

# TOWARD AN ORGANISMIC SUBJECTIVITY

TOWARD AN ORGANISMIC SUBJECTIVITY:  
AFFECT, RELATION, ENTANGLEMENT

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## **ABSTRACT**

The motivating ambition of this thesis is the endeavour to think the subject anthropocentrically, to free it of its conscious-agential overtones and to foreground instead the active organism in all its ecologically entangled, metabolically perspectival glory. I define the subject, in the course of the thesis, as a body productive of its own spatial and temporal fields, a body that lives its own space and time. Ecology is pluralized, made bodily. And the body itself is dynamicized and rendered porous—less an absolute limit than a variable topology separating, uniting, and enfolding organism and ecology, self and other, subject and world. I begin, in Chapter 1, with Deleuze and the rhythmic contractions that define the temporal pole of organismic subjectivity. In Chapter 2, I turn toward the way spaces are configured on the basis of the affective enaction of organismic life. This is organismic spatiality. In Chapter 3, I introduce Deleuze’s distinction between the actual and virtual in order to properly theorize the way organismic abilities and environmental layouts are pre-subjectively related such that actual organismic activity individuates a field of spatiotemporal experience. And as the structure of this relation fluctuates, so too does the framework of subjective experience, the sensorimotor-perceptual affects by which experience is defined. Organismic subjectivity is, as a consequence, both relentlessly dynamic and tied irreducibly to the organization of its own world. To think this entanglement is to think subjectivity as swarm, a concept that opens this theory onto an array of new possibilities—toward, to take only one example among a range of many, a human-technological entanglement that conceives scientific apparatuses in their integration with a collectively human subjectivity. I conclude the thesis with a brief gesture toward the implications carried by the development of such possibilities.

### KEY WORDS

Philosophy of Ecology, Philosophy of Organism, Subjectivity, Temporality, Spatiality, Gilles Deleuze, Baruch Spinoza, Gilbert Simondon, Henri Bergson, James Gibson, Dialectical Biology, Niche Construction Theory

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This thesis is a unity, as all things are, only in word or concept. And if it isn't any one thing, then the credit can't lie with any one person—certainly not with me. It was born out of a crowd of voices, and took form only in the wake of a flurry of influences, obstacles, aids, allies, and enemies. I won't pretend to be able to exhaust the list.

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Last, I want to dedicate this thesis to the memory of a dear interlocutor, for whom philosophy was not so much luxury as necessity. He taught me the fiery significance of serious thinking, and left with me the haunting implications of its death.

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## INTRODUCTION

*Ecosystems are incredibly complex articulations of innumerable, sentient subjects, engaging each other through the lenses of their own subjective worlds.*<sup>1</sup>

Given our situation in the midst of environmental crisis, we hear often the call for a radical reorientation of ecological thought. And, indeed, the encounter between Deleuzian metaphysics and ecological theory has begun to develop into one of the most productive vectors of contemporary philosophy, drawing as it does upon complexity theory and non-linear dynamical systems modeling. But this convergence of philosophy with science and ecology tends to read Deleuze only in terms of his late collaboration with Félix Guattari. Doubtless, Deleuze and Guattari do provide the material necessary for a radical reconception of ecology, but one that comes, I think, at the expense of the ability to think subjectivity and what Deleuze called, in *Empiricism and Subjectivity*, “the problem of the Self,” in sufficiently robust terms.<sup>2</sup> The present study will retain the question of the subject as the locus for a novel approach to thinking ecology: one that begins not with ecology as such, but with ecologies in the plural. This shift in emphasis entails an analysis of the affective spatiotemporalities whose geneses reside in organismic activity.

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<sup>1</sup> Alf Hornborg, “Vital signs: An Ecosemiotic Perspective on the Human Ecology of Amazonia,” *Sign System Studies*, Vol. 29, Issue 1 (2001): 125.

<sup>2</sup> Deleuze, Preface to the English-Language Edition of *Empiricism and Subjectivity: An Essay on Hume's Theory of Human Nature*, trans. Constantin V. Boundas (New York: Columbia University Press, 1991), x. By the time of *A Thousand Plateaus*, everything is decentered: the organism, and all that it stands for, is now the enemy. It is a problem, a judgment of God, a capture and striation of nomadic potentialities. And it is precisely these potentialities, these lines of flight that ought to be traced, mapped, followed—these suppressed, renounced, repressed ontological capacities that exceed the body, the bodily, the individuated. But the force of *A Thousand Plateaus*'s displacement of stratification falls weakly upon our ears if we do not first appreciate that we are all organisms, what it means to be an organism, and that every organism is the locus of a spatiotemporal construction. Before the organism is made to refer back to the flows and processes of deterritorialization that underlie it, before it can be dissolved back into the chaos from whence it came, it must constitute itself inside that chaos. It must contract a flow of repetition into a living present; it must found a distinction between inside and outside. It must, in other words, construct for itself a relative spatiotemporality within which it can be understood to be subjective. There is, then, a Deleuzian motivation for the present study. While my aim is to think ecology in terms of the organismic subject, it is also worth noting that this project can serve to delineate more fully the nature of the organism so that thinkers so inclined can better follow Deleuze and Guattari's deconstruction and problematization of living things. One must, to put it differently, *understand* first what one seeks to *deconstruct*.

The topic at hand, then, is not the *human*, but the *organismic* subject, the organism as subject. I define the subject as a body productive of its own spatial and temporal fields, a body that lives its own space and time, embodying a perspective on the world. In so doing, the subjective body (or organismic subject) transforms *the* world into *its own*. The following chapters found this conception of subjectivity in the *organism*—in the metabolic, affective, enactive, organic, living body. This is my starting point, in biology. Although I do not draw from his thought in particular, it is the work of German biologist, ethologist, and philosopher Jakob von Uexküll that motivates this endeavour to think organisms as subjects and space and time as effects of their activity. It is worth quoting him here at some length:

We comfort ourselves all too easily with the illusion that the relations of another kind of subject to the things of its environment play out in the same space and time as the relations that link us to the things of our human environment. This illusion is fed by the belief in the existence of one and only one world, in which all living beings are encased. From this arises the widely held conviction that there must be one and only one space and time for all living beings.<sup>3</sup>

The belief that one and only one world exists, that this is a world fitted to human specifications, tuned to human perceptual systems, a world that ticks to a human clock, a world measured in terms of human space: this is the anthropocentric gesture *par excellence*; a comfortable illusion that degrades, in one fell swoop, the expansively dense complexity of the non-human terrestrial biosphere. Humans lord over this one world, Cartesians through and through. Less sophisticated creatures are mapped hierarchically onto a single spatiotemporal scale, a scale whose ultimate referent is always and only the human. In order to trace the organisms themselves, in order to follow the effects of their activities, to peer into the worlds in which they live, it is therefore necessary to locate each organism in its own spatiotemporal field. Spaces and times are, as I will

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<sup>3</sup> Jakob von Uexküll, *A Foray into the Worlds of Animals and Humans: With A Theory of Meaning*, trans. Joseph D. O’Neil (Minneapolis: University of Minnesota, 2010), 54.



argue, produced dynamically out of the organisms themselves, spun like webs that weave disparate elements of indifferent environments together into unified subjective worlds.

It is therefore with an *anthropo-eccentric* gesture that I wish to introduce this project. Ecological space and time are concepts better understood as networks of *ecologies* of spaces and times. And spaces and times themselves are, far from human measurements of change or distance, real effects of the way organisms relate with their environments and each other. As a philosophy of subjectivity, this is onto-biology: a study of the nature of being routed in the biological, a cartography of the fundamentally *organic* geneses of space and time. Although I will not pursue it in any detail here, it is the hope of this work that a displacement of human analytic privilege will contribute productively to a reorientation of ecological thought. It is, after all, the image we have of the world that founds our interventions into it. To Marx's famous injunction that *the* point—despite endless theories and interpretations offered by philosophy—is and should be to change the world, Heidegger once replied that this claim itself relies on an *interpretation* of the world that posits a need for change. Indeed, conceived conservatively enough, change is the last thing the world needs. Thus, I follow Heidegger in holding that practical intervention necessitates a theoretic image on the basis of which it is to be rendered intelligible. Reshaping this image means reorienting our practices and the dispositions out of which they emerge. The concern of the present study is, however, strictly analytical: I seek only to theorize the nature of organismic ecologies, not to venture the hypothetically political or practical implications carried therein.<sup>4</sup> Post-human modes of analysis do, to be clear, already constitute a vibrant and

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<sup>4</sup> On the real ecological import of theory, I offer the words of Alf Hornborg, who is emphatic that “we seem to have difficulties understanding exactly in which sense human ideas and social relations intervene in the material realities of the biosphere. Rather than continuing to approach ‘knowledge’ from the Cartesian assumption of a separation of subject and object, we shall have to concede that our image-building actively participates in the constitution of the world. Our perception of our physical environment is inseparable from our involvement in it;” Alf Hornborg, *The Power of the Machine: Global Inequalities of Economy, Technology, and Environment* (Walnut Creek: AltaMira, 2001), 10. Anthropocentrism makes it difficult to build a robust ecological ethic, precisely because positing the human as a

burgeoning field. It is not, then, as revolution that I offer the present study, but rather as contribution, collaboration.

