through the resolution of tensions in the relationship between existing structures and structures in the environment (ibid, p.88). Their account provides insights into the developmental dynamics that support learning and the logic for why any act of perception reflects an individual history. Consequently, they provide an answer to the question of why the agent is attuned to some "some particular subset" of environmental information, "that has meaning to it at this moment" (Di Paolo 2016, p.327). The 'issues' with these perspectives are not the internal details of the accounts themselves, but that they maintain the limitations highlighted in the various accounts of affordances. Thus, what is introduced here is not an amendment to any of these accounts, though both may be informed by it. Rather, it is intended as a framing within which conversations between these various approaches might be couched given their shared interests in making intelligible the dynamics of situated action.

Following Baggs and Chemero (2018), this starts with the recognition that the apparent incompatibilities with the above approaches result from attributing some reality, just different types, to each notion of affordance. The enactive approach emphasises the structure of experience and how the world emerges in the relationship between organism and 'environment'. In other words, emphasis is placed on the umwelt, which describes the environment as the "meaningful, lived

surroundings of a given individual" (ibid, p.6). One primary value of the enactive perspective is the epistemic limits it sets, reminding us that the knower is always implicated in the known. Nevertheless, enactivists tend to conceive of their project not in the idealist terms attributed to them earlier, but as a kind of middle way, and are even committed to a basic ontological 'realism' of sorts, i.e. there are some sort of mind independent structures that we can come to know, even if coming to know 'them' we render them mind dependent. Enactivists thus speak about the 'structural coupling' of organism and environment (Varela, Thompson and Rosch 1993). But accounts of the structure that make up the environmental side of the coupling are admittedly underwhelming.

More classically ecological approaches, given their ontological focus and their desire for an account of how structures in the environment can be a source of selection pressures, emphasise what Baggs and Chemero refer to as the habitat: "the environment as a set of resources for a typical, or ideal, member of a species." (ibid, p.6). Importantly, the "habitat" does not designate physical reality writ large, but rather, the set of material relations that exists prior to and independently of any individual member of a species that could in theory impact them. "The habitat", writes Baggs and Chemero, "is the physical world described relative to a potential actor, or set of actors" (2018, p.7). This account speaks of a dispositional account of affordances, and its recognition is valuable for it provides the basis for an empirically grounded anti-representationalist approach to understanding perception and action, one that helps acknowledge the basic intuition that we occupy a shared world despite our individual histories.

Holding these distinctions, Baggs and Chemero (2018, p.8) claim, we can retain the best of both approaches.

> The affordance concept serves a different purpose depending on whether we invoke it in the habitat or in the umwelt. In the former case, affordances are dispositional properties, or persisting resources that exist across generations and exert evolutionary selection pressure. In the latter case they are relational properties that exist for only so long as a given animal continues to live, and that change as that animal develops new skills and abilities, or loses them.

As will be observed, this observation can be very generative, and serves as a powerful leaving off point for making sense of some of the challenges faced by existing accounts. In the compatibilist account, the ecological perspective clarifies what might be said about the environmental side of the structural coupling, thus supporting the commitments throughout the valley to the possibilities of an account of perception and action grounded in the language of science. The enactive perspective, on the other hand, reminds us that even such a language is but a frame onto the world (See Cummins 2020 for extended discussion of these relations).

6.3 Finding compatibilities

A starting point for thinking about compatibilities between these two approaches is simply pointing out that both accounts are centrally concerned with processes of self-maintenance. The enactive approach continues in the tradition of Maturana and Verela (1993) and describes self-maintenance in terms of autopoiesis (or autonomy more generally). The SIF borrows from the Fristonian account (2009, 2010), and describes self-maintenance in terms of the free energy principle (FEP) (detailed below). As Kirchhoff points out, comparing the originary accounts, they both "converge on … the organizational property for living systems: self-maintenance through a process of autopoiesis." (2016, p.8) "One can show", Kirchhoff goes on, "that the process of autopoiesis is a process that minimizes free energy" (ibid). Given the demands of space, the extent to which this claim is true or not is not explored here (see Kirchhoff 2016 for discussion). Rather, by contrasting the concepts typically used to describe the activities that support self-maintenance, *sense-making* and *tending towards optimal grip*, this account begins by teasing out the compatibilities that will be relevant to the positive account later on.

6.3.1 Sense-making and tending towards optimal grip

Sense-making as has been previously suggested, describes the activity of an adaptive autonomous body directed at its ongoing viability. In short, it describes a "bodily process of adaptive self-regulation" (Di Paolo and Thompson 2014, p.9). The self-production of the biochemical networks constitutive of organismic life, or autopoiesis, requires ongoing and periodic access to various material and energetic resources. As such, actions are appraised as better or worse according to their ability to satisfy these requirements. Consequently, the autopoietic instantiation provides a meaningful background against which activities and events are made sense of, a "natural perspective from which encounters in the world are intrinsically meaningful for the organism following the norm established by the continuing process of self-production" (DI Paolo 2005, p.429–430).Thus, the job of sense-making is the maintenance of the identity of the organic body. Recently, however, as reflected in the previous chapter, sense-making has been expanded to include not just the maintenance of autonomous biochemical identities (life), but sensorimotor identities too, in the form of habits and networks of habits (ways-of-life) (Barandiaran 2017; Di Paolo et al. 2017).

In the SIF, the notion of sense-making is effectively replaced with the notion of 'tending towards an optimal grip'. Kiverstein and Rietveld (2018) write that "We characterise … sensemaking activity in terms of the tendency towards an optimal grip on multiple affordances" (2018, p.156). This notion of tending towards an optimal grip originates in the work of Merleau-Ponty (1945) and has been long championed by Dreyfus (2002, p. 378), who writes that

According to Merleau-Ponty, in absorbed, skilful coping … acting is experienced as a steady flow of skilful activity in response to one's sense of the situation. Part of that experience is a sense that when one's situation deviates from some optimal body-environment relationship, one's activity takes one closer to that optimum and thereby relieves the 'tension' of the deviation. One does not need to know, nor can one normally express, what that optimum is.

Put simply, the agent is moved to improve its grip on its environments by negating or limiting tensions therein. As Bruineberg and Rietveld put it, "an organism self-organizes by reducing a disequilibrium in the brain-body-environment system" (2014, p.12). In the ecological account, getting a more optimal 'grip' entails reducing 'dissatunements' between endogenous and exogenous dynamics, by continually negating deviations from an optimum (Bruineberg & Rietveld 2014). Common examples include finding the best angle to take a photo; adjusting your distance to the person in front of you in the queue; or, settling into position before hitting a ball when playing golf. However, more cognitively complex examples might also include editing a text or playing a game of chess.

Regardless of the complexity of the task, living systems are continuously striving to improve grip (Kiverstein, Miller, and Rietveld 2017). And so, we are sensitive to tensions that manifest in our experience and seem to 'solicit' action, by, in a sense, calling for their reduction, and thus better approximating optimal grip. There is not necessarily some explicit goal state organising action here. As Bruineberg and Rietveld write "the skilled individual does not have an explicit goal in mind, but rather is solicited or invited by the field of affordances … what is at the root of skilled activity is not a set of desires or goals, but rather the ongoing modulation of coupled self-organizing dynamical systems that results in the adequate interaction of an organism with its environment" (2014, p.3). Consequently, maintaining or returning to optimality might be a very basic norm characterising the regulatory dynamics of the organism-environment relation, and that supports self-maintenance.

In line with the FEP account, tending towards optimal grip entails the progressive movement of the organism towards better 'models' of their environments over time by continually reducing dissatunments as they show up. This, however, unlike closely related Bayesian constructions that focus primarily on brain processes (e.g. Clarke 2015, Kiefer and Hohwy 2018), does not posit structural representational models that carry representational content. "Under the FEP," it is suggested, "models are not explicitly encoded by physical states … states of the brain. Rather, it is the adaptive behaviour of the system that implements or instantiates a generative model" a statistical 'prediction' or anticipation of optimal behaviours in their particular 'econiche' (Ramstead, Kirchoff & Friston 2019). The agent resonates with its environments in ways that prepare it for acting therein. They are attuned. An intuitive example is the ways in which the

circadian rhythm of a particular Londoner might be said to 'model' the light cycle as it is common to GMT. The configuration of bodily states that readies one for bed in a sense "modelling" night-time. These 'models' are quite obviously not internal mental representations, but they can be thought to entail anticipations about what one's world is likely to present them with, readying them accordingly. Continuous, though much more flexible models, are thought to underlie our sensorimotor and affective dynamics also, whereby through acting in a given environment we 'model' its features, such that we might then anticipate those features and act accordingly the next time we encounter that environment. The language of "modelling" will be troubling here for some, as decoupling it from its representationalist implications is something of a challenge (see Ramstead, Kirchoff & Friston 2019 for an insightful comparison of the differences between classically "structural representationalist" accounts, and their *enactive inference* account)[61]. Having introduced these central notions, some of the tensions and compatibities that follow from them can now be considered.

6.3.2 Habits and Abilities

The notion of habit will not be developed in detail again here (see Chap. 5 for a detailed elaboration). Nevertheless, it is worth reminding ourselves that within enaction habits comprise "self-sustaining patterns of sensorimotor coordination formed when the stability of a particular mode of sensorimotor engagement is dynamically coupled with the stability of the mechanisms that generate it, and which is reinforced through repetition" (Barandiaran 2008). Here, habits demonstrate forms of circular self-production analogous to other autonomous forms, such as autopoiesis, and thus provide "a first analogy with life and a first approximation to a sensorimotor conception of identity and normativity", whereby "through repetition … a habit can take on a life of its own: it is both the cause and the consequence of its own enactment" (2017 p.13). Also recall that within this account they move beyond single self-reinforcing habits to networks of inter-regulating habits that unfold across longer timescales but maintain a coherent behavioral structure. In this account, rather than the organic whole being the sole background against which sense is made, habits, networks of habits (Di Paolo et al. 2017) and so on, are also norm-generating backgrounds both being maintained by and shaping the sense-making of the embodied subjects that instantiate them.

As habitual ecobehavioural entities, the norms of habitual organisations can partially decouple from the normative dynamics of the autopoietic biochemical structures upon which they lean, and, as such, can even instantiate self-regulating norms that function counter to the norms

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[61] See Fultot (2016) for a constraints-based approach that avoids the language of modelling but can still provide principled accounts of anticipation. Fultot makes the case for how a particular context "pre-constrains" the living system, resulting in an "anticipatory poise" relevant to acting therein.

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of these organic wholes (Barandiaran 2017). As Di Paolo puts it, "the inherent regulative tendencies of sophisticated processes of identity generation are likely to sometimes enter into conflict even with basic metabolic values" (2009, p. 18). What results is a relatively integrated network rife with tensions and contradictions. Examples might include participating in extreme sports, drinking excessively, consuming food that you know to be harmful, and so on. In such instances, the behaviour of the embodied subject, although motivated by the self-production of some particular identity (e.g. a way-of-life as a big wave surfer), is simultaneously threatening another identity (the organic living whole) and the expression of habits that would otherwise support it, and can thus result in states of tension or dissonance. Indeed, some so-called bad habits get their name for this reason (Ramírez Vizcaya and Froese 2019). Thus, one recognises some inter-regulatory dynamics at work in the relationship between different forms of autonomy.

Where enaction speaks of skilful action being subtended by integrated networks of habits, the SIF speaks of *abilities*. Within the SIF, affordances are the relationship between features of a sociomaterial environment and abilities in the form of life (van Dijk and Rietveld 2017, p.10). Any individual, at any time, is embedded within a field of affordances. However, given their present concerns, only some subset of the field stands out as relevant, the 'field of relevant affordances'. To say that they 'stand out' suggests that they are experienced as soliciting behaviour (Dreyfus and Kelly 2007; Rietveld and Kiverstein 2014). This depends upon a bodily "action readiness" on the behalf of the skilled actor (Frijda 1986, 2007), whereby within a given situation the individual is attuned, or 'selectively open', to certain features of their environment, anticipating what they are likely to encounter, and readying themselves to act so as to be responsive to the demands of the situation (van Dijk and Rietveld 2017). The abilities of a given individual, which have taken shape through a history of engaging in sociomaterial practices (Rietveld 2008), are reflected in the patterns of action readiness, selective openness, and skilled engagement that manifest in any particular situation. Tending towards optimal grip, one is continually responding to solicitations, and thus constantly reorganising the dynamics of the body-environment system such that the field of relevant affordances is in continuous flux.

The emphasis in this account, as previously noted, is more on the side of the environment. The self-maintenance of the organism is thus characterised in terms of its ability to maintain an adaptive relationship to its environment, by being ready to act in relation to the affordances that support the general tendency towards optimal grip. Given such emphasis, however, the SIF fails to account for the richness of 'abilities' that the inter-regulating plastic structures captured in the enactive account seem to suggest. 'Abilities' is simply far too coarse grained a notion. For instance, one does not merely have abilities or not have abilities. Rather, one has abilities and varying degrees of integration of those abilities within larger competencies. Consider an example

common to didactic situations, wherein, for instance, one uses a heuristic from one domain transferred into the present domain in order to facilitate a particular bodily configuration, e.g. if one is asked to switch the hips in Brazilian Jiu-Jitsu with a back kick of the leg, but struggling with it until instructed, 'like you are kicking your leg to propel yourself on a skateboard', and suddenly, given the alternative frame, the ability is available and can be integrated with the present situation. Here, the ability existed already in some genuine sense, and even though one could notice the affordance for a certain kind of backwards kicking of the leg, it was not integrated into a larger competency, and thus unavailable. Of course, such an example comes with explanatory challenges that extend beyond the bounds of the present effort. What it makes clear, however, is that a satisfactory account of the 'abilities' of an embodied subject demands an account of the integrated networks of habits discussed in enaction, wherein patterns with their own self-regulating norms are part of larger networks (which have achieved some degree of coherence) with more general norms, and so on.

On the other hand, although the habitual structures one finds in enaction potentially offer an account of the rich topography of inter-regulatory dynamics characteristic of action, this account is limited to a purely relational view of affordances, and thus suffers from the limitations normally associated with such perspectives. When thinking about habits in this context, limitations concerning the emergence of novel habits become apparent. Also, the notion of structural coupling implicates the availability of enduring structures in the habitat, whereby the ongoing reproduction of the structures characteristic of a particular umwelt depend upon the ongoing availability of features of the habitat. Just like life necessitates the availability of certain biochemical structures for its reproduction, ways-of-life necessitate certain sociomaterial structures for their production and ongoing reproduction too. Thus, it is impossible to speak about habits and their reproduction without implicating the affordances spoken about in the SIF account, i.e. not those related to individual abilities as such, but the sociomaterial affordances of the habitat. As Skolosy et al. put it, "Enactivism has the advantage of concentrating on organisms as wholes, but the disadvantage of lacking an approach to perception that allows a coherent account of how organisms are connected/related to their surrounds" (Szokolszky et al. 2019, p.17). In sum, though each has a different emphasis, the abilities gearing an individual into a particular field of affordances can be seen to be compatible with the networked structures characteristic of habits and networks of habits[62].

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[62] This set of relations invites some interesting potential routes of further inquiry. Kirchoff suggests that the autopoietic biochemical system can be understood as a process that minimises free energy (2018). If we take our ways-of-life to be following analogous organisational dynamics, we can ask, might habitual organisations also be interpreted as eco-behavioural entities that minimise free energy but understood from an internalist perspective? Is the ability to synthesise novel models or update existing models compatible with the inter-regulatory dynamics common to habits? Can each perspective simply inform the other in productive ways? And so on.

6.3.3 Timescales

With the characterisations of the previous section in mind, the multiscale approaches of the enactive account and the SIF are mostly compatible. In both, any activity is always conceived as spread over multiple scales simultaneously. Di Paolo et al. write that "Habits do not stand in isolation as egotistically self-sustaining behavioural patterns. On the contrary, habits are nested in hierarchical, sequential, and ultimately networked relations in a kind of ecosystem …" (2017, p.147). The 'hierarchy' here is primarily a temporal one. When sense-making, a simple habit, such as picking up the soap with your right hand, is embedded in a larger ritual, washing your hands after going to the toilet, which is itself embedded in a 'micro-identity', getting ready for bed. Here, the unfolding of any activity is always-already the unfolding of body-environment organisations that have acquired closure at various timescales and have achieved a certain amount of integration. This supports our being geared into our environments in ways that bring a certain coherence to our action, and a sense of temporal continuity in which we flow from one activity to another. As a general (but not hard) rule, we can see that activities that unfold at shorter timescales, such as short-lived sensorimotor coordinations on the timescale of milliseconds to seconds, are entrained to those at longer timescales, such as activities that unfold on the timescale of seconds to multiple seconds, and so on[63]. This provides conditions for adaptive responses within activities at the shorter timescales to accommodate the particularities of the situation, whilst maintaining a consistent course of action at the longer timescales also. The organisational dynamics characteristic of each informing the normative dimensions of the unfolding situation. Of course, activities at the shorter timescales also feedback on the longer timescales, but there is, one might suggest, a dominance of entrainment from long/slow to short/fast.

In the SIF account, when tending towards an optimal grip, a compatible account is apparent. Van Dijk and Rietveld write that "when driving to a store, writing a text, or building a house, skilled individuals also adjust their activity in an anticipatory manner—people act adequately by anticipating situations as they unfold across larger scales, although often in a less certain manner than activities on smaller timescales" (2018, p.2). These anticipatory dynamics are effectively action readiness patterns that are the consequence of being embedded in what in the SIF refers to as the 'landscapes of affordances' (e.g. Kiverstein and Rietveld 2012; Bruineberg and Rietveld 2014). The concept of the landscape of affordances in intended to capture the deep

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[63] Of course, there are numerous ways one can conceive of how the timescales of action should be carved up. See Loaiza, Trsmundi, and Steffensen (2020) for a comprehensive account well aligned with the perspective developed here, but with a different set of heuristics, a "specification hierarchy" (Salthe 1991), as opposed to the scalar hierarchy adopted here.

entanglement of available affordances. One does not ever encounter a totally distinct isolated affordance. As Bruineberg and Rietveld (2014, p.3) put it

> The affordances of places (libraries, restaurants, etc.) typically constrain behaviour over a longer timescale, while the affordances of objects nested in such a place, say the door to the library's reading room, typically constrain behaviour on a shorter timescale. Such place-affordances (the affordances of say, university libraries, railway stations, supermarkets, swimming pools or restaurants) are the contexts in which many of our activities unfold.

And so, when tending towards optimal grip, one is always mediating between the demands of multiple timescales. Or, as Bruineberg and Rietveld suggest, "The nestedness of the landscape of affordances … helps the organism to gain a grip on multiple relevant affordances simultaneously" (2014, p.4). An illustrative example of this might be the experience of walking with someone into a religious or library setting whilst having a conversation, where the norms of the setting itself demand quietness. Walking towards the building, one is sensitive to the affordances that support walking and the affordances of the conversation itself. In approaching the entrance, and transitioning from the longer timescale affordances of the street outside to the interior of the building, a progressive diminishing in the volume of vocal exchanges is undergone, until a volume reflecting an optimal grip on the appropriate conversational levels is achieved. The skilful unfolding of such situations depends upon a multiscale responsiveness whereby "interacting action-readiness patterns at multiple timescales contribute to the organism's selective openness to relevant affordances" (Bruineberg and Rietveld, 2014, p.1). Indeed, temporality is a feature of the affordance. Gastelum, working mostly within the SIF, is proposing that the temporal experience of any activity is a consequence of being attuned to this multiscale organisation. As she puts it, "we do not perceive "time" as an abstraction, but only experience the temporal structure of affordances and events" (2018, p.271).

As a quick aside, the places that offer groups of related affordances are sometimes referred to as *behaviour settings,* e.g. a library, a church, a classroom, a toilet, and so on (see Heft 2001, or McGann 2014). The affordances of such places become particularly valuable when social interaction is the concern (see Chap. 8).

Importantly, within the SIF, affordances at various timescales are co-determining such that responding to solicitations at one scale has consequences for the other scales too, in both directions. In van Dijk and Rietveld's words, "being responsive to the small scale allows the larger scale to keep inviting. Conversely, being … responsive to the larger scale, small scale activities are invited in terms of it" (2018, p.13). Thus, one gets a sense of how, for instance, a project at a longer timescale can shape the situational readiness of the actor over and above what the affordances pertaining to their immediate activities are capable of, and how those longer

timescales might be reorganised by something happening in the here and now (see van Dijk and Rietveld 2018 for discussion of how this relates to the practice of architecture).

There is an interesting tension here, one that reaffirms the need for the compatibilist account. Without the autonomy characteristic of habitual organisations it's difficult to see how tensions can emerge between patterns at different timescales, something that seems readily apparent in our experience, e.g. the tensions between one's smoking habit and one's identity as someone who lives a healthy lifestyle. Given that tending towards an optimal grip pertains to the situation writ large, one might expect to be always achieving some sort of middle ground, but this is obviously not always the case. Sometimes the norms of the smoking habit are satisfied in the fullest fashion possible with little regard for the healthy lifestyle. On the other hand, there are also occasions where we seem to experience solicitations over and above that which we have previously habituated at any timescale, possibly even as a resolution to some tensions. In other words, tending towards optimal grip, solicitations can reach from outside any habits as they presently exist, supporting the emergence of new habits and the abilities that reflect them. Such compatibilities prove essential to the account of enhabiting later.

6.3.4 Environment

In *Sensorimotor Life* (Di Paolo, Buhrmann, and Barandiaran 2017)*,* the notion of affordances is not developed in any technical sense. Nevertheless, they do speak about, "The world", as "a constitutive part of any instance of sensorimotor coordination" (Di Paolo et al. 2017, p.105), or about "dynamical mechanisms that allow environmental conditions to "call for," or resonate with, certain sensorimotor schemes" (ibid, p.102). For Kirchhoff, the lack of concrete enactive vocabulary concerning the 'world' is a consequence of enaction's focus on self-production, which aims at describing processes of system self-maintenance from within the system itself (Kirchhoff 2018). As he puts it, within enaction the "explanatory relation between living systems and the environment" takes "an internalist form, reducing the role of the environment in homeostasis" (Kirchhoff 2018, p.3). But this 'internalism' is also a fundamental tenet of the enactivist perspective, for it highlights that the world 'out there' is one about which our knowledge is enacted, and that we cannot but encounter it through our own individual histories of relating to it (even if we can do good science[64]). Given the centrality of this edict to the enactive position, the humble umwelt often appears the only environment of import, and affordance but a handy term that affords description to certain aspects of experience.

The SIF, by centering the notion of tending towards optimal grip, places the regulatory load at the intersection of environment and embodied subject, suggesting that the developmental aim

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[64] See Cummins 2020 for a compelling presentation of the inescapability of this epistemic framing.

of the organism-environment system is to grow in synergy over time. Of course, this necessitates that there is something for the embodied entity to synergise with. As Baggs writes, "To understand the animal's behaviour ... we must first understand what the animal's behaviour is directed towards … Having an account of structure in the environment is important because it provides a basis for understanding how an animal performs a particular task" (2018, p.396). This ecological position reflects what Kirchhoff (2018) calls an 'externalist causal-explanatory relation". The externalist position is concerned with explaining self-preservation, which emphasises the adaptive relationship between a changing environment and a changing organism. It builds upon Friston's account of the free energy principle (FEP), which proposes that the "structural and functional organisation" of a living system "is maintained by causal structure in the environment" and that "the hierarchical [statistical] structure of our brains is transcribed from causal [statistical] hierarchies in the environment" (Friston and Stephan 2007, p. 418; taken from Kirchoff 2018).

Here, the habitat plays a much more explicit role than in the enactive account. In any FEP account, the 'job' of the organism is to achieve and or maintain a "maximal fit between their probabilistic models and environmental niche via embodied activity", sometimes referred as active inference (Friston et al. 2012; or more recently, enactive inference — see Ramstead et al. 2019). Basically, this suggests that organisms act in ways that minimise surprise (which is a measure of free energy), by actively taking part in their environment so as to produce sensory dynamics that align with what they anticipate to be the external causes of those dynamics. Such alignments are spoken about in the SIF in terms of tending towards an optimal grip. Thus, a kind of pervasive norm guiding the activity of the embodied subject is to progressively align with the structures of the habitat. Any environment will, of course, be rich enough that there will be many well aligned structures.

Here again, the value in the compatibilist approach is apparent. Without a structured umwelt structure in the habitat means nothing, but without structure in the habitat a structured umwelt cannot evolve or be sustained. Occupying one perspective and then the other is a little like switching between the different aspects of an optical illusion in which one can only really appreciate one or another image at a time, despite knowing that both are available to perception. In one aspect I have in mind an environment about which I can say very little outside of my experience, in the other I must acknowledge the environment as limiting and shaping the experience about which I can say anything at all.

6.3.5 Identity and normativity

This section highlights some inconsistencies with the above accounts that turn on many of the distinctions already made. These will be central to the positive account that follows and point to the necessity of a compatibilist account.

Sense-making describes regulatory activities that support the ongoing individuation of autonomous organisations, be they autopoietic or habitual. However, understood as describing the self-*maintenance* of autonomous structures, it runs into trouble, the core trouble in the relational account of affordances also. Namely, we do not just *maintain* existing structures, but bring about novel ones also. The sense-making that supports the maintenance of autonomous organisations requires an existing 'identity' to maintain, but it does not account for the emergence of such identities in the first place. Di Paolo does suggest at one point that sense-making is involved in the 'construction' of 'frames' (2018, p. 36). But this is not the traditionally held position, nor is there presently any account that addresses this process in a way that overcomes the limitations elaborated herein. The production of an identity is somewhat different than its reproduction. To apply a single term to both without significant qualification is not very helpful. Neither is it to apply a term initially proffered to explain the maintenance of life to the maintenance of ways-of-life. Similar points have been made elsewhere. Beaton asks, "how can non-sense ever become sense for us, if perception only ever presents the world within the existing structures of our understanding?" (Beaton 2014, p.153). Or, Weinbaum and Veitas (2017) write that enactivists, "treat closure as an ideal point that delineates the existence of the individual in time, and … only from such a point and on sense-making is possible" (2017, p.382). The latter, looking to Simondon, shift their focus from the individual as their primary ontological category, in which the "genesis of individuals is merely the manner by which one individual transitions into another" and to the processes of individuation, what they describe as "the formation or becoming of individuals" (ibid, p.376). In part two, a similar move is suggested as necessary when thinking about the coming into being of identities of the habit variety also[65].

The recent *equilibration* account also recognises something of this need. Di Paolo, Buhrmann, and Barandiaran (2017) synthesis an account of the "sensorimotor body" wherein sense-making takes on a broader characterisation, more in line with the criticisms above, even if not explicitly. They suggest "Enactivism is concerned with explaining precisely these critical transitions between particular conditions that sometimes afford different functional descriptions and those "in-between" dynamics that (re)constitute these or novel conditions" (Di Polo et al. 2017, p.27). However, when isolated their account suffers. Di Paolo et al. write that, "Equilibration does not assume a "functional" source of normativity guiding adaptive change ..." and wants to account for all change in terms of the "stability of individual schemes, along with their holistic coherence in

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[65] In recognising this limitation, that "we tend to treat bodies more or less as givens, as starting points …" (2019, p.2), Di Paolo has also recently aligned the Simondonian perspective with enaction. However, his efforts are conducted in a purely enactivist manner and take a different line than the one taken here. This emerging engagement with Simondon is a promising one for radical embodied cognitive science and, given the richness and originality of Simondon's thought, is sure to be productive.

the sensorimotor repertoire" (2017, p.104). However, tending towards optimal grip seems to reflect just such a source, and as will be observed below, when combined with the "stability of individual schemes" and their 'holistic coherence', can provide for an account of the individuation of novel habits in a way that avoids the limitations of existing approaches.

There is an oddity within the SIF also. The SIF borrows from Varela et al. and speaks about normativity, at least in part, as an upshot of identity preservation. For instance, they write that "Autonomous systems ... have purposes of their own that arise out of the struggle to sustain their identity through the regulation of their coupling with the environment. They have an individuality and identity, and based on this identity they are differentially sensitive to an environment of things that matter to them and are thus meaningful and valuable" (Kiverstein & Rietveld 2018, p.151). However, identity preservation here refers only to the biochemically individuated entity, and it does so despite their implications otherwise. They evoke the limitations spoken about earlier (and in the previous chapter), suggesting that the normativity governing cognitive systems and that governing life are not straightforwardly equivalent. They also recognise that any living human system, during its life, will produce and sustain multiple identities (Kiverstein & Rietveld 2018, p.152). Despite momentarily recognising that such identities can include "patterns of sensorimotor behaviour [that] can quite literally take on a life of their own", they nevertheless reaffirm the position that they "interpret the enactivist concept of 'identity' to refer to the biological organisation of an individual that is maintained over time through material and energetic exchanges with the environment" (2018, p.152). But it is hard to see where the former of these insights, relating to autonomous "patterns of sensorimotor behaviour" are integrated into the SIF. Indeed, it seems they cannot be without recognising that abilities are underpinned by autonomously organised habitual organisations with their own self-generating norms.

The proposed solution to the above issues is to argue for a compatibilist approach. Autonomous habitual structures supply the norms for the bulk of the self-maintenance, and it makes sense to think in such terms when thinking about the ongoing reproduction of the umwelt. But tending towards "an overall grip on the situation"[66] (Kiverstein 2019, p.2859) can supply a

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[66] The notion of tending towards optimal grip may strike one as something of a deus ex machina in this context, attempting to explain the resolution of tensions into novel organisation with something of a poorly specified 'mechanism'. I have some sympathy with this concern, but for now I will simply say this. It is not entirely clear to me at this point how well enactive accounts focused on autonomy and accounts that lean on the FEP ultimately play together, but that our experience reflects a general tendency towards optimal grip over and above the normative dimensions of our existing habits does seem apparent. Thus, the notion of tending towards optimal grip at the very least, has some heuristic value. That said, my feeling is that the tension between these concepts reflects a larger theoretical tension between the theories within which these concepts are typically embedded, i.e. between accounts that center operational closure and those that center thermodynamic openness. Enactive approaches, as we know, tend to build their ideas with notions of operational closure center of mind (even if acknowledging the necessity of thermodynamic openness, e.g. Di Paolo et al. 2017, p.115), more ecological leaning accounts tend to center notions of thermodynamic openness, even if sometimes acknowledging the role of operational closure (e.g. Chemero 2009, Kiverstein and Rietveld 2018). In

more general norm when existing norms will not do. This tendency enables one to pick up information that supports the production of habitual organisations, establishing novel interdependencies between bodily structures and structures in the habitat, transforming the umwelt in the process. In part two, such compatibilities support an account of the individuation of novel habitual organisations and the relational affordances they embed.

One can get a clearer sense for the various normative dimensions at work here when they conflict. When, for example, you find yourself acting out a habit that is not at all well attuned to the situation, a kind of misfire: you keep entering your old password when logging in to your account; you go to the bathroom to use the toilet and find yourself suddenly brushing your teeth, or you go to the bathroom to brush your teeth and suddenly find yourself having to use the toilet, again etc. I recall a situation where I was once waiting for an elevator and when the doors opened, I earnestly greeted the passenger who was exiting with, "Hello, come in, come in". Of course, I quickly passed it off as a witty remark, realising my error. Thus, there is a kind of overdetermination by the norms of some habitual organisation with respect to the dynamics of the overall situation. A compatibilist approach suggests that situational demands and the demands of self-production of autonomous organisations are constantly being negotiated. Both the quality of the fit between agent and environment, and the ongoing reproduction of existing habits, are always on the table. The next part of this chapter suggests that the compatibilities outlined up to this point open the way for an account of individuation of novel habits and the relational affordances they embed.

Part 2

Enhabiting provides an account of the individuation of relatively invariant patterns of body-environment relations through the emergence of interdependencies between bodily structures and structures in the habitat. From a compatibilist perspective, this is the set of processes by which features of the habitat of a species shape transformations of the umwelt of a particular individual. This account of enhabiting takes inspiration from the Simondonian account of individuation.

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accounting for the individuation of novel habitual organisations, it seems one cannot, ultimately, ignore either perspective. The notion of tending towards optimal grip then, is used here as something of a placeholder, reflecting the dimensions of thermodynamic openness relevant to the individuation of novel habitual forms, but not yet well developed in the relevant literature so as to constitute a 'mechanism'. What this mechanism must ultimately account for is the means by which the system can maintain a kind of situational metastability, very much along the lines of the Simondonian account (see section 6.4 below), that enables the resolution of tensions into novel forms. The notions of hesitation and symmetry breaking might be informative here (see section 6.5.3), as might the notion of self-organised criticality (see Chap. 4). There is ongoing work that explicitly takes itself to be working in the generative space between these two theoretical positions (i.e. operational closure and thermodynamic openness), e.g. Montevil and Mossio (2015), Woermann (2016), Loaiza et al. (2020). Although there is not time or space to develop the relevant histories herein, or work a sophisticated understanding of the insights of such positions into the present account, the compatibilist account under development here can be taken to be allied with such positions. Beyond this thesis, the thinking developed herein will pursue such generative tensions and their relevance for a compatibilist cognitive science more wholeheartedly.

6.4 Simondon

Simondon's philosophy of individuation takes on the question of becoming at the level of individual entities (physiochemical, biological, psychological, social). How do individuals both come into being, and maintain their being thereafter? How do the boundaries and distinctions that characterise the individual take hold without any individual preceding them? Simondon starts with the supposition that what is primary is not the individual but the processes of individuation. Any 'individual' is something like a time slice of those processes. Writing about Simondon's approach, Weinbaum and Veitas suggest that, "For him, the individual is a metastable phase within a continuous process of transformation ..." (2017, p.377). The 'individual' then, is an abstraction from the primary reality that entails ongoing processes of individuation. Giving some indication as to what this process might entail, Simondon himself writes, "Individuation must ... be thought of as a partial and relative resolution manifested in a system that contains latent potentials and harbours a certain incompatibility within itself ..." (Simondon 1992, p.300). The 'individual' does move through what are relatively stable (or metastable) states, but it is fundamentally plastic and periodically going through periods of heightened transformation that reorganise tensions active within the individual (Weinbaum and Veitas 2017, p.377). Technical features of Simondon's account have already been mentioned. It will be necessary to disambiguate the core features here before putting them to use.

The first feature is *metastability*. The term, as has been described previously, comes from dynamical systems theory, and describes systems that are relatively stable but not occupying any one deep well of attraction. Engstrøm and Kelso describe a metastable system as one in which "no stable or unstable fixed points remain, yet dynamical remnants of attractor~repellors linger, giving rise to a dynamical flow ... (2008, p.4). Simondon's use reflects such a definition quite well, although it has its own emphasis. Combes, describing Simondon's use of the term, speaks about a physical system being "in metastable equilibrium ... when the least modification to the parameters of the system (pressure, temperature, etc.) is sufficient to break the equilibrium of the system" (2012, p.11). An example of a basic system in a metastable state is a wobbling bowling pin, which although kind of stable, might just as likely tip over as come back to standing, depending on the slightest change in conditions. Weinbaum and Veitas (2017) also offer the illustrative example of two people engaged in an argument, suggesting something also about the application of such notions to social systems too. One can recognise from such examples, a degree of tension is necessary for a system to maintain metastability. Indeed, any such system necessarily harbours potentials that are effectively incompatible. Metastability is ongoing if the system has not exhausted these potentials, e.g. the bowling pin has not come to rest, the argument has not died out.

A second feature of Simondon's account is the notion of intensive differences. Intensive differences (or intensities) are effectively the drivers of individuation. They are "energetic differences that drive structural and state changes in a system" (Weinbaum and Veitas 2017, p.376). In the example of the argument the intensities can include each interactant's personal convictions. These concerns animate the metastable system, potentially leading to the breakdown, but also potentially resulting in *consensual structure*. If they find a point of commonality, or if one is convinced by the other, there is a *determination* of consensual structure in the form of a shared understanding, e.g. an agreed upon solution and a momentary relaxation of intensities. Weinbaum and Veitas write that these "intensities are correlated to the measure of metastability and level of structural changes taking place in the system. Low intensities are associated with relatively more stable dynamics, while high intensities are associated with volatile dynamics and swift structural changes" (ibid, p.377 - 8). In other words, if there is no tension, there are no drivers of individuation present, and metastability is unlikely to emerge. Equally, if tensions are too severe, the determination of consensual structure is less likely, or will be much more dramatic. Most individuation proceeds within the sweet spot of low intensities[67].

Intensive differences arise within the context of a *problematic*. In the argument example the problematic might be a work situation where the interactants need to coordinate on a project. Differing views on how best to approach it comprise the intensities that drive individuation, ultimately leading to some emergent consensual structure in the form of a shared plan. As Weinbaum and Veitas put it "individuation of systems in general always starts from a situation of disparity. It takes place in the course of gradually establishing a coordinated exchange of signals among gradually differentiating elements that together bring forth a system" (ibid, p.378). In this fashion the system individuates and acquires an identity of its own, resulting from the coherence that has emerged between the involved agents. At any time, the system includes both consensual structures, comprising its previously individuated aspect, and ongoing intensities that drive future processes of individuation and either reproduce the previously achieved consensus or lead to its breakdown. These latent potentials, these unresolved intensities, Simondon refers to as the *preindividual* elements in a system.

Any determination is highly dependent on its context and is in fact a co-determination between structural and behavioural aspects of the elements involved. The ongoing individuation of a persisting entity entails a trail of progressive determinations, a process referred to as *transduction*. For Simondon this is a very general characterisation and is taken to hold across

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[67] The notion of tending towards optimal grip might be comparable to the Simondonian account of individuation to occupying the space of low intensities. It may be the case that our thermodynamic efficiency is optimised at the point of low intensities, and thus we have adapted to optimise our behaviour by being sensitive to maintaining this variable, experienced as an 'optimal grip'.

domains, from the physiochemical to the social, in any of which it demands more specific description. However, there is a general logic at work here worth spelling out. The process of transduction describes a chain of operations on structures with each operation serving as a transformation of one structure into another, and every structure mediating between one operation and the next. Structure and operation (e.g. behaviour) thus have a co-constraining effect: structure enabling the operation that might follow from it and behaviour enabling the (re)production of structural coherence. Transduction can start off quite messy and random, but as it progresses invariants emerge such that "sets of structures and operations become mutually bounded", and an "individuated entity arises which may either further consolidate or eventually disintegrate" (Weinbaum and Veitas 2017, p.379). Such entities, one might notice, have much in common with the autonomous habitual structures of a radically embodied account, in which the organisation enables behaviours that in turn enable the reproduction of the organisation.

6.4.1   Autonomy and the pre-individual

Di Paolo has acknowledged the importance of the Simondonian perspective for enaction, writing that it "makes explicit the material conditions of autonomy and introduces new elements for enactivism such as the notion of pre-individual criticality as inherent in the living body" (2016, p.14). Integrating certain ideas from this account with the notions of autonomy, sense-making — ideas that are "only implicit in Simondon" (ibid) — and tending towards optimal grip, the notion of *enhabiting* is introduced: a compatibilist account of the individuation of the novel habitual structures that comprise the umwelt, one that retains a strong appreciation for the role of habitat (as a source of preindividual potential) in its production, reproduction and transformation. As such the notion of enhabiting is a metatheoretical concept. Straddling frameworks that each have different starting points, it invites us into a somewhat liminal space that is sensitive both to the umwelt and the habitat, and focuses attention on the point at which the former is transformed within the latter. It, you might say, provides a metastable perspective from which to inquire into the dynamics of habituation and the emergence of relational affordances.

6.5   Enhabiting proper

What the basic account suggests is that in situationally tending towards an optimal grip one is also sense-making at multiple timescales simultaneously and thus acting according to the self-generating norms of multiple relevant habitual organisations. However, intensities can arise between existing organisations at various timescales and situational demands, manifesting tensions with no practiced path toward reduction. Tending towards optimal grip, if the situation can be held as metastable (a kind of momentary hesitation in responding and embracing of dissonance or uncertainty), and does not simply 'breakdown' and default to existing habitual

organisations, novel interdependencies can emerge between bodily structures and the structures in the habitat which thereafter form the basis for new habits and habit networks. In other words, resolution of these tensions can result in the emergence of novel autonomous ecobehavioural entities (what Simondon might characterise as the 'consensual structures') with their own normative dimensions. And so, novel habits emerge from the preindividual potentials that exist between bodily structures and the dispositional affordances that comprise one's habitat. This event in which novel habits emerge or existing ones are transformed (or reinforced) is referred to in terms of enhabiting.

6.5.1   Example: seeding a habit

Enhabiting is ongoing all the time to varying degrees. There is, however, a scale of description that offers a window onto these processes as they apply to our everyday experience. Before developing these examples however, it is important to prefigure them with the recognition that when one applies this as a lens through which to make sense of our everyday experience we are attempting to establish continuities between the domain of theoretical biology, in which these ideas can be more formally worked out, and into what is effectively the domain of folk psychology. Herein, the attempt is to develop accounts that help make intelligible the unfolding of everyday experience from the perspective of one who is concerned with such unfoldings, and hopefully, do so in a way that does justice to their unfolding within biochemically instantiated entities in reciprocal exchange with their environment[68]. The following discussion, and indeed, the discussions that follow from it in this and subsequent chapters, are discussions in which assertions of an apparently objective nature are always done so 'in brackets', to borrow Maturana's term, and are always posited *as if* the rest of the world were able to be held stable, and *as if* our concepts might reliably map to mind independent features in the world.

The first example developed here is of you attempting to develop a consistent exercise routine. This type of example is chosen for some very specific reasons. Firstly, those actively and consciously engaged in the processes of behavioural change have recognised some basic regularities within the processes themselves, and some guiding principles that make the stabilisation of novel trajectories of action more probable have emerged (e.g. Fogg 2019). It so happens that they parallel the Simondonian accounts of individuation quite well. A couple of

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[68] One might say that the recognition of any pattern as an invariant autonomous organisation better reflects an invariant pattern of perception in the observer. And indeed, at least in some instances, this is of course true. But even if true, it is still the recognition of invariance (in the perceptual system as an observer) in the organisation of human living, and one still needs some organising dynamics to account for this. In other words, when one reliably posits the existence of a habit, it may simply be a habit of perception to do so, but either way one needs to account for habitual organising dynamics organising the activities of embodied subjects, whether the habit of the observed or the habit of the observer. Of course, it is necessary to recognise this to maintain our epistemic humility, but it is also just as necessary to cut it off at a certain point, or it becomes mind-bendingly recursive, for one begins to recognise their attribution of autonomous dynamics to the habits of everyday experience as dependent upon autonomous dynamics organising their perceptual experience, which are themselves attributions … and so on, ad infinitum.

stereotypical examples of change efforts are outlined and compared. The differences in the efficacy of approaches can help illustrate the details of enhabiting. What might be recognised as the typically more successful approach better approximates the conditions laid out by Simondon as important to the individuation of novel forms.

Lastly, when actively pursuing a behaviour change, a kind of meta-normative dimension emerges that works as a kind of implicit problematic (to use Simondon's term) coordinating the various components of the system under change. As such, at least for the purposes of an illustrative example, it offers a more circumscribed set of relevant processes that need to be included in the description, and thus a good starting point (the more 'natural' example of 'enhabiting the pressure passer' below is necessarily more expansive). Di Paolo has recently suggested that something that is missing from an enactive account is a "detailed look at the existential structure of becoming in conjunction with an operational/theoretical description of its relevant processes" (Di Paolo 2020, p.3). What is provided here aims at precisely such an effort[69].

You habitually display a set of activities that reflect a personal identity that might be named 'healthy person'. Although you have not previously maintained a consistent exercise routine, you find yourself curious about the possibility, though tending to give yourself justifications for why you are not exploring it whenever the opportunity arises: you 'haven't got the right space', the 'right equipment', the 'time to get to a gym' etc. Then, you move into a new house in which your new housemate exercises regularly with some gym equipment in the basement and tells you that you are welcome to join. Now you are resourced with everything you would need to engage the practice. You decide to join her with the ardent commitment that you are going to take it very seriously, envisioning yourself a competent exerciser within no time. However, within a couple of days of exercising one hour per day, you find yourself making excuses, and within the week have fallen off entirely. Your experience is not one of optimal grip, but of wild deviations from optimal. But from what are you deviating? What is producing the dissatunement that now calls for some action or set of actions to bring about its reduction, ultimately leading to the abandonment of the practice?

A necessary starting point is the recognition that herein multiple existing habituated autonomous organisations are giving rise to a host of norms shaping your activities across levels of organisation and timescales. Of course, in reality, the ecology of relevant habitual structures

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[69] Such examples reflect an understanding derived from number of autoethnographic efforts (both successful and unsuccessful), familiarity with both popular and academic literatures pertaining to behaviour change and frameworks for change, and my own developments towards a systematised practice for behaviour change I refer to as Ecobehavioural Design (2019). However, in this context these examples are not intended to be anything other than illustrative of the individuation of novel habitual organisations at multiple timescales, wherein, inspired by the Simondonian account of individuation, the dynamics that more reliably support the emergence of novel invariant patterns in individual behaviour can be made intelligible through the compatibilist understanding being developed.

will be impossible to define and disambiguate. Nevertheless, there are some reasonably clear invariant patterns that suggest a degree of autonomy that can be abstracted and used as lenses through which to discern some of the primary normative dimensions of the situation. At shorter timescales, norms embedded with habits and habit schemes that pertain to the avoidance of pain, the navigation of the gym equipment and the coordination limbs, muscles and breathing patterns in novel ways; at longer timescales, norms embedded within micro-identities of being efficient in your actions so as to get to work on time and within personal identities that might be described as "efficient learner". The experience of optimal grip in part relates to one's actions being concordant with such norms across timescales. Another way of saying this is that one is satisfying the self-generated norms of the autonomous organisations presently enacted by acting within the boundaries of viability they supply. However, rarely are norms across all timescales perfectly synergistic within a given situation, and particularly in novel situations such as this. What is more common, and is the case here, are incompatibilities of varying degrees between situational demands and the self-generated norms of autonomous organisations at varying timescale.

Initially, your grip on the situation maintains a kind of optimality, for you are satisfying the various norms constraining your action: variables relating to the experience of pain are all within viability, sensorimotor the same, you have plenty of time before having to leave for work, and you appear to be successfully enacting your identity as an efficient learner. Such an experience is likely to generate a deep sense of being well located. However, before long, simply exercising — say, for instance, you have started out on a rowing machine — proves to be something of a chore, and deviations from optimal abound, limits of viability are breached, and the self-regulatory norms that aim at some prior homeorhesis now animate you. You feel pain in your back and something in the way you are bending your knee feels off, but you do not appear to be able to negate such dissatunements regardless of your adjustments. The warmup program in the machine proves difficult to follow and you start to think that you are truly awful at exercising. All of this seems somehow incompatible with your identity as an efficient learner, and you start to question yourself. By day three you have bailed because you have "too much on at present to give it the time it deserves".

In Simondonian inspired terms, the situation of committing to a practice one has not done before with the specific intention of bringing about a change represents a problematic (a task constraint that helps coordinate the components in the system), and the norms of existing relevant autonomous organisations at various timescales (e.g. tendencies to avoid pain, identities as someone who gets to work on time and is an efficient learner) and the structures that support them comprise the intensities. These intensities are pregnant with preindividual potentials, and under this problematic can either lead to the breakdown of the system and its reorganisation into some

previous configuration (as in the above example in which you abandon the practice), or, to the enhabiting of some novel autonomous organisation if the system can maintain metastability. In the example thus far, the former is a more apt description. Intensities are simply too pronounced, and thus the system defaults to some pre-existing habitual organisation.

This stereotypical example of a failed effort towards behaviour change can now be compared with an example guided by a core principle of successful behaviour change as championed by B.J. Fogg, the founder of Stanford's *Behavior Design Lab*[70]. The principle is basically this, if you want to develop a new habit, make it small (Fogg & Euchner 2019; Fogg 2019; Lieber 2016; Al Marshedi et al. 2016; Olt & Szasz 2019). It's important to say here that the 'habit' that eventually emerges as the micro-identity that might be described in terms of one's exercise routine, is not at all straightforwardly equivalent to habits as understood by Fogg. The equivalence is rather one in which a new trajectory or set of invariances in one's action is stabilised. Fogg would likely refer to this as a habit. In the language developed here, however, this new trajectory reflects a multi-scale ecology of inter-regulatory habits that acquire some degree of coherence and closure. The present account is not intended as advice on how to change behaviour (though it may be informative to such practices), and Fogg's work is leaned on only as an orienting device.

Imagine instead of taking the above approach, you commit to exercising for a couple of minutes every day for the first week, increasing each week thereafter for five minutes until you reach a practice time you are happy with. Besides the length of time you have allotted for practice, the same norms are operative. This time, however, norms embedded in habits relating to pain and discomfort are maintained mostly within viability, except for some slight tensions in your back; there is a newness to the sensorimotor coordinations the exercise demands, but nothing too strange; you have plenty of time before having to leave for work; and, you are acting from comfortably within your identity as an efficient learner. Under these constraints, although by two minutes you are experiencing some slight dissatunements and you have a distinct sense of being a 'beginner', it is nothing greatly outside of what you might have anticipated. Within a couple of days, the routine generates no feelings of dissatunement whatsoever, and a host of novel relational affordances pertaining to the various aspects of the practice are available that previously were not. Moreover, encouraged by the experience, the practice begins to solicit as a general course of action, and you find yourself looking forward to the slight increase in time each week.

In this example, and one might speculate, what undergirds the success and attendant popularity of Fogg's "tiny habits" method to behaviour change, the problematic is one in which low

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[70] Fogg refers to this basic approach to behaviour change in terms of 'tiny habits'. If one were to doubt the efficacy of Fogg's approach, it's worth noting that so many luminaries of the present tech world who have got us addicted to our networked devices are graduates of his lab (Leslie 2016). Something Fogg himself expresses some remorse over.

intensities at multiple scales prevail. Relatively low intensities are, as previously noted, associated with more metastable dynamics, and so the experience of optimal grip can be somewhat retained even when not acting strictly according to the norms of existing autonomous organisations. In other words, although the norms of some existing autonomous organisations are deviated from, such deviations are slight enough that the system does not fall back into some previously sedimented stability. Here, an opening is found. One in which novel interdependencies between bodily and environmental structures can stabilise, enhabiting novel habits with their own self-maintaining norms. Tending towards optimal grip, a new ecology of related habits has been stabilised and carries your activity through a particular course of action for a particular period of time, allowing you to make sense of the ongoings therein by providing a normative background for the ongoing interaction, and allowing you to adequately anticipate some set of contingencies likely to arise.

Enhabiting emphasises a kind of transformation in which dispositional affordances in the habitat of a particular species enable the emergence of relational affordances in the umwelt of a particular individual. It is the mutual bounding of structure and operation resulting from action that transforms or reinforces existing habits or leads to new ones. The sensorimotor (or affective, or linguistic) constitution of habit structures at multiple timescales, orchestrated by the tendency towards optimal grip. It is the process, from within a compatibilist perspective, by which an "individuated entity arises which may either further consolidate or eventually disintegrate" (Weinbaum and Veitas 2017, p.379). The Simondonian notion of determination most closely resembles the notion of enhabiting as developed here. However, given the precariarity of habits and their tendency to dissipate without reinforcement, enhabiting is intended to capture something of the notion of transduction also, in which a given structure can be more robustly individuated with successive determinations. Thus, we can speak about enhabiting in terms of degree, suggesting something about the degree of closure a given habit has acquired through repetition. In other words, habits may start out as minimally autonomous systems, with poorly defined boundaries and so on, progressing towards greater degrees of autonomy with time and repetition, becoming more clearly articulated, more obdurate, and more trans-situational. Think of how the exercise habits of the beginner will be precarious, fragile, and dependent upon an ecology of supporting habits, whereas the habits of the long-time exerciser, who has personal-identities consolidated around such practices, will be much less dependent upon the enabling constraints of one particular environment (though they remain part of a larger ecology mediated by particular environmental structures). At such levels of organisation an interesting dynamic is present, whereby the endogenous side of the structural coupling begins to take some precedence. The traveling exerciser who carves out a space for their routine upon getting to a new room, and so

on. What has sedimented is a relatively invariant metastable integrated identity that self-organises under the right conditions and animates the embodied subject in ways that tend towards its reproduction. Of course, any such identity is also integrated with the larger whole as a mobile metastable unit in space that "must retain", as Di Paolo et al. put it, "a residue of dynamic criticality without which they would simply be unchangeable automatisms" (2017, p. 102).

It is worth mentioning, the enhabiting of consensual structure, to borrow Simondon's term, will, generally entail processes at shorter timescales being entrained to processes at longer timescales. There is, in other words, typically a temporally hierarchical relation between habitual organisations, with the dynamics of longer timescales (working as a kind of implicit problematic) constraining those at shorter timescales and providing a general direction to the enhabiting of novel habitual structures. Equally, however, though less common, events at very short timescales can reorganise, in an instant, habitual structures at longer timescales. Such experiences can be both challenging and/or rewarding, and the feeling of the ground beneath one's feet shifting pronounced. Moments of deep insight, artistic and creative breakthroughs, realisations around one's identity, spiritual revelations and so on, occupying the more positively valanced side of the spectrum; the loss of a loved one, traumatic events, accidents, diagnosis of deadly disease, having to give up on a dream, and so on, tending to occupy the more negatively valanced side of the spectrum (more on this in Chap. 7). With time, and continually tending towards an optimal grip, the sense of settling into the reintegrated organisations can stabilise, as the norms across various timescales and relevant situations adjust to the novel regime. This general tendency then, is like a grand conductor, integrating forms of autonomous organisation across domains and timescales, from the autonomic to the linguistic. A kind of forcing function for situational systemic coherence, continuously bringing forth new trajectories of becoming. Issues relating to the normative, temporal dimensions of such organisations are elaborated further in the following chapter.

6.5.2 Example: enhabiting the pressure passer

A final example will be helpful, a more 'natural' example in which one is not setting out to make a behavioural change as such. The aim here is to give a better sense for how these processes unfold during everyday life. The example will be the process of enhabiting a 'personal identity' as a Brazilian Jiu-Jitsu (BJJ) practitioner with a particular style.

Within BJJ the permutations of positions and strategies are vast, and the practitioner cannot hope to develop proficiency in them all. This is understood by coaches. Thus, as well as demonstrating technique, their job at longer timescales is one of assisting the coachee in 'finding their game', i.e. the set of proficiencies well suited to their natural attributes. This process of finding and later refining one's game can be viewed through the lens of enhabiting.

When first entering the gym, the 'selective openness' characterising the absolute beginner — given their prior individuation as someone who enters unfamiliar communities of practice — is attuned to solicitations relevant to their immediate concern of finding their place in the group. They will be selectively open to, for instance, hierarchies of authority, permissible and impermissible ways of comporting oneself, sartorial norms, and norms about how to receive instruction. An optimal grip at this point primarily pertains to finding a place from which to take up their position as a learner. Sensitivities to the details of the technique are not yet well developed. However, iteratively responding to solicitations engendered by modes of selective openness, with time, one transcends their identity as an absolute beginner, transitioning to a novice learner. Now, although sensitivities to the norms previously mentioned persist and continue to constrain activity, the acquiring of technique becomes the trainee's primary concern. The dynamics of enhabiting are already at play here. However, the transition from novice learner to pressure passer will help us articulate them in detail, as this provides a more circumscribed set of processes for consideration.

For the first year or so as a novice learner, the typical coaching is to remain as open as possible to all the moves demonstrated. There are many reasons for this: for instance, it gives the novice learner enough time to get a feel for the primary positions and acquire some defensive and offensive options from them (e.g. from the 'back', from the 'mount', from 'side control'); it also gives the learner the opportunity to discover what is well suited to their natural attributes, personality, etc. Thus, at this stage — in broad strokes — one can say that the novice is selectively open to as much technique as possible, reflected, for instance, in their taking notes on *all* the technique demonstrated after each class. Sensitivities at this point tend to be to the coarse-grained dynamics of the movements, analogous to the novice guitar player who moves from one chord to another but is not yet introducing flourishes into their transitions.

For those wishing to progress past the stage of novice learner, this mode of openness becomes somewhat problematic. Spreading their practice time across as much technique as possible, the practitioner can never hope to acquire any real depth of knowledge. By now, however, continually tending towards an optimal grip during practice and in conversations with coaches and training partners, watching instructionals, and watching footage of professional fighters with similar attributes, the learner is developing sensitivities such that a certain 'path' of development solicits, whereby one set of "tensions to be reduced" comprise solicitations of a more encompassing set over longer timescales. This is more commonly spoken about in terms of the emergence of a 'game'.

As a novice learner, the norms of the habitual organisations that maintain the identity of our learner as a capable person are in tension both with his identity as a good student and the existing sensorimotor norms that organise the coordination of his muscles. Tending towards

optimal grip, actions that best satisfy this nest of norms give rise to interdependencies that undergird novel, though, at this stage, relatively diffuse organisations, e.g. the habits, schemes and micro-identities that support basic techniques. Our protagonist is a larger male who lacks the dexterity of his smaller and more athletic training partners. In the process of acquiring basic techniques some have a kind of stickiness which collectively suggest that he can use his weight and size to his advantage by maintaining top position. The stickiness of such positions already reflects previously enhabited structures resulting from the resolution of low-intensities. Working from these positions he is selectively open to opportunities to leverage them further and he begins to identify with them. Encountering the so-called pressure passing style, something like a game, a more integrated network of moves that work well together in a particular situation, begins to solicit. The sense of identification with grows, and the solicitations promise to resolve some lingering tensions. A new set of norms emerge pertaining to the pursuit of a particular path of development. Having the physical attributes that he does, this proves a fruitful path for our learner, and his additional attention to its details leads to increased success in sparring. Now, he is selectively open to what might advance his developmental path further still and thus he becomes differentially sensitive to the affordances that reflect that path, whilst others lose their glow[71].

This implies a multi-scale process, dependent upon both local/situational solicitations, and solicitations at longer timescales. Welcoming completely novel environmental structures into our personal umwelts, or transforming the relations between structures already therein, such moments signal the integration of some previously diffuse or even disparate organisations into more integrated coherent autonomous wholes and can have enduring transformations on what we are selectively open to in any relevant situation. Only in this context do the finer details of our learners 'game' begin to cohere, for now what he is selectively open to has been reduced from every bit of instruction in every class to the instruction that will help develop 'my' game. Here, he is undergoing a more holistic process of individuation, such that a relatively invariant domain specific autonomous whole emerges — a personal identity — with its own self-regulating norms and dynamics of selective openness, i.e. me as a pressure passer.

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[71] Being animated so has the effect of engendering a selective openness in how one enacts their world, meaning that they will be open to certain environmental features whilst appearing to dampen any potential influence of others; potentially even making sensitivities to environmental features that do not serve their self-generated norms difficult or even impossible. The pressure passer, for instance, experiencing strong identifications with other pressure passers and receptive to participating with them, whilst being veritably insensible to someone extolling the virtues of the 'leg lock' game and maintaining strong distinctions in relationship to them. Infants, from as early as five months old (Marno et al. 2016), selectively attend to utterances from native speakers of their language, even showing a preference for learning from such speakers, suggesting a possible inhibitory effect mediating their response to non-native speakers.

What is being described are nested processes of enhabiting at multiple timescales in the context of a set of evolving and overlapping concerns[72]. To enhabit then, is to individuate, it is to construct through iterative processes of tending towards an optimal grip, identities that we not only bring into being through our activities, but identities we thereafter live within. In enhabiting, by manifesting novel structural interdependencies between body and environment, we transform impersonal potentialities into meaningful relations through which we make sense of our on-going experience.

6.5.3 Hesitation and symmetry breaking

Although there is not adequate space to develop them properly, there are a couple of promising ideas that might help deepen an understanding of enhabiting. The first is the Bergsonian notion of *hesitation,* particularly as it has been revived within critical phenomenology (e.g. Al-Saji 2014, 2018). Alia Al-Saji has been central in this effort, applying it to an understanding of interrupting racializing habits of perception. However, it can be applied more broadly too. In short, hesitation simply points to the "temporality and space required to interrupt habitual patterns of perception" (Dolezal and Petherbridge 2017, p.7). Precisely such an interruption is necessary if novel interdependencies between bodily and sociomaterial structures are to stabilise. Reflecting the dynamics of enhabiting articulated above, in which existing habits are not adequate to the task, Al-Saji (2014, p.155) writes the following.

> These are events for which we cannot account from within our instituted system of meaning — events that reveal, if we are open to them, the fractures in the coherence of the visual field. There are two ways of responding to such events: by maintaining the normative organization of the field and refusing to see them, or by receptively allowing an event to insinuate itself into our vision as the dimension according to which the visual field is restructured—thus changing how we see.

Although Al-Saji refers solely to the visual field here, there is no principled reason why this precise understanding may not be applied to the processes of habituation more generally. When we hesitate, we allow "the time both for a situation to be undergone and affectively registered and for marginal self-awareness, searching, and recollection to take place" (Al-Saji 2014, p.146). What results, according to Al-Saji, is an 'opening', which must be "*taken up* for new possibility to be created" (ibid p.149). In the present account, it is precisely by tending towards optimal grip on the overall situation that we allow for this hesitation and thus resist the overdetermination of the situation by falling back on existing habitual structures. Therein, we can 'take up' (or 'enhabit') new

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[72] Importantly, these processes extend beyond the bounds of the gym and might also emerge during anticipatory acts, for instance, acts of thinking, imagination, languaging, e.g. when rehearsing particular moves and sequences of moves when lying in bed; or talking with a peer about the various aspects of ones 'game'.

relationships that reflect new routes, modes, and patterns of being, thus becoming "responsive to what … (we have) … been unable to see" (ibid, p.147).

A second notion is the idea of *symmetry breaking,* which comes from the maths of pattern formation, and abstractly describes a process in which order emerges in physical systems. For mathematicians, the degree of symmetry in a system is the degree of invariance present in that system under transformation. The more transformations that can be made that leave it looking unchanged, so-called s*ymmetry operations,* the greater the symmetry (Ball 2009, p.20).

Consider a perfect sphere. The sphere can be rotated indefinitely upon its axis without variance. Moreover, reflections across its axis, in which one side is mirrored back upon the other, are also infinite. It has an infinite number of transformations without change under the operations specified here, and thus has high symmetry. Contrast this with a five-sided star, which has only five rotations and five reflections across its axis, a total of ten possible symmetry operations under transformations accounted for here. In the five-sided star we observe more order than in the sphere, but this order, somewhat counter intuitively, is the result of a breaking of symmetries. Thus, the transition from uniformity to order can be thought to entail symmetry breaking. As Brender puts it, "the question of the genesis of form is not how symmetry arises out of disorder, but rather how the symmetry of disorder gets *broken* in determinate ways to produce the characteristic asymmetries of the forms we find in nature" (2012, p.267).

Brender (2012) has tied these ideas to the notion of sense-making. Following Merleau-Ponty, who was wont to point out that it is the difference between figure and background that makes perception possible, Brender contends that it is the "asymmetry of the body's environment that makes the perceptual regulation of movement possible" (2012, p.240). The texture of such differences is precisely what allow for the getting of a perceptual 'grip'. Such asymmetry, however, is also revealed by movement. Bodily movement helps reveal asymmetries as variation under transformation, the movement itself being the transformation which engenders variations in the perceptual field. Importantly, differentiation here is not a one-sided affair, but is something that happens in the whole body-world relation. Combining these ideas with the notion of hesitation, one might suggest that hesitation provides the conditions for subtler forms of transformation, which in turn helps bring forth distinctions not previously available. If such distinctions support the general tendency towards optimal grip, structural interdependencies and new situational specific norms can be stabilised. There is not space here to adequately explore the extent to which these ideas work well with the above account, but they do seem promising, and may offer routes for future investigations.

6.5.4   Environments in enhabiting

A final point in need of emphasis is the role of the environment in enhabiting. Enhabiting novel habits is a process of establishing interdependencies between structures in the habitat and structures in the body that thereafter support the maintenance of our ways-of-life. The enduring invariant structures that any habitat provides prior to being 'internalised' in the process of enhabiting, supply potentialities which when in contact with the perceiving subject limit that subject such that only some forms of relation are possible. Speaking about the role of environment in Simondon's account of individuation, Mark Hensen (2009, p.134) writes

> … the upward spiral of individuation is driven … [in part by] … the coupling of individuation with the entire environment as a source of "preindividual," "metastable" potential. [This helps] ... ensure that emergence qua individuation involves a recursivity that is not driven solely or primarily by the organism's demands but that instead draws from the global situation—the preindividual as potential—within which all individuations necessarily occur[73].

This position supports the ecological claim that affordances are enduring structures in the environment that drive adaptation, and the attendant SIF claim that tending towards optimal grip progressively realises an attunement between organism and environment. Moreover, as previously mentioned, Di Paolo has written that, Simondon "makes explicit the material conditions of autonomy and introduces new elements for enactivism such as the notion of pre-individual criticality as inherent in the living body" (2016b, p.14). Here one can see that these contributions do not simply relate to the biochemical resources supplied by our physical environments, but the sociomaterial resources supplied by our habitats also. Enhabiting recognises a process that extends beyond the embodied subject at its centre and is in contact with the raw materiality of the world beyond. With our ways-of-life we brush against the world and rub off it. The notion of enhabiting offers a bridging concept, a point of contact that can be acknowledged by both ecological and enactive approaches. To enhabit is to bring forth (to enact) within (to inhabit)[74]. We do not simply inhabit our worlds, we enhabit them, growing them in this or that direction according to the actions we take, reinforcing existing corners through revisiting them and letting the ones that no longer serve us die off due to our absence. Thus, it may be more accurate to speak of the habitual homeorhetic organisations that shape our umwelts at various timescales as "enhabitings", emphasising their nature as active entities that animate our being in the world.

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[73] Text in brackets is my addition.
[74] The suffix 'en' does not capture the meaning of 'bringing forth'. 'Enhabit' is simply a portmanteau of enact and inhabit.

6.6 Conclusion

This chapter set out from a distinction introduced by Baggs and Chemero (2018, 2019) intended to help clarify the relationship between enaction and ecological psychology and the various types of affordances common. It was suggested that by maintaining this distinction, we might recognise some existing tensions between certain enactive and ecological approaches as in fact reflective of underlying compatibilities. It was then argued that by adopting a compatibilist framing, certain shortcomings in each account, particularly as they relate to questions of learning, might be avoided, and that, in fact, such an approach was necessary to make intelligible the individuation of novel habits. The body of the chapter was then divided into two parts. In part one, starting with the recognition of a shared concern for self-maintenance, a host of related notions were teased out, and compatibilities highlighted at every step. In part two, with inspiration from the philosophy of Simondon and examples of habit change, the positive account of enhabiting was developed, highlighting how the individuation of novel habits depends upon the compatibilities outlined in part one. Ultimately, it was argued that enhabiting speaks of a form of individuation that is sympathetic with the distinctions Baggs and Chemero advocate. It offers an account whereby structure in the habitat enables the stabilisation of structure in the umwelt.

The notion of enhabiting supports a dual-aspect view of phenomenal matter and can help deepen our sense of the compatibilities between ecological and enactive approaches in line with a radical embodied cognitive science. In doing so, it also provides a framing within which theories of learning from each approach, such as the enactive account of *equilibration*, or the ecological account of *direct perceptual learning,* can maintain productive conversations. Acknowledging such perspectivalism entails something of a metatheoretical move along the lines that Baskar advocates (see Chap. 1). That said, given the epistemic limits set by enaction, the umwelt does hold something of a privileged position. As Cummins puts it, "Framing is, in a sense, everything" (2020, p.6). This should not be taken as a stain on our abilities to do good science, but rather an injunction against excessive hubris. The next chapter takes some time to make some clarifications about the notion of habitual organisations as they are developed here, by suggesting they should be understood as *sense-making frames*. Such clarifications will be helpful in the chapters that follow when arguing for the coenhabiting of social habit structures at multiple timescales.

7   Sense-making frames

> Being human means existing in an operatively curved space in which actions return to affect the actor, works the worker, communications the communicator, thoughts the thinker, and feelings the feeler.
>
> Sloterdijk (2013, p.110)

7.1 Introduction

Prior chapters have dealt with situating the object of concern of this thesis, exegetical matters relating to the proper understanding of the terms employed, the various frameworks and formal understandings through which to make the object visible and legitimize some of the claims about it. In this chapter, now that the basic outline of the object has come into relief — at least at the level of the individual — some explicit clarifications concerning the more distinctive contours of such 'objects' will be helpful, before finally extending this understanding to the social domain in the chapters that remain. This chapter is somewhat more self-contained than previous ones, in that it primarily focuses on — by working what are hopefully intuitive examples — clarifying claims already made and some of their potential extensions in language already introduced. Moreover, given the slightly less formal approach herein, a somewhat more liberal speculative spirit than has been permitted in previous chapters is present at times (it is highlighted in the text when this is the case).

This chapter is structured as follows. It begins with some justifications for employing the language of frames. After that, it argues why habituated sense-making frames need to encompass more than just strict sensorimotor dynamics. Then, several features common to sense-making frames and their inter-regulation are clarified and speculated upon beyond what they might have been already, including dimensions of temporality, normativity, and inter-level regulation. Finally, notions of boundaries and backgrounds — ideas that have been somewhat overlooked to this point — are developed in detail.

7.2 Of frames

Consider your now not so new exercise practice. You have been consistently showing up in the basement for a number of months, and not only do you have a sense of having developed a stable practice, but you have seen much progress in your abilities too, in terms of your technique, form, and so on. What, we might ask, has been laid down in your walking this path? Previous chapters spoke about enhabiting in terms of the stabilisation and ongoing reinforcement of interdependencies between structures in the body and structures in the habitat to bring forth an umwelt. From a phenomenological point of view, such interdependencies come to be experienced

as affordances, they channel action along particular paths and trajectories, and manifest as dissatunements when those paths are obstructed. One can talk about such dissatunements as reflective of deviations from the self-generating norms of the autonomous organisations shaping action across various domains and timescales, i.e. habits, habit schemes, micro-identities, and personal identities. But having to enumerate or specify the timescales involved with such organisations at every juncture is rather laborious.

A simpler approach is to introduce a generic term referring to any such organisation, regardless of timescale of operation or domain of relevance (a methodological move that will be valuable in the transition to the social domain also)[75]. The term *sense-making frame,* or *sense frame* for short (hereafter SF) is adopted here for such purposes. What we enhabit are SFs that are affective, sensorimotor, and even linguistic. Important to keep in mind here is that frames just are habits or bundles of habits at various timescales. The language of frames is employed simply as means to move between timescales without always having to specify the timescales involved (e.g. habits, micro-identities). That said, the choice of the word 'frame' is not arbitrary. Our making sense is always-already framed by our history of acting in the world by virtue of the habits and bundles of habits that have stabilised. Thus, by using the language of sense frames one can not only acknowledge the invariant patterns that stabilise in the relationship between embodied subject and environment, but also how they bear on their experience by providing a normative framing within which ongoing interactions unfold. Importantly, sense-making frames (as habitual organisations at various timescales) do not belong to the embodied subject or the environment, but are relational entities that emerge and stabilise in the interaction, providing the normative background for situated action. The sections that follow focus on some of the characteristics of SFs. Firstly, however, it is suggested that there is some precedent within embodied cognitive science to introduce the language of 'frames'.

7.2.1 Why sense-making frames?

The idea that sense-making operates within a 'frame', and that sense-making entails the construction or reconstruction of 'frames' has surfaced elsewhere, particularly in the enactive literature. Consider, for instance, Di Paolo et al. (2018, p.36) when they write — contrasting the sense-making account with more traditional functionalist accounts — that

> A sense-maker relates to its own world in terms of significance. However, sense-making is not an act of "adding meaning" to a physical coupling with the environment, as if the latter was a vehicle of information that must be communicated to the agent. Quite the opposite: information, in the functionalist view, implies an already interpreted and prejudged frame of reference whereas sense-making is precisely the ongoing activity of

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[75] It might also be true to say that the terms employed here function regardless of material basis, i.e. autopoiesis might also be captured with the language of sense-making frames. However, for present purposes the focus is purely on sense-making frames of the habitual variety.

selecting, modifying, and even constructing such frames, by and for the autonomous sense-maker.

Or, recall the quote that served as the epigraph to the previous chapter, in which Di Paolo et al. write of the "… simultaneous partial abandonment and retention of the old frame of significance", and how in this "time between moments" the "frame of sense-making is reconstituted, brought forth, possibly as a transition to some different existing frame or even as the start of a totally novel one" (Di Paolo, Buhrmann, and Barandiaran 2017). Although DI Paolo et al. do not elaborate on the notion of frame, what they are pointing towards is precisely the kind of autonomous organisations considered here. Habits, bundles of habits, micro-identities and personal identities all constitute habituated SFs within and through which we make sense of our experience. To enhabit then, is to constitute the sense frames that comprise our umwelts, through stabilising and reinforcing interdependencies between structures in our bodies and structures in our habitats[76].

7.3 Habitual frames beyond the sensorimotor

Something implied previously, but necessary to elaborate here, is that sense-frames as conceived herein do not pertain solely to sensorimotor processes, i.e. they do not solely relate to processes involving the coordination of sense organs and motor capacities towards some task. One can get the impression that this is what is implied by the notion of habit within enactive theorising, largely due to the lack of any in depth treatment of the notion of affect in autonomist enactivism (e.g. Barandiaran 2017, Di Paolo et al. 2017), or any explicit role for the notion of habit in their account of language (e.g. Di Paolo et al. 2018). But, taking the case of the exerciser, for instance, one can quite easily see that the notion of habit demands broader application. While exercising, SFs of course enhabit at a 'sensorimotor' level, e.g. those that regulate posture and the movement of limbs. However, affective, and linguistic organisations are also enhabited. For example, organisations that allow you to remain equanimous and persistent with your exercise in the presence of pain in your knee are enhabited; or beginning every session with a pep talk, or counteracting distractions by deploying a particular phrase. In fact, one can view progress in this domain as a process of developing and integrating such organisations, such that they develop mutually stabilizing relationships that progressively retreat into the preconscious background of one's activities during exercise.

The activities subject to processes of enhabiting then, should not be reduced to sensorimotor behaviours alone, but rather, any operation of the biosocial being that regulates the structural interdependencies between body and environment in a way that has the potential to

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[76] Another word for sense frames might be 'habitings' or 'enhabitings' emphasising the active processual nature of these structures.

reproduce those relations, be they sensorimotor, affective, or linguistic, or any combination of the above. SFs then, are metastable relational wholes with the potential to intersect and integrate numerous bodily processes at various timescales, from neurodynamic and circadian rhythms, to moods and personalities, to arcs of action that last from seconds to minutes, or even hours at a time. The continuity of such SFs is significantly independent of any material instantiation (though it borrows from it) but highly dependent upon the set of relations that undergird it. As such, the relative invariance of your exercise habit (your preference for red wine over white, your gender, etc.) can be maintained — much in the style of Theseus's ship — despite a changing environment and every cell in your body being replaced. Thus, a SF might be defined as a self-sustaining ecobehavioural entity in which activity (e.g. affective, sensorimotor, linguistic) and the interdependencies that support that activity (e.g. bodily and environmental structures) have established mutually enabling relations that can disintegrate or be reinforced depending upon available conditions: repeated within appropriate timescales, presence of particular task constraints, adequate energetic resources, etc.

7.4 Characterising sense-making frames

The features addressed in this section have been at least touched upon in prior chapters (particularly Sect. 6.3). That said, all of them will be well served by some additional elaborations, and some have been addressed in only cursory fashion to this point. Effort is made here to include only the minimal repetition necessary of previously explicated points. The organisation and integration of SFs at multiple timescales is a very messy business. Any one characteristic cannot be easily described apart from the others. Consequently, as is apparent below, one struggles to illustrate one without mention of others, there is no obvious starting point, and the same ground needs to be revisited from multiple angles. What follows is a detailed characterisation of SFs and their inter-regulation, and some suggestions about how they relate to stability and change in the relationship between embodied subjects and their worlds.

7.4.1 Temporality

In any SF, past and future come together to construct the present: past insofar as previously enhabited norms are preserved and bare on the present; future in so far as the SF is future oriented, anticipating particular relations to prevail. Under the right conditions, SFs attune subjects and their worlds in ways that allow them to act in relation to what is given and anticipate what might come next. Acknowledging the nest of SFs that inform any situation complicates this picture by degree, for it speaks of this attunement at multiple timescales simultaneously. Here, a common experience from within the practice of Vipassana meditation can provide helpful illustration of these temporal dimensions.

In meditation it is very common for SFs to be enhabited that allow the practitioner to anticipate the end of the session within seconds of its actual end, and indeed this 'skill' develops rather quickly and without any conscious effort. If one consistently sits for 10 minutes every day with the time being demarcated by some sound, e.g. an automated bell, before long they will typically develop a reasonably accurate sense for when the bell is about to sound, very often to within seconds of its ringing. In this author's experience, this skill tends to scale quite well upwards of an hour, typically manifesting in a felt sense of anticipation for the bell, and maybe some thoughts reflecting this, when the hour is approaching.

Now, if one is meditating for an hour with the bell set to ring every ten minutes, with repetition one can come to anticipate the bell every ten minutes as before, but there is a qualitatively different experience of such anticipation given its nesting in the longer timescale, which is also anticipated. The ten-minute segments are experienced as just that, segments of a larger temporal arc. And so, SFs can supply a kind of nested multiscale temporal dimension to our experience, their contours being defined given their prior rate of repetition, and thus, the degree of closure present. SFs, thus, have a particular lure to them, from the past and through the present into anticipated futures at multiple scales[77]. More than just readying us for action, they channel us through nested arcs of activity whilst also readying us for contingencies likely to arise under such circumstances. It is this multiscale integration that supports an ongoing metastable adaptive relation between the acting agent and its environment.

One might speculate how this is highlighted further in the context of a 'behaviour change' and how this helps make intelligible the advice to first introduce small changes when ultimately working towards a larger change (see Chap 6, Section 6.5). One must, in a sense, 'coax' the self-organizing dynamics underlying stabilities to help realise change. Taking such an approach, first introducing only very small changes, the self-regulating norms of SFs at longer timescales, and the expectations and anticipation they generate, are not perturbed too much, and thus do not result in regulatory dynamics that insist upon their reproduction and the negation of any possibility of change. To get a clearer sense of this, consider the inverse, in which one pushes themselves too hard too fast with a new practice, leading to a kind of failure. One issue herein might be that activities not enhabited as part of SFs at shorter timescales (that could carry the various activities of the exerciser in an arc that accords with the practice) are perturbing the SFs of organisations that function at longer timescales (e.g. personal identities) and so get appraised according to the norms therein, resulting in dissatunments that call out for reduction. Such dissatunements might

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[77] Of course, the picture is substantially more complicated than this. We spend a great deal of our time in various modes of being that are not of the present as such (e.g. recalling past events or a past that never even happened). Something is said very briefly about such dynamics in the section below on inter-level regulation. However, any thorough explication of these ideas is a task for future work.

show up as feelings of doubt and insufficiency, self-castigation, and rational justifications for why such a course of action is not suitable, all of which reflects a history of some prior structural coupling. This results in a kind of contra-adaptation, away from the proposed novel path and all its anticipated discomfort, and a return to some prior stability.

On the other hand, it might be the case that if one makes a small change initially, when this activity and the attendant affect is appraised according to the SFs at longer timescales it does not run counter to the norms therein, and thus, can more easily be integrated with the self-regulatory norms of those SFs[78]. In other words, you are not anticipating prolonged periods of discomfort, but rather, something that is, in effect, worth the effort. After a few iterations, it might be that the anticipatory dynamics of the novel SFs at shorter timescales begin to help carry your activity, pre-reflectively, towards a particular end at some point in the future — e.g. the five minute mark in meditation — and what once felt like some effort is now no effort at all. Small changes thus serve as something like a progressively developing ballast upon the sea of self-regulatory dynamics of longer timescales, a ballast from which progressively more ambitious changes can be made. Starting to practice for five minutes and extending it week on week by a couple of minutes from there, allowing one to progressively fill their 'behavioral ballast' by each time extending the arc of action that obviates the need for conscious reflection or the intervention of existing SFs at longer timescales. In this way, SFs at shorter timescales might be integrated with SFs at longer timescales, and whatever goes on in the shorter timescale, in a sense, contained by the emerging SFs that organise it. In everyday terms, this might be reflected in our coming to remain equanimous and realising that the 'pain' in one's knee will only last so long at any point. Such transitions also signify how SFs at longer timescales (personal-identities) become infused with elements of a practice at shorter timescales (micro-identities), and solicitations begin to organise one's action at longer timescales towards a course of activity that includes the everyday enactment of a particular micro-identity, e.g. you decide you want to become a meditation teacher and start taking courses.

There is a particular class of body-environment dynamics (structural couplings) that can supply a strong intuitive grasp on some of the multi-level multi-scale temporal dimensions of SFs, for we already think of them in such terms, i.e. those we normally refer to in terms of our 'circadian rhythms'. The patterns that reflect such rhythms are deserved of the designation of SFs also, for they demonstrate the autonomous dynamics characteristic of such organisations. Though they tend to be less plastic than habitual SFs per se, the stability of the SFs that comprise our circadian

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[78] As part of our adaptive capacities, we likely have habituated organisations with their own self-regulatory dynamics that are directed at periods of exploration. Such dynamics are not developed in any detail here, but may, for instance, help account for the common initial enthusiasm for behaviour changes. One can notice invariant tendencies therein also, and how they might themselves be subject to habituation.

rhythms are also enabled by the actions they enable (operationally closed), and highly contingent upon certain conditions, for instance, the flow of certain structures in the light (precariousness), for their ongoing stability. Think of the drift that can occur in your rhythms when you start having to rise out of bed earlier for a new job, and the obvious dependence upon certain structures in light, food, electromagnetic frequencies, and so on. We often only notice the work of these SFs when they, in a sense, breakdown, e.g. when suffering from jet lag and you are struck by an irresistible need for deep sleep in the middle of the day. Here, then, one can see how the endogenous structure has been partially preserved by the operational closure of the bodily dynamics, but also how the reproduction of such structure is mediated through its coupling with certain structures in the environment. The SFs that comprise our circadian rhythms thus provide an interesting case somewhere in between the more determinate organisation of autopoiesis and plasticity of habits, and are deserved of more attention than afforded them here.

Such SFs rely on an incredibly complex set of interdependencies across body-environment systems (and even multiple-body-environment systems), but their primary function for the subject at their centre is that they allow them to anticipate the unfolding of regular events in their environment so as to be able to act adaptively with respect to them (Aschoff 1986; Davidson and Stephan 1998). For instance, such rhythms entail the self-organisation of body-environment structures (e.g. Scheer and Buijs 1999) early in the morning prior to waking such that one can wake up at the right time, refreshed and ready to respond to the challenges of the morning ahead, e.g. raising the levels of cortisol (a mediator of 'wakefulness') in response to the levels of light on the skin. Or, at night-time, winding down the body (e.g. Pandi-Perumal et al. 2007) to prepare it for sleep and recovery, e.g. dim lighting supporting the release of melatonin (a mediator of sleep). The reasonably healthy adult experiences these times in the day as having certain nested temporal trajectories, arcs of anticipated action against which we, in part at least, make sense of the goings on therein. Importantly, such SFs enable (and are enabled by) more classically habitual SFs at shorter timescales also, such as the particular micro-identities one enacts in the morning (e.g. their meditation practice) or evening (e.g. the hygiene routines one engages before going to bed). The kinds of inter-regulatory dynamics that might support such relations are explored below in some detail. The primary motivation for including this discussion here, however, is a more descriptive, even metaphorical one.

A colloquial and suggestive name often used to account for the dynamics embedded in our circadian rhythms is the 'body clock'. Though if one reflects on the meditation example previously mentioned, one can see that habitual SFs also function as 'body clocks'. Our SF's can thus be understood as highly plastic and modifiable body clocks, organising our temporarily lived extension in the present by preserving the rhythms of the past and orienting us towards a future

composed of a nest of anticipated arcs of action at different timescales. Acting according to these frames then, we are not only spatially situated in relationship to a physical environment, but also temporally situated. This is something nicely captured by Knausgaard (2017, p.30) when he writes about the nest of temporal arcs that has emerged with the yearly recurrence of his birthday.

> My own birthday ... gathers time around itself in a very particular way, since it returns every year and in contrast to all the other recurrent dates is singled out. It is as if on that morning I step into a certain room, which I have visited once a year for as long as I can remember.

Here, the complex temporal entanglements of SFs at multiple timescales are apparent, the longer timescale entailing a kind of 'gathering', while the shorter timescale of the birthday itself, given its recurrence and thus sedimentation, constituting a 'certain room' whose features are anticipated. These are how our spatiotemporal orientations are preserved. As encapsulated within SFs, they are, in a sense, experientially integrated self-replicating events.

Undoubtedly, this line of development will be served going forward by a more thorough engagement with existing literature and developments on the temporal dimensions of habitual action and lived experience. Thinkers like Husserl, Merleau-Ponty, Bergson, Whitehead, Simondon, and Deleuze all have rich and overlapping accounts that might be mined for insights relevant to a compatibilist cognitive science. Moreover, recent work within radically embodied cognitive science (e.g. Gastelum 2018; 2020) takes the temporality of lived experience as its primary target, and, developing Husserlian ideas concerning the "structure of time consciousness" argues that temporality is intrinsic to affordances. There is much in common between the account developed here and Gastelum's account. Indeed, she even brings together sensorimotor autonomist enactivism and the skilled intentionality framework in support of her position. However, Gastelum seems to be after the more integrated perspective that is eschewed in the previous chapter. As Gastelum writes in the abstract to a recent talk on the subject, "I claim that differences in temporal scales is significant because they are constitutive of sensorimotor schemes dynamics, and sensorimotor schemes dynamics are constitutive of affordances, hence affordances are intrinsically temporal" (2020). Moreover, Gastelum, borrowing from Varela, argues for a threefold division at which the temporal scales of affordances might be analysed: "the elementary, the integrative and the narrative" (Gastelum 2020). This may have some heuristic value. However, if the temporality of a given organisation has something to do with its achieving a certain amount of closure, as seems apparent in the meditation example, for instance, it might be better to leave open the possibility of an almost infinite number of temporal scales which, as has been done here, may be carved up for heuristic purposes in terms of habits, habit schemes, micro-identities and personal identities. Either way, these are welcome developments within radical embodied cognitive science and point to what will surely be a significant focus of research in the years ahead.