If it is appropriate to begin, as I have begun, by invoking the name of Deleuze, it is not because this is a thesis on his work. It is, on the other hand, because the organismic subject is an account of subjectivity I develop out of Deleuze’s first theory of time and the concept around which it turns, the “larval subject.” But I do not read this theory in terms of larvae. Neither do I read it in terms of organisms. Instead, I understand it as a theory of passive, organic proto-subjectivity, a partial selfhood to be thought on the basis of organic contraction. Deleuze is content, however, at least in *Difference and Repetition*, merely to think the subjectivity of organs in terms of temporal rhythm. Indeed, his ambition is otherwise: he moves from an analysis of organic time, not to a more comprehensive investigation into the character of *organisms*, but rather toward a more comprehensive theory of the nature of *time*. Organic temporality is but a moment not in the development of a theory of the former, but in the development of an account only of the latter. It is consequently here that I depart. I take from Deleuze his discussion of organic temporality, I build out of it a theory of *organismic* temporality, and I move away from time entirely in order to think the spatiality of organisms. I draw, in Chapter 2, primarily upon a conjunction of Spinoza, Simondon, Gibson, Bergson, Maturana, and Varela in order to conceptualize the spatial pole of organismic subjectivity. Chapter 3 plugs Gibson’s ecological philosophy of perception into productive connections with cognitive science and dialectical biology in order to account for the genesis, development, and entanglement of organismic subjects out of, within, and relative to their environments. But before establishing these

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starting point implicates us either in a destructive instrumentalism (whereby the environment is understood to be of value only derivatively and therefore subject to human whim), or else in a framework of intrinsic value (whereby all human intervention is denounced as blameworthy *a priori* and humans are separated problematically from the rest of the natural world, aggressive actors interfering with a harmonious natural equilibrium).

connections, I bring Deleuze’s distinction between actuality and virtuality to bear on the relation between organismic ability and environmental affordance. A Deleuzian thread therefore weaves itself through the whole of the thesis, though for the most part present only implicitly.

I will argue that organisms organize their worlds in terms both of time as well as space. It is for this reason that I ascribe to them an ecological concept of subjectivity, a concept that—for the purposes of this project—implies a position from which space and time are lived in terms unique to the subject at hand. I posit this kind of subjectivity, not as an ecological reproduction of the Kantian Aesthetic, but, on the other hand, by tracing its recursive, entangled development out of an environment that it is organized on its own terms. This, then, is the task: to think the subject as organism, to think the organism as the locus of a production of spatiotemporality, and to think this production in recursive, developmental terms.

## I. OUTLINE

Before tracing the genesis and development of the organismic subject in Chapter 3, I build this theory first in terms of time, in Chapter 1, and then in terms of space, in Chapter 2. The thesis is formatted accordingly. I begin Chapter 1 with Deleuze’s theory of larval subjectivity, a concept that arises out of his discussion of habit and time in *Difference and Repetition*. “We are made,” Deleuze writes there, “of contracted water, earth, light and air.”<sup>5</sup> Indeed, “every organism, in its receptive and perceptual elements, but also in its viscera, is a sum of contractions.”<sup>6</sup> Contractions are plural: they refer to a series of habitual expectations and retentions. And as such, a “soul must be attributed to the heart, to the muscles, nerves and cells, but a contemplative soul whose entire function is to contract a habit.”<sup>7</sup> Contemplative soul, larval subject, partial self—linguistic determinations proliferate, but the concept is the same: prior to

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<sup>5</sup> Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (New York: Columbia University Press, 1994), 73.

<sup>6</sup> Ibid.

<sup>7</sup> Ibid, 74.

the advent of subjectivity, there exists a series of contractive syntheses that found the subject's rhythmic temporality. If larval subjectivity is the contraction of a habit, then organismic subjectivity is a polyrhythmic network of these habits, "the system of the self": the temporal now of subjectivity.<sup>8</sup>

Turning, in Chapter 2, to organismic spatiality, I take as a point of departure Deleuze's reference, in *The Logic of Sense*, to Gilbert Simondon's concept of the membrane. The membrane distinguishes interior from exterior, separating the organism from a space outside it. It is therefore the founding moment of organismic spatiality. Far, however, from a static limit, the membrane is a variable topology capable of torsion, expansion, multiplication. It works in selectively porous terms, distinguishing what can penetrate its surface from what it excretes. The membrane is, in other words, an affective apparatus. Here, I engage Simondon with Spinoza, marrying membrane to affect. In this chapter's final section, I bring the membrane into conversation with autopoietic systems theory in order to foreground the ongoingly active role played by the organism in the configuration of its environment. Living is sense-making, in autopoietic terms. And in the process of sense-making, the organism constructs the world outside it in terms particular to its own constitution.

In Chapter 3, I trace the genetic, developmental contours of this theory of subjectivity, moving it away from an orthodox transcendentalism and toward a robustly evolutionary-ecological account of the contingent, relational dynamic between what organisms can do and what their environments become. I begin by invoking the distinction Deleuze makes, in *Difference and Repetition*, between the actual and the virtual conditions for its manifestation. Armed with this division, I argue that the relation between organismic affect and environmental affordance is best conceptualized as a set of virtual relations individuated in actual organismic activity and concrete

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<sup>8</sup> Ibid, 78.

environmental layout. Conceiving affects and affordances virtually, the organismic subject emerges as an ongoing resolution to a set of problematic fields. The condition for the possibility of organismic subjectivity becomes the experiential manifestation of a virtual field that links the subject with its world. And as these relations change, so too does the structure of subjective experience, the sensorimotor-perceptual affects by which experience is defined. Organismic subjectivity is, as a consequence, both relentlessly dynamic and tied irreducibly to the organization of its own world. I turn, at the end of Chapter 3, to an ecological complication of the separation of the organism from its environment that the first two chapters ostensibly establish. The subject, I claim, enfolds its world into itself. It is also enmeshed in an ecology outside of it. Its body, then, is less an entity distinct than it is a blurry zone of the interaction between genetics, symbionts, behaviour, and environment. I call this entanglement. The subject is legion, frustrating traditional distinctions between nature and nurture, individual and world. To think the entanglement is to think subjectivity as swarm, a concept that opens this theory onto an array of new possibilities—toward, to take only one example among a range of many, a human-technological entanglement that conceives scientific apparatuses in their integration with a collectively human subjectivity. In the project’s final section, I outline the way an organismic subjectivity lays the groundwork necessary for a new, constructive approach to realism. I conclude with a brief gesture toward the implications carried by the development of such a theory.

## CHAPTER 1: TEMPORALITY

*Isn't this the answer to the question "what are we?" We are habits, nothing but habits—the habit of saying "I." Perhaps, there is no more striking answer to the problem of the Self.<sup>1</sup>*

This chapter takes as its topic a theory of organismic temporality, structured by way of a systematic consideration of Deleuze's first synthesis of time, the passive synthesis of the present.<sup>2</sup> Out of the passive temporal syntheses constitutive of the present emerge the rhythmic contractions of the larval self and the polyrhythmic network of the organismic subject. This chapter moves from a discussion of larval synthesis into an analysis of the organism's own temporal contractions. I begin with an analysis of repetition for itself, the way a series of distinct elements becomes-repetitive. This discussion delineates the nature of imaginative contraction, the synthesis of a present in time. From here, I move into a study of the way an organ is, no less than the imagination, capable of such a contraction. I conclude by building out of the organic present a picture of organismic temporality. Generally speaking, temporality consists, for Deleuze, in the coexistence of three temporal series: the present, the pure past, and the eternally recurring future. I am concerned here, however, only with the first synthesis of the present, the synthetic production of a living *now* as it figures into the organismic subject. This first synthesis is worthwhile not only as the temporal structure of larval subjectivity, but also because it is, in the words of Jay Lampert, "not as well known" as one of Deleuze's conceptions of time; and when it is discussed, it "is generally treated as a false or superficial notion of time that [the second synthesis of] co-existence is meant to replace."<sup>3</sup> On such an account, Deleuze's second synthesis

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<sup>1</sup> Gilles Deleuze, Introduction to *Empiricism and Subjectivity*, trans. Constantin V. Boundas (New York: Columbia University Press, 1991), x.

<sup>2</sup> This chapter is forthcoming under the title of "Organismic Temporality: Deleuze's Larval Subject and the Question of Bodily Time" in *Symposium: Canadian Journal of Continental Philosophy / Revue canadienne de philosophie continentale*, ed. Marie-Eve Morin, 2015.

<sup>3</sup> Jay Lampert, *Deleuze and Guattari's Philosophy of History* (London: Continuum, 2006), 12.

of time is intended to supplant the first, and his third synthesis is intended to supplant the second. He is, in other words, delineating the synthesis of the present only in order to subsequently prove it inadequate. The consequence of this kind of reading is, however, a lack in the secondary literature of thoroughgoing analyses of Deleuze’s first synthesis.<sup>4</sup> Indeed, as John Protevi noted recently,<sup>5</sup> the major commentators on *Difference and Repetition* pay no special attention at all to this synthesis and the organic syntheses that underlie it—especially not in their relevance for the organismic subject.<sup>6</sup> In drawing upon this relatively underdeveloped material, this chapter presents the temporal nature of the networks of larval selves that together constitute the organismic subject in time: the *now* of subjectivity.

## I. REPETITION

The transition from an exteriority of atomic instants to their contraction in habit is the central problematic of Deleuze’s analysis of the first synthesis of time. He begins not, as one might expect, with a description of temporal experience, not with an analysis of lived continuity, but rather with precisely the opposite: the repetition of discrete elements or atomic parts.<sup>7</sup> “Repetition,” for Hume, “changes nothing in the object repeated, but does change something in the mind which contemplates it.”<sup>8</sup> It changes nothing in the object, because no single element in a series is the cause of an element that follows it: the clock’s tick is not the cause of its subsequent tock. Considered independently, there is no way of connecting the two or establishing a relation between them. If Hume takes the *case* as an example of repetition—as opposed to the *instant*—

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<sup>4</sup> This is to say that if Deleuze is, after all, really aiming at the kind of theory found in his second and third syntheses of time, then commentators are better off looking there, and ignoring the first.

<sup>5</sup> John Protevi, “Deleuze, Jonas, and Thompson: Toward a New Transcendental Aesthetic and a New Question of Panpsychism” (paper presented at *Society for Phenomenology and Existential Philosophy*, Montreal, Quebec 2010).