7.4.2 Normativity

The autonomous dynamics undergirding SF's are norm generators. For the embodied subjects instantiating them, these norms manifest as feelings of rightness or wrongness (good or bad, better, or worse, etc.) accompanying the various goings on that constitute their relating to their worlds. Moreover, acting according to such norms typically entails avoiding or reducing feelings of tension or 'dissatunement' within one's experience. In the case of habits and habit schemes, it might mean acquiring your favourite knife and chopping board to prepare your lunch; in the case of the micro-identity, it might mean waiting until one o'clock to eat when lunchtime comes around, even though you are already hungry; and, in the case of a personal identity, it might mean eating only organic produce. And so, the activity of preparing your organic produce, on your favourite chopping board, to cook to satiate your hunger at lunchtime reflects reducing dissatunements in this multi-scale normative organisation. In other words, the nest of sense-making frames organising any given situation, in tandem with a general tendency towards optimal grip, determine the normative dimensions of the situation.

The musical language of dissatunement is more precise here than one might first anticipate. Think of the experience of tuning a guitar in the absence of a tuning device or capacities for perfect pitch[79]. One common strategy under such circumstances is to look for strings that appear to have held their tune and then use them as a basis for tuning the other strings. This is done by comparing the relationship between strings. For instance, if I hold the low E string on the fifth fret (an a) and play both it and the A string (the string just below the E string), if they are in tune they should sound the same a note. If I am lucky and they happen to be in tune, I can then use this as a reasonable basis to proceed through the rest of the strings. But what is the experience of them being in tune that allows me to proceed as such? I am not, *de facto*, listening for a precise frequency in both strings. Rather, I am listening for any dissonance in the relation between them when played together or in close succession. No dissonance, no tension to be reduced, and I can proceed with confidence to the next string. Now, the D string (the string below the A), if in tune, should be consonant with a D played on the A string by holding down the A at the fifth fret. But if playing them together I hear a harsh dissonant sound, I am struck with the awareness that my D string is out of tune. The process of bringing it back into tune is one in which I adjust the tightness of the string using the tuning peg and either add or subtract tensile stress, increasing or lowering its pitch, depending on its relationship to sound of the A held at the fifth fret (a d note). My experience of bringing the guitar into tune is not one of finding the perfect frequency, but one of reducing the dissonances in the relationship between the D string and the D played on the fifth fret of the A, and so on.

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[79] Of course, it is worth keeping in mind that this is a learned skill and needs some practice to develop proficiency in

The parallels between this example and our action more broadly considered are important. Much of the time, if not most of the time, rather than acting with respect to some perfectly available ideal or well specified goal, we are negating dissonances or dissatunements that allow us to live within some previously habituated optimal (or finding new optimals, as per the Chap. 6). Rietveld (2008), building on work by Wittgenstein, refers to this in the case of, for instance, a craftsperson working on the production of a particular object of their craft, as a process of 'directed discontent' (really a manifestation of the dynamics of tending towards optimal grip). Using the language of this account, much like the person tuning the guitar, the craftsperson directs their attention to their work through the lens of different SFs and is in a sense hunting down any 'discontent' that can be reduced. Think of this in a context that will be familiar to most reading this text, i.e. editing a text. At each stage of the editing, one is enacting a different SF that brings forth certain norms regarding the features of the text. What one is on the 'lookout' for are tensions that arise therein, dissonances or dissatunements that seem to demand some reduction. Only, in such instances, as with most action, we are not comparing two features in the world (unless we are just learning how to edit a text), as one is when playing the two strings side by side[80], but comparing features in the world with a habituated sense of optimality derived from prior experience and sedimented as part of some SF, and a general tendency towards optimal grip on the entire situation. We are, in fact, a bit more like those with perfect pitch than the person tuning the guitar.

This applies to the temporal dimensions of experience also. Think of the musical example when you anticipate a certain phrase or section lasting a certain amount of time and can encounter quite a bit of dissonance if it does not meet your expectations. One might speculate that much of the newcomer's frustrations with jazz, and its deviations from anticipated time signatures and phrasings, are of this kind. Hearing modified cover versions of familiar songs for the first time also often can have similar effects. It is common to associate the experience of dissatunement with a general dislike towards its source, and often it requires an identification with a relevant higher order organisation to overcome the initial dissatunement and, in a sense, break through to the experience of pleasure, e.g. the musician who identifies as someone who *should* like jazz and keeps listening until they genuinely do; the foodie who identifies as someone who *should* like olives, or goats cheese, and so on[81].

It is quite plain to see using these examples, that acting in relationship to these dissatunements and their soliciting effects is acting according to self-generated norms that

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[80] Importantly, the ability to tell if two strings are in tune is itself a learned skill for most people. Thus, even in this case, one is, in fact, comparing the sound of the vibrating strings with a habituated sense of optimality between strings.
[81] Insights such as these, I believe, can be critical to understanding how the dynamics of power, racism, sexism, and so on, intersect in the body as pre-reflective dispositions and result in the ongoing reproduction of larger structures of inequality. Moreover, such insights might support the development of emancipatory practices that help disrupt undesirable habits. See also end of Chap. 9 for some discussion.

organise the SFs through which we make sense, and a general tendency towards optimal grip. Different SFs enact different forms of selective openness and influence actions with respect to different environmental features. When editing a text for sentence structure, given their history of enhabiting, one is differentially sensitive to the norms of sentence structure and less sensitive to the norms of word selection, and vice versa. Moreover, one is likely to continue with their efforts until they meet, to use a musical metaphor again, some sort of resolve (an optimal grip).

Over time, SFs at various levels, and all their normative dimensions, will develop incredibly complex inter-regulatory dynamics, even if maintaining some sort of relative autonomy. The following section looks at some of these inter-level inter-regulatory dynamics more explicitly. However, it comes with a warning. What is presented therein is perhaps the most speculative part of this thesis. The inter-regulation between the relative stabilities of bodily dynamics is as complex as life itself, and so any hard and fast rules are going to be difficult to distil from observation. Nevertheless, there do seem to be some basic logics that can be extracted, following from much of what has already gone. Given the speculative thrust of the section, and in the hope of keeping it as grounded as possible, it sets out from some empirical work modelling the dynamics of habits and so-called 'intelligent habits' from an enactive perspective.

7.4.3 The logics of inter-level regulation

A potentially fruitful approach when thinking about inter-regulation between SFs across levels is to begin with the assumption that what they are in the business of doing over and above their ongoing self-production, is regulating the activity of the embodied subject so as to maintain some other variable(s) within boundaries of viability also. The logic of such relations is quite clear when, for instance, thinking about the relationship between organic autopoiesis and the habitual SFs that support it, e.g. habits pertaining to food preparation and consumption, temperature regulation, and so on. Indeed, the basic position here has been a topic of study within enaction for some time. Di Paolo (2000; 2003) for instance, developed several computational models demonstrating how a behaviour generating mechanism might stabilise the conditions necessary for its own persistence. The latter of these efforts was directed at modelling how self-maintaining behaviour-generating mechanisms (i.e. habits) can be integrated with the self-maintenance of the organism. Therein, Di Paolo modelled a cycle of dependence between the biological needs of a simulated robot (a viable battery level was taken as an analog of metabolism) and particular habits in its activities, whereby if the emergent habits drove the 'metabolism' outside viability limits the behaviour-generating mechanism (and thus the habit), would also loose the conditions necessary for its ongoing reproduction (see Di Paolo 2003 for extended discussion; or Iizuka et al. 2013 for related developments). In models such as these, however, much of the dynamics are already

prespecified, and so they do not serve as good analogues for the kinds of emergent plastic inter-regulations that might exist between SF's at various levels and scales in living systems.

More recently, however, Egbert and Cañamero (2014), have developed some robot models that are taken as support for the idea of so-called 'intelligent habits', i.e. behavioural habits that self-organise in a mutually enabling relationship with processes necessary to the regulation of ongoing autopoiesis. Their notion of intelligent habits is explored in some detail below. What is suggested, ultimately, is that the kinds of inter-regulatory dynamics that characterise these relations can be extended beyond the regulation of essential organic variables, and can include the ongoing regulation of SFs across all levels and scales. However, to get a proper appreciation for this position, it is necessary to first introduce some work that served as a precursor to these efforts, i.e. work by Egbert and Barandiaran (2014) who modelled the dynamics of habit constitution using what they refer to as the Iterant Deformable Sensorimotor Medium (IDSM) (Egbert & Barandiaran 2014).

When the IDSM is coupled with the motors and sensors of a simple simulated robot it allows them to interact within their two-dimensional environment in a way that supports the self-organised stabilisation of simple habit behaviours, as recurrent self-maintaining trajectories of action. Egbert and Barandiaran develop this model to illustrate a particular claim that has been endorsed throughout the past couple of chapters, namely, "both habits and metabolism are self-maintaining, precarious, dissipative structures that rely upon cyclic processes to persist and, in both cases, the processes of self-maintenance are contingent upon the existence of an appropriate environment" (Egbert & Barandiaran 2014, p. 10). What follows will show why the IDSM supports these claims, before then extending it to clarify what is meant by the notion of 'intelligent habits'.
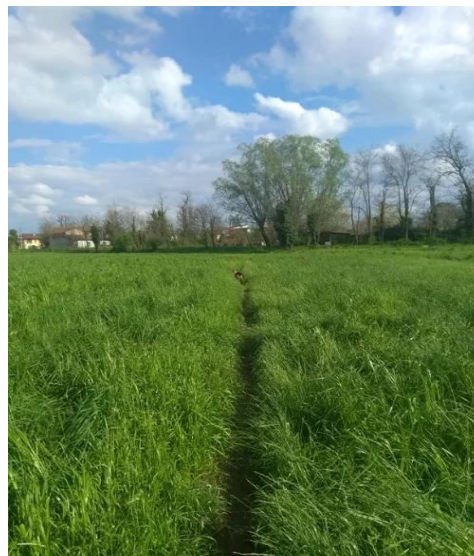
Figure 18. A path through grass

A path through a field of grass left by and reinforced by human and animal traffic, and likely to disappear in its absence.

To get a sense of how the self-modifying dynamical system that is the IDSM works, consider the familiar example of how trails emerge in a human or animal environments. See **Figure 18**. If you were to walk across a field of grass and were to walk it again shortly after it is likely that in your second crossing you would take a path similar to the one you initially took, for the grass will have been flattened slightly along it given your earlier crossing and thus invite walking. Moreover, on subsequent crossings it is all the more probable you will use this path again, for each time you use it you flatten its grass more, and the more of a path that is available to you the more likely you are to use it. The IDSM amounts to something akin to the grass in this metaphor. As Egbert and Barandiaran put it, for a simulated robotic agent, "similar to how an imprintable ground, such as grass, is necessary for self-reinforcing trail-formation, the IDSM makes possible the existence of self-reinforcing sensorimotor trajectories" (2014, p.4). A complete formal description of the IDSM is not necessary here. However, the following quasi-formal description from a subsequent paper by Egbert & Cañamero (2014, p. 6), will be helpful.

> The IDSM supports the formation of self-maintaining patterns of behavior by (1) assembling a collection of "nodes" that track the SM (sensorimotor) -state-velocity for different SM-states, (2) using these nodes to drive later behavior, and (3) having these nodes, which perpetually degrade, depend upon a mechanism of self-reinforcement to persist. The self-reinforcement of a node is accomplished by the re-visitation of SM-states near to the node's "position", and so only patterns of behavior that repeatedly visit SM-states can persist.

Each trial begins from a random position with the motors set to random values selected from a flat distribution, and, as Egbert and Cañamero contend, "as sensorimotor trajectories are experienced, pathways are worn in the IDSM's "sensorimotor-space" such that future sensorimotor pathways are likely to be similar to those pathways that have been taken in the past" (2014, p. 4). Thus, when this system is coupled to the sensors and motors of a robot it shapes the robot's behaviour such that it repeats behaviours it has already performed, allowing for patterns to be reinforced through repetition so that the more recent and the more recurrent a pattern, the more likely is its occurrence in future similar circumstances. In other words, when the robot comes close to trajectories it has previously taken, those previous trajectories (like the path in the grass) pull the robot into a particular course of action, thereby deepening the pull should it return to those trajectories again. See **Figure 19** for a graphic plotting 24 sensorimotor spatial trajectories of habits formed by the agent.

Thus, the persistence of both habits and metabolism rely upon recurrent processes, and the self-maintenance of both is only possible in the proper environment: whereas ongoing metabolism — the dissipative chemical processes described in autopoiesis — depends upon the proper environment to make available the flow of 'external energy-matter gradients', the maintenance of the ongoing organisational dynamics of habits rely upon the proper environments to make available the structure for the sensorimotor flow that is necessary for their maintenance (Egbert & Barandiaran 2014, p.10). As Barandiaran contends, basic autonomy is the result of an organised set of dissipative far-from-equilibrium chemical reactions, but cognitive autonomy is made of habits (2008). The claim here is that habits are dissipative in the dynamical systems sense — rather than the thermodynamic sense — for the dynamics of the IDSM are both irreversible, and non-conservative (Nicolis & Prigogine, 1977). In the IDSM, if such re-enactments do not occur, the nodes of the IDSM degrade and the patterns ultimately vanish, thus their organisation is a precarious one[82]. The emergence of new nodes, the way they change and the degree to which they get reinforced or otherwise, is contingent upon the behavior of the systems in its given environment. As Egbert and Barandiaran contend, "structured collections of nodes are reinforced while others cease to have influence, and thus habits emerge and are sustained by the behavior they create in a circular self-organised manner. It is in this sense that habits can be some kind of mental or sensorimotor life-forms" (2014, p. 11).

Habits in the IDSM are not simply the collection of constituent nodes, but necessarily include the actual sensorimotor correlations that get repeatedly enacted. In other words, the habit describes both the structure and the operation. If a pattern of behavior is prevented, either by some environmental impediment or according to the trajectories taken by the robot (historical impediment), the nodes along it cannot be reinforced, the behavior cannot become recurrent, and the self-maintaining system, the habit, simply vanishes. The model provides support for a view of habits wherein their conditions of existence extend into the world, beyond merely the head or even the body.

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[82] Egbert and Barandiaran make the analogy here between these sensorimotor structures created in the IDSM, that rely upon their particular 'sensorimotor flow', and the Bernard-cells found in Rayleigh-Bérnard convection; that are reliant upon the flow of a particular gradient of heat in a pot of oil (2014, p. 11).
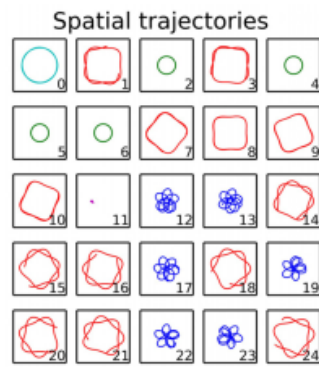
Figure 19. Plotting the spatial trajectories of habits

Plots 24 sensorimotor spatial trajectories taken by the agent. Adapted from Egbert and Barandiaran (2014)

The notion of 'intelligent habits' was introduced by Egbert and Cañamero (2014), and also avails of the IDSM. In the above modellings, trials were randomly initialised, and habits emerged according to the interactive dynamics unfolding between the sensorimotor capacities of the robot, coupled to the IDSM, and its given environment. The model explicated here entails a few extra variables, but it begins as a simple simulated robotic agent with two directional light sensors and two independent motorised wheels embedded in a two-dimensional environment in the shape of a square (Egbert & Cañamero 2014). The dynamics of the metabolism are simulated to be indirectly influenced by the motor behavior, and are modelled on the dynamics of blood sugar regulation in a diabetic, whereby hormonal regulations can restore blood-glucose levels to within viability limits should they be breached, but prove insufficient for maintaining blood glucose within viability limits on their own. With the addition of an interoceptive sensor that allows for the state of the metabolism (the viability of blood sugar) to be included as a variable in the sensorimotor environment of the robot, self-sustaining patterns of behavior emerge such that they stabilise the 'metabolic' dynamics of the 'organism'.

The model is composed of three coupled differential equations representing concentration of blood-glucose (G — the essential variable); insulin concentration (I — automatically removes G from blood above viability threshold); and glucagon concentration (U — releases G into blood below a viability threshold). The system is healthy within pre-specified viability levels, outside of which hormonal regulation ensues, thereby returning it to viability. Certain behaviours of the robot, i.e. maintaining a certain distance to a light, constitute 'feeding', and thus impact G. If ideal behaviours are performed G will maintain viability indefinitely. However, other 'non-ideal' behaviours (one can think about these as akin to eating too much or eating too little) can cause G to leave viability, whereupon 'damage' is accumulated, only being restored to health by the

automatic actuation of I & U (add insulin to remove glucose if one 'eats too much', or add glucose of one 'does not eat enough').

Several trial scenarios were initiated, both experimental and control. In the experimental scenario the sensorimotor space of the IDSM is sensitive to two motor dimensions, left and right motors, and three sensory dimensions, two light-sensors and an interoceptive sensitivity to blood sugar levels (G), i.e. its essential variable. In the control scenario, all is the same apart from the fact that the IDSM is not sensitive to the essential variable G. In the ensuing trials the IDSM was allowed to control the randomly initialised robot and the trajectories were tracked for 2500 simulated time units, assessing the extent to which the robot was successful at maintaining the essential variable (not incurring damage) within the limits of viability; on each trial the essential variable was initialised to a value at the center of its viability region. The top five performances from each scenario were extracted for analysis. By plotting spatial and glucose concentration trajectories against time, they found that by the end of the simulation all five in the experimental scenario were successful at maintaining the viability limits of the essential variable G, whereas none of the top five in the control were found to stabilise G (Egbert & Cañamero 2014). See **Figure 20** for a graphic depiction of these results.
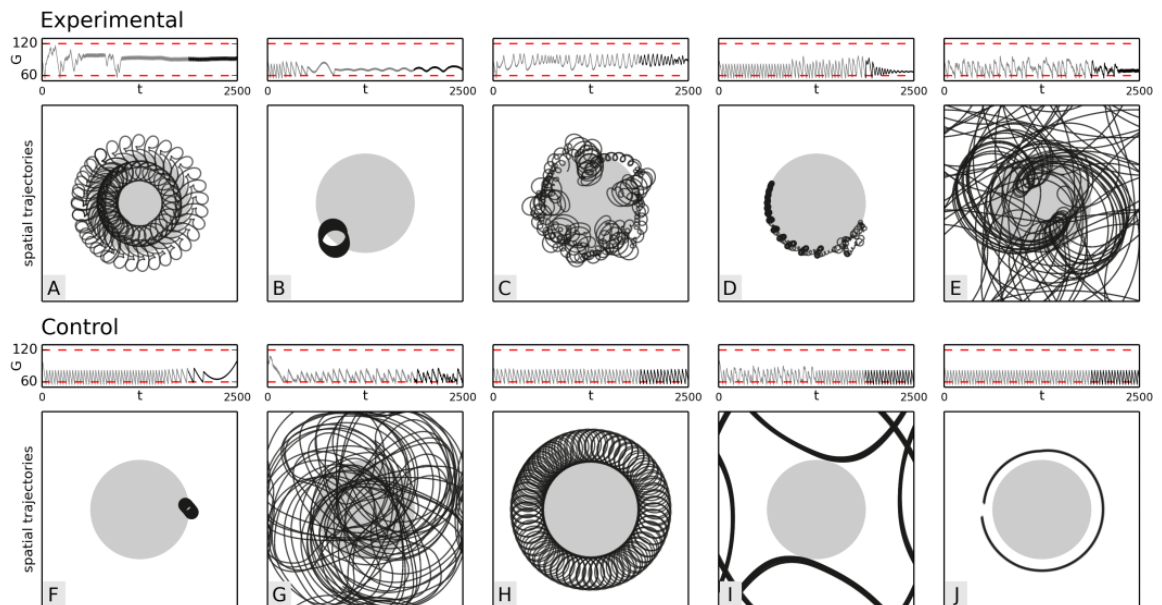
Figure 20. Spatial trajectories of best performing agents

Essential variable G and the spatial trajectories of the five best performing experimental and control agents. The square plots indicate the spatial trajectories taken by each agent, the filled in circle indicates the feeding region. Above each spatial plot, G is plotted against time, with the limits of viability (outside of which hormonal regulation ensues), indicated by the red-dashed lines, and the period corresponding to the spatial plot reflected in the darker segment of the line.

As suggested above, the IDSM supports the formation of stable patterns of behavior by establishing an archive of the sensorimotor dynamics of the system, which thereafter constrain ongoing behaviours in a manner that is similar to previous behaviours in similar circumstances, but only patterns of activity that recur will persist. Consequently, when the IDSM includes an interoceptive sensitivity to the state of the essential variable G in its sensorimotor space, the behavioural patterns that persist will be patterns wherein values of G are regularly revisited in a way that correlates with the other sensorimotor variables. In these models the stable patterns are very often patterns wherein G is maintained within viability limits. The reason Egbert and Cañamero propose for this outcome is that the dynamics of blood sugar are more constant when maintained within viability, and thus easier to correlate with stable sensorimotor patterns. To solidify the point, think of the inverse. If agents breach these limits auxiliary hormonal regulations — I or U — are initiated, which destabilise the correlation between sensorimotor variables and recurring blood sugar values, for the latter become much more chaotic, and thus make it less likely that stable patterns that support the maintenance of blood sugar within the bounds of viability can emerge. Blood sugar thus acts as both a biological essential variable, and a sensory variable in the IDSM. Consequently, as Egbert and Cañamero put it, "the 'mental' and biological autonomous structures are thus intertwined in the sense that they share an essential variable" (2014, p. 7). Such dynamics then, allow for the emergence and maintenance of 'intelligent habits' in these modelling scenarios.

One speculative suggestion offered here is that something analogous is possible between SFs at all levels and timescales. Emerging habits at any level, might not only serve the maintenance of biological essential variables (bionormativity), but the maintenance of variables that characterize habituated SFs also (psychonormativity). Indeed, this may be the kind of dynamic responsible for the inter-regulatory dynamics already observed in prior examples, where situationally coherent organisations at shorter timescales (e.g. a habit scheme) emerge that reflect an organisation at a longer timescale also (e.g. a personal identity). In other words, patterns of behaviour that satisfy the self-generated norms (regulating 'essential variables') of SFs at longer timescales are more likely to sediment as SFs at shorter timescales, in a manner analogous to the intelligent habits seen here. Some examples will be helpful.

Returning to the behaviour change paradigm and the example of exercise. Imagine two people attempting to take up a new exercise routine having been convinced about some of its potential benefits. P is someone who has previously sedimented a personal identity that reflects an interest in various forms of 'self-development'. C, on the other hand, is someone who has stabilised a personal identity that might be characterised in terms of 'being a hardnosed cynic and sceptic of all things 'healthy''. When P first exercises their activities are not out of step with the

SFs that organise their personal identity at longer timescales, and they challenge the boundaries of said frames only very little. When C exercises, on the other hand, even just participating in this type of activity is pushing the limits of existing SFs, engendering self-regulatory dynamics that seek to establish some prior homeorhesis, possibly manifesting in a basic cynicism towards the practice. Moreover, when the challenges of exercise become apparent, the various discomforts in the body, etc. the self-regulatory dynamics of the SFs organising P already acknowledge a little discomfort as necessary to development, and thus, such 'challenges' are only mildly perturbing to the SFs that constitute the background to P's action. For C, however, when such challenges are appraised by SFs that maintain the cynic as cynic, they are likely to find in them justifications for not continuing with the practice.

Much like the robot model is more likely to stabilise habits that maintain blood sugar levels within its essential variables when its values are included in the state space, one is more likely to stabilise autonomous patterns of behaviour that maintain our identities within their essential variables when we are simultaneously sensitive to the normative dimensions of those identities as well as to the dynamics of ongoing action. In this way, activities at one level get infused within the normative dimensions of other levels, but also feedback upon those levels, maintaining their normative dynamics, or transforming them, however subtly, in the process.

Although not thought about in these terms, there is something of a recognition of these dynamics in practice. In existing popular approaches to 'behaviour change' there is talk about so-called 'golden behaviours' (Fogg 2019), behaviours that one must on some level "want to do". Behaviours that, in the words employed herein, accord with some self-generated norms of your existing SFs at longer timescales. Not all novel behaviours are going to be accommodated by everyone to the same degree, regardless of whether they approach the effort to change in precisely the same way. In other words, the more a particular pattern of operation coheres with the norms of the existing ecology or reduces existing tensions therein, the more likely it is to stabilise as a SF. One can think about this as being analogous to the dependencies of certain plants on the presence of certain conditions. An olive tree is unlikely to take root in the wilds of Greenland in a manner similar to how a consistent exercise habit is unlikely to 'take root' in the relationship between the 'hardnosed cynic' and their environment[83]. Similarly, other authors speak about 'identity-based habit change' (Clear 2018). Although written for a popular audience, lacking any acknowledgement of the temporal dimensions entailed, informed by a more associationist understanding of habits and positing identity as some sort of belief structure, Clear's writing

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[83] Of course, one must be careful suggesting what will and will not 'take root' in any individual. Human beings and their ways of life are infinitely more complex than olive trees and their ideal growing conditions. I have encountered native Japanese folks who play traditional Irish music with the same dedication as someone born and raised in County Clare.

nevertheless imparts some of the insights included in this chapter, i.e. that there is some inter-regulation between identities and habits, whereby identities enable the formation of habits, and thus one is much more likely to stabilise habits that accord with some existing identity (and, not incidentally, that identities emerge from collections of habits).

Of course, once one recognises that such inter-regulatory dynamics may exist at all scales and all levels, one must admit that there is infinite potential for inter-regulatory dynamics between SFs. Consequently, any hope to provide simple general rules for their integration is likely misguided. Nevertheless, it is not difficult to imagine the possibility for cascading relations throughout the normative dimensions of the various relatively autonomous organisations relevant to a given situation, wherein, for instance, affective dimensions might help regulate the variables of biological frames, sensorimotor dimensions might help regulate the variables of affective frames, linguistic dimensions might help regulate the variables of sensorimotor frames, and so on. Consider the following — admittedly caricatured — example of a nest of inter-regulating SFs enframing a situation for B, who suffers from diabetes.

As per the example of intelligent habits above, B needs to maintain stores of the essential variable glycogen within the bounds of viability. This opens a possibility space in which certain other processes are more likely to habituate, for they also maintain B within those bounds. Having lived with diabetes for some time, B has grown sensitive to how highly aroused states, such as a strong fear response, dysregulated blood sugar with a delayed effect and can lead to hypoglycaemia. As such, B has developed some sensitivity to the levels of fear she is able to manage without triggering such a response. Thus, the essential variable glycogen frames the affective possibility space, and supports the stabilisation of a set of affective boundaries of viability within which B tries to maintain her levels of fear. Having practiced maintaining these levels for so long, a degree of autonomy emerges at the level of the fear response itself. This habituated affective frame can in turn provide some boundaries of viability for sensorimotor coordinations. Having developed some sensitivity to her degree of fear response, sensorimotor coordinations that are sensitive to its regulation are simply more likely to take hold. With repetition of approaching the boundaries, activities that help regulate the fear response are allowed to stabilise, e.g. a tendency to get up and walk around, focusing attention on the breath in the present moment and breathing deeply and slowly, the recitation of a mantra. Over time, such a collection of habits might cohere into a personal identity with its own autonomous dynamics, which then provides some boundaries of viability for the stabilisation of additional micro-identities, which holds the same potential for habit schemes, which holds the same potential for simple habits, and so on. At a certain number of degrees removed, B will likely not have any conscious awareness that her

simple habits are being enabled by her levels of blood sugar. Nevertheless, those that are sensitive to such dynamics will be more likely to sediment.

Importantly, this is not a bioreductive account. Levels of autonomous organisation, as has been pointed previously, can emerge that work against the maintenance of biological variables within optimal viability limits. In fact, any level of autonomous organisation can emerge in tension with others, they are simply less likely to. By leaning on the compatibilist language developed here, this account attempts to make intelligible how SFs at various levels and scales can establish mutually enabling organisations that can be understood as 'intelligent', i.e. they support the regulation of some variable not directly under their control. Refining our abilities to disentangle the kinds of inter-regulatory dynamics highlighted here will be invaluable work in future works, with implications across almost every domain of human activity. However, there is one other inter-regulatory dynamic worth highlighting before closing out this section. Mentioned in the previous chapter, it concerns the momentary reorganisation of SFs at longer timescales, and thus illustrates that the emergence of SFs is not always one in which shorter timescales are entirely subjugated to longer timescales. SFs, in other words, are not organised in a strict hierarchy, even if there is typically a dominance of entertainment from shorter/quicker to longer/slower.

Typically, SFs that function at longer timescales arise from the progressive integration of multiple SFs that function at shorter timescales, e.g. activities that get repeated form habits which get networked together and eventually gain some closure as micro-identities, which cluster to form personal-identities, and so on. However, as also mentioned in Chap. 6, there are occasions in which SFs that function at much longer timescales get reorganised in a moment, having significant consequences for whole hosts of SFs they help shape at shorter timescales. Depending upon the centrality of the SF in the larger ecology, such experiences can be powerful for the subjects at their centers, and can be both challenging (e.g. sudden loss of a loved one, traumatic events) and/or rewarding (e.g. artistic and creative breakthroughs, realisations around one's 'identity'). With time, of course, and continually tending towards an optimal grip, the sense of settling into the new SFs can stabilise, as the norms across the various timescales and relevant situations adjust to the novel regime. In the language of complex systems, such dynamics reflect critical fluctuations in the system dynamics (a bit like the bigger avalanches in the sand pile).

Most mature adults will have experienced several such events in their lifetime. Indeed, they might even point to them as turning points or defining events. I recall one here from my own experience that I take to be particularly insightful to the present discussion, given its distinctive phenomenology. I grew up in a relatively active religious context and in a home in which a general spiritual framing was common, and as a young man I had many relatively unsophisticated commitments consonant with such surroundings. Around the time of coming to university to pursue

a degree, I recall listening to an audiobook by the sceptical thinker Michael Shermer (2002) over the course of a long drive by myself. I was utterly convinced by it at the time, and within a couple of hours I had abandoned a veritable lifetime's worth of commitments. Being a meditator, however, I was sensitive to the dynamics of my experience and their changing, and having made the 'decision' that I was abandoning my 'spiritual' commitments I observed what I can only describe as a radical self-(re)organisation of my identity taking place throughout the next seventy two hours or so (a major avalanche, if you will). The distinctive phenomenology of the experience was as follows.

I found myself intensely imagining two types of situations repeatedly, ruminating upon them, each with distinctive affective tones accompanying them. One type of situation was those in which I had acted from my previous commitments; occasions where I spoke from a place that betrayed my prior 'spiritualism'. Imagining such occasions, I felt deeply embarrassed and ashamed, and the feeling of wanting to distance myself from 'that person' was evident. The second type of situation were those in which my new commitments might be now relevant. Some of these were situations modelled on the previous ones mentioned, where now I acted 'this way' instead of 'that way', but most were just potentially relevant situations that I was concocting and imagining how I was going to act if ever such a situation arose. What might I say? How might I respond if this or that was asked of me? And so on. Practicing the answers, feeling them in my body. The intensity of the experience was not unlike how one feels when they are in the heat of a confrontation, a kind of intense searching for the right response and anticipation of counter responses. Accompanying these imagined situations was also a feeling of self-righteousness, a stepping into a new, somehow better, and now finally 'right' me.

All of this seemed totally outside of my 'control', or, at least, if I were to set about intentionally making such a change, would have demanded skills that I have not to this day cultivated. I simply found myself defaulting to these imaginings any chance given, and would repeatedly kind of walk in on myself, catching myself ruminating on these imagined scenarios repeatedly. Then, when later finding myself acting in situations consonant with my imaginings, I watched the rehearsed patterns emerge as if from the core of my being. The new personal-identity, attendant micro-identities and so on, had been partially enhabited in my imaginings, and only sedimented further when repeated in real life situations. Of course, this account has many complex dimensions that could be teased out in detail, e.g. social dimensions, imaginal dimensions, a history of engaging with ideas that had, in a sense, primed me for such a change, and so on. It is primarily included here, however, to eschew any ideas of simple hierarchies by pointing towards the capacity for events at short timescales to significantly transform SFs that function at longer

timescales. This likely entails the abrupt cohering of a network that occupies some central position in the ecobehavioural ecology.

Such inter-regulatory dynamics align well with the 'mechanisms' introduced in previous chapters. Much like the pile of sand poised in the critical state, for which it is impossible to predict whether the next grain of sand will lead to an avalanche or not, for entities comprised of inter-regulating frames across multiple levels and scales, it is virtually impossible to predict how any given event might reshape the existing arrangements. Under such conditions, tiny perturbations (akin to the grain of sand) can have significant impacts as they cascade through the ecology of SFs. Conversely, larger perturbations that one might expect to lead to substantive reorganisations might be encountered without much of an impact at all. Moreover, throughout all the critical fluctuations, a more global criticality (analogous to the slope [the order parameter] of the sand pile) is retained. That I can identify both the spiritualist, and the sceptic, and some of the twists and turns before and since, as 'me', speaks to precisely such a preservation.

Ongoing investigations into these inter-regulatory dynamics will be well served by their analysis alongside some of the more formal mechanisms explored in previous chapters. One might ask, for instance, to what extent these multi-scale multi-level relations reflect nested interaction dominant, softly-assembled systems (or synergies), and to what extent do these help comprise the structures undergirding habitual organisations at various timescales? What are the temporal dimensions of synergies, and to what extent can this language be extended to affective, or even linguistic processes? Does, for instance, the emergent network of habits that support B's adaptive responding to stressful situations to maintain her response within the limits of viability reflect a temporally extended synergy, in which frames at various timescales allow for reciprocal compensations and the maintenance of some more global goal of the system (e.g. maintain blood sugar within viability)? Or does the uncontrolled manifold offer insights into the relationship between emergent SFs and the variables they help regulate? Recall that activities within the manifold that maintain the value of the performance variable (e.g. blood sugar, level of fear response, identity as a good learner) as constant are permitted, those that do not are limited. More formal investigations into such inter-regulatory dynamics should be encouraged in future research and will need to employ experimental and modelling methods to render with the clarity demanded by a radically embodied cognitive science. Clarifying these dynamics will be invaluable within, for instance, the domains of healthcare, education and design, helping us move away from more reductive approaches — which have dominated these domains in the last centuries, and although all have contributed greatly, have by now outstayed their welcome — and usher more ecological, relational, holistic approaches. In what remains of this chapter I want to make explicit a couple of

notions that have been mentioned at various points up until now, but have not received any elaboration, namely, *boundaries* and *backgrounds*.

7.5 Of boundaries and backgrounds

7.5.1 Boundaries, what boundaries?

One concept, important to the notion of SFs, but remaining somewhat ambiguous up until this point, is the concept of boundaries. Indeed, the notion of a frame is somewhat synonymous with a boundary. If the claim is that any SF is an autonomous system in the proper sense of the term, it is essential that it realise a boundary of some description, for only in doing so can it distinguish itself from its medium and maintain itself as an integrated unity (part of the definition of what it means to be autonomous). Of course, in the autopoietic organisation the boundary is easily specifiable. Therein, the material membrane functions as the boundary by which life distinguishes itself from not-life in its biochemical medium[84]. The boundaries that form the membranes to our ways-of-life, however, are of a rather different sort, and certainly less easily specifiable. They are boundaries, it is suggested here, within the umwelt of the embodied subjects that bring them forth. Grounded in the bodies of those who enact them, and the traces left throughout their sociomaterial mediums, they are produced, reproduced, perturbed, or torn down with every act of selective openness, and every arch of action taken.

The notion of selective openness itself already suggests something of a boundary in our attention and peripheral awareness. For instance, as well as moving towards certain features of my environment and opening myself to their effects (acts of self-production), I also retract from other features of my environment, or dampen their possible effects (acts of self-distinction). I am open, but selectively so. Not incidentally, the kinds of dynamics implied here are congruent with Kyselo's enactive account of the ongoing individuation of the self, which she writes about as emerging with and from a world (2014, p.8). It is both dependent upon or *participating* with certain features of the world (self-production), whilst also emancipating itself from it by making *distinctions* (self-distinction). Thus, tending towards an optimal grip, these dynamics manifest in the bodily dynamics of embodied subjects as patterns of selective openness and attendant patterns of action that are relevant to the reproduction of autonomous dynamics organising them in the first instance. Indeed, it is precisely the maintenance of such boundaries that the self-regulating norms of our habituated SFs are aiming at. Such boundaries are prodded and poked at when we feel awkward in our movements learning a new dance step; when we feel fear about attempting a headstand in

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[84] As suggested previously, there are other autonomous organisations with their own boundaries relevant to the sustenance of life also, such as those enacted by the immune system.

yoga; when we feel disgust at the food that we have long forgotten why we feel disgusted by; or when we feel threatened by that thing in our environment that caused us harm all them years ago.

Some recent work by the philosopher Konrad Werner (2018) puts forth a very similar position. Werner develops the notion of a 'cognitive niche', or what he terms a 'c-niche' for short. Introducing his account, and his justifications for articulating it, Werner (2018, p.26) writes that the account of the C-niche

> can be described as making some introductory claims about how complexity and stability emerge in the peculiar domain of cognition or rather in-between the cognizing creature and its environment. In other words, how relatively stable structures come about not in the physical world proper ... but in the lived world.

What Werner is pointing towards are structural interdependencies not unlike those argued for within processes of enhabiting. Though, Werner's account suffers some vital shortcomings. According to Werner, once the autopoietic entity (what he calls the 'tenant') is sufficiently developed, there arises a need for the tenant to make its actions efficient. This need, he claims, leads to the construction of the C-niche, which results in the surrounding world being partitioned into "things, properties, regions, events, etc." (ibid, p.20) Much as it has been argued that the enhabiting of SFs entails a kind of transformation of habitat into umwelt, for Werner too, the development of the C-niche entails the "transformation of" what he calls the "niche base" (read habitat) into what he calls the "niche medium" (read umwelt), a process that quite explicitly has to do with "boundaries coming into being." As Werner writes "cognition is not about representing the existing boundaries or surfaces of the surrounding world but about establishing boundaries within it, so that the world shows itself ... in the guise of a C-niche as divided into regions and objects, in accordance with the cognizer's autonomy. And this is not about creating representations of boundaries; it is about bringing them forth in the world" (ibid, p.14). As can be seen from this quote, the enactive notion of autonomy is important to Werner's concerns and to the production of boundaries in the C-niche too. Indeed, in a fashion that is highly sympathetic with the compatibilities between the autonomous dialectic and the selective openness that have been teased out previously, Werner writes that "A niche is a container whose external boundaries delineate only entities that are relevant to the tenant; i.e., the boundaries are established by a set of conditions that are necessary to maintain the tenant's autonomy (2018, p.10). For Werner, the notion of autonomy refers purely to organisations within the biochemical domain, i.e. autopoiesis, and possibly the autonomy of the immune system. As such, however, he is making use of only one class of SF's. Under such an account the "stable structures … in the lived world" (ibid, p.25) of the embodied subject are entirely limited to those relevant to autopoiesis. In other words, the

structure of the cognitive niche under Werner's account is related only to the maintenance of life but excludes the ways-of-life that are embedded in our habitual SFs.

But the boundaries that segment our umwelts denote objects and things over and above those relevant to maintenance of life. Indeed, given the plasticity human beings are capable of, even the 'C-niche' that is brought forth because of biochemical autonomy is so entangled with our ways-of-life (we don't just eat, we eat X because X) that any satisfactory account of something like a C-niche must necessarily entail the broader understanding of autonomy and habitual SFs also. Thus, we can be inspired by the notion of the C-niche, and the bringing forth of boundaries that it suggests, but it must be decoupled from its purely biochemical basis, recognising it as also comprised by SF's that borrow from the biological but do not derive their normativity entirely from that domain. Herein, the terms umwelt or life space (Fuchs 2019) are preferred over c-niche (as the frame of all sense frames of any subject) and taken to include the kinds of distinctions and boundaries that Werner advocates as well as all others that might be relevant to our ways-of-life.

Moreover, Werner's account is rather solipsistic, something he admits himself when he writes that "it is true that the niche approach neglects participation of more than one subject in the process of enactment".[85] Given the kinds of intercorporeal dynamics spoken about previously, and how such dynamics can shape the sense-making of any individual subject, the co-construction of the umwelt, in the form of patterns of being together, can be coherently argued for. This will become clearer over the following chapters when developing the account of *coenhabiting*. In sum, the boundaries in the compatibilist account being developed here, over and above those instantiated as material boundaries in the biochemical domain, are functional boundaries operative in the sociomaterial domain and enacted in the relationship between subject and world, they are the boundaries of and in the umwelt. Any boundary one observes is precisely such a boundary, and its stability is contingent upon its being embedded in a habituated SF. If one asks, where are the boundaries of our SFs (for autonomous systems need boundaries), one legitimate answer is, they are the boundaries in and of your world, whatever they may be.

The more central some SF is to the organisation of our active engagement with the world, the more 'policed' its boundaries are likely to be as a function of the density of its integration with other sense frames in the network. For instance, religiously and politically infused personal-identities are so central to the organisation of our action across such a broad range of situations, and in relation to such a broad range of issues, that to challenge them is often to flirt with substantial dysregulation of the entire umwelt. As such, the boundaries of such identities tend to be fiercely protected, sometimes at the cost of the biochemical organisation from which they

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[85] This is something he is strongly criticised for by De Jesus, who writes of *The Myth of the Cognitive Niche* (See De Jesus 2017 for extended discussion).

borrow. In such instances the idea that SF's "take on life of their own" is often more than a metaphor, and they might sometimes even be viewed as parasitic. Given the kind of inter-regulatory dynamics spoken about previously, such boundaries are reflected in our visceral responses to situations that perturb them. Thus, concepts, language and so on, can serve as linguistic SFs integrated with SFs at different levels and timescales and so animate us right down to our most primary biological relations. One might speculate that it is such inter-regulatory relations that allow for phenomena such as placebo effects, whereby even the pretence of medical treatment can have regenerative effects on biochemical processes in the body.

Barandiaran et al. do not speak much of the boundaries of habitual organisations. Though, from what they do say, one senses they seem to want to limit any talk to the endogenous activity of the embodied agent, even if mediated by structures in the environment. Barandiaran (2017, p.12) writes

> We can avoid committing ourselves to the externalist position that many have attributed to Alva Noe … that is, the supervenience of cognition upon (extended, out of the head) environmental states. Sensorimotor constitution involves the correlation structure of M → S as constitutive of cognition, it needs not assume or defend that the state of the environment is also constitutive, that is M → E → S.

However, if to be considered part of an autonomous network a process simply needs to be enabled by and enabling of other processes in the network (recall the black circles from Chap. 4), such that in the absence of the network said processes also stop, it is not difficult to imagine how such processes might be extended beyond the boundaries of the head. Think of the upright position of a unicycle and its relationship to the skill of unicycling. The position of the unicycle enables the reproduction of the SFs that support the skill of unicycling, but those SFs also enable the position of the unicycle. If a skilled rider feels it slightly out of position they will experience a tension, the self-regulatory norms of the SF, that they reduce by repositioning themselves on the unicycle, thus enabling its position and allowing it to enable the reproduction of the SF. In such cases, the environment seems to play a constitutive role in the autonomous network[86]. In this way, boundaries in the life space can become correlated with boundaries in the physical world, i.e. the norms of the SFs that support skilful action become correlated with the angles within which the unicycle can be maintained as upright. Indeed, even more explicit examples can be developed. Think of someone who may have enhabited a personal-identity as someone who needs to feel safe, and this in turn manifests in an actual boundary around one's house in the form of some laser sensors. The sensors enable the maintenance of the personal-identity as someone who values safety, and the personal-identity enables the maintenance of the laser boundary. Thus,

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[86] The path through the grass is another clear example of such.

features external to the endogenous bodily dynamics of the agent are part of the precarious operationally closed network. If the network disappears, e.g. one injures their leg, or no longer feels the sense of threat having engaged in some psychotherapeutic treatment, the upright position of the unicycle, or the laser boundary, might disappear also. Likewise, if the upright position of the unicycle is no longer available, the skill will degrade, or if the laser breaks, one may eventually adjust to life without the sensor and still feel safe. And so, one can see how, at least on some occasions, the environment can play a constitutive role (and not merely mediating role) in the production and reproduction of habitual SFs[87].

A final though important point to include here is that boundaries in habitual SFs can also be temporal. As has been said previously, SFs carry us through courses of action and organise our expectations and anticipations over arcs of action that typically have a beginning, middle, and end. As observed in the example of meditating, such boundaries can be quite distinct, aligning corporeal time with clock time to margins of error on the scale of seconds. In this sense, SFs can quite rightly be thought of in terms of temporally bounded events.

The next chapter will suggest something about how the boundaries of SFs function in the social world also. In what remains of this chapter, however, a notion that is closely related to the idea of the boundary will be considered, i.e. the background. It is important to develop it now, for as will become clear later, it proves a very useful notion when thinking about the dynamics of social interactions and the emergence of patterns of being together.

7.5.2 Backgrounds

One could go into detail on elaborating what is implied be the notion of background when referring to sense-making frames. Indeed, much ink has been spilled that might inform the topic, particularly by phenomenological thinkers of the 20th century and their progeny. e.g. Husserl, Heidegger, Merleau-Ponty, and Dreyfus. Husserl, for instance (and later Merleau-Ponty), conceives of our perceiving anything at all as the perception of a figure, which is the focus of attention, against a background, which informs the experience of the figure but is not the direct focus of our attention. Husserl used the language of 'horizons' to speak about such backgrounds. Moran writes of Husserl's horizons as "zones of genuine significance that cannot be objectified in the manner of the objects of perceptual experience but serve to contextualize ... the objects in experience" (2017a, p.9), or Kaüfer and Chemero (2016) speak of the horizon of an act of perception as the background of meaning against which an object of perception stands out from. When you observe the chair, although you are sitting still and seeing it in only a very limited fashion — you do not see its back side, nor its underneath — you nevertheless have some sense of it

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[87] Insights such as these may allow for the extension of the notion of autonomy into discourses concerning ideas of niche construction and the co-evolution of species and their environments.

having such features, of it comprising a three dimensional object. This sense is predicated upon what Husserl referred to as an 'awakening'. What is awakened is a set of possible related perceptions (a horizon) one could have of the chair that is dependent upon a history of interacting with chairs. Merleau-Ponty (1963), effectively expressing the same idea, speaks about the apperception of the object, in which the object is given as a whole with its context even though the focus of attention is only on the object itself[88][89]. Not incidentally, for Husserl the horizon was very much a temporal notion, "marking the way", as Moran puts it, "in which the present emerges from the past and projects toward the future" (2017a, p.9).

Recently, these ideas have been developed further. Kee (2020), for instance, extends this understanding of horizons — suggesting it is predicted on dynamics of habituation (perfectly congruent with the present account) — to an understanding of the dynamics of languaging. Therein, he makes a compelling case for the idea that our perception of language is not altogether different than our perception of objects, i.e. whether we perceive a chair or just hear the word chair, it awakens "a dim sensorimotor simulation of some of the relevant perceptual and motoric features of seeing or interacting with [chairs][90]" (Kee 2020, p.19). In other words, horizons do not relate solely to sensorimotor dynamics, but habituated dynamics of all forms, up to and including language.

In the language developed herein, the perception of the chair (in its particular context) mediates the reproduction of an ecology of habituated inter-regulating SFs — at various scales and levels — that enable a particular course of action and subtend a readiness to act with respect to some set of contingencies that reflect a history of interacting. What is different about the background here than the horizons of the more squarely phenomenological account (as I understand them), is the explicitly goal directed character of SFs that aim at their own reproduction. In other words, in sense-making and tending towards an optimal grip, we are not just ready to act with respect to some set of contingencies, but always-already acting towards some implicit ends, i.e. the reproduction of our existing habits and identities, or their better integration when they prove inadequate.

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[88] Husserl did use the language of apperception also, but it has been more robustly developed within the work of Merleau-Ponty.

[89] Interestingly, Merleau-Ponty also relates these ideas to notions of the 'unconscious'. In his *Working Notes*, Merleau-Ponty writes that "This unconscious is to be sought not at the bottom of ourselves, behind the back of our "consciousness," but in front of us, as articulations of our field. It is "unconscious" by the fact that it is not an object, but it is that through which objects are possible, it is the constellation wherein our future is read (Merleau-Ponty, 1968, p. 180). The 'unconscious' then is a kind of structure that makes relationships possible, and the ultimate background against which any perception is made. Developing these ideas further recently, Thomas Fuchs (2019) has replaced the notion of the unconscious with the *life space,* and how it shows up in any situation, the *phenomenal field* (see Sect. 9.5)

[90] Kee develops the example of a hockey stick. In the quest for continuity I have swapped it for the example of a chair here.

Dreyfus, building primarily on the work of Heidegger, also develops a sophisticated account of the 'background' that goes beyond perceptual experience. The 'background' — or in more social terms, our 'background practices' — is that which situates our being-in-the-world at its most primary level. For Dreyfus, it is meant to capture a kind of basic relationship to the world that our more conscious intentional states are derivative of. As Wrathall suggests about Dreyfuss's position "intentional states can only have a content against a non-intentional or pre-intentional background" (2000, p.93). We need not delve into questions concerning content here. Suffice it is to say that, for Dreyfus, the background is the set of habituated skills, practices and activities that gear a body into its environment. Stern writes that the Dreyfusian background is supposed to "help us see how phenomena as diverse as consciousness, intentionality, rule-following, knowledge, and representation presuppose skills, habits, and customs" (2000, p.53). Dreyfus's background, in other words, is not all that different from an account of horizons that acknowledges notions of habit as central to their construction. However, although Husserl, Dreyfus, and Kee too, all specify habit as central to their accounts, none have attempted to develop the notion to the extent that it has been developed herein.

The notion of a frame is not just synonymous with the notion of a boundary, but also with the notion of a background. What the notion of sense frames provides is an account of the background that aligns with the ambitions of Dreyfus (Husserl, Kee, etc.) but is also more amenable to a contemporary cognitive science that is ultimately concerned with empirical investigation of such notions. The Dreyfusian account of background is, at best, a rather coarse-grained heuristic. As is, it does not adequately capture the features that are explicit in the account of sense-making frames developed here, i.e. that they are inter-regulating, metastable, self-producing, ever-evolving wholes, that function at multiple scales and multiple levels of human organisation simultaneously. And so, when referring to the background going forward, it is certainly intended to capture the skills, habits and customs that reflect our bodily being in the world, but more than that, it also suggests something about the normative dimensions of our being in the world, given that it is comprised of autonomous self-producing sense-making frames at multiple scales and levels. That said, the notion of background does itself have descriptive value, and, using language that has been employed previously in this account, one can think of SFs as providing the situated backgrounds within which our ways-of-life unfold, like silent grooves within which improvise in the day to day of living.

7.6 Conclusions

The structure of musical performance seems to provide an example par excellence through which to refract the various dimensions of SFs. Inter-regulations between various levels and

scales, temporal and normative dimensions, boundaries, and backgrounds, are all quite easily illustrated in this domain. Think of the organisation of a jazz band doing an improvised performance, the band comprising a rhythm section — e.g. bass and drums — and some lead elements — e.g. a lead guitar and an alto saxophone. The rhythm section lays down a groove that brings a temporal order to the action space, functioning as a background that supplies a structure within which certain kinds of relations are possible. For the lead players what emerges is not only a readiness to act in relationship to the emergent structure, but arcs of action that fill the space, reflecting the order of the rhythm section by playing in the key or particular style it suggests, but at shorter, quicker timescales. Thus, within the groove of the rhythm section a background of sorts is manifest, one with musical boundaries, temporal limits, and normative dimensions with which lead elements might be more or less consonant. Here optimal grip and radical dissatunment may be only a single fret, or a single beat apart. Here rhythm and lead components inform and enable each other, allowing for the self-organised emergence of distinctive patterns that are the property of the group. The musical example is valuable for it provides an analogy with which to make the types of structuring relations that usually comprise an undisclosed background come into relief. Here we can see and hear the organising relations, as if embossed upon the structure of existence. But illustrative as they may be, they are but the tip of a vast iceberg, a great and hidden debossing that must be in place for these relationships to emerge as they do.

The rhythm section functions as a background for the lead, but there are depths of undisclosed background also, the host of habituated SFs within which the activity of the performance is also taking shape, e.g. the sub-genres and genres of music that it reflects, the scales and modes employed, the tradition within which it is embedded, the local dynamics of the scene, the behaviour setting of the interaction, and so on. Each sense frame enables the performance, and collectively they provide a multi-level, multi-scale background of varying degrees of plasticity and sedimentation (i.e. varying degrees of autonomous closure). SFs at shorter timescales tend to be more plastic and subject to the reorganising effects of the improvisations of the performance. The lead improvisations feed back into the framing provided by the rhythm section, modify it as it goes, speeding it up, slowing it down, etc. The performance might even have some effect on the constitution of sub-genre within which it is being performed. But any one performance will have only trivial consequences on the genre, and virtually none on the scales, traditions, and so on. Of course, analogous to the inter-regulatory dynamics spoken about previously, there are performances (a bit like my conversion to sceptic) that will redefine a genre, but they are much less common.

The suggestion is that in any given domain analogous structuring dynamics are present — though tending to be more like the disclosed variety — and our manifest behaviour is largely

reflective of our attunement to them. The case of musical performance is introduced here, however, with an additional goal in mind, over and above clear explication of such multi-level, multi-scale organisation. What this example implicitly suggests — that other examples employed up until this point have not — is that SFs can also function in the social domain. Notions of temporality, normativity, inter-regulation, boundaries, and backgrounds become all the more important when attempting to make not only sense-making frames more intelligible, but habitual social organisations too.

Having now clarified the most important dimensions of sense-making frames, returning now to the original object of concern of this thesis, the remaining chapters will argue that what have been referred to up until now as patterns of being together are in fact better described as participatory sense-making frames. These are self-producing ecobehavioural entities with varying degrees of autonomy that come into being in relationship with others and thereafter shape those interactions as their implicit and ever-evolving backgrounds, giving rise to boundaries both within the interaction itself and between the interactive grouping and the sociomaterial medium wherein they take shape. The individuation of PFs is dependent upon our ability to coordinate within nests of frames not unlike the example of musical performance. Indeed, the patterns that characterise those composed or rehearsed in recurrent musical interactions are themselves prime examples of such frames, particularly those that reflect a history of playing together. We are all a bit more like jazz performers than we might imagine, though, unlike in the case with musical performance, the frames of everyday interaction tend to remain transparent to our view and we are all playing lead upon silent grooves.

8 Coenhabiting

> Others, then, exist inside us, side by side with the person we are to ourselves ...
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> Knausgaard (2017a, p.108)

> … our humanity is at once shared and singular. This paradox of plurality means that we both identify with others and differentiate ourselves from them ... Identity connotes both *idem* (being identical or the same) and *ipse* (being self in contrast to other). Accordingly, human beings seek individuation and autonomy as much as they seek union and connection with others.
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> Jackson (2012, p.6)

> They demonstrate that even the essential character of human consciousness is such that the community is in some sense implicit in every individual, and that man is not only part of society, but that society and the social bond are an essential part of himself; that not only is the 'I' a member of the 'we', but also that the 'we' is a necessary member of the 'I'.
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> Scheler (2007, p.229)

8.1 Introduction

Our shared concerns bind us and support the emergence and reproduction of autonomous patterns of being together at multiple timescales[91]. Consider a couple of newlyweds lifting furniture into the back of a removal van. As their interaction unfolds, patterns are produced and reproduced at multiple timescales, in the dynamic coordination of limbs and bodily postures, in sets of expectations and anticipations about how activities relating to various dimensions of the interaction can and should unfold. At one timescale, the newlyweds coordinate their sensorimotor dynamics in accordance with their most proximal concern, successfully lifting the furniture into the van. Having this shared concern helps call forth the affordances that allow them to co-regulate their bodily postures, joints, and limbs to guide the furniture into position. Lifting three chairs into the van today, they don't need the same degree of explicit co-regulatory activities — in the form of words, nods, grunts and such — for lifting the fourth and fifth chairs tomorrow (or even next week). And indeed, some of the co-regulatory activities they use have taken on stable meanings specific to the context at hand. The implicit backgrounds that now help coordinate their action seem to have taken on a self-producing dynamic, channelling their coordinative coupling into previously worn paths, reinforcing them further with their recurrence.

At another timescale, they are concerned with enacting their identities as newlyweds moving into their first home. Such concerns show up in how they address each other, e.g. a certain tone in their voices, a degree of patience and care in how they approach their task. But such dynamics

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[91] Herein the language of *concerns* is employed to speak about the normative dimensions of our ways-of-life-together.

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also reaffirm those shared identities, reminding them of their status, what it means to be 'newlyweds', subtly modifying such meaning as it unfolds within the passing moments. And at still another timescale they coordinate according to the concerns of being part of the institution of marriage. These manifests, for instance, in feelings of conviction that this move will be for the longer term. It is reflected in their language and their plans together, in how their new levels of commitment shape their attention to things in their environment. Again, these feelings and how they permeate the actions of the pair, even when simply lifting furniture into the back of a van together, feed back into the meaning of the institution as they understand it, however trivially.

Such patterns carry forth the concerns that gave them shape, but also stabilise new concerns specific to the interactive situation (the gentle pace at which they spontaneously approach their task on day two reflects the learned need for a gentle pace on day one). This allows the coordination of successive interactions with respect to a set of shared, though often implicit, concerns/norms. To further the musical metaphor, they come to form the shared but silent grooves within which they 'jam' together. Such norms are not limited to the task that specifically entails the coordination of joints and limbs, but also the maintenance of the interdependence of the beings who enact them, the reproduction of a sort of caring bond between each other and their socio-material milieu. Thus, we not only sediment patterns of bodily doing together, but rather, and more encompassing, self-reproducing patterns of bodily being together.

These concern generating habitual organisations will be generally referred to as *participatory sense-making frames,* or *participatory frames* (PFs) for short. In what remains of this thesis, building upon insights from previous chapters, the hope is to show that PFs can be understood as autonomous self-producing organisations perfectly continuous with the sense-making frames explored in previous chapters, but dependent upon more than one person for their production and reproduction. Participatory frames, it will be suggested, pre-reflectively gear individuals into each other, and social interactions into the meaningful social structures they help comprise, they serve as the normative backgrounds to ongoing social interactions, shaping what is both likely and possible therein, and they are effectively the primary carriers of the cultural orders that comprise our habitus. Such frames include everything from simple shared habits (e.g. each member in a couple having their own sides of the bed, or the grunts and nods that arise and sediment in the context of lifting furniture together) and habits schemes (e.g. dressing the bed in the morning together, or one partner taking the heavier side of the furniture), to more encompassing shared micro-identities (e.g. tending to go to bed around the same time and thus coordinate getting ready, or one person normally waiting upon another to get started lifting furniture into the van) and more complex and enduring interpersonal inter-identities (e.g. a newly married couple who do everything together, including sharing a bed and lifting furniture into vans

together). Such inter-bodily habitual organisations, goes the claim, arise within the dynamics of prolonged and/or recurrent social interactions through processes of *coenhabiting*. Repeatedly tending towards a *(co-)optimal grip,* and acting with respect to a variety of individual and shared concerns at multiple timescales, patterns of being together that integrate those (or some of those) concerns with situational dynamics stabilise as autonomous participatory frames, consensual organisations that form the background to ongoing social interactions, shaping the sense-making of those who instantiate them whilst carrying forth the regularities wherein they came into being, though also reorganising them in the process.

This chapter is again presented in two parts. Part one begins with some framing of the present efforts. Firstly, continuing in a compatibilist spirit, it situates the present account amongst both De Jaegher and Di Paolo's enactive account of the *participatory sense-making* framework (2007) and Chemero's recent ecological leaning *sensorimotor empathy* framework (2016). Then, to set some precedence for the novel extension of the notion of habit to the social domain within radically embodied cognitive science, a review of the existing literature on social accounts of habits is provided, with some suggestions as to how the present account extends beyond some of the limitations therein. Finally, a brief review of Simondon's account of collective individuation and some suggestions about the importance of focusing on face-to-face recurrent interactions are offered. In part two the positive account of coenhabiting is developed in detail. Here, through the development of the notion of tending towards co-optimal grip and the explication of some intuitive examples, it is demonstrated how acting towards both individual and shared concerns in recurrent social interaction, *participatory frames* stabilise at multiple timescales, from simple social habits to *interpersonal inter-identities*. After that, some refinements and corollaries of the main position are offered, and some suggestions are put forth in terms of potential ways to consider these phenomena experimentally. Finally, as something of a summary and synthesis of the account gone, a basic diachronic account of the individuation of novel participatory frames is included.

Part. 1

8.2 Some framing

8.2.1 Participatory sense-making and sensorimotor empathy

Chap. 5 introduced the notion of participatory sense-making at some length. There it was suggested that the notion of sense-making as it applies to individual agents needs to be extended in the context of social interaction, for the intercorporeal dynamics characteristic of such interactions modify the kinds of meanings that can be produced by opening up new dimensions of meaning that are not available to the individual agent alone. As De Jaegher and Di Paolo put it, through "the coordination of intentional activity in interaction … individual sense-making processes

are affected and new domains of social sense-making can be generated that were not available to each individual on her own", (2007, p. 497). It was also suggested that the notion of autonomy was helpful in characterising the basic organisational dynamics of social interaction, for what emerges in interaction is an organisational order that tends to reproduce itself. Here, the examples of the conversation that persists, or the pair who end up wobbling over and back together in the tight corridor, were taken to exemplify these basic dynamics. In such examples, there is, in some genuine sense, a third party to the social interaction beyond the individual interactants, i.e. the interaction itself. This interaction can take on a historical dimension, such that a "history of coordination demarcates the interaction as an identifiable pattern with its own internal structure ..." (De Jaegher and Di Paolo 2007, p.492). It is the internal structuring of the interaction that is of concern now. Herein, it will be argued, such structuring is best thought about in terms of the coenhabiting of autonomously organised habitual entities — *participatory sense-making frames* — that both shape and are shaped by the activity of those who instantiate them, whilst borrowing from and transforming a larger sociomaterial niche.

This account is largely a refinement of the framework of participatory sense-making (PSM). In the literature, PSM is more explicitly about the construction of novel meaning than is individual sense-making, as typically developed. The reasons for this are straight forward. The notion of sense-making emerges from the biological domain in which an existing identity is assumed, and thus, it gets developed in terms of the maintenance of such organisations[92]. But social interaction is much more contingent, and the 'maintenance' of an existing identity is not an obvious starting point. Although explicitly concerned with the production and reproduction of meaning, the account of PSM — and its progeny, such as accounts that deal with languaging (e.g. Di Paolo, Cuffari and De Jaegher 2018) — has not satisfactorily specified the dynamics that undergird it. Indeed, When Di Paolo et al. (2018) consider the capacity for social interactions to develop forms of autonomy beyond the basic autonomy comprising the 'identifiable pattern' (i.e. the basic interaction itself), they seem to reject such a possibility. They write,

> It is unclear whether the autonomy of interactions can go further than ... basic closed organisation, whether it may develop active forms of functional self-distinction, and so on, like actual living systems do … Social interactions are dependent on the more functionally integrated organic and sensorimotor autonomy of their participants but, as a self-organised pattern, interactive autonomy seems to be of a more basic kind.
>
> Di Paolo et al. (2018, p.67)

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[92] The account of enhabiting developed previously can be understood as a refinement of the notion of sense-making, to account for the sensorimotor, affective, or linguistic constitution or reinforcement of autonomous organisations in the form of habituated sense frames.

There are a few necessary responses to this position that help set the stage for the account to come. The present account takes something of an alternative position to the standard account of the dynamics of participatory sense-making and the role of autonomy in social interactions. Nevertheless, it sees itself as aligned with the general framework. Much like enhabiting is a refinement of the more general notion of sense-making, the notion of coenhabiting introduced here is a refinement of the more general notion of participatory-sense making (inviting them both into a more compatibilist view). And so, firstly, even if social interactions were dependent upon "the more functionally integrated organic and sensorimotor autonomy of their participants", Di Paolo et al. do very little to specify how such dependencies operate[93], how the sensorimotor autonomy of participants is mediated by engagement in social interaction, or what role social engagement might play in the constitution of such organisations. Secondly, it seems quite intuitive that such interactions do develop active forms of functional self-distinction: the patterns we fall into with old friends, the stabilities that emerge when we practice together, and so on. Here one can easily envision mutually enabling relations that span the bodily divide and undergird such patterns. Finally, there is good reason for Di Paolo et al. to refrain from pursuing such a line of development. In their account of linguistic bodies (2015; 2018), they rely on the unfolding of a dialectic of tensions between a twofold autonomy, individual and social, to develop their account. If one were to integrate with their account a multi-scale multi-level autonomy in the social domain, along the lines being developed here, it may complicate their already complicated dialectical account beyond all applicability. The tensions between such accounts and the present account will likely provide fertile ground for discussion and development in the years to come.

The present account is also positioned in relation to the sensorimotor empathy framework advocated by Chemero (2016). As suggested in Chap. 5 also, Chemero (2016) describes the forms of coupled coordination with other people (or objects) in terms of 'sensorimotor empathy'. Chemero contends that in engagement with the world around us our lived bodies expand to transiently incorporate tools or other people in a basic form of embodied knowing (2016, p.8). Operationalising such couplings, he leans on the notions of synergies and interpersonal synergies (Riley, Richardson, Shockley and Ramenzoni 2011) (see Chap. 3 and 4 for extended discussion). It has previously been suggested that habituated sense frames cannot be reduced to synergies, though very often they will entail them. But moreover, it is likely that not every synergy becomes a habit either. A synergy that emerges under very particular constraints that do not recur might never have the chance to be reinforced within the dynamics of an autonomous sense-making

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[93] Di Paolo does at one point write that "in a group of frequent interactors sensorimotor bodies become, to an extent, co-defined with other bodies" (Di Paolo 2020, p.18). However, no attempt to illustrate this co-definition in terms of habits is made, nor any suggestions about what that would mean for the autonomy of social interactions.

frame with a tendency for reproducing its own invariant organisation. The same is true, one might suggest, in the social domain. Participatory frames, as they are developed below, cannot be reduced to interpersonal synergies, though they might entail them, and not every interpersonal synergy can be understood in terms of a participatory frame either. This is an interesting dynamic and again suggests the need for the kind of compatibilist account on offer here[94].

8.2.2 Social habits: Bourdieu, Merleau-Ponty, and Dewey

Given the centrality of the notion of habit to the present account, it is worth saying something about the history of this concept as it relates to the social domain. The concept of habit has a long history in the western philosophical tradition and has on occasion been deployed in the realm of the social. Notable amongst such deployments are John Dewey's account of shared habits, Merleau-Ponty's recognition of the intersubjective relevance of habits, and Pierre Bourdieu's concept — explored very briefly in Chap. 2 (some of which is restated below) — of habitus (Bourdieu 1977). Starting with the latter, each will be considered in turn now.

Bourdieu is possibly most famous for his rendering of the habit-like behaviour that embeds one's social practices and thus reflects their social status, class, and so on, in terms of habitus. However, the concept of habitus remains somewhat ambiguous within his work, with no authoritative definition to be garnered from his writings. That it implies something akin to habit is clear. However, if it were simply habit there would hardly be need for the modified term, and thus it is important to understand what these differences amount to for Bourdieu before then saying something about its social nature. Writing about such differences in *Outline of A Theory of Practice*, Bourdieu suggests that, "One of the reasons for the use of the term habitus is the wish to set aside the common conception of habit as a mechanical assembly or preformed programme ...' (Bourdieu, 1977: 218, note 47). In other words, habit for Bourdieu denotes an associationist notion in which habits are atomised, automatistic, stimulus-response mechanisms (see Di Paolo and Barandiaran 2014 for a genealogy of the notion of habit within the western philosophical tradition and some distinctions between associationist accounts of habit and organicist accounts).

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[94] This is in part the repetition of Footnote 66 from Chap. 6. The tension between these concepts reflects a larger theoretical tension between the theories within which these concepts are typically embedded, one that was reflected in the chapter on enhabiting also and the relationship between sense-making and tending towards optimal grip. The tension is that between accounts that center operational closure and those that center thermodynamic openness. Enactive approaches tend to build their ideas with notions of operational closure center of mind (even if acknowledging the necessity of thermodynamic openness, e.g. Di Paolo et al. 2017, p.115), more ecological leaning accounts tend to center notions of thermodynamic openness, even if sometimes acknowledging the role of operational closure (e.g. Chemero 2009, Rietveld et al …). There is ongoing work that explicitly takes itself to be working in the generative space between these two theoretical positions, e.g. Montevil and Mossio (2015), or Woermann (2016). This tension was revealed to me through the development of this work and the recognition of some of the shortcomings of either position when over emphasised. What a compatibilist account lacks in systematicity and internal coherence, it makes up for in generative potential. As has been argued already herein, novelty emerges from tension and incompatibility when those tensions are held for long enough. To occupy this division, and to participate in holding it as metastable, is thus to occupy a space of becoming and possibly help enable the resolution of such tensions into what Simondon would refer to as a 'consensual structure'.

Thus, the term habitus for Bourdieu is an attempt to rescue something of the habitual but put it in a more organicist framing. As Crossley writes, "'Habit', Bourdieu is suggesting, denotes ... a stimulus–response reflex, whereas 'habitus' implies a flexible disposition which, though pre-reflective, remains commensurate with purposive action and in no way precludes intelligence, understanding, strategy or knowledge on the part of the actor. Habitus, as the reference to 'dexterity' suggests, entails competence and know-how. It captures the skilled activity of the expert player rather than the conditioned response of the lab rat." (2013, p.139) Crossley, however, also offers a more mundane explanation for Bourdieu's move towards habitus, suggesting that it was for 'purely strategic reasons' (ibid, p.142). The notion of habit was in poor standing in Bourdieu's time, having been experientially denatured by the behaviourists. Consequently, it is possible that the shift in terminology was to avoid any embarrassment or confusion. Of course, this is not out of step with Bourdieu's own justification. Behaviourist accounts were associationist accounts par excellence.

Bourdieu being a sociologist, the sociality of habitus was central to his thought. As suggested previously, in his work *Distinction* Bourdieu is empirically concerned with the distribution of various social forms, such as 'tastes' among the classes. Such tastes, for Bourdieu, are to be comprehended as habitus. Habitus in these accounts are understood as social structures that are incorporated and thus perpetuated by the actors that develop within classes[95]. As Crossley writes "'Habitus' does not refer to this or that concrete practice ... but rather to a stylistic or ethical consistency apparent across a range of practices insofar as they are enacted by a particular social group" (2013, p.155). As suggested previously, as an example Bourdieu specifies the tight-lippedness of the bourgeoisie, as deployed in their habituated practices of laughing, eating and so on. This, suggests Bourdieu, contrasts sharply with the 'slack-mouthed' practices of the working classes. He later writes that habitus operate at the social level in a manner analogous to how genes operate at the biological, serving as instructions for the reproduction of social structures (Bourdieu, Passeron and de Saint Martin 1996). In other words, Bourdieu considered habitus to be trans-individual configurations that could be incorporated by any individual but were themselves the property of a particular class, group, etc. However, as suggested in Chap. 2, without grounding habitus in the specifics of concrete practices and embodied interaction, the Bourdieusian account is rendered somewhat impotent, for it lacks any sophisticated account of the propagation or perpetuation of the kinds of practices meant to be captured with the notion of habitus, something that the present account hopes to redress. Both Merleau-Ponty and Dewey

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[95] Bourdieu develops this further with the notion of 'homology', which suggests that there is a deep structure to certain constellations of habitus that denote one group or another. He also speaks about a 'social field' which seems to reflect the broader sociomaterial medium wherein habitus take shape.

developed social accounts of habit that are organicist in nature also. However, rather than replacing the notion of habit, as Bourdieu did, both thinkers simply sought to expand it to include dynamics that are social.

For Merleau-Ponty, habits are 'structures of behavior … which take shape and are reshaped in the dynamic and always ongoing process of interaction between actor and world" (Crossley 2013, p.147). Such structures are inherently meaningful for their subject, sedimenting understanding in the body as some set of meaningful relations in the interaction between agent and its environment. Knowledge does not belong to a transcendental realm for Merleau-Ponty, but, by virtue of habit, it is "in the hands" (1962). Indeed, mirroring the broader account of habit adopted herein, the habituation of the structures of perception is as much a part of nature for Merleau-Ponty as is the habituation of bodily action, and so habit was a means of overcoming the bifurcation of nature into mind and (bodily) mechanism. Merleau-Ponty writes "the body has understood and habit been cultivated when it has absorbed a new meaning and assimilated a fresh core of significance" (1962, p.146). Summarising Merleau-Ponty's account, Crossley writes that "habit arises when we arrive at a new (relatively stable) way of handling or using the world, which in turn then constitutes its meaning differently for us", going on to say that, "Insofar as these habits are shared institutions, moreover, insofar as they derive from a common social repertoire, then the meanings in question are intersubjective" (2013, p.149). The patterns we take up in habit are thus always-already infused with the traces of the actions of others. Moreover, for Merleau-Ponty, habit is central to the experience of continuity of self throughout one's life, it allows one to start again tomorrow where they left off today. However, this continuity is not limited to the life of an individual agent but applies at the cultural level also. As Crossley (2013, p.146) writes again, tying it in with the point just made, for Merleau-Ponty,

> habit lends this same continuity to collective history and culture. We are not just creatures of habit but also creatures of culture and fundamentally historical beings who reflect the historical epoch to which we belong in all that we do, think, perceive, and say. We are only any of these things, however, in virtue of a body inclined and equipped to incorporate external patterns and conserve past experience.

For Merleau-Ponty, any distinction between culture and nature is an arbitrary one, rather, culture is that element of nature that is flexible and plastic. He writes that "What defines man is not the capacity to create a second nature — economic, social or cultural — beyond biological nature; it is rather the capacity of going beyond created structures in order to create others" (1963, p. 175). One will notice resonances in this account with the account of the production and reproduction of sense-making frames already developed, and the integration but relative autonomy of progressively more plastic structures at the various levels of organisation (from the

tight biochemical integration of cells, to the limited flexibility of circadian rhythms and the super plasticity of habits).

The account Merleau-Ponty offers is similar to Bourdieu's notion of habitus. However, concerning the objectives of this thesis, it also represents something of an advancement of the account that Bourdieu supplies (despite Merleau-Ponty largely developing his work in advance of Bourdieu). Merleau-Ponty not only offers an elaborate account of the functionality of habits, but also some account of their emergence. His is a dynamic developmental account of habit. As Crossley writes, for Merleau-Ponty "they [habits] form the actor but are equally formed by way of the actor's engagement in specific interactions and the resourcefulness of the actor (qua creative and resourceful organic structure) in handling novel situations" (2013, p.147) In such accounts (Bourdieu's too), one already gets a sense for the kinds of reciprocal dynamics between structure and operation that would later allow Barandiaran to refer to habits as autonomously organised.

Although both historical and social in his account of habits, and despite developing the notion of intercorporeality that is important to the present position, Merleau-Ponty does not offer a satisfactory account of the formation of habit in interaction with other social agents. Like Bourdieu, in other words, Merleau-Ponty offers nothing like a social 'mechanism' that might support the emergence of habits. Moreover, to acquire social habits is to acquire a social understanding or intersubjective meaning for Merleau-Ponty, in the form of linguistic, symbolic, or technological practices. But when Merleau-Ponty refers to collective habits he tends to prefer the terms 'custom', 'culture' or 'institution'. Thus, it becomes less clear whether such terms are intended to capture the same organisational forms that are being picked out when we speak of habits, or what the continuities that exist there might be[96].

One thinker who does offer a more direct account of collective habits, that also take shape in interaction with others, is John Dewey. For Dewey, much like his contemporary and fellow pragmatist William James, habits are central to both his epistemology and ontology, and the agentive animal is very much something akin to James's 'bundle of habits'. "Habit formed in the process of exercising biological aptitudes", writes Dewey, "are the sole agents of observation, recollection, foresight and judgment: a mind or consciousness or soul in general which performs these operations is a myth. The doctrine of a single, simple and indissoluble soul was the cause and effect of a failure to recognize that concrete habits are the means of knowledge and thought" (Dewey, 1988, p.123). Here Dewey makes explicit that habits are not limited to sensorimotor processes, something also argued for in the previous chapter, but also relate to 'higher' forms of

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[96] Elisa Magri (2020) has also done work teasing out the role of habit in Husserl as it applies to the social domain. Additional work in embodied cognitive science that relies on these ideas will be well served by a more thorough engagement with such efforts, and indeed the work of Husserl and his interpreters more generally.

cognitive activity also. Thus, it is not just consistency in the conduct of our sensorimotor systems that should be identified as stemming from interlocking and mutually reinforcing habits, but, in line with the present account, the plastic invariances in experience more generally too, including our anticipations, judgements, recollections, and so on.

For Dewey, all habits are at base social. The logic here is quite straightforward: because our individual habits both borrow from existing collective habits, and their incorporation is subject to social evaluations in the form of sanctions and reinforcements from others, there is a priority of the social over the individual, and an inescapability to the sociality of most if not all habits (Dewey 2002, p.15-17). For Dewey, much like Bourdieu, habits are also responsible for our aesthetic preferences, tastes and so on. They are effectively "ways of incorporating the environment" (Dewey, 2002, p.15) including the social environment (Bedia et al. 2019, p.343). However, Dewey's position is slightly more satisfying to our account here, as it offers at least a basic mechanism of interactive propagation. This is also going a step further than Merleau-Ponty's account, who thought about the emergence of habits in terms of interactions between an agent and environment but fails to offer anything like a satisfactory account of the emergence of habits in interaction with other actors. As Crossley points out, Dewey adds to the position of Merleau-Ponty in an important respect, by acknowledging the fact that interactions often involve other actors, and thus habits "emerge from and belong to the collective life of human beings. Habits that shape in the to and fro of social interaction" (2013, p.152).

For Dewey, interactions between group members are largely responsible for the generation of habits in a social context. In other words, he recognises within interaction rudimentary mechanisms for the emergence of customs among groups. For example, when thinking about the division of working class groups into specific customs, the likelihood for greater degrees of interaction that is experienced by the working class generates, "relatively closed networks of mutual influence which, in turn, generate distinct habits and lifestyles" (Crossley 2013, p.155). For Dewey, the segregation of social groups allows them to develop their own collective habits through the networks of mutual influences mentioned, such that "segregated classes develop their own customs, which is to say their own working morals" (Dewey 1988, p.58-9), and thereafter maintain them, for "As long as society is mainly immobile, these diverse principles and ruling aims do not clash" (ibid). In other words, being clustered together and having to interact more often acts a kind of generator function for the stabilisation of shared modes. This also comes with some dangers. When organised so, encountering others with their own set of "working morals" leads to some conflict, whereby "... contact with the thoughts and desires of other classes … disturb the settled distribution of customs." (ibid). Such conflicts are often difficult to resolve,

Dewey adds, for each group is "rigidly sure of the rightness of its own ends" and happy to proclaim the "ultimacy of order - that of some old order which conduces to its own interests" (ibid).

Although Dewey's mechanism is still somewhat wanting to a contemporary cognitive scientific account, due to its rather coarse graining, his insights into these social configurations are prescient. What Dewey highlights in the above statements are insights that will prove central to the account of participatory frames: 1) they include a deep appreciation for the role of embodied interaction in the emergence of social habits; 2) the norms of these settled social orders reflect a concern for the reproduction of the social orders that embed them and thus dispose their instantiators to perceive the world in ways that support their existing organisation, blinding them to the positions that might do otherwise; and 3) when such orders encounter other existing incompatible orders this leads to tensions. Part of the challenge for the present account then, is offering an account that both integrates the insights of these existing perspectives and overcomes their shortcomings, in particular the apparent lack of any sophisticated propagative 'mechanisms' that makes use of the dynamics of face-to-face interaction. This can be done through extending a multi-scale account of habits to the social domain.

Reassuringly, this is not the only work that has recognised the need for this line of inquiry. It was already implicit in the Fuchsian account of inter-body memory when he alluded to the role of autonomous dynamics in the account of inter-bodily memory[97]. But moreover, in a recent paper by Ramirez-Vizcaya and Froese they write that "enactivism generalizes the notions of autonomy ... from the biology of the body to the psychology of habits – and potentially, considering the sociocultural constitution of many human habits, to the sociology of habitus" (2019, p.6). And indeed, an even more recent enactive contribution has been made by Bedia et al. (2019) in which they model very basic 'social habits' with the help of some simulated robots. Therein, beyond providing empirical support for the account developed here, they also make some conceptual contributions that help further this account. In particular, they repurpose a taxonomy of social behaviour — originally introduced by De Jaegher et al. (2010) — that provides some illumination. These works by Bedia et al. (2019) and De Jaegher et al. (2010) will be returned to in some detail later after developing the positive account of the coenhabiting of participatory sense-making frames. Before that, however, the philosophy of Gilbert Simondon is revisited very briefly, and some final framings are offered.

8.2.3 Simondon and the social

The basics of Simondon's account of collective individuation are well aligned with the account of individuation considered previously. Indeed, some of the examples used therein were

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[97] Indeed, Fuchs suggests that the existent notion that comes closest to his account of a collective body memory is the notion of habitus.

in fact examples of collective individuation. However, Simondon's explicitly collective account does introduce some additional insights worth elucidating that will also serve as inspiration for the account of coenhabiting. The basic set up for collective individuation is the same as the individual case. Indeed, it has already been suggested in the example of the argument. In interaction with each other we encounter tensions that require some sort of resolution. In Simondon's terms, these tensions provide the preindividual potentials necessary for the processes of individuation to unfold. As Scott puts it, "the parameters that prescribe the group's interiority emerge from a fundamental conflict, a disparity resonating throughout the group … Without emotion, without potential … without this dynamism pledged by this preliminary tension, the individuation of the group is impossible" (2014, p.136). The group's interiority effectively refers to the dynamics that hold together an in-group. This process relies upon a transformation within the group such that some portion of the existing tensions are resolved into something like a shared position, or "consensual structure". Scott again writes that, "the group of interiority is born when the forces of the future received by several living individuals lead to a collective structuration … in this instant there is the individuation of the group" (2014, p.183-4).

An example of such is when, for instance, a couple of individuals are organised around a task, such as work project[98]. The work task provides a shared tension of sorts, that Simondon describes in terms of a "fashion of being linked to the world through activity that calls for a structuration" (see Scott 2014, p.136). Given the previously individuated elements of the individuals involved as individuals (e.g. their desire to do a good job, to get paid, etc.), and as a group (e.g. certain roles for the individuals within the group, meeting dynamics, etc.) the work situation provides a 'problematic' that calls for the resolution of existing incompatibilities, and **"**causes individuals to exist together like elements of a system comprising potentials and metastability, expectation and tension, then discovery of a structure and functional organization that integrates and resolves this problematic" (Scott 2014, p.138). The collective individuation occurs then as the individuals involved reduce a set of shared tensions by moving through their shared action space in a way that releases some of those tensions.

A second element to recognise in the Simondonian account is how participation in this process informs the individuation those who comprise the group — the 'individuals grouped'. The above dynamics not only serve to bind the group together as a group, serving a form of collective individuation, they also serve, as Scott puts it, "the individuation of those individuals grouped"

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[98] This example was briefly introduced previously in a way intended to highlight the continuities between processes at the level of the individual and the social. In other words, by introducing it in the way that it was in Chap. 6, in which the move from individual to social domains was not explicitly reflected upon, the aim was to illustrate how the language moves effortlessly between domains without any loss of intelligibility, and consequently, is well suited to the compatibilist account under development.

(2014, p.136). For Simondon the 'interiority' of the group depends upon what he terms a "superposition of individual personalities" (ibid, p.135). As such, interaction within the group is not merely the buffeting of atomised personalities previously sedimented elsewhere, rather, there is a coextension of individual personalities and group personality. The group dynamics, what Simondon refers to as the "interiority of the group", are thus preserved in the individuals that help comprise it and manifest as a certain dimension to their individual personality, which, writes Scott "extends the limits of the self to the frontier distinguishing the in-group and the out-group" (ibid, p.129). Thus, the group lives on in the individuation of the individual. But the reciprocal is also true, "The integration of the individual to the social is done by the creation of a functional analogy between the operation defining the individual presence and the operation defining the social presence; the individual must find a social individuation that recovers its personal individuation" (see Scott 2014, p.130)[99]. The individual then, will find themselves well located in groups that call forth their personal identities, and their personal identities will be called forth in accordance with the groups they help comprise, each helping to define the boundaries of the other. Not much is said about such dynamics in this chapter. However, they are obviously important, and thus, in the concluding chapter some reflections on trans-situational identities that reflect such dynamics are offered. For now, though, some final thoughts before turning to the account of coenhabiting proper.