<sup>6</sup> I will rely, incidentally, rather heavily upon Jay Lampert’s treatment of the synthesis of the present, a treatment provided toward the development of a robust philosophy of history, not, as will be the case in the present work, the development of a robust philosophy of organism.

<sup>7</sup> “We start with atomic parts, but these atomic parts have transitions, passages, ‘tendencies,’ which circulate from one to another. These tendencies give rise to *habits*,” Deleuze, *Empiricism and Subjectivity*, x.

<sup>8</sup> Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (New York: Columbia University Press, 1994), 70.

then it is for this reason: once there is a case, a conjunction of elements or instants, the way the second element refers to the first becomes intelligible.<sup>9</sup> They are no longer irreducibly discrete (as instant); they are part of one and the same occasion or impression (a case). Given a succession of double-impressions (AB, AB, AB), I learn to expect the second (B), when confronted with the first (A). But nothing is changed in the object or case, for the impression (AB) is indifferent to the way it is contemplated. And yet, given A, I *learn to expect* B. I draw a difference: “something new *in* the mind,” as opposed to the object.<sup>10</sup> Expectation is the character of this difference; this difference is the advent of repetition. It is not, in other words, until a succession of cases—themselves multiple—are related one to the next by means of anticipation or expectation that we can speak of repetition. Repetition is, then, a relentlessly circular affair: I draw a difference from repetition, but it is only in drawing this difference that I speak of repetition.

The ground of this circularity is, for Hume, the imagination, “defined here as a contractile power: like a sensitive plate, it retains one case when the other appears.”<sup>11</sup> To speak of the imagination as a power of contraction is to say that the force of anticipation effected by the appearance of the first element in a repetition of cases corresponds to a retention of cases past. To anticipate B when A appears is to refer backward to a retention of ABs. I anticipate because I retain. But this is imprecise, for the imagination does not hold in reserve a distinct series of past impressions. Contraction is not *quantitative*, but *qualitative*: “it contracts cases, elements, agitations or homogeneous instants and grounds these in an internal qualitative impression endowed with a certain weight.”<sup>12</sup> One might imagine a piece of foam pressed inward by a repetition of indentations: there is only one imprint, but the longer the series of impressions, the more

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<sup>9</sup> Ibid. Cf. Lampert, *Deleuze and Guattari's Philosophy of History*, 14.

<sup>10</sup> Deleuze, *Difference and Repetition*, 70.

<sup>11</sup> Ibid.

<sup>12</sup> Ibid.



significant the indentation. The longer the series of elements contracted, the ‘heavier’ the impression.

If it is misguided to speak of a quantitative retention, then it is equally misguided to speak of contraction as an operation of the understanding. To contract is neither to reflect nor to remember. It is not yet a temporal act—a reflection or remembrance carried out in time—for it is itself the very constitution of time as such.<sup>13</sup> Indeed, before the movement of contraction, there can be no relation at all among separate elements. “A succession of instants does not constitute time any more than it causes it to disappear; it indicates only its constantly aborted moment of birth.”<sup>14</sup> Time is the result, then, of a synthesis, just as repetition is the result of a difference.<sup>15</sup> In the synthetic contraction of discrete impressions, time is constituted as a living present to which past and future also belong. This is, in essence, a temporalization of repetition: if the present is the *now* of repetition, then the past is the retention or contraction of preceding elements, and the future is the anticipation or expectation that the pattern will continue. I live the present as a relative contraction of instants; it seems to have a duration, no matter how brief. As such, it is not wholly atomic or instantaneous, but rather synthetic: “each time is a contraction of several times.”<sup>16</sup> Each case is double, each impression itself a contraction or synthesis from which a difference is drawn. But if synthesis underlies the sensation of every impression, then sensibility is itself synthetic. For even when it seems as if I perceive an element distinctly, a present moment or single impression, synthesis is at work. The perception of an instant in time is, in other words, a contraction of several. The present is multiple, extending outward both backward into the past

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<sup>13</sup> While Deleuze does eventually situate what he calls here an “originary synthesis” in another temporal series—the pure past—I will not take up this secondary analysis, concerned as I am with subjectivity, and not with the nature of time as such.

<sup>14</sup> Deleuze, *Difference and Repetition*, 70.

<sup>15</sup> “Time,” Deleuze writes, “is constituted only in the originary synthesis which operates on the repetition of instants;” *ibid.* This synthesis is the double-movement of retention and anticipation.

<sup>16</sup> Lampert, *Deleuze and Guattari’s Philosophy of History*, 22.

and forward into the future. The past belongs to the present not as a set of precedent presents, but rather as the qualitative impression of the present's contractions of cases past. The imprint in the foam is, to return to the example, both a present impression as well as the trace of a preceding series of indentations. It is in precisely this sense that the living present retains the past. To understand how it is that the living present is oriented toward a future in time, James Williams offers the case of a horse, disoriented as it walks for the first time on frozen ground.<sup>17</sup> The point applies, however, just as well to a man encountering an icy path for the first time. He contracts his past steps on soft soil, endowing the impression with a weight so formidable that he is at a mystifying loss when he comes across the hard and icy path. He might stumble or fall, but in any case, it takes him a moment to realize what is happening. This is because part of what it means to contract and retain the past is to anticipate that the future will continue to follow the same pattern.

To live through the present is to retain the past in contraction and orient oneself toward the future in anticipation. The move from past to future is also the move from particular to general. In the synthesis of the present, a series of past particulars are synthesized into a general rule for the future.<sup>18</sup> The man synthesizes his past encounters with soft earth into the general rule for what is underneath it: that it is soft and dry—not that it *has been*, but that it *is*. It is, however, worth noting that particulars are simple givens no more than universals are just constructions. “Particulars,” Lampert writes, “are just as much products of synthesis whereby a temporal field is contracted into a present moment.”<sup>19</sup> In terms of subjective temporality, in terms of the way the temporal field is organized as a condition of experience, it is synthesis all the way up and down.

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<sup>17</sup> James Williams, *Gilles Deleuze's Difference and Repetition: A Critical Introduction and Guide* (Edinburgh: Edinburgh University Press, 2003), 87.

<sup>18</sup> Deleuze, *Difference and Repetition*, 71.

<sup>19</sup> Lampert, *Deleuze and Guattari's Philosophy of History*, 16.

In order to draw a difference from repetition, one must contract a number of impressions. In order to envelop a series of past particulars in a future generality, one must synthesize these contractions.

This movement from the contracted past through the living present into an anticipatory future constitutes the triple-structure of the synthesis of the present in time. It also constitutes the direction of what Deleuze refers to as “the arrow of time.”<sup>20</sup> But even if it is constitutive of time, “it is not, for all that, active. It is not carried out by the mind, but occurs *in* the mind [...] prior to all memory and all reflection.”<sup>21</sup> The synthesis of the present is not, in other words, an active or conscious operation effected by a willing subject. I do not one day decide to contract a repetition of past instants into a living present. I do not choose to orient myself toward the future, as if it were a matter of belief whether or not breathing might continue to fill my lungs with oxygen. And yet, I do carry out these contractions; I do orient myself toward the future. This is not a ready-made temporal structure into which I am placed as a subject. “Time,” in Deleuze’s words, “is subjective, but in relation to the subjectivity of a passive subject.”<sup>22</sup> Before I am active, before the advent of activity, I am already oriented toward the future through a contraction of the past. This synthesis is unconscious, and it is in this sense that we can speak of its passivity.

It is out of this passive foundation that the active syntheses of memory, reflection, and prediction are developed. Indeed, when I think of the past, I remember it. To say, then, that the past as unconscious contraction is passive is to say that it is the condition for the genesis of memory, that it is out of unconscious contraction that the activity of memory develops. When I remember the past, I recall some distinct set of experiences. Contraction, however, gives me only

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<sup>20</sup> Deleuze, *Difference and Repetition*, 71.

<sup>21</sup> *Ibid.*

<sup>22</sup> *Ibid.*

a quality, a weight adequate to the number of repetitions contracted.<sup>23</sup> It does not give me a numerical series. It is, then, “on the basis of the qualitative impression in the imagination [that] memory reconstitutes the particular cases as distinct.”<sup>24</sup> This is a reflection or representation from passivity into activity. Qualitative impression is reflected in memory as a reconstitution of particular cases, an undoing or relaxation of the originary contraction. This is the active synthesis of the past as it develops out of passivity. Similarly, the generality of anticipation is reflected in activity as a prediction based upon the reconstructed past of memory. The syntheses work the same way: out of the reconstituted past emerges the capacity to weigh the significance of particular cases and make, on the basis of their significance, a prediction for the future. I am, in activity, oriented toward the past in recalling it, and toward the future in predicting what will happen. Of course, the separation between passivity and activity is nowhere near so neat: doubtless, the two levels constantly interfere with and relate to each other in complicated ways.<sup>25</sup> The force of this distinction lies, however, in the foundation of what we typically consider to be subjective temporality in a more originary, passive, unconscious synthesis of time.

The foregoing analysis of repetition liberates the lived present from the activity of a conscious subject. Far from a foundational experience, the lived present is now the result of an unconscious synthesis, an originary contraction on the basis of which time becomes thinkable. And yet, this analysis continues to remain at the level of the human subject.<sup>26</sup> I speak of temporal experience as if it is mine, as if it belongs to me. Indeed, this approach “leaves us at the level of

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<sup>23</sup> It is worth noting, however, that there are exceptions: in cases, most significantly, of trauma, as well as in significant experiences more generally, single occurrences can be very intensely remembered.

<sup>24</sup> Deleuze, *Difference and Repetition*, 71.

<sup>25</sup> One might imagine making predictions without recalling individually past events, but only by referring back to the force of a contraction of past experience. Similarly, one might imagine reconstructing the past inaccurately based on the way one is actively oriented toward the future.