8.2.4 Face-to-face recurrent interaction

Cleanly delineating the tangle of participatory frames relevant to any interactive situation is going to be, in all actuality, an impossible task. Nevertheless, examples at a certain breadth and depth can elucidate the kinds of patternings that are common and the processes that bring them about. The example of newlyweds lifting furniture, for instance, is an example of a recurrent face-to-face dyadic interaction that supports our ability to maintain a certain descriptive hygiene, for invariant patterns produced and reproduced therein (at least some of them) are relatively clear. Methodologically, such clarity is obviously valuable, and the following account leans mostly upon face-to-face dyadic interactions of this sort. However, this is not intended to imply that such examples capture the full extent of what it means to be organised and animated by participatory frames. The following chapters expand into additional worked examples that speak more to the full richness of PFs. However, it is only with some consensus as to these primary examples that we might venture into those messier terrains with some sense of what to be on the lookout for.

The focus on face-to-face interaction is important for another reason also. As many have suggested, here and now face-to-face interactions are the most basic archetypal forms of social

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[99] One senses that the observations underlying this position are not altogether different, even if the language employed to describe them is very different, to the observations that Collins is reflecting upon when he suggests that individuals will be drawn to groups that 'excite' their 'emotional energy'. Collins, in other words, may be on to something, even if his account of that thing is not at all satisfactory to a radical embodied cognitive science.

interaction, of which all others are effectively derivatives (e.g. Jurgens and Kirchhoff 2019; Bolis and Schilbach 2020; Berger and Luckmann 1967). Face-to-face here and now interactions might thus be thought of as the basic unit of the social domain. Given that participatory frames might be said to constitute the basic unit of such interactions, it seems reasonable, in turn, to suggest that they comprise what might be called the basic unit of the social mind. The account here is still a relational one, of course, and the notion of a basic unit refers to a minimal set of processes, rather than some static entity. Moreover, the kinds of dynamics that are inherent in face-to-face interactions are thought by many to be the most consequential to the development of individual cognition. Vygotsky, for instance, is famous for having proclaimed that "through others we become ourselves", and for making the case that cognitive operations, such as using language to direct one's actions, are effectively derivations of what were originally explicitly interactional phenomena. And finally, it is in such interactions that our personal identities are most assuredly reinforced, or otherwise. Indeed, even ostensibly individual behaviours and habits that might first emerge outside of face-to-face interaction are reinforced, modified, or ended when they show up in the social domain.

Many dyadic social interactions take on a historical dimension — i.e. sustained or recurring interactions — and take shape according to the coordinations, breakdowns and recoveries that constitute their history. As suggested also in the dyadic body memory account and in the account of participatory sense-making, these histories empower interactors to coordinate ongoing interactions and recover from additional breakdowns more easily. "We often perceive some interactions as improving over time," write De Jaegher and DI Paolo, "and recovery from a break down as a sort of learning ..." (2007, p.496). Thus, in recurrent interactions we learn to anticipate the situationally specific bodily dynamics of those we are engaged with, and to respond accordingly.

The emergence of such anticipatory dynamics is also recognised by Jurgens et al. in their diachronic account of social cognition. Therein, quoting Hutto (2005, p. 400), they suggest that in the enactive account,

> sensorimotor dependencies of the various sensory modalities can account for the anticipation of the subtle differences in the other's behaviour in subtly different contexts. Sensorimotor dependencies, in conjunction with the particular features of the other as encountered in a situated physical and social context, account for both the perception and anticipation of the qualitative differences of the other's behaviour tendencies.

Jurgens et al. (2018, p.15) also realise the value of recurrence here, writing that

> anticipatory processes … are realised and grounded in recurrent interaction between individuals ... in the interactional dynamics between the interactors and their relationships to their shared world. The ability of the interactor to attend to, recognise and respond to the others' emotions and intentional behaviour ... is grounded in situated, ongoing

> engagement with other agents, over multiple spatial and temporal scales … [in which] ....temporally unfolding patterns of engagement over time [are] explanatorily prior to what is the case at any given moment in time. Hence, … mutual affective resonance is constituted by in a reciprocally coupled two-body system, which is informed by a history of engagement.

However, without grounding such an understanding in the autonomous dynamics supplied by the notion of habit, the normative dimensions of recurrent social interactions and how such dimensions feed into the production of novel forms, are left unaccounted for. P learns how to lift the chair with S who is much smaller than her and they come to habitually adopt inter-bodily coordinations under the conditions of lifting. Such coordinations embed a sensitivity to the discrepancy in size and strength, such that each interactant comes to anticipate the unfolding of the others spatiotemporally situated actions to maintain a synchronous relation throughout the task. Through repeated interactions under varying conditions a whole repertoire of self-regulating dynamics sediment in the relational system until what emerges is a network of metastable inter-regulating patterns. Such patterns demonstrate conservation tendencies as the norms of their own self-regulation, motivating activities that sustain their organisation as such, pulling interactants into modes of being, often experienced as a kind of 'falling into' familiar patterns when present with someone with whom you have a history of interacting.

Translating this into the mechanistic terms employed earlier, one might say that recurrent interaction supports, and depends upon, the emergence of nested softly-assembled interaction-dominant systems that rely upon the ongoing co-regulation of intercorporeal dynamics to maintain themselves within limits of viability, co-regulatory dynamics that are reinforced and become ever more pre-reflective with recurrence. This account differs from — though is perfectly congruent with — the account of participatory sense-making in so far as it acknowledges not just the emergence of a basic autonomous dynamic in social interaction, but the emergence of more fine-grained autonomous organisations within the interaction (the patterns within the patterns, if you will); organisations which are likely to facilitate the more general autonomy of the interaction, but need not (more on this in Section 8.4.1). One way to think about the basic distinction here might be to say that the participatory sense-making account illuminates a basic social autonomy, whereas the account here aims at illuminating forms of cultural autonomy. In Part. 2 of this chapter, accounting for the emergence of these multiscale autonomous structures within social interaction demands — building upon the account of enhabiting developed in Chap. 6 — the explication of a couple of novel related concepts: 1) the notion of coenhabiting: a set of processes wherein the interdependencies that undergird the autonomous organisations comprising PFs are established within a given sociomaterial niche, whilst also transforming that niche at longer timescales; and 2) the notion of a co-optimal grip: a social extension of the notion of optimal grip explicated earlier.

Part. 2

8.3 Coenhabiting proper

8.3.1 Coenhabiting and tending towards co-optimal grip

Being together implies a simultaneous expansion and contraction of the degrees of freedom of the individual embodied subject. There is a lot more that can be done in orchestration with others, but one cannot bring all of themself to any particular interaction. The expansion of possibilities also expands the horizons of uncertainty. By multiplying the capacity and diversity of collaborative work we also multiply potential sources of dis-attunement. This expansion, however, is counteracted by the incorporation of environmental regularities in the sociomaterial niche into interpersonal organisations in the form of participatory frames (which also feed back into that niche and transform it at longer timescales) that then serve as the background for ongoing interactions. Such processes reflect a kind of coarse graining of individual potentialities into higher order dimensionally compressed organisations. When interactions become recurrent, certain of these organisations become more probable. The circular generative processes that characterize these transformations — which depend upon the co-regulation of processes of interaffectivity, joint action, and joint attention — are what are spoken about in terms of coenhabiting, and they are continuous with those already spoken about in terms of enhabiting. These are processes in which we are jointly "laying down a path in walking" (Maturana & Varela 1987), in which we are jointly producing and reproducing our ways-of-life-together, our shared worlds.

In social interactions, the increase in tensions to be reduced relates in large part to the coordination of multiple nested normative dimensions which reflect autonomous organisations at multiple scales and levels. Thus, PFs arise out of the resolution of tensions emanating from the existing sense-frames of individual interactants, the previously sedimented PFs of the interacting pair, the basic autonomy of the social interaction, and a general tendency towards co-optimal grip.

In reality, any abstraction from the near-infinite number of norms enacted in any embodied social interaction is going to be insufficient for accounting for the observed dynamics. Nevertheless, there are some that it seems obvious most of us most of the time pay some attention to when acting together. Here a couple of such norms are abstracted as basic forms of concern most people bring to most social interactions and they are used as a kind of prism through which to refract the processes of coenhabiting that stabilise participatory frames. One is a general concern to "get along" (longer timescale), and the other a concern for "successfully acting together" (shorter timescale). When interactions become recurrent, in combination with a general tendency towards co-optimal grip, the activities that allow them to maintain these concerns within what we might call their viability limits (experienced as forms of interactive stability or flow)

sediment as participatory frames, which thereafter allow for the habitual regulation of interactions in line with these concerns in future similar interactions. An example will be helpful.

8.3.2 Example: coenhabiting the drilling pair

This example looks again to the domain of Brazilian Jiu Jitsu (BJJ). Our protagonists this time are two female competitors who have taken to training together. The account starts where the primary concern is already *successfully acting together*. It is common in BJJ for the coach to demonstrate a particular technique using a subject picked from the coachees present, moving through the sequence a few times, each iteration adding details or emphasising some aspect. In so doing, they provide a set of co-available constraints with which coachees can coordinate their drilling together. As well as coordinating according to the constraints supplied, *successfully acting together* to maintain the 'drilling' dynamic (what might be more accurately called in this instance *successfully drilling together)* depends upon each training partner being selectively open to, 1) a host of intra and inter-bodily dynamics, such as physical capacities, bodily dimensions, relative skill levels; 2) relevant environmental features, such as available space on the mats, norms of the gym, the time allotted for drilling etc., and 3) the basic emergent autonomy of the social interaction itself. In other words, each partner is regulating with respect to a whole host of existing dynamics at various levels and timescales that are inevitably in some tension with each other. In Simondonian terms, such dynamics provide the preindividual potentials for individuation, and the drilling dynamic in which they are aiming at *successfully acting together* provides the problematic. Unlike in the individual case, for it is obviously not a possibility there, being together under such conditions (ideally) takes the form of both partners acting to assist one another's *successfully acting together,* as well as their own[100]. This reflects, a more general normative dimension present in any truly social interaction, a tendency towards what has elsewhere been referred to as a *co-optimal grip* (James and Loaiza 2020).

In this example, a co-optimal grip can take on a rather literal interpretation. For instance, when the 'passive' partner assists the 'active' partner to gain the optimal position — such as a grip on a lapel — to efficiently reproduce the technique. Enacting such a grip, interactants co-regulate their activities to enable optimality in their partner's efforts also. This co-optimal grip, when drilling within the general concern of successfully acting together, is felt by our pair as an efficiency (a kind of shared flow or mutual attunement) in the application of the technique under situational demands. It demands that each partner is sensitive not only to the other's actions in the very moment, but that they can anticipate something about what they are aiming at also. Meyer and v. Wedelstaedt acknowledge this kind of anticipatory relation also in their account of inter-

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[100] Not incidentally, this suggests a very similar dynamic to the one Goffman speaks about in terms of "saving face" and the observation that in interaction we are not only concerned with saving face for ourselves, but also for one another.

kinaesthetic gestalts, writing that, when "a second subject comes into play, ego's expectations ... become co-dependent upon alter's expectations, [and] expectations of expectations emerge … (2017, p.66) (also, see Marmelat and Delignieres 2012 for some empirical work on so-called 'reciprocal strong anticipation' in interacting pairs that reflects these ideas).

And so, operating from states of what might be called *sympathetic readiness*, interactants are co-selectively open to certain features of the interaction itself and the normatively rich environment in which it is taking place, so that they can co-regulate their interaction in a way that serves their *successfully acting together* whilst tending towards co-optimal grip. Coupled coordinations that satisfy these norms are effectively resolutions of the prior tensions therein and are thus welcomed into the shared repertoire of the interactants as solutions to a set of shared problems. At this point, interdependencies have been established between the interactants and their shared environment, which may be further reinforced through repetition. What has emerged then is a scheme of interrelated habitual social patterns that are, at least in this instance, constitutively dependent upon the coordinated coupling with the other in a shared sociomaterial niche. This kind of patterning has been acknowledge by recent work in developmental psychology also, e.g. the action arcs observed in the relationship between child and caregiver during nappy changing, wherein with repeating instances there can be observed a characteristic beginning, middle, and end to the action (Rossmanith, Costall, Reichelt, López & Reddy 2014). In such examples we observe the coenhabiting of PFs at timescales that relate to the coordination of limbs in the context of a drilling scenario' but as has been suggested, these are multiscale processes, and in fact, are rather more complicated than this example suggests, for they are themselves nested within ongoing processes at longer timescales also, e.g. *getting along.*

Throughout the actual drilling scenario, the dynamics of *getting along* manifest in a general care that training partners have for one another, and maintaining a co-optimal grip with respect to this often requires explicitly checking in. Although varying across gyms, drilling is typically initiated by a collective hand clap along the lines of "Everybody got that? OK, 1, 2, collective clap", after which pairs peel off. When partners pair up they do not simply start drilling, but rather introduce themselves and shake hands if they have not met before (at least this is common practice in many Western gyms), or maybe share some pleasantries if they have. Either way, just prior to drilling they will engage a ritualistic and ubiquitous hand-clap-fist-bump. Although there is no striking allowed in most BJJ, there is forceful bodily contact, each partner striving for control over the other's body so as to be able to gain a submission, all the while being challenged with the full resistance of their opponent. Thus, one might speculate, given the intimacy of the sport, the ubiquity of the hand-clap-fist-bump helps initiate bodily contact in a way that frames what follows

in terms of a general dynamic of comradery (such gestures are also ubiquitous before and after sparring), motivated by the concern to *get along*.

Tending towards a co-optimal grip throughout, drilling partners check in with one another as they go, indicating, often with grunts and hisses, if someone is being a bit heavy handed or less than cooperative. Anything that might threaten the dynamic of *getting along* is made up for with an additional hand-clap-fist-bump before returning to drilling. Gross deviations from co-optimality generate feelings of awkwardness, of shame or embarrassment, and require efforts from both parties to make right. If, for instance, one partner injures the other whilst being over-zealous, recovering the dynamics of 'getting along' relies as much upon the injured party's graciousness in accommodating the apologies of the injurer as it does upon their displays of shame and making apologies. With recurrence, much as in the above case of *successfully acting together*, the interactional dynamics that serve to maintain the norms of *getting along,* experienced as a kind of stable sense of comradery, also sediment as habitual and thereafter function as participatory frames that shape the interaction.

But of course, the activity at the shorter timescale of *acting successfully together* also unfolds against the background of *getting along* and derives at least some of its meaning and normative value from such a framing. Getting along serves as a kind of implicit problematic framing the more explicit problematic of drilling according to the coaches' instructions. However, what it means to *get along* in a jiu-jitsu gym when drilling together will also be informed by what it means to *successfully act together*, and it is, in fact, in the maintenance of these multi-scale variables that social habits and networks of social habits — i.e. participatory frames — emerge. It should be pointed out, in case the implication is not clear, these reciprocal dynamics are true at all available scales of coordination. Coenhabiting interdependencies between interactants and their shared environments is all the more probable to the degree that tendings toward co-optimal grip satisfy these nested concerns, and those beyond too — the norms of the gym, of the culture etc. — for the overall system is more stable and novel stable patterns are more likely to be coenhabited (more on this in 8.4.1). Given their reliance on available environmental structures and regularities to facilitate this process, any coenhabited PF is a partial reproduction of those structures and conservation of the normative dynamics that they embed. In this way we see how maintaining interactional stability, by tending towards co-optimal grip at multiple timescales, serves as a very fundamental 'mechanism'[101] for the production and reproduction of the very plastic social structure within which we make sense, the means by which 'structures' get 'structured' and go about 'structuring', to play upon Bourdieu's famous phrase. It will now be helpful to say a bit more about

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[101] Mechanism is employed here in the sense that it was articulated previously, i.e. a relatively reliable set of processes that have relatively dependable effects.

how previously sedimented PFs shape our ongoing interactions and manifest something like boundaries therein.

Being open to the features that maintain the interactional dynamics of *getting along* and *successfully acting together* also means being closed, in effect, to the myriad of other elements that the dyad could, in theory, be paying attention to, e.g. the mild injury one has in their knee; what their training partners are doing on the mats around them, the noises coming from outside the gym, etc. In other words, ongoing individuation at this level too depends upon the dialectics of self-production and self-distinction. Through their utterances, gestures, and the myriad ways they comport themselves when reproducing PFs, social interactants exhibit functional boundaries in the dynamics of their perceiving and acting that reflect their previous couplings. Such boundaries effectively limit or possibly even dampen the potential effects of environmental features not relevant to, or potentially even detrimental to, the reproduction of those frames. As interactions become more and more recurrent the results from these processes become more pronounced. In our example (though admittedly it is not the best example for explicating this feature), this might initially be evident in the training partners focusing on some co-available feature of their interaction in defiance of their coach's instructions. But with some repetition, these initial traces eventually stabilise into a set of boundaries that becomes more stable and more refined. Thus, the normative dynamics specific to the pattern itself come to carry the behaviour of the interactants, functioning like a template of interrelated anticipations and arcs of action, and the reproduction of the pattern itself becomes a specific concern, as an network of habits it has acquired norms of its own self-regulation. Now, activities that might challenge it or excessively perturb it will manifest feelings of aversion for those who instantiate it. Again, like in the individual case, they will be experienced as deviations from optimum, dissatunments that engender solicitations that help restore optimality. Optimality at this point, being underwritten by the previously stabilised participatory frames that form the background to the ongoing interaction, and the tendency towards co-optimal grip on the situation at hand.

Of course, such frames can decouple from the specifics of the activities in which they were derived, acquiring a degree of portability. For instance, when our pair drill collar chokes instead of arm locks, they follow more or less the same template. At a certain point, the template effectively recedes from view, like a mutually available but silent groove that acts as the backing for ongoing interactions, a metastable participatory frame produced and reproduced in our acting together, disposing us to be receptive to some aspects of our environment, and ignorant of even aversive to others, i.e. the patterns themselves come to organise the dyad as such, disposing the interactants according to sympathetic action readiness patterns under certain conditions, and drawing them into courses of action serve their ongoing reproduction. Di Paolo et al. (2015; 2018)

refer to patterns that are commonly shared in a culture, such as greeting rituals or the routines that surround the exchanges between cashiers and customers in a supermarket in terms of *participation genres.* However, they do not specify the autonomous dynamics that allow for the stabilisation of such patterns, nor how they might emerge and sediment in the relationship between two people in recurrent interaction.

Participatory frames, then, serve as the invisible self-producing backgrounds that enframe our ongoing interactions together. Much like autonomously organised identities in other domains, such entities manifest norms of their own self-regulation. In this manner, we are lived through by such entities. Our individual tendencies towards (co-)optimal grip and our capacities for habituation allow us to sediment patterns that also gear us into patterns much larger than ourselves and thereafter act on their behalf, even when finding our own personal identities within them, and transforming those larger patterns over the longer term.

8.4 Refinements and corollaries

8.4.1 Inter-regulation in the social domain

There are a couple of inter-regulatory dynamics that are implied above, but not as obvious as one might like. The first is the interaction between an ongoing tendency towards co-optimal grip and previously sedimented PFs in embodied interaction. Much as was observed in the individual case, in the social case too when existing PFs do not suffice for the ongoing regulation of the situated interaction, by maintaining the general dynamic of tending towards co-optimal grip, novel more integrated organisations can emerge. These multiple normative dimensions become obvious, when, for instance, you meet someone outside of the situation within which previously sedimented participatory frames have taken shape. Indeed, such interactions often have a rather humorous component to them.

For instance, you meet your colleague, whom you have only ever interacted with in the seminar room, by the fridges in the supermarket, and 'fall into' a conversation about philosophy that seems at odds with the situated norms of your interaction. The basic habitual dynamics underlying this 'falling into' (the participatory frames) are always operative within recurrent interactions, we simply don't notice them most of the time for the majority of our interactions, with people with whom we have not built up highly portable participatory frames, occur within self-similar situations. We typically encounter our training partners at training, our colleagues at work, our house mates at home. Thus, our falling into particular modes of interaction are typically experienced as relatively well attuned to the environments in which they are occurring. In instances like the supermarket however, the self-generating norms of the previously sedimented structures that normally pull you into felicitous interactions do shape the interaction, but they prove

insufficient and must be informed by the more situated norms characteristic of tending towards co-optimal grip. We, for instance, make a philosophically infused joke about the affordances of the supermarket, drawing upon both existing PFs and the situational dynamics. Were such a situation itself to become recurrent, more situationally relevant participatory frames would have the opportunity to stabilise, but they would have borrowed from the normative dimensions of the frames that informed this first interaction also.

Interestingly, such examples also further emphasise how participatory frames are carriers of cultural and even physical regularities wherein they come into being. To solve the problem of maintaining interactional metastability in each social situation, interactants are deeply dependent upon coordinating with respect to the co-available regularities and normative dimensions their behaviour setting supplies. By allowing our interactions to be informed by such co-available elements we incorporate such elements into the interactional dynamics. By recurrently interacting under such constraints, we reinforce those normative dimensions as intrinsic to the participatory frames that thereafter guide our interactions, potentially even beyond the setting where they initially took shape. A favourite illustrative example of this (it is of a group more so than a dyad, though dyadic examples will be readily available also), is when the teacher takes the classroom outside on a sunny day. In such cases, the normative dimensions of the classroom, now sedimented in the participatory frames that form the background to the ongoing interaction, are more or less preserved despite much of the original behaviour setting falling away (those involved will also be organised at longer timescale by still being on school grounds, and thus subject to the teachers instruction, etc.). The children still obey the rules and so on characteristic of the classroom.

Such an account is a direct response to the limitations of the social accounts of habits/habitus considered previously. Herein, one gets a sense not only for the role of interactive dynamics in the production and reproduction of social habits, but also how such dynamics can support the perpetuation (and inevitable evolution) of larger cultural forms, even across generations. Moreover, such dynamics also feed back into the organisation of the behaviour setting. In other words, processes proper to the autonomous dynamics of participatory frames can be extended into the environment within which the social interactions take place. Like a couple who move house and decorate their second house in the image of their first one, the organising dynamics of participatory frames we stabilise in interaction also extend back into our environments and configure them in ways that support their ongoing reproduction (if our students and teacher had to build a new classroom, it would likely not be all that different from the one they formed their initial relationship in). Much like the trail in the grass or the upward position of the unicycle is both enabling of and enabled by other processes in the networks of sense frames, features of a shared

environment can be enabling of and enabled by other processes in the networks of participatory frames.

Another dynamic worth highlighting is that many of the participatory frames we coenhabit depend upon a co-constitutive relationship with the "pull to coordinate" (Marsh et al. 2008) characteristic of the basic autonomy of the social interaction, such that the PFs that are more likely to stabilise are those that actively support this pull, and the pull is made all the more successful, and possibly even more likely, given the presence of certain frames. There are really two points here, firstly what might be called the success condition, and, secondly, what might be called the probability condition. Regarding the success condition, the claim is as follows. When interactions become recurrent, we experience not just a basic pull to coordinate, but a pull into normatively infused patterns of coordination that support the basic autonomy of the interaction. Thus, part of the operational dynamics of PFs is also the maintenance of the basic social autonomy. The PFs that emerge in support of this basic autonomy are very much analogous to the so-called 'intelligent habits' described by Egbert and Cañamero (2014) in Chap. 7. Recall that an intelligent habit according to these authors, is an autonomous sensorimotor coordination pattern that helps maintain some essential variable (e.g. the regulation of blood sugar) within limits of viability such that the variable functions as essential to both metabolic stability, and the stability of sensorimotor dynamics.

Sensorimotor activities that correlate with the stability of the essential variable are more likely to sediment as habits, for if they leave the 'feeding area' they result in more chaotic trajectories that are less likely to become self-reinforcing in a way that correlates with the maintenance of the essential variable. In social interaction also, activities that support the regulation of the basic autonomy of social interaction, the basic pull to coordinate and maintain a kind of basic interactive stability, are simply more likely to stabilize as PFs, but they need not of course. They are *likely to,* largely because behaviours that maintain interactions have more opportunity to be reinforced than those that lead to breakdowns (*a la* the regulation of blood sugars in the robot models). They *need not,* for a social interaction may be recurrent enough that interactive behaviours have the opportunity to get reinforced that always lead to breakdowns, e.g. a couple who are in the habit of getting into heated arguments that instantly flair up and lead to breakdowns of the general autonomous dynamics of the social interaction.

Consider two expert tandem unicycle riders for whom riding a tandem unicycle (see **Figure 21** for a visual representation below) is as easy as standing up is to the average five-year-old human child. As adult interactors with some history of interaction, we might imagine our basic ability to coordinate in social interaction and maintain a general autonomous dynamic as

analogous to the ability of these expert riders to maintain an upright position[102]. Thus, when riding, the expert riders are in a position from which they can develop habits that are not directly targeting the uprightness of the tandem unicycle, but nevertheless it is included as a variable in their emergence. For instance, they might develop the habit of taking a certain path through the park in which they cycle. The new habit of taking the path is in a co-constitutive relationship with the network of habits that allow them to maintain their upright position and it is simply more likely to emerge given that it supports the upright position. If, on the other hand, the path is slightly too difficult to maintain the upright position on, the pattern simply does not have the opportunity to get reinforced as a participatory frame. Put another way, the behaviours that support this upward position are simply more likely to get repeated, and thus sediment as shared habits, for they simply have more opportunity for recurrence and reinforcement. Behaviours that lead to the breakdown of the system, on the other hand, don't have the same opportunity for reinforcement, for they are visited less often, and thus are less likely to sediment e.g. the expert riders are less likely to develop the habit of going down a path that always breaks the uprightness of their unicycle and knocks them off.

Figure 21. A pair of tandem unicycle riders
Image retrieved online from Cycology Clothing (2020)

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[102] Of course, there will be a basic autonomy to this social interaction too, but for the purposes of illustrating the point, the upright position of the unicycle is used in its place as a kind of visual metaphor.

If one considers the uprightness of the unicycle as analogous to the basic autonomy of an ongoing face-to-face social interaction, one can see how even participatory frames that don't explicitly target the ongoing maintenance of interactive stability can nevertheless help support that stability, and thus stabilise as participatory frames. The riders may be so proficient at simply maintaining their upright position that in taking the path their explicit concern is no longer the maintenance of upright position as such, but rather navigating the path to reach a particular destination within a particular time frame. Nevertheless, the habitual maintenance of the upright position is part of the background conditions that enable their now explicit goal of navigating the path at speed. Interesting to note here, is that following the logic of inter-regulatory dynamics presented, the habit of riding the bike through the particular route in the park as well as being entangled with the maintenance of the upright position of the unicycle, is also entangled with the riders' blood sugars too. In this way not only are "the 'mental' and biological autonomous structures … intertwined" (Egbert and Cañamero 2014, p. 7), but the social too. Indeed, such deep entanglements point to the limitations of these categories as indexing phenomena in distinct domains.

Through such examples, one can see how layers of inter-regulating participatory frames and their embedded concerns sediment through a history of interaction, allowing for the ongoing individuation of novel participatory frames, and the relatively fluid integration of the interactional social system as a metastable adaptive whole. Our histories of structural coupling together are histories of the progressive sedimentation and transformation of ecologies of compatible participatory frames that not only stabilise and reproduce patterns specific to the social interaction, but also those of the larger culture in which they take shape. Much like the habits of the tandem unicyclers reflect their history of interacting with the upright walls and fences that first allowed them to stabilize their upright position, historical social interactions of all sorts reflect the specifics of the sociomaterial mediums wherein they were produced and reproduced. Crucially, this means the incorporation and reproduction of the functional boundaries present there also. Through stabilising participatory frames in social interaction, we dispose ourselves to be selectively open to features of our environments that support the reproduction of such frames and possibly even hostile to features that might threaten the reproduction of such organisations.

Moreover, the ecology of frames that organises any particular interactant will likely have some degree of transferability, e.g. the habits that organise B's actions in learning to ride a tandem unicycle with S have some transferability such that some of their dynamics and supporting bodily structures are called upon when B rides with T also. Nevertheless, there remains an autonomous dynamic proper to B-S that is to be understood at the level of the interactional system. Of course, recognition of such dynamics complicates the picture even more, for it also suggests that SFs and

PFs maintain some sort of inter-regulatory relationships too. More will be said about such relationships in the final chapters. For now, it might simply be helpful to tie in this basic point with the previous point about participatory frames having functional boundaries. A brief example in which such boundaries become apparent will be helpful.

Consider, for instance, an exclusive night club with a strict door policy. When a new member of staff joins the security team it will be necessary for them to attune to the norms of the club. They might assist a more senior member of the club on the door at first, getting a sense for what features of the punters they are sensitive to, their dress, their behaviour, the cultural tastes they reflect, and so on. By largely entraining their actions to existing stabilities they will learn to incorporate the dynamics that will eventually allow them to function as security. In an interview by Burt Helm (2015) in GQ magazine with Sven Marquardt, head bouncer of Berlin's infamous techno club *Berghain,* when asked, "what do you tell your guys working the door to look for in the line when they decide who comes in?", Marquardt, after suggesting that only a few guys get to the point of selecting guests, answers that, "They first have to understand what Berghain is all about first, and I try to give them that foundation.", but that, "Beyond that, there are no set rules.", and, rather interestingly, "My people all have their own personalities, and you can see their sensibilities reflected in the crowd over the course of their shifts". When new bouncers join the staff they get exposed to the culture of the club, and in interaction with Marquardt they develop a sense for how to regulate the flow of incoming punters so as to maintain a certain dynamic as stable.

What they incorporate, then, are a set of functional boundaries that organise their perceiving and acting, and ultimately support the maintenance of a particular type of individuation. One might presume that the bouncers come to rely upon a kind of felt sense for who to let in and who not to, as Marquardt suggests, "there are no set rules". The presence of a particular punter or group of punters to the person on the door either maintains some previously habituated optimum and thus entry is granted, or it results in some sense of dissatunement, and the punter is turned away. In this way, the cultural form is reproduced within some limits of viability and is thereby maintained. Marquardt's comments that, "you can see their [whoever happens to be on the door at that time] sensibilities reflected in the crowd" highlight a couple of additional relevant points. The first is simply that whatever participatory frames stabilise in interaction with Marquardt are quite obviously entangled with the individual history of those who help instantiate them, thus leading to a style within the style, as it were. Secondly, that Marquardt can discern who is on the door from the collective style of the entrants, illustrates the bounded invariant coherence that is characteristic of the particular organisations that inform the perceiving and acting of those on the door. Such examples thus illustrate how frames sedimented in relationship with others can inform the production of individual frames also. The boundaries of such organisations extend into and

organise their environments and are reproduced through ongoings therein. Of course, unless your identity hangs on getting into exclusive clubs, being on the wrong side of Marquardt's functional boundary is relatively benign. However, when such boundaries reflect gender, ethnic, class, racial, ability lines, and so on, it is an altogether different matter. The language of participatory frames might contribute to such considerations in the future, as an understanding of the dynamics underlying such organisations may also suggest some means of disrupting or transforming them.

Regarding the *probability condition*, the basic claim is this. Those who interact and achieve stable interactions, thus sedimenting participatory frames, are more likely to interact in future. This points towards a social analogy of a kind of Hebbian 'wiring'. This is a possibility Froese (2018, p.1) points towards — leaning on computer modelling work by Davies et al. (2011) — when he writes that

> just like a neural network can optimize its collective dynamics via Hebbian learning ("neurons that fire together, wire together"), a social network can optimize its collective dynamics via habitual learning (Davies et al. 2011). The formation of a genuinely collective social memory only requires that people are creatures of habit: two individuals who have coordinated successfully tend to strengthen their relationship such that they are more likely to coordinate again in the future.

Davies et al. (2011), however, develop their account with reference to selfish agents. One implication of the coenhabiting position is that individual actors can be animated by organisations that extend beyond their boundaries and can include, for instance, other people. Think of the network of processes undergirding a simple shared habit scheme, such as ritually dressing the bed together. The intercorporeal dynamics that support such a practice extend beyond any singular person such that circularly enabling elements transcend the limits of singular bodies. This is not to say that participatory frames do not have some primary locus of activity, nor is it to assert some experiential subjectivity to the emergent system[103]. Rather, by recognising such extended forms of autonomy, it blurs the boundaries of what exactly it means to speak of a 'selfish agent', even if we can develop functioning models using such ideas that seem to reflect intuitively obvious phenomena of everyday life, i.e. that we tend to interact more with those with whom we have previous interacted.

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[103] As suggested in James and Loaiza (2020), following Stapleton and Froese (2015), there is no implication here regarding the emergence of a collective subject, if understood to be a kind of collective first-person. Rather, participatory frames are conceived as entailing collective second-person perspectives, which can imply the realization of shared lived perspectives (ibid, p. 232). In agreement with these authors, genuine collective subjectivity requires tight material integrity, a requirement that only multicellular bodies have. However, the shared lived perspectives characteristic of collective second persons can be derived from the behavioral and affective integrity of social interactions, particularly as they become recurrent and sediment into compatible participatory frames.

Recall Simondon's position that the "interiority of the group", is preserved in the individuals that help comprise it and manifests as a certain dimension to their individual personality. In the language developed here, this can be refined by saying that in tending towards co-optimal grip and stabilising participatory frames we become disposed towards our environments in ways that support the reproduction of such frames, i.e. we become individually disposed to reproduce the dynamics of the groups with whom we identify. Consequently, we find ourselves selectively open, both in social interaction and beyond, to opportunities that enable such reproduction. This might simply be the individual pursuit of certain lines of action, but it might also include interactions with others. The reciprocal dimension of this dynamic is also recognised by Simondon, who writes that, "The integration of the individual to the social is done by the creation of a functional analogy between the operation defining the individual presence and the operation defining the social presence; the individual must find a social individuation that recovers its personal individuation" (see Scott 2014, p.130). And so, previous interactions in which some sort of co-optimality was achieved organise the perception of potential interactants such that they become selectively open to opportunities that support such forms of individuation, either with specific others, or with others who seem to signify such possibilities. Our history of interacting then shapes an action space, sculpting the normative dimensions of individual sense frames to seek out certain types of interactions (these dimensions are explored further in both Chap. 9 and Sect. 10.3.1). Certain others then effectively serve as attractors within that space.

Related intuitions were present for Maturana and Varela when they considered extending their understanding to social systems. They wrote that, "What determines the constitution of a social system are the recurrent interactions of the same autopoietic systems. In other words, any biological stabilisation of the structures of the interacting organisms that results in the recurrence of their interactions, may generate a social system" (Maturana and Varela 1980, p.xxvi). But without the account of the sensorimotor constitution of habitual social organisations, it was not possible for them to offer an account of 'the biological stabilisation of the structures of the interacting organisms" any more detailed than the one offered. It, in other words, remained little more than an intuition. The account of coenhabiting participatory frames, on the other hand, allows us to make this intuition intelligible in a way that one expects Maturana and Varela would themselves see as satisfactory.

8.4.2 Of tensions

Most of us, most of the time, are incredibly adept, even if rarely perfect, in managing the tensions that characterise our social interactions. We have developed sensitivities that any world class jazz improviser should be envious of. Given the ubiquity and quotidian nature of our skills, however, they normally remain transparent to us, and that we are operating within certain

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boundaries, and improvising against highly structured backgrounds — akin to shifting styles, keys, modes and such — whilst also transforming them in the process, goes undisclosed. But this kind of activity appears to be going on all of the time, including in conversation (once we get to language per se a whole new set of complexities emerge — See Di Paolo et al. 2018 for an extended discussion on this). Viewed through the lens articulated above, we can see that in conversation we are constantly invoking 'problematics' — in the forms of events, ideas, tasks, cultural norms and narratives — that set up tensions which we thereafter work to reduce whilst attempting to maintain some situational metastability. When you mention the ongoing ecological crisis to your colleague, it is understood not as a mere statement, but as a gap to be filled, an opportunity to say something relating to it in return, with the expectation that whatever is said, will, most likely, be sensitive to the ongoing metastability of the whole. In this way there is a constant gearing into, reproduction and transformation of the larger structures we are embedded within, whether we know it or not.

This is reminiscent of Vygotsky's (1978) account of the zone of proximal development, in which enculturation proceeds with the caregiver maintaining a tension filled space that solicits certain forms of action from the child. The child, in reducing said tensions, sediments structures that form the basis for that child's making sense in the world. In everyday adult conversation, we, in a sense, evoke comparable zones for ourselves and each other. We reframe a present situation by calling forth some previously habituated frame, we point to the boundaries of our existing frames or we express some dissatisfaction with the way things are in light of some possibility, and so on. Social interaction, thus, becomes a structured improvisation in which referencing something going on in the world outside, or some co-available feature of our environment, engenders a tension filled space that calls for the resolution of tensions through tending towards co-optimal grip. In musical interaction these tensions are sometimes referred to as 'participatory discrepancies. Doffman describes these in terms of tensions "... in our social communications, between self and other, between seeking closeness and maintaining distance, between group and individual ..." (Doffman, 2009, p.146). In cooperating to limit such tensions, in striving for a co-optimal grip, whether it be in the context of a musical interaction or a conversation, we coenhabit interdependencies between ourselves, each other, and our environments, interdependencies that shape our action thereafter in the form of habitual social organisations at multiple timescales, i.e. participatory sense-making frames. Any of the examples of dyadic interaction already given could be used to clarify these specifics, but there are cases from group interaction that illustrate them in a way that is most exemplary.

Think of a situation in which a bunch of people who know each other, but are not normally together as a group, are on an outing, e.g. some colleagues taking a trip to the country together.

Within such situations there are strong collective concerns to get along, to be inclusive of all participants, a general tendency towards co-optimal grip, and so on. The utterances and activities that satisfy these concerns and bring some co-optimal grip to the group dynamic are more likely to sediment into the dynamics of the group[104]. I recall from two recent trips some examples that suggest precisely such dynamics and that I expect will seem familiar.

One example emerges from a relatively recent trip, on which I spent five days recording music in person with members of a musical group I am part of, but with whom I spend relatively little time in person (as most of our composition is done over the internet), and rarely, if ever, are we all together simultaneously. At one point early in our time together, whilst taking a break from recording we watched a comedian do a bit online. We all found the bit hilarious, and in sharing this experience, it is fair to say, many of our collective concerns were satisfied, certainly approximating an experience of co-optimal grip. For the rest of the trip, the basic premise of the joke served as a template for ongoing interactions to the point that it was difficult to stop, painfully difficult at times. Indeed, I noticed that it is only in the last few months (more than a year now since the trip was taken), that we have stopped using this basic template, when, for instance, we are all on a group call together.

Another recent example comes from a trip to the West of Ireland with some academic colleagues for a 'review weekend', none of us having spent much time together socially before. At one point, the concept of 'constraints' was spontaneously introduced in a playful way that, again, might be said to have satisfied our shared concerns and our general tendency towards co-optimal grip. Having had such an effect, it too served as a kind of template for ongoing interactions over the course of the weekend, though again to the point of exhaustion. On this occasion, however, one particularly interesting thing happened. An insightful colleague, presumably from having had similar experiences in the past and recognising a certain quality to the shared event, pointed out on the initial occasion of its use, that *this* (use of the notion of constraints to make nerdy jokes with) was going to be 'the thing' for the weekend. There was, in other words, a recognition of it satisfying a set of implicit conditions, such that it would thereafter function as a participatory frame through which any of us might improvise.

Reflecting upon such examples we can see how patterns characteristic of participatory frames that serve interactive metastability within certain sociocultural milieus might be propagated in interaction, and thus PFs can work like a kind of embodied and diffusive 'meme' of sorts, a niche specific coordinative structure that gets reproduced by those who also participate in its instantiation, and gets instantiated if it supports their tending towards co-optimal grip. In other

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[104] See Harrington (2009) for an ethnographic investigation of a field trip that conveys similar insights, although with a rather different framing.

words, we can see how an existing cultural form might get 'selected', in a sense, for it works within the conditions of a given group to resolve some set of tensions and supports their tending towards co-optimal grip — it supports an ongoing process of group individuation. The better it supports the flow or stability of the interaction, the more likely it is to be mutually incorporated[105]. Coenhabiting is how we produce novel social stabilities, but it is also one means by which we perpetuate and transform existing cultural patterns by embedding them in our PFs. Thus, this kind of account responds to limitations with existing accounts of habitus or social habits. It supplies the 'mechanisms' of propagation that the interactionist accounts and existing accounts of social habits are lacking, whilst also grounding this understanding in the bodily dynamics of the individuals that embed them. The account of participatory frames then better approximates an account of cultural inheritance than existing accounts of habitus and may be expanded as a radically embodied alternative to existing accounts of memetic inheritance.

8.4.3 Dimensions and directions

Recent work by Bedia et al. (2019) — modelling social habits in a way that is very much aligned with the present account[106] — makes two important contributions to the larger theoretical position developed herein. Firstly, as suggested, they develop a robot model that demonstrates processes of habituation that align with the account of participatory frames developed here. Secondly, building on previous work by De Jaegher, Di Paolo and Gallagher (2010), they refine an account of social behaviours that helps categorise types of social habits. These will be introduced in reverse order here.

When Bedia et al. speak of the social dimension of habits their interest is on whether one can speak of autonomous sensorimotor coordinations that depend upon social or interactive conditions for their production and reproduction (2019, p.344). They begin by first establishing three potential dimensions of the sociality of habits:

1. a generative dimension - whether H can be acquired without social interaction per se
2. a coordinative dimension - whether the enactment of H demands coordination with other agents
3. a structural/stabilising dimension - whether the structure of H depends upon ongoing interactions with others for its continuation

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[105] See Nordham and Kelso (2018) for some empirical work looking at how emergent dynamics in interaction shape the post-interaction dynamics of those involved, whereby patterns that better support interactional stability are more likely to leave a 'remnant of the interaction' beyond the interaction itself. One can easily envision how these have cumulative effects, being reinforced through recurrence, and indeed how they might prime the interactants for future interactions along similar lines.

[106] At the time of writing, this is the only other enactive contribution to the notion of social habits that I am familiar with.