<sup>26</sup> Although the concept of temporal synthesis has been rid of its conscious, active overtones, the passive subject in question is still ostensibly a human one.

sensible and perceptual syntheses,” unable to grasp the true “mystery of habit.”<sup>27</sup> We are left at the level of sensible synthesis because we continue to speak of the subject’s temporal contraction. We continue to speak of the way time is synthesized for a subject, in relation to her past and future. Even if subjectivity is no longer active or conscious, contraction is still, as it were, the subject’s own doing. We can, however, proceed even further. If locating temporal contraction in the subject prevents us from comprehending the mystery of habit, it is because it obscures a more foundational mode of synthesis—not of what we perceive, but of what we are. It is to this more fundamental level that I now turn.

## II. THE ORGANIC

In order to grasp the foundational nature of contraction, synthesis, and habit, we have to move from a discussion of repetition to a discussion of the organic.<sup>28</sup> Just as the active syntheses of thought refer back to the passive syntheses of perception, these passive syntheses themselves refer back to the organic syntheses of which we are constituted.<sup>29</sup> “We are made,” writes Deleuze, “of contracted water, earth, light and air—not merely prior to the recognition or representation of these, but prior to their being sensed.”<sup>30</sup> Recognition, representation: these are the active syntheses beneath which work the passive syntheses of sensation, the syntheses that produce sensibility itself, the primary material required for representation. Beneath the syntheses of perception—the case-synthetic impressions of which I earlier spoke—lie the contractions and syntheses that constitute the perceiver. The subject is, in other words, a series of differences

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<sup>27</sup> Deleuze, *Difference and Repetition*, 72, 73; respectively.

<sup>28</sup> On the necessity of the foregoing analysis of non-organic contraction, Protevi writes that “Deleuze cannot go directly to his key notion of organic synthesis because he must first free a notion of habit from the illusions of psychology, which fetishizes activity. For Deleuze, psychology, through fear of introspection, misses the element of passive ‘contemplation’;” John Protevi, “Deleuze and Life,” *The Cambridge Companion to Deleuze*, eds. Daniel W. Smith and Henry Somers-Hall (New York: Cambridge University Press, 2012), 262 n. 8.

<sup>29</sup> The primary contraction that gives us a temporal instant. In Lampert’s terms, “it is first of all a conjunction that allows data to ‘count as one’ (to use Badiou’s phrase);” Lampert, *Deleuze and Guattari’s Philosophy of History*, 13. Cf. Protevi, “Deleuze and Life,” 241.

<sup>30</sup> Deleuze, *Difference and Repetition*, 73.

drawn from repetition. If this seems self-reflexive, this is because it is so, relentlessly: the subject is simultaneously that which draws a difference from repetition as well as a series of precisely these sorts of differences. “The subject is defined,” Deleuze writes in his study of Hume, “by the movement through which it is developed.”<sup>31</sup> It is both a series of habits, as well as the contemplative power that underlies their contraction.<sup>32</sup> “We are used to thinking of habit,” Lampert writes, “as an activity we learn as a result of our own endeavours rather than a synthesis that takes place for us in the objects [and subjects] themselves.”<sup>33</sup> As a consequence, the domain of contraction or habit expands outward: thought is synthetic, perception is synthetic, and we, too, are products of synthesis.<sup>34</sup> The organism is triply contractile: actively (representation), passively (perception), and viscerally (organically).<sup>35</sup> And each contraction is itself triple, for every lived *present* retains a *past* and anticipates a *future*.

If active contraction recalls and predicts, and passive contraction retains and anticipates, then what is the nature of organic contraction? “Need,” writes Deleuze, “is the manner in which this future appears, as the organic form of expectation. The retained past appears in the form of cellular heredity.”<sup>36</sup> Unfortunately, this is basically all Deleuze has to say of organic synthesis. He is content merely to point to its existence, and to just briefly scrape the surface of its nature. Thus, there is extrapolative work that needs to be done, beginning with the claim that we are a series of organic syntheses. The ‘we’ in question is the organism, a body made up of parts that stand in a

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<sup>31</sup> Deleuze, *Empiricism and Subjectivity*, 85.

<sup>32</sup> “We are habits, nothing but habits—the habit of saying ‘I.’ Perhaps, there is no more striking answer to the problem of the Self;” *ibid*, x.

<sup>33</sup> Lampert, *Deleuze and Guattari’s Philosophy of History*, 20. In material, objectile terms, one might think here of the way matter self-organizes, or of the symmetry-breaking bifurcations that push dynamical systems into different phase states. But, concerned as I am with subjectivity, I will limit the present study to the organic register.

<sup>34</sup> On the equation of habit with contraction, Deleuze writes that “habit *draws* something new from repetition [...]. In essence, habit is contraction;” Deleuze, *Difference and Repetition*, 73.

<sup>35</sup> “Every organism, in its receptive and perceptual elements, but also in its viscera, is a sum of contractions, of retentions and expectations;” *ibid*.

<sup>36</sup> *Ibid*. I will bracket for now a consideration of cellular heredity, for it seems to be the most extreme form of a retention of the past. As such, it does not necessarily mark the limit of organic synthesis. Briefly, one might, however, understand cellular synthesis as the qualitative retention of a quantity of bits of information.

particular relation to each other as functioning organs.<sup>37</sup> The organism is a structure, an organization. It is an organic system. To say, then, that we are a sum of contractions is to say that, in addition to the *mind*, the *organ* too is habitual and synthetic. Recall the starting point for our discussion of repetition and synthesis: that contraction “changes nothing in the object repeated, but does change something in the mind which contemplates it.”<sup>38</sup> If the organ is also the locus of a contraction, then one must speak of its movements, not as involuntary impulses, but as contemplations.<sup>39</sup> But if organs perform contractions in the same way the mind does, then the question is, of course, one of what they contract.

Consider, as an example, Deleuze’s claim that we are made, among other things, of a contraction of air.<sup>40</sup> The contractile power that corresponds to an intake of air is, of course, embodied in the lungs. In terms of their respiratory function, the lungs remove carbon dioxide from the bloodstream, supplying it, in turn, with oxygen. They oscillate between exhaling the former and inhaling the latter. The tempo of this oscillation is their respiratory rhythm, the rate at which each phase—*inhalation*, *exhalation*—recurs in a series. (*Inhale-exhale, inhale-exhale, inhale...*). To transpose onto this repetition the terms delineated above is to claim that the lungs expect to exhale after they inhale. Given the first, they learn to expect the second. The lungs retain an impression of the past and project that impression into the future in the form of expectation, thereby drawing a difference from repetition. But this is imprecise, for it seems strange to attribute to the lungs the capacity to anticipate anything. It is, on the other hand, *need* that constitutes their synthetic futurity. After inhalation, the lungs need to exhale. After exhalation, they need to inhale. Indeed, “the present extends,” for Deleuze, “between two

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<sup>37</sup> By “organ,” I mean a structurally distinct collection of tissue capable of performing a function in the organism. On this definition, the liver and lungs are organs, but nerves and blood are not. See *Vander’s Human Physiology: The Mechanisms of Body Function*.

<sup>38</sup> Deleuze, *Difference and Repetition*, 70.

<sup>39</sup> I will bracket for now the implications of treating organic activity as contemplative.

<sup>40</sup> Deleuze, *Difference and Repetition*, 73.

eruptions of need.”<sup>41</sup> But it is only with the introduction of the concept of fatigue that we can begin to make sense of an organic contraction, for need marks only what Lampert calls “the *futural* dimension of the present.”<sup>42</sup> Need is expectation; fatigue is retention.

If the organ’s future expresses itself as need, then its past is marked in terms of fatigue. “Fatigue,” Deleuze writes, “marks the point at which the soul can no longer contract what it contemplates, the moment at which contemplation and contraction come apart.”<sup>43</sup> Need is an urge to hurry forward, as in the case of an accelerated heart rate or a quickening of one’s respiratory rhythm in an effort to take in more oxygen. Fatigue is precisely the opposite: a slackening or deceleration born of a satisfied contraction. When I have enough oxygen, my respiratory rhythm slows. This is fatigue. I can attempt to inhale more, but if I do not need it, then contemplation and contraction come apart: I can take larger and larger breaths, but to no avail. It is satisfaction that ties fatigue to the past, for if I have enough air, then it is only because of a past series of satisfied contractions. As such, it is not two eruptions of need that mark the duration of the organic present, but the interplay between need and its satisfaction, between the urge to increase the momentum of contraction, to contract and retain more and more, and the satisfaction of these contractions, the fatigue that pulls respiratory rhythm in the opposite direction. “Need and fatigue,” in Lampert’s words, “come into focus when the momentum of satisfaction (when contraction accelerates, it is need) alternates with loss of momentum (when it decelerates, it is fatigue).”<sup>44</sup> If one can speak of the organ’s living present, it is in terms of the oscillation between need and fatigue that constitutes its rhythm of contraction.

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<sup>41</sup> Ibid, 77.

<sup>42</sup> Lampert, *Deleuze and Guattari’s Philosophy of History*, 24. Emphasis mine.

<sup>43</sup> Deleuze, *Difference and Repetition*, 77. I will bracket for the moment Deleuze’s use of the term “soul” here.

<sup>44</sup> Lampert, *Deleuze and Guattari’s Philosophy of History*, 24.