They add the above dimensions to a matrix that also includes the degree of sociality involved. First articulated by De Jaegher et al. (2010) with respect to the sociality of behaviour more generally, but here applied to the consideration of habits, the degrees of sociality include

1. contextual - an other agent's behaviour S affects or produces variations on H

2. enabling - H cannot happen without S

3. constitutive - S is part of H

They also include in their taxonomy some refinements on the enabling condition, i.e. a weak version in which the other's behaviour S has to happen for H to occur only in cases in which conditions change (such as an impairment has taken place), and a strong version in which S has to happen for H to occur (See **Figure 22** below for a table reflecting the various dimensions of habit and degrees of sociality). They use the example of dressing up to illustrate the various degrees and dimensions present. Bedia et al. (2014, p.344) write that

> So, for example, dressing up might be something that is done individually, without coordination with others. But it is certainly generativity social (wild infants have not been seen to dress up) and is probably a structurally social habit (meaning that out of a social context, the care and disposition to dress up fades away). However, dressing up fashionably is constitutively social at the coordinative level. Similarly, if your partner has often a say on how you should dress up, whether you follow the advice or directly and systematically oppose it, the habit will be contextually social at the coordinative dimension.
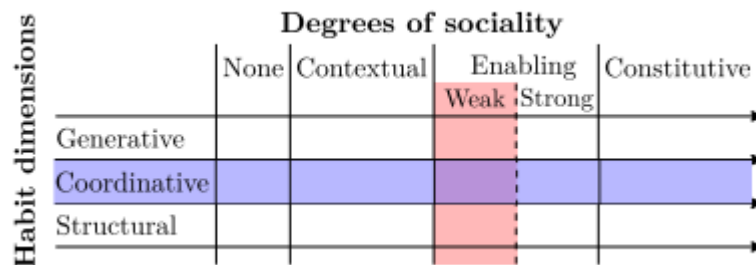
Figure 22. Table of the dimensions of habituation and degrees of sociality

The point at which the purple and pink lines intersect reflect the dimensions and degrees characteristic of the social habits of the simulated robots modelled. What these models offer is evidence for weak enabling sociality of the coordinative dimension. Adapted from Bedia et al. (2020)

Building upon Barandiaran's definition of habit (2008; 2016), Bedia et al. (2019, p.344) hypothesise — and go on to support with the help of their robot modellings — that

> *when the stability of internal behavioural mechanisms is coupled to the stability of a behaviour, and other agents are present during this behaviour, a social interdependence of behaviour takes place: a social habit is established, even if the task is not coordinatively social.*

To investigate their hypothesis, leaning on some of the previous habit modelling efforts explored (e.g. Egbert and Barandiaran 2014), they modelled pairs of simulated robots demonstrating phototaxis under various conditions. They found that agents evolved to couple internal homeostasis to behavioural fitness displayed social interdependencies in their behaviour such that blindness to the object of taxis did not disrupt the habit, at least when social perception was still active (Bedia et al. 2019, p.344; see for details). In other words, even under disrupted conditions where one robot no longer had perceptual access to light sources, and therefore could not demonstrate individual habits, given that they have also established habits that relate to the others behaviours, they were still able to act adaptively, though at a rather reduced capacity. They also found that under such conditions the success of both agents was diminished, not just the one with the obstructed vision. This suggests that the success under the control conditions, in which both agents see each other and the light source, reflects a coordinated effort, even if no social interaction above the mere observation of the other is necessary. Bedia et al. (2019) ultimately conclude that the dynamics observed reflect "a mode of weak social enabling for habit enactment" (see **Figure 22**) (Bedia et al. 2019, p.344), and thus, that there are cases in which no specific 'social mechanism' is necessary for a social habit to emerge.

Social habits may not require a social mechanism for their production in every instance, as in those modelled by Bedia et al. (2019). But that there is a social mechanism that supports the production of social and individual habits is precisely what has been suggested previously. Indeed, the participatory frames (the habituated social organisations that organise action at various timescales) that have featured throughout this chapter might be said to be of the constitutive/coordinative (possibly even constitutive/structural) variety, and such habits, by their very definition, necessitate some form of social mechanism. Of course, Bedia et al. are also sensitive to such a possibility, and were simply laying some of the formal groundwork with these efforts for more substantial empirical investigations later. They write, for instance, that "A natural next step on the evolution of social habits is to apply this framework to a constitutively social coordination task" (ibid, p.347). Indeed, although these developments have run in parallel to the account offered in this thesis[107], they write about the need for developments very much in line with what has already been undertaken herein. Future investigations, they suggest, should ask questions such as "What is the nature of social habits?", Are they "merely aggregation[s] of individual habits?", "[D]oes the social dimension play a constitutive role for generating emergent collective habits?", and "How can we attempt a gradual path towards social habits?". Moreover, they suggest that further work could explore "different possibilities to study different ways in which

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[107] Since the publication of this article I have been in touch with the primary authors of this paper and future collaborations on these matters are likely.

habits can be socially constituted at different levels and degrees", or "the social constitution of the behavioural field. For instance, habits could be formed not (or not only) by exploiting the synaptic plasticity of an agent's neural controller, but by plastically modifying its own environment." (Bedia et al. 2019, p.347 - 8). All these points have been developed to varying degrees throughout this thesis. That said, there is now need for much collaboration around empirical work that addresses these issues directly, and either supports and refines the ideas put forth herein or supplants them.

One recent body of work by Walton et al. (2014; 2015; 2016; 2018a; 2018b), that looked at the spatiotemporal coordinations of pairs of improvising jazz pianists, might be instructive about the kinds of directions empirical investigations might take going forward, and, indeed, to the breath of potential applications of the coenhabiting framework. Walton et al. write that, "Musical performance emerges with a context of social collaboration, resulting from ongoing interactions among multiple individuals, where members are collaborating to construct and negotiate the flow of performance from moment-to-moment (Sawyer 2003)" (Walton et al. 2015, p.3). Given the accounts of social interaction that have been developed above, such language should feel somewhat familiar. There, by resolving existing situational tensions between various levels and scales of inter-bodily organisation, interactants coenhabit participatory frames that (typically) allow them to maintain the stability/flow of the interaction. However, the levels and scales of coordinative dynamics that organise our musical participatory sense-making make themselves available for observation in ways that the complex dynamics of most social interactions simply do not. Thus, musical interaction can serve as a kind of living model that might help orientate and refine our investigations into social interaction more generally. Moreover, given the dependence of musical performance and musical relationships on the coordination of sensorimotor, affective, and even linguistic elements too, the understanding of participatory frames applies as much to musical interactions as it does elsewhere. Walton et al. write that, "Quantifying the collective changes and transformations in the body movement coordination between improvising musicians can … provide a glimpse of the dynamics that make possible the emergence of previously unimagined forms of order" (2015, p.3). Here, these methods of quantification provide a glimpse into the order that characterise musical performance. However, they might just as easily (at least in theory) be applied to the quantification of the emergent order within pairs drilling jiu-jitsu moves or lifting furniture into the back of a van together[108].

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[108] Indeed, there is related work also carried out by Walton and colleagues (Kiefer et al 2017) that highlights how the approach taken here to musical interaction can be extended to, for instance, the analysis of groups of pedestrians walking together.
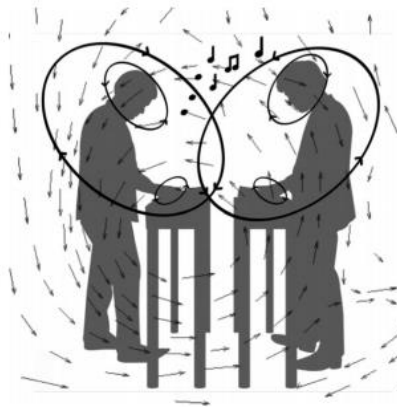
Figure 23. Jazz pianists improvising

Two jazz pianists improvising listening to a backing track whilst having their
arm movements, head movements and their musical expressions recorded.
Adapted from Walton et al. (2018a).

The primary empirical work undergirding these studies involved highly trained jazz pianists improvising with each other under various conditions whilst their head, left and right arm movements, and musical expressions were recorded (see **Figure 23** above for a graphic representation). They analysed various coordinations within the interactions under a number of different conditions, most notably, playing with a backing track and playing with a drone (a drone is harmonic musical accompaniment whereby one or two notes or chords, typically at a lower register, are continuously sounded). Several different analyses were then made of this data (Walton et al., 2015; 2018a; 2018b).

Walton et al. (2015) report on using the methods of cross wavelet spectral analysis, which measure the level of coordination between two time series (one from each interactant) using spectral decomposition (see **Figure 24**). Such methods enable them to assess the strength and patterning of the behavioural coordination between the improvising pairs across a range of nested time-scales, thus detecting local microscale structures within more global macroscale structures (see Grinsted et al., 2004 for more details concerning cross wavelet spectral analysis). **Figure 24** demonstrates the use of cross wavelet analysis to investigate the coordination of lateral movement of the forearms of two piano players under conditions in which they improvised with either an ostinato backing track (left) or a drone (right). The strength of coherence over the course of the performance is denoted by the colour (dark red for very high, dark blue for none) for each period on the y-axis, in units of seconds. The arrows denote the relative phase of coordination. Right facing arrows reflect in-phase coordinations, left facing arrows reflect anti-phase coordinations. As is evident from such analysis, the different musical contexts constrain the interaction in different ways, engendering very different patterns of coordination.
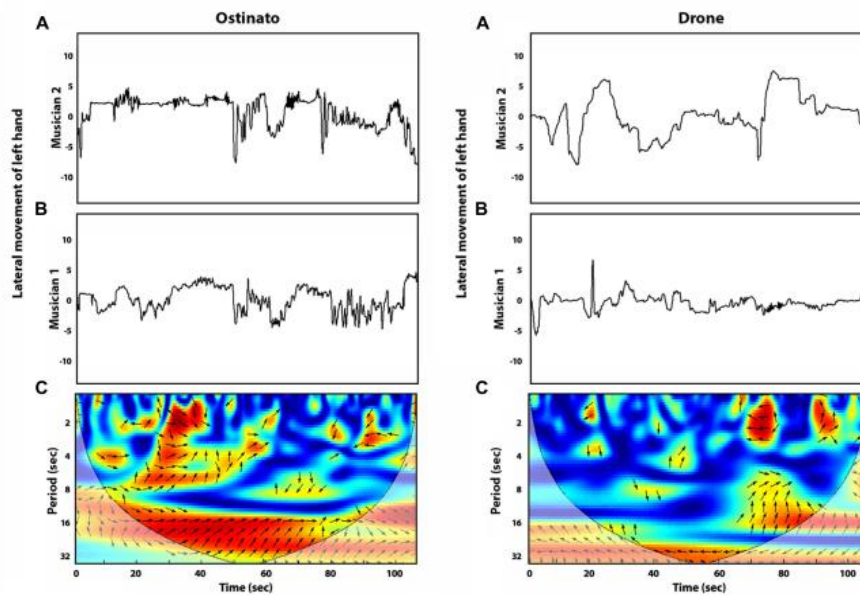
Figure 24. Wavelet analysis of improvising pair

Cross wavelet analysis of lateral movement of the forearms of two piano players under conditions in which they improvised with either an ostinato backing track (left) or a drone (right). The strength of coherence over the course of the performance is denoted by the colour (dark red for very high, dark blue for none) for each period on the y-axis, in units of seconds. The arrows denote the relative phase of coordination. Right facing arrows reflect in-phase coordinations, left facing arrows reflect anti-phase coordinations. Adapted from Walton et a. (2015).

Later work, using the same set up (Walton et al. 2018a), but using the methods of cross recurrence quantification analysis (CRQA) revealed additional insights about the types of coordination involved in these types of interactions. CRQA is a non-linear analysis method that quantifies the similarity between two behaviour sets over time by basically identifying whether states within the two time series repeat (i.e. whether they visit the same states), and then quantifying the more global dynamic patterns of these recurrences by performing a selection of different statistical analytics. In the context of these experiments the behaviours measured included harmonic recurrences (the same note, regardless of octave), temporal patterns of key presses (regardless of actual notes) and head and arm movements. When comparing conditions of playing along with either the backing track or the drone, they found that the musicians repeated each other's harmonic note combinations, key presses and head and arm movements all significantly more under the conditions of the drone. Reflecting on these findings, Walton et al. (2018a, p.108) write that,

> the CRQA results for both the movement and musical coordination that emerged between the musicians indicate that the musicians' playing behaviour was harmonically and rhythmically *more similar* when improvising with the drone compared to when they were

playing with the swing backing track, reflected by the increased coordination in both what the musicians played and how they moved together.

This is somewhat different than the above plots seem to illustrate. However, it is suggested that these measures reflect better the degree to which the participants were coordinating in relation to one another, rather than both coordinating with the backing track.

As reported by Walton et al. (2018a), participants were also interviewed regarding their performances together. Whilst watching and listening to recordings of their performances they were asked to narrate the recordings, offering insights into their experience during the improvisation. Interestingly, while their playing was ultimately more similar and coordinated when playing with the drone, they also reported greater experiences of freedom under such conditions. Under such conditions, and the relative lack of coordinating structure in the form of a highly structured backing track, the interactants impose their own structures which allow them to be more responsive to each other. As one of the musicians suggested, "playing with a backing track, there is no room to grow as a whole . . . it's tough to tell a story. We did it best on the drone, where we started out with simple ideas and grew in dynamics, rhythm, and added different harmonies." (ibid, p. 108). Others commented on how the conditions of the drone supported the experience of social connection more than the backing track, "it allowed us to really interact with each other" (ibid, p.108). One might say that the minimal constraints allowed for the self-organisation of patterns that reflect *more* of each of the individuals involved. Of course, any emergent coordinations are still in keeping with the dynamics of the drone, they keep the same key, and so on. As such, the context and the emergent behavioural dynamics are still tightly integrated. The looser performance context does not impose structure on the performance, but it does act as a constraint on how the interactants co-determine the kinds of structures that emerge. It, in a sense, sets up the right kinds of tensions.

Additional analysis, looking at long-range correlations in the musician's movements, revealed more about how the self-imposed structure of these interactions is organised. In Walton et al. (2018b) they report on employing the methods of *detrended fluctuation analysis* (DFA) (see Riley and Van Orden 2005). DFA measures the long-range correlations in a time series by assessing the degree of variability relative to the time scale over which it is measured and extracting a scaling exponent *alpha* (Walton et al. 2018b, p.8). A time series with an alpha value between .60 and 1.10 is indicative of long-range correlations (otherwise known as fractal self-similarity (see Peng et al. (1995)). Analysis of the data revealed that the alpha values for the musicians head movements were significantly higher when improvising with the drone in comparison to the swing track (see **Figure 25**), indicating significantly higher levels of long-range correlations in the former. This seems to contrast with other findings using cross wavelet analysis,

which demonstrates that there was actually less variability in the same head movements (i.e. greater beat to beat coordination; see **Figure 26**) when improvising using the backing track, as opposed to the drone. The explanation offered is that greater variability does not necessarily imply a lack of deterministic structure (a similar point was made in Chap. 4 when speaking about the difference between relative and absolute coordination), as one can observe states of the system constraining each other over longer timescales giving rise to interpersonal synergies. As Walton et al. put it, "LRC demonstrates this deterministic structure in a systems variability, where the future states and prior states of a system are not independent of one another" (2018, p.12). Interestingly, such long-range correlations were correlated with the experience of being in the 'groove' for the interactants (see Walton et al. 2018b for a very interesting discussion of such relations in which they talk about the groove as effectively an evolving dynamic with its own boundaries of viability). Indeed, such interpersonal synergies, write Walton et al. "are themselves the experience of groove, and provide an understanding of its temporal and social dimension" (2018b, p.13).

Here, one can see how dynamics of the interactive system that function at longer timescales (the interpersonal synergies reflected in the long-range correlations of head movements), might provide a kind of shared background for the dynamics that unfold at shorter timescales, allowing for the kind of metastable adaptive flexibility necessary for those systems to engage with respect to each other and a shared environment over some period of time. In summary, what these layers of analysis reveal about these musical interactions is that the sonically more harmonious and experientially more enjoyable (and listenable, as revealed by another analysis reported in Walton et al. 2018a) musical interactions were those in which interactants were able to self-organise under minimal constraints and bring about a co-created shared background tightly integrated with their contextual constraints.
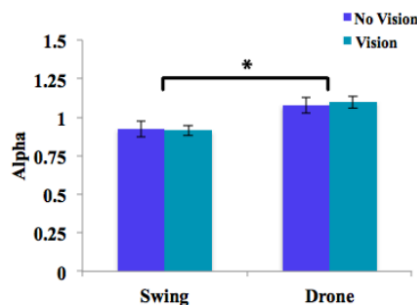
Figure 25. Graph of alpha values for head movements

Alpha values for conditions of both playing according to the swing track and the drone under conditions in which participants could either see each other or not (the latter point does not bear on our interests here and thus is not reflected in the above discussion). Adapted from Walton et al. (2018b).
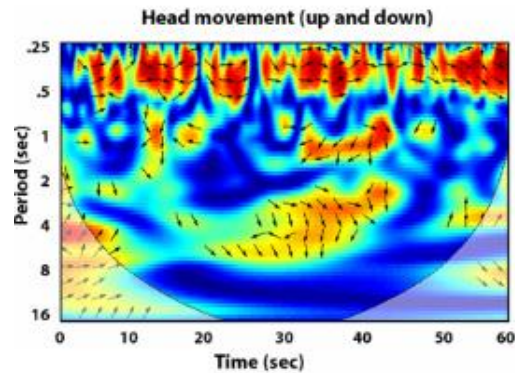
Figure 26. Graph of cross wavelet analysis of head movement

Cross wavelet analysis of experimental data from two pianists improvising to a *swing* backing track, demonstrating the coordination of the musicians' up-and-down head movements. Adapted from Walton et al. (2015).

When describing the experience of jamming with the drone one musician commented that, because "there is no time, it's just a steady tone … we created time between us." (2018a, p.114). For Walton, this creation of time reflects the sensorimotor empathy spoken about previously and is largely dependent upon the emergence of interpersonal synergies at multiple timescales. By establishing and adapting such synergies we can realise and maintain a "group flow" (Hart & Di Blasi, 2014; Sawyer, 2006) (basically a groove in the context of music) and in doing so establish a "foundation from which the performance will be developed" (2018a, p.114). As Walton et al. describe it, ""mistakes" or "surprises" are defined by how their actions deviate in relationship to this foundation performers create together" (ibid). Another way of saying this might be to say that a history of interacting together stabilises a normative generative background for the ongoing interaction. In the above example they refer specifically to within the context of single social interactions, but the language might be extended further in alignment with the account of coenhabiting. As interactions become recurrent over timescales of hours, days, weeks, and so on, that which enables our "group flow" comes to provide a kind of implicit shared foundation also, a normative and generative background that defines our actions as mistakes or surprises by virtue of their deviating from it, a relatively integrated set of self-producing participatory frames that provide a kind of implicit context for our ongoing interactions and reflect our history of interacting together. Indeed, the sedimentation of the relatively invariant patterns that come to define even our musical interactions, their particular signatures and styles, seem to reflect precisely such frames, and indeed, even the emergence and development of genres at longer timescales and as distributed across wider populations.

It seems reasonable to suggest that methods of the kind employed above might also help reveal whether and how the dynamics of recurrent social interaction lead to the sedimentation of

autonomous forms of habitual social organisation, and whether these are simple habits along the lines of the "touch to the head that signals "back to the top," or eye contact and nodding of the head before or after solos" (2015, p.3), or more encompassing configurations, akin to the style of a particular musical group. Such an understanding would offer us a powerful grasp on the dynamics by which our larger cultural patterns are produced and reproduced in and between the bodies of those they animate. What the account of autonomous habituated social organisation might add here is some justification for the normative dimensions of patterns of being together that characterise our relationships. At some point the patterns themselves take over and we find ourselves reliably animated by forces larger than ourselves.

When we jam with others with whom we have some shared history, then, whether in jazz practice, in training Brazilian Jiu-Jitsu, or in making the bed together, it is not a stretch to suggest that we have what we might call a shared repertoire, a habituated collection of compatible participatory frames. The traces of jams past live on in our bodies such that when we anticipate and again jam together, we typically do so in a way that enacts the groove that served us previously. But just as any groove will not support just any improvisation, any participatory frame will not support just any form of sense-making, and different frames will be more tried and tested and thus more reliable. In this way, much like the musicians who cannot seem to help but fall into a basic ii-v-i progression every time they sit down to jam, and their actions become reasonably predictable and easy to anticipate so too can the actions of those with whom we share our social lives, such that we — like Fuchs said — "fall into" patterns of being-together that allow us to act as more cohesive wholes. For better or worse, in recurrent interaction we self-organise according to compatible participatory frames that get us on the 'same page', as it were, allowing us (or at least some aspects of ourselves) to feel well *located*, to feel that we are, as Merleau-Ponty might put it, "taken up and understood."

Of course, the methods outlined above are not the only ones available to researchers that might be interested in the emergence of participatory frames in recurrent social interactions. The perceptual crossing paradigm outlined in Chap. 5 for instance, has been employed in the context of pairs of players recurrently interacting over time, exploring how at a certain point in the interaction the players become simultaneously aware of each other (Froese et al. 2014). However, these more prolonged experimental set ups might be easily modified to inquire into other dynamics of the evolving social interaction, including the emergence of the kinds of shared patterns that are the subject of this thesis. That said, as Bedia et al. (2014) suggest, the perceptual crossing paradigm is often limited to what might be called a mono-scale analysis, and typically to dynamic coordinations at relatively short intervals. Thus, experiments employing the perceptual crossing paradigm might be supplemented by forms of fractal analysis (e.g. assessing whether such

interactions demonstrate so-called 1/f scaling, a measure of self-organised metastability; see Van Order, Holden and Turvey 2005) that inquire into multi-scale dynamics present in minimal social interactions (see Bedia et al. 2014 for details about how these two approaches can be combined). Likewise, time series analysis (e.g. Fourier spectral analysis) that inquire into forms of coordination, such as so-called complexity matching (which matches the 1/f scaling properties of two or more coordinated systems, see e.g. Abney et al. 2014, or Marmelat and Delignieres 2012 for empirical work employing these methods; or, see Zapata-Fonseca et al. 2016 for an extension of these methods to the same data analysed by Bedia et al. 2014), or the methods of two-person neuroscience (see Schilbach et al. 2013; Dumas et al. 2018), such as the hyperscanning(e.g. Reindl, Gerloff, Scharke and Knorad 2018; Pan, Cheng, Zhang, Li and Hu 2017) of electrical activity in the brains of multiple interactors to reveal inter-brain coordinations, might be creatively applied to the study of recurrent social interactions at longer timescales and the emergence of patterns of being together[109]. Moreover, the methods of agent based modelling — possibly building upon some of those already explicated herein, such as the inter-regulatory dynamics apparent in the IDSM — could be exploited to inquire into whether the patterns that emerge in the relationships between interacting agents might be understood as participatory frames.

8.5   A diachronic of individuation

Before concluding this chapter, as a kind of summary and synthesis, it will be helpful to include the table below (see **Figure 27**) and outline the basics of what it includes, i.e. an idealised diachronic of the coenhabiting of participatory frames. Of course, every interaction is different, and, of course, there is no chronological unfolding that is typical as such, but that we commonly open interactions with culturally appropriate ritualised greetings and close them with culturally appropriate ritualised farewells already indicates that there might be some homogeneity present. What is proffered here is a chronology of sorts. One that is hopefully general enough that it might be recognised as having a broad application, but also detailed enough that it captures the primary tensions and transitions relevant to most situations in which participatory frames are coenhabited.

When in ongoing face-to-face interaction, we are co-selectively open to features of the situation that support our tending towards co-optimal grip, supporting the production or reproduction of participatory frames. The general unfolding of the arch of such processes is itself so habitual that it animates our interactions without reflection. Think, for instance, of most of the interactions we have in the foyer of a conference gathering with attendees we do not yet know. The primary normative registers at that point are the cultural institutions within which you are

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[109] Several experimental designs are presently in their development stages and future collaborations will work to experimentally investigate the claims that the undisclosed background to our social interactions should be understood as autonomously organised.

situated and the basic autonomy of the interaction, a basic experience of stability[110]. Thus, we make greetings in line with some culturally appropriate norms and are sensitive to the emergent stability of the interactional dynamic enacted. In Western Europe this typically takes the form of extending one's hand for a handshake and introducing oneself by name (phase 1 in **Figure 27**). However, such moments are highly precarious. Thus, like expert jazz players trying to maintain and develop a groove, we must act quickly to maintain interactional viability. In responding to such precariarity a new level of co-available constraint, a new primary normative register, must be summoned.

And so, we become selectively open to spatiotemporally proximal, co-available situational constraints (phase 2), e.g. specific features of the behaviour setting or spatiotemporal proximal events. This is highlighted by our tendencies to begin asking questions and making statements such as, 'When did you get here?'; 'How did you find that talk?'; 'I love that group also', pointing to the logo on your interlocutors t-shirt; 'This really is such a nice space for a conference'[111], 'What about the situation going on in Dublin at the moment?' and so on. Given their spatiotemporal proximity, and thus, co-availability, such features function like a safe bet, normative registers that enable the coordination of co-regulatory activities that can support the ongoing stability of the interaction beyond the pleasantries of mere greeting rituals. Thus, they serve as a viable next step when attempting to maintain and develop the flow, or groove, of a social interaction. However, if the interaction is prolonged coordinating according to such norms has a limited viability too, and there is often an 'artificialness' to encounters wherein the co-regulatory dynamics get stuck in such forms of coordination. We colloquially speak about the languaging dynamics characteristic of this phase in terms of 'small talk'. The spatial metaphor here is actually quite apt. When limited to small talk we have the sense of being confined to the present situation. Given such confines, what accompanies such interactions, for most of us at least[112], is a growing sense of the precariarity of the interaction due to potentially 'running out of things to talk about'. As such, an additional type of co-regulatory constraint is summoned. Finding ourselves in such circumstances, we tend to seek a *common ground* (phase 3): a set of shared interests or experiences that transcend the behavior setting. This provides a "co-available level of constraint and significance" (Cuffari et al., 2015) over and above what the previous phase could provide, and from within which moves in the ongoing interaction can be produced and interpreted. Though, some feature of the behaviour setting, given their 'apperceived' 'horizons', to use the language of phenomenology, is often a

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[110] At each phase in this diachronic the '*primary* normative registers' are spoken about with the basic recognition that, in fact, in any phase there is always a host of relevant normative dimensions at play, but nevertheless, one may be abstracted at any phase for the purposes of explication for it might be seen to be playing a dominant role.
[111] Think also of our tendency to speak about the weather, or when speaking with someone on the phone to inquire as to their location or time of day.
[112] There are those who seem pleased to continue talking in this register.

good indication as to a potential common ground, e.g. you ask a question about what the person is working on, or about their relationship to the band on their t-shirt.

In a way, behavior settings and small talk might be understood largely as means to the goal of establishing common ground, and, indeed, it is perfectly possible to skip the two previous phases and initiate an interaction primarily from within this phase. However, not transitioning to a common ground does not mean that no meaningful interaction has taken place. Small talk, or more formally *phatic utterances*, about the weather and so on, can serve to establish a common sentiment or mood, and an intention of being social, even if not, apparently, right this moment. Referring to such utterances, Malinowski (1930, p.315) writes that, "Each utterance is an act serving the direct aim of binding hearer to speaker by a tie of some social sentiment or other". We experience this in the ties we feel with folks with whom we have only ever shared basic pleasantries, a neighbour or colleague whose route we routinely cross when putting out the bins or waiting on the kettle. Knausgaard gets at something similar when he writes that, "...the exchange of words about the rain might be a way of establishing a shared space, of affirming that though they don't really know each other, they aren't strangers either, since they ... are now here together" (2017, p.178). Thus, participation in such languaging events is, in however small a part, participation in the making of sense and the reproduction and transformation of the sociomaterial order that animates such languaging.

In transitioning to the common ground, we move from speaking about the conference and the weather, to talking about what are you working on, the hip-hop group on your T-shirt, politics, philosophy, sport, spirituality, sex, hobbies, food, and so on. If we conceive of the network of sense frames and participatory frames that organise in our engagements with such topics, we see how moving to such a level of constraint is to move to a set of co-available normative registers that is not limited to spatiotemporal proximal constraints, but rather is more squarely located within and between the bodies of the interactants themselves, even if continually mediated by their surrounds. The usual experience of making such a transition is to find oneself more in the groove of the interaction. To find common ground then is to be coordinating according to compatible sense frames that can serve as the backgrounds for ongoing improvisations, providing some normative context for our interactions that is not solely reflective of the institutions or behaviour settings (even if continuing to be informed by such) within which we make sense together and coordinate towards shared ends. They act like metastable zones that confer a level of adaptive capacity to the interacting pair that enables a partial decoupling from the immediate constraints of their behavioural settings, a set of compatible horizons that extend beyond any immediate physical confines. As such, the pair acquire a kind of mobility.

There is a potentially interesting correlation here between the transition from spatiotemporal proximity to common ground and some of the observations by Walton et al. concerning the interpersonal synergies between jazz pianists playing under different conditions. Recall that when interviewed about their experiences of playing together the musicians described their experience of playing with the drone (in which they had higher levels of long-range coordination) as having more "freedom" when compared to the swing track (in which they had more rigid coordination). Only in the former condition did they have the sense of having the opportunity to "truly interact with one another", claiming that therein that they could work together to "create time" (Walton 2018). There are some parallels here between the woodenness of coordinating primarily according to the highly structured norms of the behaviour setting or spatiotemporal proximal events (small talk) and jamming to the highly structured rhythmic structure of the backing track, in comparison to the ability to "truly interact with one another" when jamming according to the drone and having transitioned to being situated in some common ground. When we transition to a common ground, the overly determined woodenness of small talk is often supplanted with a sense of groove, and the experience of social connection, or "truly interacting with one another", substantially heightened. One might suggest that this groove, whether it be in the context of musical performance or conversation in the foyer of a conference hall, is subtended by sympathetic repertoires of integrated sense frames that habitually allow the interactants to anticipate the activities of the other within some limits of viability despite having only met them, sympathetic bodily horizons enacted under the conditions that the situation demands[113]. The final phase here entails the simple recognition that when interactions become recurrent, what stabilises are participatory frames that are proper to the interaction itself, integrated socially habituated organisations constituted within the dynamics of embodied interaction that support the felicitous coordination of ongoing interactions and the experience of being socially connected. Acting according to participatory frames then confers adaptive capacities on the interacting pair beyond what the common ground can. An example that illustrates this is the ability of a long-term couple to navigate through a busy city environment together as opposed to a pair who have only just met. It seems reasonable to suggest that the former will demand substantially less explicit co-regulatory acts to maintain what might be called the dynamic of 'navigating together'.

Of course, the transition to common ground can already signify the coenhabiting of participatory frames specific to a particular social pair that function at quite short timescales. If the interaction becomes recurrent, aspects of the greeting and general dynamics of the interaction

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[113] The notion of complexity matching might be fruitfully applied to this level of coordination. Here coordinations proceed that are not reducible to easily observable bodily coordinations, though they nevertheless seem to provide a kind of background for such forms of coordinations.

that serve the basic autonomy of the interaction will have already begun to stabilise, e.g. you and your neighbour who now greet each other with a relatively invariant salute, despite never having spoken a full sentence to each other. However, it is typically when acting together from common ground that we begin to coenhabit participatory frames (as per the account above) that come to form the background for ongoing interactions. When the interaction becomes recurrent — e.g. you meet the following day at the conference, or at another conference a couple of months later — if the conditions are right, after some pleasantries, you might simply fall into ways of being together that reflect the previously established common ground. In other words, now the history of the interaction itself serves a primary co-available normative register. Forms of operational closure have stabilised within the interaction itself over and above the basic autonomy of the interactive system, can be reinforced and transformed when revisited, and channel the activity of the interactants into particular habitual enactments at various timescales.

And so, one can see how a recurrently interacting dyad progressively takes on its own identity, ultimately reflected in a kind of invariant style characteristic of the interaction itself. Habit structures at various timescales and various levels establish inter-regulatory relationships, forming the background for ongoing interactions, being transformed in the process, and provide the potentialities for new habits to emerge. In this way, the recurrent dyadic interaction becomes an entangled web of ever-evolving patterns of being together, and the primary social mechanism in which the trans-individual habitus are also perpetuated and transformed. Froese has recently suggested that the "formation of a genuinely collective social memory only requires that people are creatures of habit" (2018, p. 1). The account of participatory frames developed here puts some meat on the bones of that claim. The 'genuinely collective social memory' might be envisaged like an ever-evolving collection of mutually supporting nets. Each net comprises a habitus, and each lattice of ropes the set of participatory frames that characterize any particular social relationship, with all their individual yarns, and fibres, and intricate interdependencies facilitating their messy integration with the whole.

Dimensions	Phase 1 - Culturally embed interaction	Phase 2 - The behaviour setting	Phase 3 - The common ground	Phase 4 - Compatible participatory frames
Primary normative register	Basic emergent autonomy and cultural norms	Spatially and temporally proximal feature	Mutual experience or interest	The history of the interaction itself and the common ground
Example	Establishing interactive dynamic with culturally sensitive greeting	Reference the conference you are both attending	Noticing one's interlocutor is wearing a t-shirt of a favourite group, the interaction takes a turn into an area of common interest, e.g. music	Pair meet at a follow up conference and some common ground is already implicit in the relational dynamics, e.g. reference to a recent musical event
Highlighted by	Moving between cultures and encountering challenges therein	Small talk that orients attention to co-available features of the setting	Tendency to ask people where they are from or, in smaller communities, who their family is	Falling into patterns of being together and displaying characteristics specific to that relationship
Musical analogy	Like playing standardised forms within a given scale	Improvising in the style of a genre	Improvising with a drone	Shared repertoire
Viability	Highly precarious	Limited - talk about the conference centre for anything more than a few turns will likely lead to breakdowns	Stability and flexibility become apparent	Stability and flexibility develop and fluid movement between situation types becomes possible

Figure 27. Table of the dimensions and phases of coenhabiting

In the above table the typical phases of the diachronic of individuation are characterised according to a number of dimensions: the primary normative register with which actions are coordinated, intuitive examples, aspects of interactional situations that highlight the phase, analogies from musical interactions, and the viability of each phase for supporting ongoing interactions.

8.6 Conclusion

What stabilises in recurrent interaction are bundles of autonomous self-producing organisations that reflect a host of shared orientations that allow for multiple people to coordinate with respect to a shared world, a world that includes relatively mundane things, like knowing where to look for the bin bags when the bin needs doing, to more consequential things, like providing the normative scaffolding for a child's development within a home. The examples used in the above account have erred on the side of the mundane (though maybe some would suggest being newly married is not fairly characterised as such), but one can easily envision how the kind of understanding developed herein might be applied well beyond the mundane. It might be applied in a psychotherapeutic capacity to phenomena such as grief, for instance, helping the grieving recognise the felt presence of the other as reflecting the vestiges of a previously shared world not yet dissipated (Fuchs 2018; see also Radcliffe 2016). Or, it might be employed in service of a critical lens onto the stabilisation of power dynamics in relationships between colleagues or family members, where, for instance, sedimented frames cede excessive power to one of the parties (more about these potentials in Chap. 9). Likewise, it might be applied to understandings of pedagogical relationships, relationships of care, and possibly even inter-species relationships. Really, anywhere people (or animals with advanced capacities for habituation) recurrently interact the dynamics of coenhabiting are likely at work and the sedimentation of participatory frames inevitable.

Continuous with the notion of sense frames developed in Chap. 7, a participatory frame might be defined as a self-sustaining ecobehavioural entity that is relevant to the experience of social interaction, in which activity (e.g. affective, sensorimotor, linguistic) and the interdependencies that support that activity (e.g. bodily and environmental structures including other people) have established mutually enabling relations that can disintegrate or be reinforced depending upon available conditions, e.g. repeated within appropriate timescales, presence of particular constraints. As such, although the emergence of participatory frames has been developed herein within the context of face-to-face recurrent interactions (i.e. coenhabiting), following the account of social habits (and their various dimensions and degrees) that Bedia et al. argue for, they do not necessitate such interactions, and can in fact be portable beyond the boundaries of wherein they first emerge. The penultimate chapter, before concluding, will explore further the role of participatory frames in organising our ways-of-life-together, suggesting something about how the boundaries they realise might order our social environments and our experience of being well located, or not. As will be observed, the examples employed extend beyond mere recurrent interactions between an interacting pair and thus also highlight the value of this understanding for a more comprehensive appreciation of the normative dimensions of social

life. There, examples in which participatory frames effectively breakdown (examples of what are called 'social dissonances') are adopted as a methodological lens through which to illuminate the organisational autonomy of our being-in-the-world-together.

9 Breakdowns

> I have a fever. I feel cold even though my body temperature is a couple of degrees higher than normal. My skin is also more sensitive than usual; every touch feels uncomfortable, even the slight pressure of clothing. This makes it clear to me how well adapted the body normally is to the world, how it merges with it as if the world were transmitting at a certain frequency and the body were exactly tuned to receive it. Within that zone, where the body's frequency is identical to the world's, whatever happens meets with no resistance. The body walks about in the world, is enveloped in its air, touches its objects and surfaces, and even if these should be as different from one another as the soft, moist flannel that one hand is squeezing and the hard edge of the bath that the other hand is supporting itself against, both are within the spectrum that we are open to, so that they almost escape us entirely, in the never formulated yet constant sensation that the world is an extension of the body.

> Knausgaard (2017a, p.89)

> The other transforms me into an object and denies me, I transform him into an object and deny him. In fact the other's gaze transforms me into an object, and mine him, only if both us withdraw into the core of our thinking nature, if we both make ourselves into an inhuman gaze, if each of us feels his actions to be not taken up and understood, but observed as if they were an insect's. This is what happens, for instance, when I fall under the gaze of a stranger.

> Merleau-Ponty (2002, p.420)

> While spatulas, saucepans, water mugs and ladles, plastic mixing bowls, whisks and hotplates stay in the kitchen and appear vaguely inappropriate in other surroundings, where they are obviously out of place – imagine a frying pan in the bathroom or an electric mixer on the lawn – the Thermos and the cool bag only come into their own outside the kitchen, where they are merely stored.
> Knausgaard (2017a, p.198)

9.1 Introduction

In a quote above Knausgaard suggests that the body and physical world resonate such that our worlds function as extensions of our bodies, the range of such extensions apparent in the degree to which the objects of our worlds 'escape us'. Knausgaard's account is, of course, a literary one. This chapter aims to further clarify a parallel philosophical position that has been developed throughout this thesis: our bodies extend into our social worlds too and the range and indeed nature of their extension is recognisable in the ways in which their 'objects' escape us. These social 'zones' (briefly adopting Knausgaard's language) depend upon a prereflective coupling possible due to processes of coenhabiting, and can be characterised in terms of synergistically integrating autonomous structures at multiple timescales that are reproduced by the activities they promote, i.e. compatible participatory sense-making frames. But PFs and the

activities they enable can be more or less compatible, and the manner of compatibility at play impacts the experiences of the subjects that instantiate them. In this chapter, it is argued that by analysing instances of 'breakdown' we can develop a better appreciation for the autonomy of such frames and how their boundaries limit our present social extensions and organise our social lives.

The gaze of everyday social interactions is one process that typically resides within the 'zones' wherein our social 'frequencies' are well aligned; and to this extent it is, it will be contended, a reflection of compatible PFs. As such, it rarely becomes an object of explicit attention. Much like the moist flannel in the bathtub, or the temperature on an agreeable day, it 'escapes us', and any PF that might be discerned remains transparent; a transparency often accompanied by a feeling of being well situated, of being "taken up and understood" (Merleau-Ponty 2002). However, when we move, or are moved, close to or beyond the limits of our PFs, the opportunity to observe something of their dynamic organisation arises. Like swimming next to one of those camouflaged coral fish, it is only when you poke at their boundaries that they stir, and you comprehend that they were in fact there all along. The possibility there being, much as it is here, that one can catch enough of a view that when they do settle again something of their outline is retained. In what follows, it is suggested that encountering what Merleau-Ponty refers to as an 'inhuman gaze', is one example in which the limits of a PF are being poked at. By exploring such experiential specimens, it is suggested, we can further clarify the autonomous dynamics of the organisations that underlie our everyday social interactions. Thus, this chapter is really a reaffirmation of the claims that have been already made about our unit of analysis, but here through a different unit of observation and using a different methodological approach. However, one will also notice that some of the examples employed herein are not limited to interacting pairs. And so, this chapter has the secondary and tertiary values of suggesting something about the nature of social normativity more broadly, and providing a novel explanation of what it is that underlies the kinds of experiences that will be used as exemplary.

This chapter begins with some framing, an example that illustrates what it means to be felicitously extended into a social world organised by bundles of compatible participatory frames, and some points about the methodologies employed. Then the notion of the inhuman gaze is developed in some detail, contrasting it with what is termed — for the purposes of this chapter — the 'human gaze'. After that, it is suggested that experiences such as the inhuman gaze are in fact one example of a particular genus of phenomena, what are referred to herein as *social dissonances*. Teasing out similarities among examples of such phenomena, some common features they share are highlighted and argued as offering support for the claim that PFs can be made intelligible as autonomously organised habitual entities that form the background to our

social life. Finally, some thoughts are offered on the significance of this understanding to disciplines outside of cognitive science.

9.2 Social extensions and the methods of breakdown

Imagine being the new inhabitant in a house share with long-term housemates. Entering the situation, you encounter a host of previously sedimented dynamics that characterise their existing relationships, even if now being presently perturbed by your presence. Initially these dynamics strike you as novel and coordinating with them as a little strange or dissonant. But before long, you negotiate and sediment stable patterns that now include you, and the new house comes to feel like home. Patterns that once stood out no longer glow with novelty but are transformed and integrated into the dynamics of perceiving and acting from which you make sense of life within the house. This web of interpersonal entanglements is, of course, ever evolving. However, the emergence of some relatively invariant and overlapping patterns of being together is also readily apparent: from simple shared habits, such as your having specific sides of the room to lay down your yoga mats when practicing together or standardised greeting routines; to more complex organisations, such as agreed upon placements for storing cutlery and delph in the kitchen, standards of cleanliness in shared living spaces, reasonable levels of noise at particular times, and so on. Moreover, specific relationships between pairs or groups within the house will sediment their own dynamics and embed a certain stance with respect to the house and the others, or other groupings, who share it. Such coordinating constraints fade into the background of living together but continue to channel your actions as housemates, generating shared expectations and allowing you all to coordinate with respect to a set of relatively compatible norms. When you help select the next housemate, you do not see the tangle of relations that they see, but see from it, see through it, indeed, even see on behalf of it. You end up with a lived but largely invisible extension into that sociomaterial niche.

Despite the staggering complexity of such patternings, there are boundaries to these organisations that might be acknowledged. Such boundaries become apparent when some expectation goes unmet, or when the patternings of some individual, some pair, or some grouping, are in tension with the activity of others in the house. Such tensions can lead to conflicts in which boundaries are made explicit. However, the resolution of such tensions and conflicts can also lead to the recasting of boundaries and ultimately more integrated structures supporting greater compatibility. Think of an example in which some standards are not being met by certain housemates. These activities thus lead to tensions between the housemates, though tensions which if managed well can serve the emergence of a more widely distributed set of standards that all are in alignment with. This example is useful for it captures a microcosmic representation of

the kinds of evolving interdependencies characteristic of any regional subsection of the social world. As such, it carries a fractal like potential and can guide our intuitions when we scale from the structures of households, to communities, to cultures, and even ecologies. At each scale, the degrees of freedom are increased, and the potential for the emergence of integrated wholes of perfectly compatible norms more limited. Nevertheless, that they are comprised of individuals, pairings and groupings that take positions with respect to larger systems of which they are part, and that they evolve by virtue of the resolution of tensions into novel structures, seems a reasonable description at any level.

The image one is left with is not one of a final encompassing whole with its own norms of self-regulation, but rather an interconnected and evolving network of transient wholes that manifest regional norms that allow for their ongoing embedding within and differentiation from the systems that serve their individuation. The fact is, however, that the social worlds into which we are extended are not always so easily circumscribable as are the dynamics that pertain to those of a particular household. Nevertheless, we can get a clearer sense for these dynamics too (their boundaries and so on) through instances of their perturbation[114]. Heidegger famously made his analysis of the differences between the ready-to-hand and the un-ready-to-hand to illuminate important aspects of our being-in-the-world (Heidegger 2010; Dotov, Nie and Chemero 2010). This chapter employs a similar method. By analysing examples of social dissonances (e.g. the inhuman gaze) in contrast to felicitous social coordinations (e.g. the human gaze), it illuminates important features of our being-in-the-world-together. This analysis helps disclose organising forces normally left undisclosed and outside our awareness, though nevertheless coordinating the flow of our social interactions; it helps reveal the nature and limits of our social extensions.

9.3 The inhuman gaze

As suggested in a previous chapter, most social interactions take place within familiar patterns. We interact with housemates at home, colleagues at work, friends in our preferred café or in their living rooms. And for interactions that happen outside of shared histories, the setting typically supplies a co-available register that supports our mutual attunement. Think of paying a cashier in a supermarket or asking someone for directions. Within such everyday interactions the gaze is not something that we normally notice. Rather, we look upon, and are looked upon in ways that affirm our participation within the conditions organising such interactions, acting with relatively

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[114] The approach taken herein is well aligned with the so-called 'breaching experiments' devised by the sociologist Harold Garfinkel. These 'experiments', carried out largely by Garfinkel's graduate students, entailed them entering everyday situations and consciously defying the implicit rules of said situations (e.g. treating their families as strangers, or responding with probing questions to phatic utterances). The researchers were interested in the responses of the others for whom the rules were breached and concerned with how the interaction order (to adopt Goffman's term, who was also involved in this approach) would be animated in response. Future developments of the line of thinking taken herein will be served by dialog with these approaches.

compatible anticipations towards relatively compatible concerns. One might refer to the gaze under such conditions as a 'human gaze'. The human gaze entails elements of intersubjectivity and empathy and is the default mode of embodied interaction. Part of the background conditions that allow for felicitous social embeddings, it implies a sympathetic readiness, its smooth and invisible coordination allowing us to get on with other aspects of our shared projects. Unless we turn our attention to it, the human gaze goes unnoticed[115].

When gazed upon by others operating from incompatible concerns (an unsympathetic readiness), however, we experience a kind of dissonance. Such examples parallel Merleau-Ponty's depiction of the inhuman gaze, which one is likely to find themselves under when the gazer has "withdrawn into the core of [their] thinking nature" (2002, p.420). In Gallagher's interactional theory of social cognition — much inspired by Merleau-Ponty's account of intercorporeality — the primary mode of reciprocal social interaction is one of a kind of intercorporeal resonance (Gallagher 2001; De Jaegher, Di Paolo and Gallagher, 2010). In other words, we typically engage each other as expert interactors, and although, like with any skilful engagement we maintain a heedful awareness which might entail some 'thinking', we only "withdraw into the core of our thinking" about others when we are strategizing to determine a certain outcome or making the other the object of our inquiry[116].

Imagine an adolescent gang that refer to themselves as 'The Bulls', after the Chicago Bulls basketball team[117]. They wear Chicago Bulls hats, jerseys, and jackets, and hang around the streets in groups, cutting an intimidating presence for anyone entering their small town. Consider one member of the gang, Peter, going about his day. Being quite senior, his relationship to the other members is generally felicitous. Social coordinations flow relatively unencumbered, meeting little in the way of resistance from other members and the locals he encounters, their gazes part of the conditions that allow Peter to feel well situated, that he is "taken up and understood". Now imagine some other young boy visiting the town to lodge some money. Having heard rumours that the pocket money of other 'non-townies' was being forcefully appropriated by The Bulls, he is on edge. Turning a corner, he is confronted with a large group of The Bulls on the other side of the

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[115] This plays out in more diffuse social interactions also. Think of the delicate dance of the eyes of a group of pedestrians or passengers on a crowded train who coordinate their interaction in part to limit any strong couplings. In doing so it is often necessary to refrain from any eye contact at all (certainly not sustained coupling), for it has the potential to transform a fluid social interaction into one that necessitates some negotiation.

[116] This is also quite well aligned with Schutzian reflections on the so-called *we-relation*, what might be described as a mutual attunement to the flow of social interaction and shared experience. As Schutz and Luckmann put it, "immediacy is preserved only as long as I live in the we-relation, that is as long as I participate in the joint flow of our experiences. When I turn reflectively to our experiences, then I have, so to speak, placed myself out of the we-relation. (…) I Live in a we-relation and subjectively experience it only when I am absorbed in our common experiences" (1974). To, "withdrawn into the core of our thinking" is thus analogous to stepping outside of the we-relation.

[117] This anecdotal example is based loosely on some of the author's own experiences as an adolescent, a time when the Chicago Bulls were at the height of their fame and very much part of popular culture, even in remote parts of rural Ireland.

street, and the intimidating black and red aesthetics of their attire. Hurrying past but filled with fascination and terror and unable to avert his gaze, he catches the eye of Peter. Briefly locked in a reciprocal gaze, each now transforming the other into an object and denying them, Peter shouts across the street 'what are you looking at?' Something about this gaze as experienced by Peter is different than the gazes of the locals and other gang members, and as its recipient, he senses this; he finds in it a limit to his social extension.

This gaze, in its lack of intersubjectivity and empathy, produces for Peter a dissonance, and it suggests that something outside of the conditions that a moment before he was comfortably coordinating within is going on; that he has become the object of someone else's considerations. It is maybe not surprising then that the retaliation is 'what', and not 'who', are you looking at? A suggestive phrase whose direct translation is common the world over and whose deployment is typical in situations in which the gazee feels like they are being objectified[118][119]. What interests us here about such a gaze, however, are some typical qualitative aspects of the experience of the gazee under such circumstances. When gazed upon so, we 1) become sensitive to the environment of our embedding; and 2) are motivated to return our situation to some pre-dissonant order. Regarding the former, like how we notice the temperature when it moves outside of some ideal, it implies something about our social extension having some limits or 'optimal' which if deviated from makes itself known. Regarding the latter, it implies that our felicitous social embeddings are organised according to norms that tend to reproduce themselves as such. Like how when we notice the cold and are motivated to put on a coat and therefore move back in the direction of optimality, when gazed upon inhumanly we are animated in ways that return us to some prior optimal also. Such descriptions already suggest our social embeddings can be profitably characterised as PFs. However, to further justify these claims it will be helpful to expand the examples considered beyond the inhuman gaze, acknowledging it as just one specimen of a more general genus, i.e. social dissonances.

9.4 Social dissonances

Some examples of social dissonances: you find that your housemate has set up their yoga mat on 'your side' of the room; someone sits too close to you on an empty train; an Arab man takes your hand (a non-Arab male friend and colleague) in public in Ireland (a practice that is traditionally common amongst many Arab male friends in Arab countries) (see **Figure 28** for a

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[118] Something confirmed by my office colleagues who come from as varied places as Ethiopia, France, Ireland, Cambodia, and Mexico.

[119] Of course, there are occasions when we enjoy being objectified or gazed upon 'inhumanly', such as when, for instance, we are involved in a performance. But in such instances, there is a larger compatibility established through the consent of the performer that transforms the relation from one of potential exploitation and 'objectification' to one of participation. In such instances, it is possible that the label 'inhuman' is not sufficient, regardless of how much the gazer draws into the core of their thinking.

now famous image of a situation that was likely dissonant for a at least one of the interactants for such reasons). Social dissonances, goes the claim, arise when something that is typically dependable, and thus largely invisible, malfunctions, and like the air conditioner that suddenly stops working, discloses itself as having been there all along. Some common organisational features apparent in these examples indicate that our felicitous social embeddings depend upon compatible autonomously organised PFs.

9.4.1   Like a hunger to be reduced

The psychological experience of so-called cognitive dissonance is often described like a hunger, in that it motivates its own reduction (Festinger 1962). The first common feature of social dissonances can be described similarly, like a hunger they engender activities that would reduce the experience of dissonance. More formally, such experiences signal some variable of the system moving away from some ideal or optimal, engendering actions that might return the system to its preferred state. Social dissonances, then, arise within a more general homeorhetic organisation wherein something is seeking to maintain itself as such. In the language previously developed, this activity can be spoken about in terms of the self-generated norms of previously sedimented PFs, in combination with a general tendency towards optimal grip. Here, one becomes selectively open to the affordances that might allow them to return to some pre-dissonant state. Much like in the case of hunger, in which one becomes selectively open to opportunities to eat, similar sensitivities are engendered when, for instance, one becomes aware that their housemate has taken up their side of the room, someone is sitting uncomfortably close to them on the train, someone takes their hand in a culturally inappropriate manner, or someone stares at them uncomfortably from across the street with an objectifying gaze. One perceives an opportunity to ask their housemate why she has switched sides with the hope of getting 'their side' back; a chance to take another seat on the train far away from their disconcerting neighbour; the proper moment at which they can retract their hand and offer some words to their Arab friend for why they are doing so; or the opportunity to shout "what are you looking at?" across the street, forcing the gazer to avert their gaze. The claim then, is that responding to such deviations is acting according to the self-regulating norms of the socially distributed structures that organise our experience of a given situation, for what is typical is that, like a hunger in that it is to be reduced, we are motivated to return to some pre-dissonant optimal order. In other words, recognising the perceiving and acting of the embodied subject as organised according to such forms of selective openness suggests that said subject is acting according to some form of autonomous

organisation. Acting within and returning to optimum (or negating social dissonances) is thus to act in a way that reproduces some previously individuated participatory frame[120][121][122].

9.4.2 Subject to habituation

The second feature common to all the examples is that they are subject to processes of habituation. If the dissonance does not reflect the primary concern for acting within a particular situation, the experience of dissonance can eventually fade and whatever organisation was producing it can be transformed, assimilating the previously perturbing features into its ongoing dynamics. Reminiscent of how the noise of the air conditioner recedes into the background of one's awareness, the once perturbing feature becomes an implicit part of the conditions that continue to organise one's situated activities. If the housemate is stubborn enough not to move back, the new side will eventually come to feel like 'their side' again. If no one moves on the train, and the other does not do anything truly creepy, like the noisy air-conditioner they will recede into the background too. If you are male and move to Saudi Arabia and have male Arab friends who spontaneously practice hand-holding with you, it likely won't take long before you come to 'think nothing' of the practice. Or consider an interaction with someone who suffers from the coordination disorder ataxia[123], a disorder wherein one struggles to coordinate the flow of the body, including the gaze, in a coherent fashion. What might first appear to its recipient as a kind of inhuman gaze, in that it produces a dissonant effect for the gazee, can quickly come to be seen as a manifestation of the coordination disorder and incorporated into the background conditions that organise the interaction, including a habituated understanding of the condition of the other and its behavioural manifestations.

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[120] Within enaction they speak of this tendency of the system to maintain itself within some boundaries of viability in terms of adaptivity (Di Paolo 2005). Originally developed by Di Paolo, adaptivity is taken to describe the set of processes by which an autonomous system that senses itself moving towards a boundary or limit will act on its own states so as to restore itself to some prior optimal. In the above examples these dynamics seem to be quite obviously at work. However, in the instances described, the systems are not limited to the dynamics of individual embodied subjects in relationship to their environments, but are systems comprised of multiple coupled embodied subjects in relationship with their environments. The optimal state depends upon dynamics that loop through other people. Deviations can occur then in multiple-body-environment systems and responding to such deviations (demonstrating adaptivity) is acting according to the self-regulating norms of the autonomous PFs that are so distributed.

[121] Of course, the examples here have been simplified for the purposes of clarity. In any real-world example, any such frame will be in complex inter-regulatory relationships with a multitude of frames at various levels and scales.

[122] The interest in deviations of this sort has captured the curiosity of philosophers for some time. Taylor Carmen, writing about the thinking of Jean Paul Sartre and some of its shortcomings, writes that "[t]he dramatic antagonistic experience Sartre regards as metaphysically basic is in fact a kind of interpersonal disturbance or distortion, a felt deviation from a social equilibrium that is ordinarily inconspicuous precisely because it is so pervasive in our experience and our understanding. The pressing phenomenological task, which Sartre neglects, is to describe that background social equilibrium that makes such interpersonal disturbances intelligible as deviations from a preferred state." (Carman 2008; quoted in Petherbridge 2017, p.112/3). Of course, the claim herein is that one needs an account of autonomously organised participatory frames to account for that background social equilibrium and any deviations that might result from it.

[123] The author suffers a mild episodic version of ataxia and has given rise to experiences of social dissonance in family and friends on multiple occasions due to irregularities in the gaze and a breakdown in felicitous coordination.

This implies that we are constantly organising and reorganising the coordination dynamics that allow us to smoothly engage in social interaction. From the perspective of the situated activities of the embodied subject, as novel dynamics are accommodated into an existing habit structure (or new habit structures are brought forth), there is a transformation in the relational dynamics that reorganizes their social extension in ways that include what previously constituted a perturbation, thus enacting a kind of extension of their social extension, a recasting of boundaries. Such regulatory dynamics, I propose, arise largely from inter-regulatory processes working across timescales. For instance, if some dissonance arises at the faster timescales of coordinating bodily dynamics in public spaces and perturb the norms of seating on an empty train, but it does not push the norms of the longer timescales away from optimal, for instance, it does not negatively perturb the self-generated norms that underlie one's getting to work on time, it might simply be accommodated, even transforming the norms at both scales in the process. For better or worse, one might go from thinking that everyone who adopts such seating arrangements on a train as being a threat, to having a more qualified view. Participatory frames, then, are habit structures that coordinate social action at multiple timescales; they are autonomously organised but nevertheless plastic *ways of living together* with their own self-generated norms that shape the anticipations and expectations of social life, and largely depend upon social relations for their production, reproduction and transformation.

Figure 28. US President George W. Bush takes the hand of Saudi King Abdullah

It might be difficult for a non-Arabs, however progressive, to look at the above picture and not experience some dissonance, however slight. Indeed, one might suggest that such dissonance contributes in some way to the humorous nature of the picture. We can imagine that for President Bush there was a distinct sense of dissonance accompanying this act, certainly more so than was present for the King. However, the act of holding hands was also nested within normative dimensions unfolding at longer timescales and which if not accorded with might have been more negatively consequential than the mere dissonance of holding hands. Indeed, it is possible that President Bush came to enjoy such hand holding in the process.

9.5 Beyond backgrounds and boundaries

In a recent paper by Thomas Fuchs (2019) he develops a couple of related ideas that are relevant to the account here: the idea of the *phenomenal field*, an idea first introduced by Merleau-Ponty 2002; and the idea of the *life space* (Fuchs 2007). It will be helpful to include some quotes here in which Fuchs describes these paired ideas, before suggesting something more about them and how they relate to the concerns of this chapter and thesis more generally. First, Fuchs (2019, p.2) writing about the 'phenomenal field'

> The **phenomenal field** is … centred in the lived body, [it] functions as the background of all experience, and as the medium of one's relations to the world. The field is not only spatially but also temporally extended; it contains both the immediate future, i.e., the bodily protentions or anticipations that correspond to the affordances ("invitations") of the environment, and the experienced past in the form of an implicit, embodied memory.

And here, a description of the 'life space',

> The life space … may be regarded as the totality of the space that a person prereflectively inhabits and experiences, with its situations, conditions, and movements and its horizon of possibilities … The life space of an individual in his or her environment may also be conceived as his or her "ecological niche". In analogy to the biological niche, it signifies the physical and social environment that corresponds to the dispositions, needs, and intentions of a person. The ecological niche may be differentiated in the form of concentric spheres, such as partnership, family, home, neighbourhood, workplace, community, and homeland.
>
> (2019, p.3-4)

In the language developed here, the life space comprises the entire set of interdependencies that have been established between bodily and environmental structures in prior processes of enhabiting and coenhabiting. It is, to use Baggs and Chemero's language, the umwelt that has been carved from the habitat of the species. The phenomenal field, on the other hand, comprises the nest of situationally relevant SFs and PFs that provide the normative dimensions to any given context, and the general tendency towards optimal grip that helps integrate and reaches beyond. It is these dynamics working together that comprise any 'thick here and now', as Loaiza et al. (2020) put it.

As we move about, the structures in our bodies couple with structures in the physical world, and the various dimensions of the life space we have previously (co)enhabited are reflected in the phenomenal fields that form the background to our ongoing sense-making. These ideas are introduced here however, for the significance Fuchs attributes to them suggests something about the value of their more formal characterisation herein, in terms of the (co)enhabiting of inter-regulating autonomous sense frames at various levels and scales. For Fuchs the phenomenal

field is "structured by physical or symbolic boundaries that put up a resistance to movement", resulting in intimate spaces, territories and personal properties, but also "domains of restriction, prohibition or taboo" and "vectors" which "attract and repel" and "emanate from attractive or aversive … affordances" which "correspond to the basic needs of a human being, be the biological or social" (2019, p.3). In other words, it is according to our sense frames that we show up in the world and the world shows up for us. Through the language of autonomy we develop a clearer understanding not only of the nature of such frames and their functions, but also their tendencies to maintain themselves as they are, acting from their ongoing impulses towards self-individuation (i.e. dialectics of self-production and self-distinction). A corollary of this, is that we might also develop a better understanding of how to cultivate life spaces that lead to more expansive, more tolerant, more integrated phenomenal fields, and indeed some sense of how we each help produce and reproduce each other's life spaces. Under this view social interaction can be seen as the point of intersection of life spaces, the coming together of phenomenal fields in the form of nests of more or less compatible participatory frames, frames that shape the present but also serve as potentialities that will resolve into future phenomenal fields.

Something worth reflecting on, not least to simply acknowledge the aesthetic beauty of it, is just how competent we are at finding compatibilities, at aligning our phenomenal fields. The Irish mystic John O' Donohue was fond of saying that music is what language wants to be. But one recognises this as upside down when one sees the music in language and the musicking in languaging. Like only the most expert jazz players, even the most average amongst us is capable of attuning to even the most subtle hints in the expressions of the other, organising ourselves in response through the flow of inter-bodily resonances. Unlike in the musical setting however, where the groove is reasonably explicit, in non-musical social interactions we are very often tasked with the additional challenge of picking up on the grooves each other are improvising within, each groove designating a set of boundaries and vectors within the phenomenal fields of those with whom we interact. Such processes are imprecise, and we often struggle to find the right key, or groove, as it were. Nevertheless, our abilities to pick up on a particular 'groove' are incredibly well developed, especially given the repertoire of potential grooves available. There are some common examples that capture some of the subtleties of our sensitivities quite nicely, e.g. when you meet someone who speaks your language but as a foreign language at a moderate proficiency and you have the sense of 'not really knowing what they are like', for the way somebody says something can evoke a whole host of 'grooves' over and above what they say. I recall a female friend going on a date in Ireland with an Italian man and meeting up with them briefly at the end of their date in the company of an Italian woman I was seeing. We interacted briefly with the pair before leaving with my friend, who despite having spent a couple of hours with this person and us having spent

a few minutes, inquired from my Italian partner, who had spoken with him for not more than a few seconds, "what was he really like?". In other words, she had an implicit awareness that somehow more can be communicated when two phenomenal fields overlap so greatly by sharing a mother tongue, and our abilities to attune to the grooves therein. What a great jazz master is attuned to in the music she has been immersed in her whole life, indicating to her whether the music is really good or not, are subtleties the novice might not even be able to hear even if pointed out to them by the master.

Maybe what some of these reflections suggest is that like a pair of jazz musicians well versed in their craft are better positioned to co-create more beautiful music together, for they already know what works well and what might be more likely to do so, an understanding along the lines developed here can allow us to better attune to each other's dynamics so that we too can (co-)create more beautifully together in domains beyond the musical. When we have a sense of the autonomous dynamics that underlie our habits and shared habits, identities and inter-identities, it is hard not to be more sympathetic and forgiving of the actions of both ourselves and others, for not only do we develop an appreciation for their tendencies towards reproduction, but also the degrees to which they are reflective of whole ecologies of interdependencies that extend deeply into the sociomaterial mediums from which they are emergent. But more than that, it gives us a greater appreciation for what is likely to happen when we attempt to make a change, and maybe even a better understanding about how best to bring about that change when it is necessary. There might be, then, significant potential in this account for psychotherapeutic purposes, for the alignment of our critical lenses with formal cognitive science, and possibly even for informing developments of political praxis.

The boundaries of our belonging, the limits of our own inclusion, are often acutely felt in the gaze of others. All of us have on occasion, and unfortunately some of us more often than others, felt excluded (or worse) in the gaze of others, felt an object beyond the limits of their extension. Conversely, all of us too have been the ones doing the gazing. One potential of the present line of conceptual development, then, is to provide a set of concepts that might allow for a naturalistic account of our social embedding, a cognitive science that helps us make intelligible through empirical and even experimental investigation, how the boundaries of the social are manifest in and perpetuated through the subjects who instantiate them, but also how they reflect and reproduce the broader sociomaterial conditions wherein they come into being. Such an understanding implies a disclosing of the normally undisclosed dynamics that shape our individual and collective actions, and consequently, one might speculate, can increase our potentials for the cultivation of more inclusive participatory frames, not only by informing how best to bring about changes in individual or group behaviours, but also by highlighting the sociomaterial resources

that will be necessary to make such changes more probable. Gail Weiss, when writing about the inescapability of habits in understanding racial bias, suggests that "Understanding habits as embodied, sedimented, relational phenomena that bind us to others and to a larger social, cultural, and historical world in ways that we are often not aware of, but which can be brought to our attention, even against our will, makes it clear that there is no way to escape or "transcend" our habits altogether" (2017, p.83). Given then, that we cannot transcend our habits, it is vital that we come to understand the conditions of their arising, the dynamics by which they maintain themselves as such, and how we might best engage with the dance of individuation to bring about shared habits that are more inclusive, tolerant, equitable, and so on.

When we have a sense of the self-producing dynamics that motivate our social behaviours and how our social behaviours participate in their reproduction, those behaviours become all the more meaningful, for we see that they are not separate from the structures in which we act and the limits of their extension, but are the very means by which they are produced, reproduced, transformed, and extended. This can support the shift within such discourses away from 'individual intentions' and so on, and to the consideration of the larger patterns that are produced or reproduced by our participation in them. Moreover, adopting such a position we can develop our sensitivities to our own experiences of belonging and dissatunement in a manner that is somehow more detached, both to get a sense of the autonomous ecological orders organising our own affect, perception and action, and to undergo processes of transformation and rehabituation where necessary. Consider the dissonance one might have experienced when pairing gender pronouns with job titles, or when we read 'her' in a passage of prose where for so long we have only read 'him'. The dissatunements we might have felt (or maybe continue to feel) in such situations point to previously habituated participatory frames with 'optimals' that seek to maintain themselves, whether we might reflect upon them as optimal or not. The same might be true of our transphobias, islamophobias, homophobias, xenophobias, and so on. Thankfully, for many of us, by virtue of larger cultural patterns and personal work we have already begun, job titles with genders that might once have given rise to some dissatunment no longer do (or at least it has lessened), and the frames that organise us along lines relating to gender, skin colour, ethnicity, sexual preference and so on, are softening. Our social extensions, in other words, continue extending. Overcoming existing orders is a matter of enhabiting new orders, but old habits die hard, particularly when they are embedded in participatory frames. Cases of so-called *intragroup dissonance,* reinterpreted through the lens of coenhabiting, might be instructive here (e.g. Matz et al. 2005; McKimmie 2009; Festinger 1957).

Matz and Wood (2005) write that intragroup dissonance extends the "common conceptions of cognitive dissonance as a phenomenon generated by intraindividual inconsistency in cognitive

elements to include dissonance generated by group level inconsistencies" (2). One reliable reservoir of intragroup dissonance is disagreement between in-group members. For Matz and Wood, disagreement generates dissonance because it threatens the validity of people's attitudes, challenges acceptance from the in-group and has the potential to undermine what is ostensibly a shared social identity. Given such potential for disruption, in such instances, according to Matz and Wood, the group deploys what are collectively referred to as mechanisms of inconsistency reduction.

The 'mechanism' deployed in any instance will depend on its contours. If, for instance, some individual expresses a 'deviant' attitude, a disagreement from some 'belief' core to the group's identity, the other group members will likely be more animated to convince them of their 'error'. If a mild disagreement is the source of the dissonance, simply laughing or making jokes might be enough to alleviate the dissonance. Or if the disagreement is stubborn but not too threatening, the discordant members might simply decide to agree to disagree. If it is severe, they will likely be expelled from the group. Elsewhere, Nowak et al. (2017) report on the identification of mechanisms that can preserve and/or enhance interpersonal and group coherence, by, for instance rejecting deviants from the group (e.g., Festinger 1950; Clore and Gormly 1974; Latane 1981). However, for Festinger, Matz, et al. the tensions motivating the MOIR are, despite the phenomena being described as intragroup dissonance, resolutely individualistic. They are, as Festinger might put it, intraindividual processes in a social context. The aims of the MOIR are to restore consistency among the individual's cognitive elements, even if facilitated through interactions within the group. However, if the account of coenhabiting is correct, and the dynamics of social interaction are constitutive of the social habits that organise interaction, then it makes little sense to interpret the "present studies [that] offer a unique perspective on group processes by demonstrating that pressures toward consistency [that] both emerge from and are resolved through group interaction" in terms individual levels processes of cognition (Matz and Wood 2005, p. 35). Such a position is comparable to some of the awkward alliances highlighted in Chap. 2, in which the accounts of individual and social level phenomena are discontinuous.

Viewed through the lens of coenhabiting, however, one can see that disagreements or deviant behaviours serve as perturbations to the dynamics characteristic of a host of interdependent participatory frames. Acting in opposition to or disagreement with existing norms then is experienced as deviations from optimality. Once perturbed, the web of frames that organises the interactions will engender a host of tensions that aim at a return to some previous optimal, or in combination with the general tendency towards co-optimal grip, some novel configuration. If the deviations are with respect to normative dimensions that organise the group at longer time scales, the best means of restoring optimality might simply be the rejection of the

deviant. Dissenters, whistle-blowers, and cult members who are given the cold shoulder because of some challenge to the prescribed doctrine, might well end up the victims of such adaptive responses. Here then, one can see how dissatunements emerge within the group disrupting the flow of some prior optimality. But also, how by acting together the group members can restore the group to optimality, whether by returning to the group to some pre-dissonant order or integrating the perturbing feature, which might be a critique of the existing order.

The feminist philosopher Sara Ahmed (2017) advocates for the character of the feminist killjoy, someone willing to not laugh at the tasteless joke, wilfully giving rise to social or intra-group dissonance and effectively 'killing' the 'joy' of the situation. From the perspective being developed here, one can see how such actions frustrate the reproduction of the participatory frames that embed the oppressive dynamics the joke reflects. This is an example of what some call positive deviance (e.g. Lundahl 2018), a tactic that is widely used within political praxis. The example — spoken about in Chap. 2 — of a "small number of courageous women and men who refused to leave their seats" that led to "one of the greatest recent social changes in North American history" is precisely such an act, one that "interrupted the reproduction of segregation" (Nicoli and Monteiro 2016; p.2). One can then see how the account being developed here might be developed in a way to inform both the discourse that surrounds such concerns, and even the development of and refinement of strategies for the disruption of the unhelpful or unfair habitus that animate us and bias us towards discriminatory actions. Indeed, given the continuity of language that has been articulated here, one can see how such an understanding might be valuable at both the individual and social levels, whilst also blurring the boundaries that ever led us to believe these were perfectly distinct domains. With such an account we get a sense of the interdependencies and inter-regulatory dynamics between the material, the biological, the psychological, the social and the political, and ultimately the lack of any real boundaries therein. But what the present account may help in the development of is not only a critical lens, but a critical lens that might also offer constructive alternatives. Indeed, maybe it can point to alternatives wherein we need not only kill the joy — like a bum note that brings an end to an otherwise musical occasion (possibly even giving rise to effects that function in the opposite direction as intended) — but can carry it in a different direction, one sensitive to a greater portion of the dynamics of the situation, one in which novel 'consensual structures' might emerge. Either way there is promise here, steps towards a critical radical embodied cognitive science in which we might look more deeply into the inter-regulatory dynamics that exist across levels, and thus contribute to debates around inequality, power, prejudice, tribalism, xenophobia, cult behaviour, political division, and so on.

There are also psychotherapeutic implications of this position, from understanding and working with undesirable family dynamics, patterns of addiction with social dimensions, patterns

in therapeutic relations between clients and therapists, and so on. However, one particularly interesting application of these understandings might be within so-called *family constellation therapy* (Stiefel, Harris and Zollmann 2012). During a session of family constellation therapy, a group of people are tasked with representing the family members of a client. The client is then asked to position these representatives in a manner that is reflective of the family structure[124]. The therapeutic intervention entails shifting these representatives around the room in response to various prompts by the therapist. In doing so, experiences of dissonance are often produced for the client, the objective being for the client to stay with these dissonant experiences and thus disrupt the subtle habituated patternings that reflect the undesirable family structure as they show up within the individual. The account developed here might not only provide such interventions with a more conceptually rigorous grounding but might also point the way toward the development of additional related practices or refinements on existing practices.

The degree to which our phenomenal fields, and their healthy integration (if one might use such language) depend for their production and reproduction on their embedding within larger aligned structures should not be overestimated. Extreme forms of culture shock, such as the so-called Paris Syndrome — whereby visitors, mostly Japanese, report to hospital after being disappointed by their experience of Paris (it not being what they expected) with symptoms spanning the gauntlet from vomiting and tachycardia, to delusional states and hallucinations (Viala et al. 2004) — point to the tight coupling that is necessary between endogenous and exogenous dynamics, and the dependency of the health of our phenomenal fields on the proper flows of sociomaterial resources. So-called *travel-related psychosis,* in which an unusually high number of first psychotic episodes occur whilst traveling, point in a similar direction (e.g. Airault and Valk 2018). What the account of participatory frames potentially highlights, and might be well positioned to tease out, is that our experience of health is in large part a function of being well sociomateriality located. Such a position has the interesting effect of blurring the distinctions between the domains of individual consciousness and our material economies, and thus may serve as a bridging language for conversations that mediate between concerns that span such domains.

9.6 Conclusion

This chapter has explored the normally undisclosed backgrounds that organise our social life. These backgrounds, it has been argued, typically enable ideal forms of activity, and thereby reproduce themselves as such. However, if their respective ideals are deviated from, they result in tensions that can be reduced by carrying out activities that return the system to some pre-

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[124] Having taken part in some of these sessions before, it is surprisingly easy to do this, and to do it with some confidence. Moreover, the effects of doing so, at least in my personal experience, are pronounced.

deviation optimal; or, by the deviations becoming plastically incorporated within the structures that comprise the situationally relevant frames. What we observe then are situationally self-reproducing structures, mediated through the bodily and inter-bodily dynamics of those that instantiate them, but also capable of adapting to accommodate shifting demands. What this account hopes to have inspired is a sense for the dynamics that are characteristic of such structures, and some confidence in the idea that patterns of being together can be understood as PFs, multiple-body-environment configurations that

1. arise largely in the presence of recurrently acting towards compatible concerns; and thereafter,
2. sediment as background conditions that embed explicit and implicit norms that allow for the coordination of collective actions at multiple timescales; by
3. engendering bodily expectations and anticipations about how spatiotemporal events can and should unfold and moving those who embody them towards their satisfaction; whilst
4. being reproduced and transformed (to varying degrees) by the activities that occur during their enactments; and
5. reproducing the regularities of the sociomaterial mediums wherein they came into being.

In the opening chapter of this thesis, eleven so-called common features of patterns of being together were highlighted. The concluding chapter will now summarise the arguments made thus far, before suggesting how said eleven features are made intelligible when these patterns are understood as participatory frames. Having done so, it will then wind down with some brief suggestions about how the insights in this account might contribute to a more comprehensive understanding of social life, and future directions this line of conceptual development and applications informed by it might take.

10 Conclusion

> One of the odd things about being himself was that there appeared to be several of him, that he wasn't just one person but a collection of contradictory selves, and each time he was with a different person he himself was different as well.
>
> Auster (2017, 28%)

> Do I contradict myself? Very well then, I contradict myself. I am large, I contain multitudes.
>
> Whitman (2001, p. 53)

> I can't think of a single war that hasn't been about identity.
>
> Knausgaard (2017a, p.96)

> Let life live through you.
>
> Keyes (2009)

10.1 Introduction

Participatory sense-making frames are consensually realised habitual organisations operative at multiple timescales. They are produced and reproduced within social interaction and function as primary vehicles of the cultures wherein they come into being. The introduction to this thesis highlighted several patterns of being together and enumerated some common characteristics. It was suggested these common characteristics point toward the possibility that their host patterns are autonomously organised. Now, it is important to return to these characteristics considering the developments made since, reflecting on how they can be made intelligible as dimensions of autonomously organised participatory frames. This can now be done in a manner satisfactory to a compatibilist radical embodied cognitive science.

This concluding chapter first recapitulates each of the previous chapters and the primary claims made therein, tying them together so the argument might be grasped as a whole. Then, with the help of some autoethnographic work on a pair of running partners, the primary insights will be synthesised to show how the stabilisation of participatory sense-making frames at multiple timescales is the manner in which we construct our shared worlds. After that — with the example of the running pair in tow — the characteristic features outlined in Chap. 1 are revisited and accounted for as features of autonomously organised participatory sense-making frames. To wind down, some important consequences of these developments are teased out. In particular, suggestions are made about how PFs shape individual sense-making beyond the dynamics of face-to-face interaction; some reflections are offered on the status of the individual subject as

being *multiply animated*; and some implications are articulated relevant to the emergence of identities well suited to the present moment and its challenges. Then finally, this chapter, and this thesis, will conclude — by way of analogy — with some thoughts on the potential significance of the compatibilist account developed herein.

10.2 Recapitulate and revisit

10.2.1 Chapter recapitulation

Chap. 1 introduced patterns of being together as the object of concern of this thesis and highlighted eleven features common to such patterns as necessary to account for. It also outlined the basic methods and frameworks with which it would make its enquiry.

Chap. 2 considered existing accounts psychological and sociological that address the kinds of dynamics characteristic of patterns of being together. The question of where to look for an explanation was introduced. The approaches explored were found to fall into two different categories, given their explanatory emphasis: individualist accounts and interactionist accounts. Given existing limitations with these accounts — e.g. individualist tendencies to offer explanations of social phenomena in terms of brain states, or interactionist inabilities to ground understandings of social practice in the bodily dynamics of the individuals involved — the case was made that a 'third way' was needed. This 'third way', a compatibilist account, would have to show how the language used to describe the relatively invariant patterns that emerge in recurring interactions between two or more people (i.e. patterns of being together) and their environment is continuous with that used to describe the invariant patterns that emerge in recurring interactions between an individual and their environment.

Chap. 3 reviewed what it referred to as 'precursors', detailing a number of literatures that form the philosophical background to the ideas under development. It took the notion of embodiment as a central concern, and a starting point from which to begin establishing the kinds of continuities necessary to a compatibilist account. There it was suggested that the account can be developed in line with a radical embodied cognitive science, and primarily within the strong embodiment account of the enactive approach. Some intellectual progenitors of this perspective were then explored, notably the phenomenology of Husserl and Merleau-Ponty. The notion of intercorporeality — the idea being that our encounters with each other entail a very basic entwinement of our corporeal dynamics — was suggested as being particularly relevant. Several theoretical positions — both sociological and cognitive scientific — that rely upon and develop this notion were then explored in some detail, the work of Thomas Fuchs on inter-bodily memory featuring prominently. Fuchs' work serves up a novel starting point for the present account, for he suggests that the enactive notion of autonomy might be relevant to our inter-bodily memory.

Before concluding, this chapter considered some recent work that argues the need for integrating insights from embodied cognitive science with work in interactional sociology perfectly aligned with the present efforts.

In Chap. 4 the enactive notion of autonomy was introduced and explored in depth. Having distinguished it from more colloquial and common philosophical uses of the term, it introduced a selection of conceptual antecedents — in particular, the notion of autopoiesis — in detail. After that, the enactive notion was developed according to the notions of operational closure and precariousness. Here, autonomy was understood as a means of accounting for how emergent systems achieve adaptive stabilities, allowing them to maintain some relative invariance. Having developed the basics, a number of 'mechanisms' that might support such dynamics were elaborated, notably the ideas of *synergies* (coordinative structures that allow the system to self-organise in an integrated fashion under task constraints); *metastability* (the ability to move fluidly between relatively stable states [e.g. between synergies] to be responsive to its surrounds), and *self-organised criticality* (the ability maintain some global order in relationship to its environment by self-organising at multiple timescales and levels simultaneously).

Chap. 5 came in two parts, each dedicated to an extension of the notion of autonomy beyond the biochemical domain. Part. 1 addressed the notion in relationship to sensorimotor dynamics. The notion of habit was introduced as a central term. The enactive account develops an understanding of habits as autonomously organised sensorimotor entities, constitutively dependent upon the sensorimotor activity of the embodied subject for their ongoing reproduction. Habit adds to the basic account of autonomy a sense for how any such organisation can be reinforced with repetition, and thus, more, or less, autonomous. Herein, it was also pointed out that habitual organisations develop some degree of closure at various timescales and levels of integration, from simple habits and routines, to micro-identities and personal-identities.

Part. 2, considered the extension of the notion of autonomy to the social domain. Firstly, the development of the notion within the context of embodied social interactions was considered, with emphasis on the notion of participatory sense-making. The case was presented that the intercorporeal dynamics of face-to-face social interaction self-organise to support the emergence of a form of autonomous organisation that constrains the activity of interactants in a way that aims at its own sustenance. It was suggested that they might do so in a way that supports the emergence of task specific multi-agent coordinations relative to a given situation. Such insights were supported with empirical work, and some mechanisms were suggested. After that, the sociological account of Niklas Luhmann, and some dialogue that surrounds it, was considered, and the case against why the Luhmannian position is not adopted more thoroughly herein was put forth. Finally, the dialectic account of autonomy was introduced as a position that could be carried

forward with some clarity, and an argument was made for why autonomy needs to be understood in terms of degrees of closure.

In Chap. 6, which also came in two parts, the notion of enhabiting was introduced and developed as an account of the ongoing sensorimotor, affective, and linguistic constitution and reinforcement of habitual organisations. In Part.1, oriented by recent work by Baggs and Chemero (2018), and the compatibilist thrust of the thesis generally, a number of complementary radically embodied cognitive scientific frameworks were brought to bear, namely the enactivism of Di Paolo et al. (2017; 2018) and the skilled intentionality framework of Rietveld et al. (2014; 2017; 2020). By acknowledging existing tensions between these accounts, some generative compatibilities were highlighted. The most important were those between the dynamics of sense-making and attendant tendencies to reproduce existing organisations, and the dynamics of tending towards optimal grip and its capacities to drive at integration under situational constraints. In Part. 2, inspired by the philosophy of Gilbert Simondon, the account of enhabiting proper was developed. Acting according to two opposing tendencies — i.e. the preservation of existing habits (sense-making), and the integration and sedimentation of habits that are attuned to situational demands (tending towards optimal grip) — interdependencies between structures in the body and structures in the habitat stabilise as habits at various timescales, from simple habits to habit schemes, micro-identities and personal identities. Habits were defined as self-sustaining ecobehavioural entities in which structure and operation enable each other in a closed circular fashion, relations which are reinforced, growing more autonomous, when repeated within appropriate timescales.

Chap. 7 developed the language of sense-making frames as a generic term for the habitual organisations resulting from the processes of enhabiting, regardless of the timescale of their operations, i.e. from simple habits to habit schemes, micro-identities and personal identities. It clarified various aspects of these entities, including their normative and temporal dimensions, and offered some ideas on how to think about the inter-regulation between frames at different levels and scales. Crucially, this chapter elaborated on the notions of boundaries and backgrounds. If any sense-making frame is to be considered an autonomous system in the proper sense of the term, it needs to make some distinction between it and its surroundings. Numerous examples were used to argue how functional boundaries arise in the umwelt of the embodied subject, as a result of enhabiting sense-making frames. Finally, it was contended that what sense-making frames do is provide an active background to our situated experience, channelling our action within previously worn grooves, animating us in ways that serve their own reproduction.

Chap. 8 then developed the notion of coenhabiting participatory sense-making. Herein the language introduced and refined in the two previous chapters was extended into the social domain

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to make intelligible the patterns of being together that were the original object of concern of this thesis. Chap. 8 was the last chapter offered in two parts. Part. 1 began with some necessary framing, suggesting how the present account situates itself in relationship to both the enactive account of participatory sense-making and the ecological leaning account of sensorimotor empathy. Then, given the centrality of the notion of habit, some time was spent looking at existing accounts of social habits, reflecting upon what is both valuable about such accounts and what their shortcomings might be; illustrating the lack of and attendant need for a well-developed 'propagation mechanism' that makes use of the dynamics of face-to-face interaction. Finally, the Simondonian inspiration was reintroduced and some methodological clarifications were made about the decision to focus on face-to-face recurrent interactions.

Part. 2 of Chap. 8 addressed the coenhabiting of participatory frames head on. In continuity with the account of enhabiting — thus satisfying the demands of a compatibilist approach — participatory frames were shown to be coenhabited by resolving a host of competing tensions present in social situations. The existing sense-frames of individual interactants, the basic autonomy of the social interaction, a general tendency towards co-optimal grip on the situation at hand, and previously sedimented participatory frames of the interacting pair, all provide the preindividual potentialities for what consensual organisation stabilise as compatible participatory frames. By working through the detailed example of the training partners, it was shown how a host of participatory frames at various timescales (i.e. shared habits, shared schemes, shared micro-identities and interpersonal inter-identities) stabilise in the intercorporeal dynamics of the embodied interactants. Such frames, it was argued, get reinforced when interactions become recurrent, serving as compatible normative backgrounds within which interactants coordinate towards shared ends, silent but resonant grooves that support their improvising together, channelling their action along particular paths, paths that they themselves have laid down and that reflect the regularities wherein they first came into being. Thus, the processes of coenhabiting were highlighted as set of processes that serve both the dynamics of the ongoing interactions and the propagation and perpetuation of cultural forms. Having presented the primary argument, some supporting empirical work was introduced, and some experimental work relating to multiscale coordination in the context of musical interactions was highlighted as potentially instructive going forward. Finally, as a distillation of the typical transitions in the development of social interactions, a diachronic of the emergence of participatory frames was elaborated.