To identify the organ with a contractile power is to attribute to it what Deleuze calls a “contemplative soul.”<sup>45</sup> This phrase comes from Plotinus, who construes the soul’s contemplative capacity as a productive principle.<sup>46</sup> However, while Plotinus retains the traditional connotations carried by the term, Deleuze is content to invoke it in a wholly alien context, effacing these overtones in the name of provocation. As such, the term ‘soul’ will serve here as one more name for the self or subject. If habit draws a difference from repetition, a difference present not in the series repeated, but in the mind which contemplates it, then to every habit must be attributed a contemplative mind or soul in which it is to occur. Indeed, “a soul must be attributed to the heart, to the muscles, nerves and cells, but a contemplative soul whose entire function is to contract a habit.”<sup>47</sup> Recall here the way Hume defines the imagination as a power of contraction. There is, then, in the contemplative soul, an extension of the domain of contraction—*pace* Hume, from strictly mental to organic life—embodied in a conceptual equivocation: mind, soul, imagination. All denote, for Deleuze, a contraction of habit.<sup>48</sup> Indeed, in locating beneath the passive-synthetic register an organic one, habit finally “manifests its full generality: it concerns not only the sensory-motor habits that we have [...], but also, before these, the primary habits that we are; the thousands of passive syntheses of which we are organically composed.”<sup>49</sup> This is no terminological provocation, “no mystical or barbarous hypothesis,” for the constitution of the subject is illegitimately effaced in confining habit to the domain of an active, conscious self. Beneath the self who acts and speaks, who learns and remembers, beneath the self to whom one

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<sup>45</sup> Deleuze, *Difference and Repetition*, 74.

<sup>46</sup> Lampert, *Deleuze and Guattari’s Philosophy of History*, 21.

<sup>47</sup> Deleuze, *Difference and Repetition*, 74.

<sup>48</sup> Protevi construes this move in much the same way: “In order to isolate,” he writes, “organic syntheses as prior to perceptual syntheses (themselves prior to active intellectualist syntheses), Deleuze radicalizes Hume and Bergson—who “leave us,” in Deleuze’s own words, “at the level of sensible and perceptive syntheses;” John Protevi, “Larval Subjects, Autonomous Systems and E. Coli Chemotaxis,” *Deleuze and the Body*, eds. Laura Guillaume and Joe Hughes (Edinburgh: Edinburgh University Press, 2011), 33, and Deleuze, *Difference and Repetition*, 72.

<sup>49</sup> Deleuze, *Difference and Repetition*, 74.

might have otherwise ascribed the sole capacity to contract a habit swarms a multitude of contractile powers, a whole field of contemplative selves. “We speak of our ‘self’ only in virtue of these thousands of little witnesses which contemplate within us.”<sup>50</sup>

If contraction necessitates contemplation, and if the organ is, no less than the mind, capable of drawing a difference from repetition, then it must be afforded its own temporal synthesis, its own living present. The organ pulses to a rhythm of contraction, defined by the intersection of anticipation and retention, need and fatigue. The duration between the two—between its contraction of a future instance of repetition and its retention of a past one—constitutes the organ’s living present. With every contraction, with every satisfaction of need, a present moment passes. And “the content of each moment of time functions,” in Lampert’s terms, “as a point of view, contemplating the content of other moments.”<sup>51</sup> Since the organic present is marked at one end by need, and at the other by fatigue, it is constituted as a lived present inasmuch as it orients itself in both directions. It contemplates its own fatigue, its retention of the past in the form of satisfaction, as well as its need in the form of an anticipation that it will be fulfilled. As such, the present is, quite literally, a point of view on the past and future. “Repetition and need are,” to borrow Ansell-Pearson’s words, “inextricably linked since it is only through the repetition of an instant that need can express itself as the for-itself of a certain duration.”<sup>52</sup> Put otherwise, it is in its orientation toward other instants (fatigue: the retained past; need: the anticipated future) that the present can be for-itself, a point of view, a perspective.

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<sup>50</sup> Ibid, 75. These “witnesses” are interchangeably selves, souls, minds, imaginations, contemplations, contractions, satisfactions, and so on. These are so many ways of speaking of passive and organic contraction, synthesis, habit.

<sup>51</sup> Lampert, *Deleuze and Guattari’s Philosophy of History*, 23. It is worth noting that Lampert sets his construal against the one found in Keith Ansell-Pearson, *Germinal Life: The Difference Engineer* (London: Routledge, 1999), 101. On Ansell-Pearson’s account, need is a given from which one can deduce duration, while on Lampert’s, it is duration that demonstrates the existence of need. The difference between the two is negligible. Indeed, Lampert concedes that it is difficult to know which is the better construal. Suffice it to say that need marks the limit of a living present, regardless of which one takes as given and which as deduction. Since I have moved from an analysis of need to one of the living present, I side here with Ansell-Pearson.

<sup>52</sup> Ansell-Pearson, *Germinal Life: The Difference Engineer*, 101.

Further, need, fatigue, and the rhythm that emerges out of their intersection vary relative to the organ in question. “It is the difference that is rhythmic,” in the words of *A Thousand Plateaus*, “not the repetition, which nevertheless produces it.”<sup>53</sup> And it is difficult to imagine any two organs drawing a difference at the same rate, even when oriented toward one and the same flow of repetition. Take, for example, the suprachiasmatic nucleus, or ‘biological clock,’ in organisms with sufficiently sophisticated central nervous systems. The biological clock functions by synchronizing the body’s systems (endocrinal, nervous, biochemical, and so on) with the time of day, harmonizing them in accordance with a circadian rhythm.<sup>54</sup> But it goes without saying that far from a creation of harmony, identical frequencies are capable only of the reiteration of a single self-same tone. Harmony consists, conversely, in a coordination of divergent frequencies, a rhythmic coherence composed of varying tempos. Even in cases of inter-systemic synchrony, each system pulses at its own rate, drawing its own difference, contracting its own habit. Indeed, the neuronal activity responsible for transmitting circadian signals occurs at a rate far higher than the corresponding circulation of glucose or cortisol.<sup>55</sup> Respiratory rhythm seldom matches heart rate.<sup>56</sup> And as such, “each individual organism, indeed each part of each organism, has its own measurement of time.”<sup>57</sup>

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<sup>53</sup> Deleuze and Guattari, *A Thousand Plateaus*, trans. Brian Massumi (Minneapolis: University of Minnesota, 1988), 314.

<sup>54</sup> R. M. Buijs et al., “Circadian and Seasonal Rhythms: Timing by Hormones and the Autonomic Nervous System,” *Journal of Endocrinology* Vol. 177, Issue 1 (2003): 17. It is also worth noting that even the simplest forms of algae and fungi have evolved clock mechanisms to coordinate cellular activity with sunlight, making them, too, a series of contemplations, contractions, retentions, satisfactions, habits.

<sup>55</sup> Ibid.

<sup>56</sup> For a study of the implications of the relative variability between the two, see Klaus D. Jurgens et. al, “Heart and Respiratory Rates and Their Significance for Convective Oxygen Transport Rates in the Smallest Mammal, the Etruscan Shrew *Suncus Etruscus*,” *Journal of Experimental Biology*, Vol. 199, Issue 12 (1996): 2579-2584.

<sup>57</sup> Lampert, *Deleuze and Guattari’s Philosophy of History*, 23.

John Protevi takes as an example of organic temporality Dennis Bray’s work on the computational cellular chemistry of *E. coli*.<sup>58</sup> Protevi notes the way “Bray stresses the retentive aspect of *E. coli*, who ‘continually reassess their situation’ by means of ‘a sort of *short-term memory*’.”<sup>59</sup> *E. coli*’s bacterial memory is tested by measuring its response to an incremental adjustment in the concentration of an attractant like aspartate. *E. coli* responds to change. It stops responding once the concentration of attractant has settled into an equilibrium. In Bray’s words, “by measuring the rate of change in the signal [the aspartate], the receptor cluster [the bacteria] has in effect performed calculus!”<sup>60</sup> In its incremental adaptation, the bacterium performs a differentiation: it has, as Protevi nicely puts it, “repeated its measurement of aspartate and drawn a difference from that repetition.”<sup>61</sup> In terms more properly Deleuzian, the bacteria contemplates the attractant and synthesizes it in adapting to fluctuations in its concentration. And every synthesis implies a duration, a present defined by the intersection of retention and protention, need and fatigue. Indeed, the case is no different with bacterial contraction: in navigating a field of concentrations of attractant, the bacterium preserves its past in the form of an adaptive pattern, and integrates this retention as it continues to follow a projective, anticipatory trajectory.<sup>62</sup> The interval between its past and future, between adaptive retention and futural projection, is approximately 10 seconds. In a similar study, Howard Berg writes that “this [interval] sets an upper limit on the time available for a cell to decide whether life is getting better

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<sup>58</sup> *Escherichia coli* is a gammaproteobacterium best known for its diversity as a species of bacteria. See O. Lukjancenko, T.M. Wassenaar, and D.W. Ussery, “Comparison of 61 Sequenced *Escherichia coli* Genomes,” *Microbial Ecology*, Vol. 60, Issue 4 (2010): 708-720.

<sup>59</sup> Protevi, “Larval Subjects, Autonomous Systems and E. Coli Chemotaxis,” 45, referring to Dennis Bray, *Wetware: A Computer in Every Living Cell* (New Haven: Yale University Press, 2009), 7.

<sup>60</sup> Bray, *Wetware: A Computer in Every Living Cell*, 94.

<sup>61</sup> Protevi, “Larval Subjects, Autonomous Systems and E. Coli Chemotaxis,” 45.

<sup>62</sup> Mention of cellular retention and protention can rather easily be translated into talk of need and fatigue—the two work, in this case, in the same way. The cell drifts off course as its contraction of the attractant is satisfied; it is fatigued. Similarly, it is propelled onward by a need to continue contracting that which attracts it.

or worse. If it cannot decide within about 10 seconds, it is too late.”<sup>63</sup> Navigation becomes a rhythmic affair: the cell must repeatedly draw differences from its environment if it is to negotiate it successfully. Every contraction is implicated in a relative duration, and every duration is articulated rhythmically.

Wherever there is a difference drawn from repetition, there is a lived present. Wherever there is a lived present, there is a point of view, a perspective on past and future—whether in terms of retention and anticipation, recollection and prediction, or fatigue and need. And wherever there is such a perspective there is a contemplative soul, a contractile power: a larval subject.<sup>64</sup> Larval subjectivity is temporal synthesis. “There is a self,” for Deleuze, “wherever a furtive contemplation has been established, whenever a contracting machine capable of drawing a difference from repetition functions somewhere.”<sup>65</sup> The ‘Self,’ the conscious subject, turns out to be a unity, therefore, only in a word.<sup>66</sup> Subjectivity is systemically unconscious, a field or network—of larval selves, of passive contemplations and contractions, of habits and syntheses.

### III. THE ORGANISMIC

To speak of the self as a network of contemplative larvae seems at first to involve a total deconstruction or dissolution of its unity. Is the self, in other words, nothing but a series of syntheses? Is the organism nothing beyond an array of organic contractions? If beneath the lived present of every organism swarms a plurality of variable organic presents, then the organismic problematic is one of consistency and coherence. If every larval or organic subject pulses to its own rhythm of duration, then the “rule” of organismic subjectivity is, in Deleuze’s words, “that

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<sup>63</sup> Howard Berg, *E. Coli in Motion* (New York: Springer, 2004), 49-50.

<sup>64</sup> Deleuze, *Difference and Repetition*, 78.

<sup>65</sup> *Ibid*, 78-79.

<sup>66</sup> A Nietzschean move, to be sure. Beneath the illusory unity of the will, Nietzsche locates a multiplicity of conflicting drives; beneath the unity of the subject, Deleuze locates a plurality of larval selves. Like Nietzsche, Deleuze does not dissolve the former into the latter, but rather complicates the boundary between the two. See Friedrich Nietzsche, *Beyond Good and Evil: Prelude to a Philosophy of the Future*, trans. Walter Kaufmann (New York: Vintage, 1989), §19.

one cannot go faster than one’s own present—or rather, one’s presents.”<sup>67</sup> At stake in the equivocation between one’s *present* and one’s *presents* is precisely the consistency of the subject: either it is an inconsistent, chaotic collection of variable *presents*, or, above these, it is capable of living its own *present* in time—a present constituted by, but irreducible to, the larval contractions that underlie it. The organism is indeed a series of habits and presents. It is not something above or beyond them. “The self does not undergo modifications, it is itself a modification.”<sup>68</sup> But one modificatory level must be distinguished from another. As a matter of explanatory convenience, the preceding sections moved from perceptual to organic syntheses. Now, with these analyses of organic contraction in mind, I will turn back toward the perceptual, the organismic.

Habits, nothing but habits. The organism is a complicated network of habits, of contemplations and contractions, but it is not an illusion. Perceptual syntheses do indeed refer back to—rely upon, emerge out of, traverse and intersect with—the organic syntheses of which the organism is composed, but they do not for this reason collapse back into them, as if powerless to add anything of their own. I take my cue here from Protevi’s claim that the “unity of the organism is always an achievement, a unification of many little selves.”<sup>69</sup> If organic unity is an achievement, if it is not simply given in advance, then this is because it is both real as well as genetic, fragile, and temporally, processually continuous. It must be supported incessantly; its consistency and unity must be maintained lest it fragment back into the thousands of variable contractions out of which it emerges. And indeed, one cannot just posit whole selves all the way down the organic scale, as if subjectivity was, in the last analysis, the transcendental condition for itself.<sup>70</sup> Identity cannot underlie identity. Subjectivity is genetic, its conditions larval and

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<sup>67</sup> Deleuze, *Difference and Repetition*, 77.

<sup>68</sup> *Ibid*, 79.

<sup>69</sup> Protevi, “Larval Subjects, Autonomous Systems and E. Coli Chemotaxis,” 38.

<sup>70</sup> *Ibid*, 35.

differential.<sup>71</sup> It is for this reason that Deleuze locates a series of organic contractions beneath the organismic whole. Before perception comes contraction, before the organism, a network of contemplative souls. The organism does indeed have its own singular present in time, but this is a *perceptual* present (or self) the unity of which consists in a multiplicity of larval, *organic* selves (and their corresponding presents). This is, however, by no means a simple answer, for we are now in the midst of a series of pressing questions: we must negotiate the relation between organic and perceptual synthesis, the variable consistency of this relation on the organic level, the implications of this variability on the organismic level, and, finally—given such a variably consistent organically temporal relation—the nature of the organism’s own living present.

To speak of organismic temporality is to speak of the organism’s perceptual syntheses: the animal’s capacity to sense the relevant features of its environment in time. Perceptual syntheses refer back to the organic syntheses that underlie them. Consider the chicken. It perceives the grain it requires for nourishment, sensing and contracting it in a rhythmic sequence of pecks. But before it can peck for grain, the chicken passively nods its head in accordance with an internal, organic rhythm. This model is Deleuze’s. “The nods of the chicken’s head,” he claims, “accompany its cardiac pulsations in an organic synthesis before they serve as pecks in the perceptual syntheses with grain.”<sup>72</sup> This is, however, a strictly logical priority: organisms are not first organically synthetic, and only afterward capable of perception; the two are, in reality, always imbricated in complicated ways.<sup>73</sup> The organism is not, in other words, first a collection of organs and only afterward a unified whole; it is both simultaneously. If Deleuze speaks of the priority of organic syntheses, then it is because they are the transcendental conditions for the

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<sup>71</sup> In Deleuze’s terms, “this self, therefore, is by no means simple: it is not enough to relativize or pluralize the self, all the while retaining for it a simple attenuated form;” Deleuze, *Difference and Repetition*, 78.

<sup>72</sup> *Ibid*, 76.

<sup>73</sup> “The priority of organic syntheses is merely logical, for all organisms, even the most simple, have both metabolism and sensibility;” Protevi, “Larval Subjects, Autonomous Systems and E. Coli Chemotaxis,” 36.

possibility of perceptual ones. Perception appropriates, in other words, its contractile structure from syntheses found already at the level of the organism’s viscera. The chicken’s perceptual syntheses take up a capacity deployed first by its organic ones—its ability to nod its head rhythmically—and redirect it outwards. The chicken senses the grain, but the rhythm of this sensation does not emerge out of the chicken’s engagement with the grain on the level of perception. It is *adopted* from a visceral, pre-perceptual synthesis—of blood and oxygen, in accordance with a cardiac rhythm—and *redeployed* at the perceptual level.

Deleuze calls this the domain of signs.<sup>74</sup> Contractions are solutions to the questions and problems posed by the contemplations that motivate them. “To contemplate is to question.”<sup>75</sup> To contract is to venture a response, a satisfaction for the need expressed in contemplation.<sup>76</sup> The questions posed to the habits that attempt to satisfy them designate a domain or series of signs. The ‘content’ of the contemplated question is a sign. Understood in this way, every habit forms a sign that can be taken up at a different level, in a different way. And if perceptual syntheses refer to structures found already at the organic level, then every sensation is the redeployment of a more fundamental sign. One must retain in order to recollect; one must need or anticipate in order to calculate and predict. “Each contraction, each passive [organic] synthesis, constitutes a sign which is interpreted or deployed in active [perceptual] syntheses.”<sup>77</sup> The chicken redeploys a

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<sup>74</sup> “All of this [the intersection between passive and active levels of synthesis] forms a rich domain of *signs* which always envelop heterogeneous elements and animate behaviour;” Deleuze, *Difference and Repetition*, 73. The sign that animates the organic contraction of oxygen, the repetition contemplated in its synthesis, does not resemble the sign that animates the organism’s ability to sense the air it needs.

<sup>75</sup> *Ibid*, 78.

<sup>76</sup> “‘What difference is there...?’ This is the question the contemplative soul puts to repetition, and to which it draws a response [a contractile answer] from repetition;” *ibid*.

<sup>77</sup> *Ibid*, 73. At the risk of digressing, one might think here of Spinoza’s claim that “the object of the idea constituting the human mind is the body;” Baruch Spinoza, “Ethics,” *A Spinoza Reader: The Ethics and Other Works*, trans. Edwin Curley (Princeton: Princeton University Press, 1994), IIP13. Mental content is, in the terms of the present study, a redeployment at the mental level of signs found already at the level of the body. Perceptual and organic syntheses venture solutions to the same questions and problems, albeit in different ways; but no perceptual synthesis is capable of contracting a contemplation wholly alien to its organic viscera. The mind and body are, to translate Deleuze’s terms back into Spinoza’s, not only parallel, but irreconcilably intersectional—perhaps even identical.



convulsive, organic structure at the perceptual level when it pecks for grain. But this is a relatively primitive example. Deleuze offers one other. “The *signs* by which an animal ‘senses’ the presence of water do not,” he writes, “resemble the *elements* which its thirsty organism lacks.”<sup>78</sup> The elements lacked by a thirsty animal constitute the questions contemplated by its viscera at the level of organic synthesis. This is simple enough: thirsty animals need to metabolize H<sub>2</sub>O. But the content of the animal’s perception of water, the *sign* of water, does not resemble the elements metabolized. This is because the animal metabolizes H<sub>2</sub>O, but senses a combination of colour, taste, and the expectation and effect of hydration. The animal must therefore first be capable of viscerally contracting the elements of which water is made before it can be capable of sensing its presence. Visceral contemplation must precede perceptual contraction.

Consider the tick, an organism capable of no more than a few simple sensations.<sup>79</sup> It survives on the blood of other animals. Everything it senses is, in the terms delineated above, a redeployment at the perceptual level of this basic organic need. It is capable of sensing, among few other things, butyric acid (sweat): a sign the referent of which is a worthy host, a warm-blooded mammal. Butyric acid is, in this sense, a sign sensed by the tick as an indication of blood; it is the metabolic contemplation of blood interpreted at the level of perception. The aroma of coffee, on the other hand, so potent a smell for organisms capable of metabolizing its effects, holds no relevant relation—at least not for the tick—to the proximity of a warm-blooded host. Consequently, it is not a sign for the tick. The tick cannot metabolize ground coffee, and therefore there is no organic contemplation to be redeployed at the perceptual level; the tick cannot sense its aroma. The organism’s perceptual syntheses rest upon structures instantiated

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<sup>78</sup> Deleuze, *Difference and Repetition*, 73. Emphasis mine.