In Chap. 9, the penultimate chapter, the object of analysis was viewed from an alternate perspective. Here, exploring instances of breakdown highlighted the fact that we are socially organised according to autonomous participatory frames and thus extended into our social worlds, but also limited by the boundaries of those extensions. The example of the inhuman gaze was

developed as illustrative of how when our action is enabled by such frames it effectively recedes out of view. But also, how when the limits of these frames are poked at, they result in 'social dissonances' and reveal something themselves in the process, in the ways they animate the embodied subjects that instantiate them. By exploring instances of 'social dissonance' and some common features amongst them, namely their homeorhetic tendencies and their plasticity, it was reaffirmed how the backgrounds that support our felicitous coordinations and our being extended into the social world are best understood as habitual autonomous organisations at multiple timescales. Building from this perspective, it was suggested that the account developed has potential for contributing to discourses within critical studies and psychotherapy.

Having made this summary, the eleven features common to the original patterns of being together can now be made intelligible as reflecting their underlying autonomous organisation. However, to support these efforts, and to highlight the central role of participatory frames in the construction of our shared worlds, one final comprehensive example will be employed; this time from some qualitative empirical work investigating the dynamics of moving bodies in interaction. The emergent stabilities they note in their autoethnography — as the core constituents of their shared worlds — can be made intelligible through the understanding of participatory frames. Having gone through the basic account, it will then be used to reflect upon the eleven common features highlighted in Chap. 1, illustrating why they are best understood as features of autonomous participatory sense-making frames.

10.2.2 Running together

Wife and husband research and running team, Jacquelyn Allen-Collinson and John Hockey (2017) investigated the emergence a particular pattern of being together, what they call *running together*. They draw upon extensive experience within the subculture, and data from a collaborative autoethnographic effort, to "explore and analyse in detail various intercorporeal practices and processes, fundamental to the enaction of training-together for distance running" (Allen-Collinson and Hockey 2017, p.173). Their aim is to develop an account of how during the practice of repeatedly running together an intercorporeally generated 'life-world'[125] (what has been referred to in terms of the umwelt herein) emerges. What they aimed to uncover was how they maintained their rhythm and timing through their "pre-reflective and intuitive corporeal coordination" (2017, p.181). Employing a sociological phenomenology as their primary theoretical framework, fundamental to their account is a recognition of the basic intercorporeal dynamics explored in Chap. 3. Interestingly, one finds that the various patterns that make up their intercorporeally constructed life-world map well to the timescales specified in the account of

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[125] What Husserl refers to as a *Lebenswelt,* or Fuchs referred to as the *life space* also.

coenhabiting. Refracted through the present account, such dynamics reflect habitual social organisations that have acquired some degree of autonomous closure, i.e. they are participatory sense-making frames. The most sensible way to present their account as empirical support for the account of PFs will be to do so by order of complexity, from simple habits to inter-identities. First, however, it will be helpful to say something about the notion *running together.*

Allen-Collinson and Hockey describe running together as a kind of intercorporeal synchrony achieved in the context of running as a pair for long distances, that, as they put it, "necessitates a constant reciprocity of attention and an ongoing and mutual adjustment of rhythm and pace … Running together", they contend, "demands of co-runners considerable interactional work" (2017, p.173). When running together the pair develop and exhibit an intuitive sense of when, for instance, their partner is struggling. This animates them to do the 'work' and co-regulate to sustain 'running-together' over various terrains. Here then, one has some sense of how the partners display a tendency towards a co-optimal grip. Running together, thus, becomes something like a primary orienting shared concern within the interaction which supports the emergence of a metastable whole they each tend to as they move along, an order parameter analogous to the slope of the sand pile. This is perfectly akin to, or maybe just a more specific example of, an interaction organised according to the concern of 'successfully acting together'[126] elaborated in Chap. 9.

When partners are well rehearsed running together, they also claim, they can become "prereflectively co-attuned … particularly if the terrain itself is familiar … ", elaborating that, "Such attunement generally only occurs when runners have long standing, sedimented knowledge and understanding of each other as running-beings…" (ibid, p.180). Beyond being an illustrative reflection of this general tendency towards co-optimal grip, such a position says something about the habitual dynamics that have emerged through a history of running together that enable such attunements. For Allen-Collinson and Hockey, such habitual organisations come in various forms, from simple 'performative utterances' to signify the need for a specific configuration, and 'interrogatory glances' to check in on how the other is 'going' (whether they are comfortable running at a particular pace, for instance) or maintaining the proper 'proximity' (shoulder distance from the other), to so-called 'typifications' at higher 'levels of abstraction' which reflect coupled actions that unfold over longer timescales, and running together itself, which houses all prior distinctions and has its own general signature.

Performative utterances (Turner 1975) are simple utterances or sounds that convey a particular feeling or signal a particular intention that bears on the dynamic of running together. Each partner attunes to the other, such that the production of a sound or the utterance of a phrase

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[126] In the context of the drilling pair, this might have just as easily been referred to as 'drilling together'.

signifies a necessary response to maintain the dynamic of running together. They report, for instance, that "Jacquelyn would attend to his breathing patterns … picking up aural cues as to whether he was running with ease or struggling, and making continual adjustments to pace to ensure running together was maintained" (Allen-Collinson and Hockey 2017, p.184). Or, Jacquelyn writes in her notes that "John often grunts, 'On me!' — meaning he should take the lead for that particular section and I must follow 'obediently' (ha!) in his wake" (ibid, p.184). In the language developed herein, such 'utterances' reflect PFs at very short timescales (i.e. simple shared habits) that have stabilised in the context of the recurrent interaction. Such habitual dynamics are proper to the interaction itself and have stabilised some meaning therein, for, as Allen-Collinson and Hockey write, these utterances refer to specific actions, "at least for someone with insider knowledge of the particular utterance and what to do on hearing it" (ibid).

Likewise, the deployment of the "interrogatory glace" is habitually used to momentarily evaluate their partner's present state and adjust, if necessary, to maintain running together. As Allen-Collinson and Hockey put it, the "glance and the evaluation that occurred with it simultaneously constitute a process of habituated action" (ibid, p.186). One variable closely monitored was the proximity of the running partner. On paths when they are running comfortably, a proximity of a few feet from each other's shoulder was maintained. Deviations from this, picked up through the interrogatory glance, enabled a response in the other to adjust to maintain running together under the present conditions. Interestingly, — mirroring the account developed in Chap. 10 — they write that "the normal pattern is only usually highlighted, when it is breached … ", continuing that breaches usually animate the unaffected partner to "ask the other if s/he was alright or would, by a process of trial and error, adjust the pace until tight running-together was again achieved" (ibid, p.187). Here again, perfectly in line with the present account, invariant patterns emerge within the interactional dynamic that have some autonomous organisation onto themselves. Through recurrently running together, the pair have stabilised a particular invariant inter-bodily relation with its own norms of self-regulation (its own habituated autonomous dynamics) such that deviations from optimal produce dissonances that animate an adaptive response to return to some pre-dissonant optimal. Moreover, although the norms of maintaining proximity are not the only norms relevant to running together (i.e. the dynamics of running together can be maintained even when said norms are not adhered to), they are deeply intertwined with it in an inter-regulatory dynamic analogous to those described in previous chapters. Such patterns equate perfectly with participatory frames at the timescales of shared habits.

Another scale of patterning is reported as also relevant to the experience of running together. Borrowing from the sociological phenomenology of Alfred Schültz (1967), they adopt the notion of 'typifications', as "common-sense constructs that were used to order the routine running

life-world on a moment to moment basis, to organise and structure our experience … of training together" (2017, p.188). The above examples might already be understood as typifications, whereby one partner drifting off pace and losing proximity typifies that they are not 'going' well. As Allen-Collinson and Hockey write, "At the most immediate and sensory level there was a particular habituated action of seeing and hearing each other in a highly attentive way. These sensory perceptions themselves became categorised mutually by us, so that, in Schutz's (1967) terms, we typified each other" (2017, p.188). However, there is another 'level of abstraction' that captures better what is implied by this notion and supports the recognition of processes of patterning at work at longer timescales and their dependence upon environmental conditions. Allen-Collinson and Hockey suggest that, "Built upon and interacting with these sensory perceptions [e.g. the interrogatory glance as a "particular habituated action of seeing and hearing each other in a highly attentive way"] was a series of typifications at higher levels of abstraction, which encapsulated our mutual form over different kinds of terrain and in different climatic conditions'' (ibid).

They report on several emergent invariants that were understood so, e.g. either partner running in circles to let the other catch up when having either ascended or descended a hill; splitting and re-joining when encountering rough terrain because being too close might lead to entanglements; each taking particular trajectories on familiar routes[127]. However, there is one example that is particularly instructive. Jacquelyn suffers from myopic vision, and so always seeks out paths that maximise the amount of available light from streetlamps, shops, houses and so on. Running together under such conditions, the pair must frequently switch sides as the amount of available light on a given side differs throughout any route. Speaking of this dynamic, they write, it was "so habitual in the dark months that it became almost prereflective (as if on "automatic pilot") on well-traversed routes" (2017, p.181). Here, one can see how a quite complex adaptive response can sediment in the habitual dynamics of the pair that is responsive not only to each other, but to the whole complex of constraints within which the interaction is ongoing. Having recurrently acted under similar conditions in the past they have developed a sense for how best

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[127] Other ethnographic work has also observed the stabilisation of such invariants in groups larger than dyadic pairs. For instance, Brummer and Alkemeyer (2017) observed the practice sessions of an acrobatic troupe learning highly choreographed routines to perform in national and international contests. Observing a particular episode of training they realise that "for their performance, agency becomes distributed among all participants with everyone and their actions being "interdependent" ... In these supra-individual figurations, the outcome of the performance cannot be controlled by any single acrobat alone; for performing the different acrobatic figures, the actions of individual participants have to merge into a shared bodily performance." Moreover, after detailed analysis of the recorded video footage, they conclude that "repeated practicing allows for the development of a shared movement rhythm which at the same time coordinates and facilitates the mutual attunement of the acrobats individual ways of moving …" (2017, p.47). In other words, through repetitious interactions an interactional pattern emerges which is both composed from but also guides and orients the behaviour of the interacting individuals. One might simply refer to this in terms of an interpersonal synergy. Here, however, one gets a sense for how recurrence is important to the stabilisation of the rhythm, and ultimately, how the rhythm itself takes on a kind of autonomy, and thus is best understood as a participatory frame.

to maintain the norms of the ongoing interaction (running together) and have stabilised a shared routine that allows them to navigate a relatively complex environmental challenge without ongoing explicit co-regulatory dynamics. To get a sense for the normative dimensions of this emergent dynamic one only has to imagine what the outcome might be if, for instance, one or the other were to fail to accord with the habituated pattern, i.e. dissonances would likely surface that help orient the runners back to their previously realised optimal.

If one conceives of 'running together' as an integration of the above dynamics that has also acquired some degree of autonomous closure, running together can be seen as an emergent shared micro-identity with its own norms, coenhabited in recurrent interaction by the pair. Like *drilling together*, or *dinning together*, *chatting together* etc., what stabilises in recurrent interaction is a metastable whole able to adapt to the shifting demands of the environment whilst maintaining some variables (some order parameters) within viability, whilst integrating novel regularities where necessary. Given the tight coupling and adaptive capacities present in such configurations, it may be valuable to conceive of such pairs as achieving a degree of self-organised criticality, something additional experimental work will eventually decide.

And so, we can recognise the interacting pair as having a shared background that channels their actions along particular routes, allows them to act adaptively regarding environmental challenges, and is reinforced under recurring conditions. In such an example, one can also clearly see how the regularities of the environment make their way into the habituated dynamics of the pair and are in interaction with the dynamics already found there. Speaking of such complex attunements, Allen-Collinson and Hockey refer to Bäckström (2014) and the need to "recognise the interrelatedness not just of mind and body, but also of mind, body and place" (2017, p.178). Recurrent interactions not only familiarise bodies with bodies, but also multiple bodies with places, such that the stabilities undergirding the experience of 'running together' are emergent from the whole complex. Understood as autonomous participatory frames, one can see how the regularities of the environment are reflected and even reproduced in the intercorporeal dynamics of the pair in ongoing interaction with their environments. Though we do not just co-attune to material environments. Our environments are, in fact, sociomaterial ones. The emergent interactional dynamics do not just reflect the availability of light and the roughness of the terrain, but the 'terrain' of the subculture too, its norms, styles, and fashions. Thus, the sense for how embodied interaction serves as a primary mechanism for the reproduction of a transindividual habitus is reinforced.

One scale of participatory frame not reported on by Allen-Collinson and Hockey, is the scale of interpersonal inter-identities. However, they do provide a documented example of stabilised invariant structures that organise relational activities at much longer timescales. We

learn that Jacquelyn Allen-Collinson and John Hockey are wife and husband *and* research partners involved in an extended project together. Marriage itself typically implies acting towards shared concerns that organise action at longer timescales. However, this relationship is also organised around a two year shared research project, a co-autoethnographic investigation, requiring "daily (or almost daily) engagement … via field notebooks, training logs, micro-tape recorders and photographs … [and] … a joint analytic log …", in which they recorded the discussions between them (2017, p.177 - 8). Undergoing such commitments implies acting from compatible concerns that organise action at extremely long timescales. Here, one can envision the stabilisation within the relation of participatory frames that embed these concerns as self-regulating optimals that orient action at these extended timescales. In embodying such dynamics, we tend to rely on aligning ourselves with transpersonal institutions that can scaffold such relations over the longer term — e.g. the cultural or religious institution of marriage, the sporting institution of distance running, and the scientific institution of sociology — and in doing so, our actions also feed back into these transpersonal institutions and modify them, however trivially.

Decomposed in this fashion, one can see the umwelts Jacquelyn and John co-produce in running together are characterised by invariant organisations at multiple timescales. Understood through the lens of coenhabiting autonomous PFs, one gets a sense for how these umwelts are both produced and propagated, and thus able to retain a certain amount of invariant order through time; order that is not biological, psychological or sociological, but some amalgamation of all of these dimensions, a relational order, an ecological order, indeed, an ecobehavioural order.

10.2.3 Common features revisited

Revisiting the features common to the original examples, one can now ask whether they might be made intelligible as characteristics of autonomous participatory frames. Focusing on the example of running together, each will now be addressed in turn.

1.) **A relatively invariant pattern**

    a.) An autonomous organisation is one that can maintain some invariant under changing conditions. By extending this to patterns in the social domain, in terms of habituated organisations constituted in social interaction, one can now see such invariance as a feature of participatory frames at multiple timescales, e.g. the performative utterances of the running partners, their adaptive routines, their running together, their being husband and wife.

2.) **Constitutively dependent upon at least two interactants**

    a.) This account specified the role of intercorporeal dynamics in the stabilisation of invariant patterns of being together. This is clear in the account of running together above, when, for instance, they speak of performative utterances, or typifications

that have become totally habitual, but only make sense contextualised by a shared history of interacting and the background it provides.

3.) **Constitutively dependent upon certain environmental conditions for their production and ongoing reproduction**

    a.) Coenhabiting describes how recurrent interactions stabilise and reinforce interdependencies between structures in the bodies of interactants and structures in the habitats in which they interact. Thus, there is an alignment between sociomaterial regularities and inter-bodily regularities. As argued, habits are precarious structures dependent upon the in-flow of certain environmental conditions within appropriate timescales for their reproduction. Thus, if the habitual social organisation (the participatory frame) is to be preserved it must have access to such conditions, e.g. the micro-identity that allows Jacquelyn and John to pre-reflectively respond to low light conditions might lose some of its fluidity if such conditions are not visited often enough[128].

4.) **Recurrence or repetition seems to be important, whereby the more the event repeats, the more its features are experienced as stable.**

    a.) The notion of habit extended the notion of autonomy to include a dynamic of plasticity and sedimentation. Participatory frames tend to operate according to precisely such dynamics: recurrence supports reinforcement/stability. The more Jacquelyn and John practice their routine running in low light conditions, the more fluid and stable it gets. Likewise, it might lose some of its fluidity if not visited often enough. Attesting to the role of recurrence in the reliability of interactional dynamics, Allen-Collinson and Hockey write that "after so many years of running together, direct questions as to the others state of being were generally unnecessary, indeed superfluous (even irritating), as were statements about our own individual 'going'" (2017, p.184).

5.) **We often enact such patterns in a pre-reflective fashion**

    a.) As argued, with recurrence the dynamic patterns that organise our ongoing interactions largely fade out of view. PFs have been characterised as silent grooves supporting our ongoing interactions, backgrounds or backdrops that channel our action towards shared ends. Acting pre-reflectively is effectively synonymous with acting out of habit. Indeed, that the "the normal pattern is only usually highlighted, when it is 'breached'" (Allen-Collinson and Hockey 2017, p.187) speaks to precisely

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[128] Of course, some patterns might be more 'portable' than others, and not be so reliant upon highly specific environmental conditions, e.g. a traveling couple who maintain a certain relationship dynamic across all situations.

such an understanding.

6.) **Decentering of intentionality or distributed sense of the agency**

    a.) This feature is present already in the basic autonomous dynamics of the social interaction, in which the conversation persists over and above the intentions of the individuals involved. But it is even more obviously reflective of PFs when describing 'falling into' patterns of being together. Like the starling at the centre of a murmuration, whose activity cannot be made intelligible as the activity of a perfectly self-determining subject, in social interaction we sometimes act from a place that can only be made intelligible as acting on behalf of 'agents' larger than ourselves. John and Jacquelyn, for instance, speak of acting 'as if on automatic pilot' in responding to their environment in ways that accommodate the needs of each other. Here the boundaries of the individual are blurred, and any attributions of individual agency are excessively limiting.

7.) **Patterns are normative, entailing a sense of how the event *should* or *should not* unfold**

    a.) The notion of PFs was developed largely to account for the normative dimensions of social interaction. As has been repeated throughout, the enactive notion of autonomy provides some grasp on the normative dimensions of experience, for our actions take place against the backdrop of an organisation that is seeking to maintain itself. Extending this into the notion of habit, one also gets a sense for how a particular organisation might have more or less normative force. Extending it further into the account of social habits (as participatory frames), one develops a sense for how the patterns that emerge in recurrent interaction come to serve as optimals, with deviations engendering the experience of some norm being breached. For Jacquelyn and John, it is because of such normative dimensions that each can track how the other is 'going' with even just a momentary glance.

8.) **A normative temporal dimension**

    a.) Again, PFs are those organisations that support our unfolding activities within space and over time, through anticipating likely actions, preparing us to respond, and supporting our responding. PFs reflect nested arches of action at multiple timescales, gearing us into the rhythms and timings of those with whom we recurrently interact, eventually allowing for our felicitous interactions. Allen-Collinson and Hockey speak two temporal dimensions, 'rhythm and pace', as the two most central variables in the dynamics of running together. It is largely by stabilising PFs that relate to such temporal variables, and abilities to respond to

deviations from their coenhabited optimals, that running together can be sustained.

9.) **Such patterns can be difficult to alter**

   a.) Like individual habits, whether desirable or otherwise, once having acquired a certain degree of autonomy, participatory frames can take on a self-producing momentum that can be difficult to alter. Indeed, this can be even more pronounced in PFs, given the decentering of the dynamics responsible for animating the action of interactants. Patterns of addiction that surface particularly in the presence of specific others, negative patterns of dependency and so on, are illustrations of such organisational dynamics. Our running pair do not explicitly reflect such dynamics in their account. However, one can imagine how patterns of running together that are less than optimal might prove stubborn or even resistant to change, e.g. they speak of needing to widen their proximity to one another when running on less predictable terrain. But one might speculate that their tendency to maintain a particular proximity was maintained on such terrain on more than a few occasions before the adaptation was made.

10.) **Even if difficult to alter, the patterns are ultimately plastic**

   a.) One central innovation in marrying the notion of autonomy with the notion of habit is the recognition that autonomous structures can be more or less autonomous given their present reinforcement. This relies upon them retaining a dimension of plasticity. By doing so they can be both stable and subject to change. Think of the multiple normative dimensions of running together and how they are produced, reproduced, and transformed in the dynamics of running together, from performative utterances that signify the need for the other to tow in behind, and glances that help maintain particular proximities on particular terrains, to the regulated flow of running together as a married couple and research partners. Inevitably, such patterns drift with time. The words used might change to reflect the times; as they learn to navigate particular terrains and develop confidence as a pair, proximities might shorten or tighten; the boundaries of what it means to maintain the flow of running together might broaden, and so on.

11.) **These patterns and their features remain mostly undisclosed**

   a.) Participatory frames, function like silent grooves forming the backgrounds to our ongoing interactions; faded out of view, they frame whatever we take to be the figure of our interactions. Allen-Collinson and Hockey went to great lengths to reveal the various patternings that organise the umwelts they co-enacted. In theory, any of us might take any relationship we have and make a similar analysis. We

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would likely be surprised by the relative invariance of the patterns that comprise it. But that such patterns are there to be found is guaranteed. Being pre-reflectively organised according to the consensual structures that reflect our history of interaction is what allows us to have a shared world but also be present to what a given situation demands of us, it supports our being co-selectively open to precisely that which is relevant to us as interactants in our sociomaterial medium. It is because such dynamics act out of view that we can come to something approximating a shared view. Like the pairs of jazz players who spoke about the drone as facilitating their ability to connect and 'make time together' (Walton 2018), our participatory frames help us orient towards the shared present such that we can not only 'make time together', but entire worlds. It is by being oriented towards running together that Jacquelyn and John co-produce their shared running world, not by being oriented towards their running world. But it is by having this shared world that they can orient towards running together and express the care necessary for them to maintain this dynamic over time.

Having provided this summary — and hopefully having made intelligible as participatory frames the patterns of being together that were the object of concern of this thesis — the pages remaining will reflect upon some extensions and implications of this position, beyond those already mentioned in Chap. 10

10.3 Extensions and implications

10.3.1 Trans-situational concerns

This thesis primarily considered cases in which processes of coenhabiting give rise to participatory frames in recurrent real-time reciprocal interactions. However, it is important to note that the construction of such frames has consequences for those engaged in such interactions over and above the situations wherein they come into being[129]. Such dynamics have been referred to elsewhere as *trans-situational concerns* (James and Loaiza 2020). Accounting for them is effectively accounting for how concerns engendered as part of participatory frames that have arisen in real-time reciprocal interactions with others, contribute to the sense-making of the individuals who comprise those relationships, even when apart from social interactions altogether.

Interpersonal relationships and the dynamics that support their successful enactments do not go dormant in the space between face-to-face encounters. People are much of the time

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[129] This is somewhat evident in the previous chapter, but it demands elaboration beyond what is presented both there and herein. Future efforts will provide such elaborations, what is offered here is just an acknowledgement of such demands and some initial thoughts on how they might be approached.

coordinating their behaviour in relation to locally absent others. Romantic relationships are exemplary here. Individuals think and even dream of their loved ones, imagine activities for future encounters, invest time in the maintenance of shared spaces, and generally behave with recourse to expectations about the continuation of relationships. Relationships — not only romantic ones — stay alive by alternating between the dynamics of close-range interactions and the dynamics of anticipation that constitute continuing bonds between persons. Indeed, our sense-making is constrained by the realities of such relationships even when we do not have some specific absent other in mind, but encounter situations that reflect concerns relevant to the webs of participatory frames that characterise those relationships.

As the present account has suggested, in social interaction with others we typically coenhabit tendencies and capacities relevant to the maintenance of said relationships. We get a feel for the 'games' we are playing as we play them and stabilise the skills necessary as we go. If I am part of a community of Jiu-Jitsu practitioners, in interaction with others in that community I am organised for interactions with them, which implies that I adopt concerns that are not unlike theirs in some key respects and stabilise ways of acting in relation to them (Loaiza 2019). Indeed, it is by stabilising a particular set of shared concerns, and acting in relation to them, that allows us to refer to ourselves collectively as Jiu-Jitsu practitioners. These tendencies and their attendant bodily capacities are substantially grounded in the interdependencies between the bodily and environmental structures wherein they come into being. However, much of the value of such tendencies and capacities to me as an individual is that they can be enacted outside of the specific contexts wherein they came into being, and thus, we recognise in them a degree of *portability* (Cuffari, Di Paolo, & De Jaegher 2015; Di Paolo, Cuffari, & De Jaegher 2018). For instance, the dynamics that undergird my capacities as a Jiu-Jitsu practitioner, and the concerns they reflect, are borrowed from, during the coenhabiting of my emerging interpersonal inter-identities when I find myself in the company of a community of Brazilian Jiu-Jitsu practitioners. My new beginning is not always a radically new one. Given that the Brazilian Jiu-Jitsu community shares some regularities with the Jiu-Jitsu community, finding my place in the latter is bootstrapped on having found my place in comparable communities previously. The emerging interdependencies between bodily and environmental structures borrowing from existing dynamics first sedimented elsewhere. This kind of portability, however, does not pertain solely to situations of social interaction. It can also apply to situations in which one merely anticipates another.

Consider another excerpt from Knausgaard, when he reflects autobiographically about his preparation to host his older brother and his brother's friend in his new flat. He recalls (2016, p.45) the activities he underwent, all the while tending towards an optimal grip.

I stood by the door and tried to see the room through Yngve's and Asbjørn's eyes. The typewriter on the desk, that looked good. The poster of the barn and bright yellow corn under the dramatic black American sky, that was good, a source of inspiration. The poster of John Lennon, the most rebellious of the four Beatles, that was also good. And my record collection on the floor against the wall, it was large and impressive, even for Asbjørn, who I was told knew what he was talking about. On the downside, the book collection was limited, comprising only seventeen volumes, and I didn't have enough experience of other collections to determine what impression the various titles made. Beatles and The Snails by Saabye Christensen couldn't be too far wide of the mark though. The same was true for Ingvar Ambjørnsen. I had three of his books ... I left Novel with Cocaine open on the table and placed a couple of issues of Vinduet next to it, one open, one closed. Three books open seemed a bit much, it looked arranged, but no one would be suspicious of two open and one closed, that was perfect

This passage suggests something about what is entailed in tending towards an optimal grip in a socially relevant situation, even when not in real-time reciprocal interaction with others it might concern. Knausgaard evokes an identity in his imagination. Framing the scene, it engenders a particular constellation of tensions to be reduced. In Knausgaard's example, such tensions pertain to his imagined self as Yngve's younger, writer brother, and his desire to gear into the world Yngve and his friend represent. The intricacies of such imaginal identities will not bother us here. However, it seems rather uncontroversial to claim that such an identity, whatever its explication, evinces concerns at least partially coenhabited in relationship with Yvnge, and other 'cool' folks in the past.

Of course, Knausgaard cannot know what his visitors' reactions will be and in preparation can only rely upon reducing dissatunements as he moves about making sense of the scene. But from where do the bodily structures that underwrite such dissatunements come? A reasonable supposition is that they are those (or at least borrow from those) that have stabilised in the coenhabiting of participatory frames that embed the same concerns. Our interactions with others change us, such that even when we decouple from them, their concerns continue to shape our individual actions[130]. Much as with concerns and attendant actions in the transition between Jiu-Jitsu and Brazilian Jiu-Jitsu communities, there is a portability here too. However, here it is to situations that only virtually reflect something about the original relation. In the example above, Knausgaard's tending towards optimal grip reflects concerns originally stabilised in relationship with his brother in relation to the sociomaterial milieu they collectively integrate with and modify

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[130] It is likely that this depends largely on the quality of the interactions and the degree to which they evoke central aspects of our identities. See Nordham and Kelso 2018 for some empirical work looking at how emergent dynamics in interaction shape the post-interaction dynamics of those involved. Therein they highlight how interactions that better support interactional stability leave their traces, such that the post-interaction behaviours of individuals tend to reflect them more so than activities that did not facilitate stability. One can easily envision how such traces might be more pronounced if they are, in a sense, more meaningful to those involved, how they might be deepened with repetition, and how they might both feed into subsequent interactions and orient the individual towards pursuits and social interactions of a particular type.

when coenhabiting participatory frames. Thus, what shows up as relevant in his environment, what solicits his action by giving rise to tensions in demand of reduction, is precisely that which allows him to continue that process of individuation.

An illuminating illustration of such integrations is the example of someone purchasing an item of clothing. Our clothes are very often our first (re)introduction to others and can help establish the basis for certain types of interaction. Wearing a particular item of clothing can signal probabilities of being organised according to certain concerns within a given sociomaterial niche, facilitating coordinations (and thus social connections) of a particular sort. Thus, our preference for some piece of clothing can be a function of our tending towards optimal grip when also organised by an individual concern to synergistically integrate with a particular other/group/collective. The experience of preferring *just that pair of shoes* being as much part of the dynamics that will serve one's (re)individuation as a component in the larger system, as they are a reflection of an individual preference[131].

If our individual concerns to integrate with particular social systems are central enough, they will come to reflect the concerns of that system, such that even when apart from others with whom we comprise such systems, when encountering situations that are relevant to the collective concerns we are likely to act in ways that are congruent with them. Moreover, when we don't act congruently, we are likely to experience some dissatunement, thus soliciting congruent actions, inviting us to reproduce the sociomaterial order and its specific concerns, or to enhabit new ways of being that reflect our individuation in relationship to these larger structures. In the cases above it might be relatively clear which relationships inform which activities, e.g. it is primarily Knausgaard's relationship with his brother that informs his activities when arranging his room; one's desire to be part of the biker gang informs their decision to purchase the studded leather jacket. However, our sense-making predominantly operates within concerns sedimented in the coenhabiting of participatory frames most of which are more subtle and not as easily exemplified as our above examples (e.g. relationships with parents, significant others, colleagues, and peers). In these ways, the social mind and the individual mind inosculate, and we must acknowledge any pure disentangling of the two as utterly impossible. This, however, is not to say that some effort towards a greater understanding of the entangling should not be undertaken. The line of thinking developed here should be directed at precisely such efforts in the future.

Participatory frames typically arise in the presence of larger cultural and institutional constraints, acting as components in the production and reproduction of those larger social entities. Any embodied subject will be a component in many such entities. But interestingly, the inverse relationship is also true. As much as any individual is but a component in the social whole,

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[131] This aligns very closely with the Simondonian account written about in Sect. 8.2.3

any social entity is but a component in the individual whole too. Indeed, the individual, even when apart from social interaction, is a composite of the vestiges of many such social entities. As much as we live within and through the multiple patterns that we coenhabit with others in our sociomaterial niches, we are equally lived within and through by them, we are animated by them; we are, one might say, *multiply animated* (see also Cummins 2020).

10.3.2 Being multiply animated

Much of the social interaction of ants from the same colony entails exchanging bodily chemicals and liquids, a process referred to as trophallaxis (Wheeler 1910). Besides transferring essential nutrients in these exchanges, ants also learn about essential variables within the colony. Mediated by their 'social stomachs', they adapt to roles that help maintain the variables of the colony within the limits of viability, e.g. they become responsive to its boundaries and which ants are actually from the colony and not from a different one nearby (Forel 1928; Wheeler 1910; Huxley 1930). What results for any ant in the wake of such exchanges is a set of dynamic tendencies that dispose them to be attracted to or repelled by various aspects of their environment. Taken together, the emergent set of individual tendencies reflect a set of organising dynamics that adaptively maintain the colony as a coherent whole. In other words, imparted in the processes of trophallaxis are a set of bodily tendencies relevant to the overarching entity that is the colony. Acting from such tendencies, the colony can maintain its status as an autonomously individuated entity across time; the individual ants and their interactions realise the dialectics of self-production and self-distinction needed for its ongoing individuation. Of course, no ant within the colony needs to have any sense of the global order — it simply emerges from their self-organising interactions — and the colony itself does not have a coherent experience as a colony.

Reflecting upon Wheeler's account, historian Charlotte Sleigh writes that, for Wheeler "trophallactic feeding was both the behavior that created the ... arrangements of the nest and the behavior that resulted from those arrangements. Through the exchange of food and other chemicals, the nest was maintained in holistic equilibrium" (2002, p.149). Here, there is a relationship between structure and operation that should now be familiar. As much as any individual ant lives through the patterns that they collectively stabilise, it is also lived through by them and the colony writ large. The individual ant is animated by the colony and its concerns within its ecological niche.

One must be cautious applying insights derived from the observation of insects, however social, to the sociality of embodied human subjects. Thus, it is worth saying, there is no attempt here to characterise the individuation of human collectives as superorganisms akin to an ant colony. As we well know, any such totalising accounts are far too obtuse an instrument for making intelligible the complexities of collective of embodied human subjects, and indeed, far too

dangerous when wielded insensitively. Some analogies that might be drawn, however, is that in interaction with others we acquire dispositions that also serve entities larger than ourselves, and that we typically do so without any awareness of such a fact. In such instances, our operations (our behaviours, affects, thoughts, and so on), are animated by structures that seem to maintain some general coherence despite being distributed across multiple embodied subjects, e.g. within dyads, families, communities, groups, collectives, and nations.

Another analogy with the ants is that much of the social interaction that goes on has the effect of engendering within individual embodied subjects a sense of their place within the larger social systems they help comprise. Here, however, the transformation of bodily tendencies is the outcome of repeated interactions and the sedimentation of participatory frames at multiple timescales. Acting from these habituated organisations, and their attendant sense of attraction or repulsion towards particular features of their niche, individual embodied subjects might be seen as reproducing the conditions necessary for the reproduction of the larger social systems of which they are component parts. Again, much like the ants, these individuals not only live through the patterns that establish the social systems, but they are also lived through by them. From this perspective, many participatory frames function like transient channels through which social system relevant information and resources flow, whilst organising their hosts in the process. Importantly, however, and this is a vital distinction between the embodied human subjects and ants, the former are animated by multiple such social systems simultaneously.

Knausgaard offers a final example, a breakdown of sorts, that brings the nature of being multiply animated to light. This is a situation most of us are all too familiar with. Reflecting upon a meeting between him and two of his friends that don't know each other well, Knausgaard writes: "I liked both of them … and I behaved in such different ways with each of them that I felt caught when they came together and I couldn't behave in one way or the other" (2014, p.234). Given its role as part of a single superorganism, and thus an attendant lack of diversity of available friendships, no ant will be familiar with such an experience. However, most adults who have had to attend their own birthday party will be aware of the kinds of (and degree of) dissatunements such situations can engender. Any individual embodied subject can not only help comprise multiple inter-identities, but such inter-identities can also sometimes be simultaneously called forth and incompatible, and they must now improvise to two discordant grooves. In other words, under the conditions of the birthday party, the participatory frames that normally support the experience of being together come into conflict, with no obvious route towards any enduring co-optimal grip[132].

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[132] It was precisely this experience and the confusion and discomfort that it caused that formed the initial impulse for the inquiry within this thesis. Given this, it is an example I bring up often in conversation. People typically describe this situation in aversive terms. "My worst nightmare", "hell on earth", "it's the worst", are a few of the descriptions I have encountered.

The tensions that result reflect the fact that such frames have stabilised under very different conditions (e.g. within the university vs within the football club) and thus embed incongruent norms. Such situations bring to light our multiple animation by revealing dynamics that are in fact present everyday: we are different people with different people, typically what our context demands of us.

An obvious corollary of this is that it makes little sense to speak of a unified, coherent self. Rather, the embodied subject, is, in fact, an entanglement of personal and interpersonal inter-identities that take shape in the presence of certain conditions and certain others, and leave their dynamical traces and their attendant concerns to contribute to the whole in their absence. Such identities are not wholly distinct, but are overlapping, interpenetrating, and inter-regulating, and brought into conversation with each other in situations that solicit more than one identity and its attendant capacities[133]. Therein, they provide preindividual potentialities for the novel participatory frames that emerge. Imagine, for instance, if Knausgaard was to sit with his two friends for some time, all being resolved to a cooperative outcome. Tending towards co-optimal grip, the three of them would eventually individuate some novel participatory frames relevant to the triadic interaction, ones that have likely borrowed from dynamics previously sedimented in the coenhabiting of the relevant dyadic interactions. Some version of this is ongoing much of the time, and reflects not only patterns stabilised in dyadic interactions, but those that reproduce cultural regularities that organise more distributed sets of relations as well. The Knausgaard that walked into the situation is different in a very real sense from the one that walked out (even if some invariances have been preserved), he is different because of the interactions he has taken part in, and he is different primarily regarding such interactions, even if the results of such interactions have cascading effects.

10.3.3 A step towards an ecological mind

The process philosopher Isabella Stengers argues for what she refers to as a *cosmopolitics.* One concern central to the cosmopolitical position is the attempt to acknowledge the plurality of worlds that make up the collective human experience without simply 'tolerating' this diversity (Stengers 2011). When a dominant culture merely tolerates the other within their culture, they, in the same breath, deny the culture/experience of the other; to tolerate — the dominant mode of Western liberal democracies — suggests a kind of 'putting up with'. For Stengers, we need something more radical. One proposal — at least at the level of individuals in social

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[133] Much like how the variety of flora that raise up from the soil beneath the forest floor are connected through the mycorrhizal networks - the so-called 'wood wide web', see Macfarlane (2016) for a popular introduction to this topic - that channel information and nutrients between trees and plants, so too, we might speculate, are our multiple identities in conversation with each other through the inter-regulatory dynamics that manifest in situations that solicit more than one particular identity and its attendant capacities.

interactions — that seems aligned with Stenger's demands, comes from political theologian Adam Kotsko (2010). Kotsko talks about the success of any multicultural society (now world) as depending on the embracing of a 'radical awkwardness'. This pertains to the adoption of a general stance in which the individual, sensitive to the fact that their own received cultural norms/dispositions (participatory frames) do not reflect those of the cultures with whom they share their living spaces, embraces a radical awkwardness in which they hold their norms at the door and welcome the awkwardness of not having habituated responses to intercultural situations. In doing so, Kotsko claims, they can go some way to acknowledging each other's realities and find ways to live alongside each other that do not demand cultural homogenisation in line with the dominant culture. In other words — in the language developed herein — in doing so they allow for the emergence of some consensual structure in the form of novel participatory frames. One might notice, both Stengers' and Kotsko's accounts reflect central aspects of the account of coenhabiting that has been outlined herein. If we are to move in the direction of more global co-optimality, the over determination of the other in our 'tolerance' is simply the reproduction of our existing frames. But if we can maintain that space of awkwardness, an almost playful space that seems very much like the Bergsonian space of hesitation outlined in Chap 5, or the Simondonian metastable space of low-intensities that is prime for individuation, therein the potential is heightened for the sedimentation of consensual structures in the form of participatory frames that allow us to feel well located despite our diversities.

Such a position not only recognises but embraces our dependencies upon each other and our inevitable diversities, whatever the challenges that attempts at large scale coordinations are sure to present. Moreover, it suggests something about the necessity of articulating the perspective being developed through this article, for in it we recognise both how in rushing to reduce tensions, how giving in to the awkwardness, can serve to reproduce the structures that generate it, and conversely, how adopting the stance that Kotsko advocates, how hesitating to embrace the awkwardness and all its tensions, can serve as the beginnings of a kind of praxis for the disruption of existing unhelpful or outdated habitus and the stabilisation of new more integrated ones. Indeed, the compatibilist approach developed throughout this thesis has been an attempt to model such a stance within the discourse of cognitive science.

Given our present environmental concerns, if we have reached a point where we can acknowledge not only our multiple animation but the dynamics by which our identities stabilise and change, our task should not be the colonial one of proselytization for a world ordered in the ways that We presently see it. Rather, it might aim at mediation, at holding the playful tension filled space for the purposes of facilitating cooperation between the multiple identities that animate our species as a whole, and indeed our broader living ecologies, approximating the custodial task of

the wood keeper or the gardener in facilitating harmony amongst all living there. When we see what the construction of our identities entails, we hold them somewhat more lightly, and can even be playful with them. Equally when we find ways of cooperating, we can stabilise consensual organisations that reorganise our selective openness and challenge the rigidity of the identities that preceded it. What is demanded of us now, by ourselves in the future and the generations that come after us, are levels of cooperation not previously known to us as a species. Whatever our existing animations, we need to be collectively animated by the concerns that we collectively share, which, one might speculate, are the basis enough for large scale cooperation whilst not doing away with diversity. What is needed is the coenhabiting of new planetary, ecological identities, on top of our existing or transformed national, community, interpersonal and personal identities, such that we come to be pre-reflectively disposed to act in the service of such entities. If embodied human subjects are to inhabit planet earth beyond the 21st century in any sort of harmony with the rest of life, it will be essential that some critical mass comes to be animated by processes that not only pertain to the dyads, collectives, and human communities with whom they interact, but the broader web of social relations that make up the ecology of life on this planet.

The account developed in this thesis illustrates that we do not need perfectly overlapping mutual concerns at all timescales to individuate consensual structures. However, it also suggests that we do need some shared concerns. This is good news, for it points toward the need for diversity, for maintaining individual and group identities whilst also leaving open the possibility for the emergence of larger, more encompassing wholes. Given our globalised economic systems, and our globalised resource dependencies, we either survive as a cooperative interspecies and like a well-functioning woodland move resources where they are needed most, or we fragment and go to war over those resources, and, not unlike the addicted individual, our lives are marred by battles for the individuation of identities that can never be anything but parasitic. This is cognitive science in a time of emergency (Bendell 2020; Segall 2012). It might just be time to get playful.

10.4 Concluding thoughts

Part of the value of this perspective is the breath of potential theoretical and practical applications it supports. Indeed, one primary motivation for pursuing this line of inquiry — and attempting to uncover a principled understanding of the multi-scale multi-level stabilisation of patterns of being and being together — was precisely to occupy the busiest intersection possible. In doing so, this account not only establishes compatibilities between levels of human organisation and academic disciplines, but it also has the potential to inform developments across a broader

intellectual and practical landscape with a common language. From one scale of analysis, the coenhabiting of participatory frames is an account of how culture, as an evolving web of entangled patterns with varying degrees of stability, maintains pockets of relative coherence across days, weeks, months, and years, while its sociomaterial substrate waxes and wanes. But from another scale, it is an account of how any individual embodied subject is a site of sociomaterial integration and transformation in a fashion that is particular to it. The articulation of such a perspective — i.e. by highlighting the continuities between the concepts of enhabiting and coenhabiting, and the notions of sense frames and participatory frames — provides a language with which to navigate vexed conversations that place arbitrary divisions between the worlds of individuals and collectives.

What this account illuminates are a set of relations and processes relevant to embodied human subjects that are analogous in some genuine sense to the processes of trophallaxis for ants. It is not surprising then, that without previously acknowledging such relations and processes, accounts of the relationships between the various levels of human organisation lead to incompatibilities and awkward alliances along the lines highlighted in earlier chapters. In other words, trying to understand the social activities of individual embodied human subjects without the compatibilist account of the coenhabiting of participatory frames, is a bit like trying to understand the activities of individual ants without any understanding of trophallaxis. Explanations of the activities of ant colonies and individual ants are different levels of explanation, but with an understanding of trophallaxis they are at least compatible. Likewise, explanations of human collectives and individual embodied human subjects are different levels of explanation, but with the ideas brought together in this thesis, and the positive account developed, one can acknowledge continuities between them and offer explanations at each level that are compatible with the other. What we have arrived at is a position within which the limitations of individualist and interactionist accounts need no longer concern us, through which we can make sense of the complex inter-regulations that realise our shared worlds, and from which we can approach the challenges that face us as we struggle to bring about a planetary ecological identity defined by cooperation and care. What has been stabilised herein, in other words, is not a final word, but a new starting point.

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