<sup>79</sup> I take this example from Giorgio Agamben, *The Open: Man and Animal* (Stanford: Stanford University Press, 2004), Chapter 10. The inspiration for this chapter is Jakob von Uexküll’s concept of the *Umwelt*.

first at the organic level. Without this foundation, you may as well have an organism without organs.

There is now some indication of the relation between a series of organic presents and the unity of an organismic one. The preceding section investigated the nature and harmony of these presents, as well as the way they constitute signs redeployed by the organism's perceptual syntheses. But what does all of this mean for the organism's own living present? Deleuze writes that "the duration of an organism's present, or of its various presents, will vary according to the natural contractile range of its contemplative souls."<sup>80</sup> It is worth stressing—although it should, at this point, go without saying—that perception is itself wholly organic. It is by means of its organs that the organism perceives the world outside it. Consider, for example, human vision—which is, of course, radically embodied. It is only by means of our eyes that we see the world. And eyes are themselves incredibly sophisticated organs, a set of structured, dynamical networks of membranes, muscles, cells, fluids, chemicals, vessels and glands. This network is dynamical because it works processually: without constantly receiving, focusing, transmitting, and converting light through its various layers and structures, the eye cannot send the requisite electrical impulses to the brain for there to be vision. This process is not open-ended. It is recurrent, its repetition rhythmic. Rhodopsin, the chemical compound responsible for the initial reception of light and the inception of the visual process, needs constantly to be regenerated. The mechanism of this reformation operates at the rate of chemical reaction and cellular integration.<sup>81</sup>

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<sup>80</sup> Deleuze, *Difference and Repetition*, 77.

<sup>81</sup> Rhodopsin is composed of scotopsin, a protein, and 11-cis-retinal, a vitamin A derivative. Exposure to light decomposes rhodopsin, converting its 11-cis-retinal (an angulated molecule) into all-trans retinal (a straight one). Unstable, the chemical decomposes again, forming several intermediate compounds, metarhodopsin II among them. This latter chemical is responsible for the creation of the electrical impulses interpreted by the brain as light. The whole process takes less than a second—the first reaction, under a trillionth of a second. In order for it to recur, the all-trans retinal must be converted back into 11-cis-retinal, which will, in turn, recombine with scotopsin in order to reform the necessary rhodopsin. See T.H. Goldsmith, "Optimization, Constraint, and History in the Evolution of Eyes," *The Quarterly Review of Biology*, Issue 3, Vol. 65 (1990): 281–322.

But this analysis has yet to reach the level of the organism, for the eye is an organ like any other, its rhythmic temporality a pulsing organic contraction and integration of elements—in this case, of wavelengths.

Just as organs must be linked *functionally* one to the other in an intricately dynamic and harmonious network, so too must they be linked *temporally* in the same terms. The two are, of course, inseparable, but while we speak often of the requisite relations an organ must hold with others in a functioning whole, we rarely think its rhythm so necessarily relative. To reiterate: every organ lives its own present duration, defined by the rhythm of its contractions. These rhythms not only mesh one with another, they not only refer to each other in a harmonious whole; the rhythm of one organ actually depends upon, and varies relative to, the rhythmic contractions of the others.<sup>82</sup> Perception is organic, and as such, its duration meshes with the durations of the body's other organs.<sup>83</sup> But it is also organismic, for while it varies relative to the meshwork of presents that underlie it, it also supersedes them, emerging out of them and containing them within itself. In organic terms, the eyes contemplate and contract at a rhythm like any other organ. But in perceptual terms, they are particularly significant.<sup>84</sup> The organismic present unifies the organic presents that constitute it. It is the consistency, synchronization, harmony, or coherence of these organic contractions that makes possible the unity of the

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<sup>82</sup> Heart rate varies relative to metabolic activity, respiratory rhythm, neuronal patterns, environmental influences, and so on. Physiologic systems all pulse at their own rates, whether neural, cellular, muscular, or otherwise. The rhythm of one system refers to the rhythm of others. It may also contain them, coiled within itself. The rhythm of the muscular system is, for instance, constituted in part by the rhythm of the endocrinal, nervous, and skeletal systems that underlie it. Organic temporality is never self-contained; it is relative, a meshwork of references to, and relations with, other rhythms of temporality.

<sup>83</sup> Visual activity necessitates the working of ocular muscles, ligaments and tendons, the conjunctiva (a thin membrane beneath the eyelid), and the lacrimal apparatus (the system of glands, sacs, ducts, nerves, and fluids responsible for tear supply and drainage). The brain's visual cortex is also responsible for the interpretation of visual signals. The nervous system transmits these signals. The vascular system supplies the eye with the requisite blood and nutrients, and so on. Each system contracts at its own rate—in a relative harmony with the others.

<sup>84</sup> Particularly significant with reference to the non-perceptual organs, of course—and still no less relational. The living present of the perceptual system still varies in accordance with the temporal rhythms of other organic systems, but this is now a relation of the organism with its organs, not of the organs with each other.

organism's perceptual present. The organismic present is, in this respect, reminiscent of Deleuze's characterization, in *Logic of Sense*, of Chronos: "an encasement, a coiling up of relative presents."<sup>85</sup>

If Chronos is the envelopment of relative durations, then perception is Chronoic.<sup>86</sup> The range of the perceptual present corresponds to the rhythmic contractions encased within it. The perceptual present emerges out of these contractions and is sustained by them. Vision requires the consistency of a process that spans multiple organic registers and physiologic systems—from lids, brows and lashes to the tarsal glands, lacrimal apparatus, the visual cortex and the relative rhythm of synthesis that animates each. Every organic synthesis is, in Protevi's words, "a contemplative soul, each has its own rhythm, and it is the consistency of those rhythms that allows the cell [organ, organism, species, society, and so on] to live."<sup>87</sup> Defects in the process may either alter the nature or duration of the perceptual present, or otherwise abolish it altogether. When rhythms clash with sufficient intensity, when organic consistency comes completely apart, the organism dies. "Death, we can speculate, occurs when the rhythms of the processes no longer mesh. Shifting musical terms, we can say that life is harmonious music; death is disharmony."<sup>88</sup> Subjective temporality requires a consistency of larval selves, just as the life of an organism requires the ongoing operation of the organs that constitute it.

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<sup>85</sup> Gilles Deleuze, *The Logic of Sense*, trans. Mark Lester, ed. Constantin V. Boundas (New York: Columbia University Press, 1990), 162. On the nested, 'Chronoic' (see note 85), nature of organismic temporality, Protevi affirms that "there are thousands of such rhythmic periods between need and fatigue, periods that compose the organic being of humans: from the long periods of childhood, puberty, adulthood, and menopause to monthly hormonal cycles to daily cycles, all the way down to neural firing patterns;" Protevi, "Deleuze and Life," 242.

<sup>86</sup> I retain the second 'o' from Chronos to distinguish 'Chronoic' from the more familiar 'chronic.' While the latter refers to long-lasting effects, the former is meant to designate the organismic instantiation of Chronos. Where Chronos is understood to be a theory of objective temporality more generally—a present so vast as to contain every other one inside of it—I use it here to designate the organismic present, a present that belongs to the organism in question and contains within it only the organism's own organic presents.

<sup>87</sup> Protevi, "Larval Subjects, Autonomous Systems and E. Coli Chemotaxis," 37.

<sup>88</sup> *Ibid.*

Before taking up the variable relationship between larval and Chronoic temporality, the nature of the latter, the lived or living present, ought to be delineated precisely.<sup>89</sup> It is clear that the organism's living present refers, quite literally, to the present it lives through: *its* present. Equally clear is the fact that the present is constituted by a duration spanning the interval between the organism's past and future. The question of the living present is therefore one of what the organism is capable of perceiving as present, and what will exceed this capacity, bleeding into its past and extending into its future. Given that every present moment is a synthesis or contraction of multiple instants, I refer to the organism's living present as its *frequency profile*—a term denotative both of the fact that perceptual systems operate in terms of temporal frequencies, and that these frequencies can span either more or less than one unit of measurement.<sup>90</sup> Visual temporal frequency is, for example, measured per second with reference to the flicker fusion of a given cyclical repetition. Flicker fusion occurs when separate instances no longer appear distinctly, when they fuse or are contracted together continuously. It therefore constitutes the limit of perceptual contraction, designating the number of repeated instants the system in question is capable of apprehending distinctly. For humans, flicker fusion occurs at 60 Hz.<sup>91</sup> The visual system of the human organism is therefore capable of perceiving just under 60 elements in a second. This means that electronic displays with refresh-rates of more than 60 times a second appear smoothly, while displays that refresh or flicker at lower frequencies appear

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<sup>89</sup> I have already provided a sufficient analysis of the former: organs pulse at contractile rhythms defined by the interplay of a relative need, pushing them into the future, and a fatigued retention of the past. While it is adequate to define the organic present by this intersection, the organismic or Chronoic present requires a more thoroughgoing analysis, for it concerns more than the rhythms that define the organism's body; it concerns the organism's ability to perceive in time, and the relation its perceptual present holds to its organic rhythms.

<sup>90</sup> Frequencies are gaged in Hertz (Hz), a unit of which measures the number of repetitions per second. Since a single second may constitute either only a fragment of the lived present (in the case of the human organism), or span multiple presents (in the case of certain insects), I refer to the perceptual present as a *profile* of frequencies.

<sup>91</sup> See S. Hecht and E. Smith, "Intermittent Stimulation by Light: Area and the Relation Between Critical Frequency and Intensity," *The Journal of General Physiology*. Vol. 19, Issue 6 (1936): 979-989, as well as S. McColl and J. Veitch, "Modulation of Fluorescent Light: Flicker Rate and Light Source Effects on Visual Performance and Visual Comfort," *Lighting Research and Technology*. Vol. 27, Issue 4 (1995): 243-256.

discontinuous and jittery.<sup>92</sup> This is, then, the contractile limit, per second, of the human visual system. But what of the duration of its present? Doubtless, this is the harder question—in part because the organism’s present will vary in accordance with the rhythms of its organs and influences from its environment, but also because it is more difficult to fix experimentally.<sup>93</sup>

Neurophysiological research dating back to the early twentieth century suggests that the human experience of the present spans a duration of approximately 2-3 seconds.<sup>94</sup> Ernst Pöppel’s more recent studies propose that humans experience these temporal intervals as units, and that this unitary perception of a present consisting of several seconds is expressed in the rhythmic iteration of everyday motor abilities.<sup>95</sup> There has since been a proliferation of such studies, locating beneath both repetitive and non-repetitive movements in humans, as well as in other mammals, the same unified 2-3 second interval.<sup>96</sup> For the purposes of the present study—more theoretical than it is experimental—I will take as given the claim that the human perceptual present consists approximately of a 3 second duration. If we refer back to the contractile limit of the perceptual second (60 Hz), we now have an image of the human organism’s frequency profile. By contracting roughly 60 elements in a second, and unifying approximately 3 seconds in a living present, the human organism’s frequency profile is 180 Hz over 3 seconds. The human perceives at a rate of 60 Hz in a unified present that spans 3 seconds. It is the unity of these frequencies that the organism lives as present. This is the temporal *now* of human subjectivity.<sup>97</sup>

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<sup>92</sup> A similar effect is often observed in fluorescent light bulbs.

<sup>93</sup> One might think here of the way time seems to “slow down” in high-adrenaline, dangerous or threatening situations like car accidents and robberies. See Eagleman et. al, “Time and the Brain: How Subjective Time Relates to Neural Time,” *The Journal of Neuroscience*, Vol. 25, Issue 45 (2005): 10369-10371.

<sup>94</sup> For a survey, see Geoffrey Gerstner and Louis Goldberg, “Evidence of a Time Constant Associated with Movement Patterns in Six Mammalian Species,” *Ethology and Sociobiology*, Issue 15 (1994): 181-205.

<sup>95</sup> Ibid, 182. The research in question is in Ernst Pöppel, “Time Perception,” *Handbook of Sensory Physiology 8: Perception* (Berlin: Springer Verlag, 1978), 713-729.

<sup>96</sup> Studies enumerated in Gerstner and Goldberg, “Evidence of a Time Constant Associated with Movement Patterns in Six Mammalian Species,” 182.

<sup>97</sup> The temporal ‘now’ of subjectivity is constituted by a contraction of elements in a second, and by a number of seconds in a present. And of course, both variables vary in accordance with the fluctuation of other factors. The

The Chronoic, organismic or perceptual present is composed of a polyrhythmic network of organic presents. To claim that perception is Chronoic is also to claim that the perceptual present varies in accordance with the larval rhythms that constitute it. In *Intensive Science and Virtual Philosophy*, Manuel Delanda expresses this point with reference to the relativity of temporal oscillation.<sup>98</sup> “What is,” in his terms, “immediate past and future for [a biological oscillator] would still be part of the ‘lived’ present of an oscillator operating at longer time scales, at the level of geological or stellar dynamics, for example.”<sup>99</sup> At the same time, this biological present “already includes many past and future events for oscillators operating at atomic and sub-atomic scales.”<sup>100</sup> Different systems perceive at different rates. Their perceptual syntheses contract relative presents; the present of one, if long enough, may include events already perceived as past by another. These rates of synthesis vary, in general terms, according to what Delanda calls the scale of oscillation: biological phenomena typically operate at rates higher than do geological rhythms. But the concern of the present study is specifically with the biological register and the organisms that populate it. As such, Delanda’s claim is encouraging, but it does not go far enough. Temporal oscillation is relative, on the one hand, to scale, but—more to the point—also to the frequency profile of the organism in question. Indeed, organisms whose systems pulse at higher rates tend to perceive the world at higher frequencies: this is part of what it means to ascribe Chronoic time to the organismic present.

Taking the human profile as a point of reference, the perceptual capacities of human vision can be compared with the capacities of other organisms. Research on the subject suggests

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numbers provided may be incorrect or inexact; I provide them only toward a clearer image of the perceptual present.

<sup>98</sup> Oscillation refers to the rhythmic pulse of a recurring temporal cycle: the ticks of a clock, for example. For human temporal oscillation, see Treisman et. al, “The Internal Clock: Evidence for a Temporal Oscillator Underlying Time Perception with Some Estimates of its Characteristic Frequency,” *Perception*, Vol. 19, Issue 6 (1990): 705-743.

<sup>99</sup> Manuel Delanda, *Intensive Science and Virtual Philosophy* (London: Continuum, 2002), 88.

<sup>100</sup> *Ibid.*

that the ocelli of dragonflies have a flicker fusion threshold of 220 Hz.<sup>101</sup> This means, to reiterate, that their ocellar nerves are capable of perceiving distinctly just under 220 flickers in a second. Beyond this threshold, they blur and are contracted continuously. Unfortunately, I know of no existing research on the temporal perceptive capacities of the dragonfly, nor of any experimental models by which we might acquire such information. We know not, therefore, how many seconds—or how many fragments of a second—are traversed in the span of the dragonfly’s present; we know not how many get to “count as one,” to borrow Badiou’s phrase. As such, we cannot reasonably compare the frequency profiles of dragonflies with those of humans. But we can, I think, infer from the difference in flicker fusion thresholds a higher rate of perception in dragonflies. And predictably, the dragonfly’s organic systems beat at rates far higher than do human ones.<sup>102</sup> Dragonflies pulse at higher organic rhythms; it is only natural that they perceive at a higher organismic rate.<sup>103</sup>

“Each level of temporal scale defines,” for Delanda, “what oscillators at that level ‘perceive’ as *relevant change*: certain cycles are simply *too slow* for them to appear as changing or moving relative to a faster level, and vice versa.”<sup>104</sup> In the terms developed above, the synchronized rate of its organic syntheses defines what the organism is capable of perceiving in its environment. The dragonfly is therefore capable of perceiving changes or contracting elements that elude the human, changes that occur at a rate beyond the threshold of unaided human perception. It is a faster specimen; it perceives the world at a higher rate. This might be why we

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<sup>101</sup> The term ‘ocelli’ (plural for ocellus) refers to the eyes and corresponding visual capacities in insects. Strictly speaking, ocelli are light-sensitive organs found typically on the insect’s head. Philip Ruck, “Electrophysiology of the Insect Dorsal Ocellus: Responses to Flickering Light of the Dragonfly Ocellus,” *The Journal of General Physiology*, Vol. 44, Issue 3 (1961): 605-627.

<sup>102</sup> The dragonfly’s heart rate is a typical 180 beats per minute, while that of a resting human is typically around 70.

<sup>103</sup> At the time of my writing this, a new study linking the size of an animal’s body, its metabolism, and the rate at which it processes temporal information has recently concretized my claims here. See Kevin Healy et al, “Metabolic Rate and Body Size are linked with Perception of Temporal Information,” *Animal Behaviour*, Vol. 86, Issue 4 (2013): 685-696.

<sup>104</sup> Delanda, *Intensive Science and Virtual Philosophy*, 89-90.



have such a hard time swatting at insects. Our most agile attempts appear to them lumbering and sluggish, for we perceive each other at different rates of synthesis. The higher the frequency profile, the more changes one is capable of perceiving in the same timespan, the more elements one is capable of synthesizing in the same movement of contraction. Such is the nature of organismic temporality: the organism's perceptual syntheses determine the duration and frequency of its living present. And these syntheses are determined, in turn, by the organism's rhythmic network of organic contractions.

Everything perceives the world at its own rate. The world is made perceptually meaningful to the organism within a certain range of frequencies. Anything that exceeds the thresholds of its perceptual capacity escapes the organism's living present and is consequently either a part of its past (and future) or is otherwise invisible. The lived present therefore designates the temporal field with which we interact as organisms. It also designates the temporal dimension of subjectivity, a dimension that emerges genetically out of the larval selves whose rhythmic syntheses serve as the conditions for the possibility of organismic time.

#### **IV. CONCLUSION**

This chapter began with Hume and the exteriority of elements in a series. It delineated the nature of repetition, the condition of which is a contraction that draws a contemplative difference from repetition. This difference is drawn in terms of a double temporal movement—of anticipation and retention—the consequence of which is a synthesis of the present. The second section applied the nature of contraction to the organ, explicating Deleuze's concept of the larval subject or contemplative soul. I conceived the organism as a synchronized system of organic rhythms, each with its own temporal synthesis. The third and final section moved from the organic to the organismic register. Here, I discussed the relationship between perceptual synthesis and organic rhythm, the Chronoic nature of perception, and the frequency profile that

defines the duration and contractile capacities of a lived present. Organic syntheses define the organism as a living thing; organismic or perceptual syntheses define the organism as a perceiving thing in time. But this is still only half of subjectivity, for the subject is defined by a spatial, as well as by a temporal, dimension. It is a *here* as well as a *now*. And just as subjective temporality is always particular to the organism in question, so too is subjective spatiality constituted by the activity of a living thing. It is therefore an analysis of space or spatiality to which the next chapter turns.

## CHAPTER 2: SPATIALITY

*Our space is constituted through the sense we make of it, the mapping of our field of orientation.*<sup>1</sup>

The task of this chapter is the construction of a theory of organismic spatiality.<sup>2</sup> I take as a starting point Deleuze's reference, in *The Logic of Sense*, to Gilbert Simondon's concept of the membrane. The membrane serves, in the present study, as a dynamically topological limit between what Deleuze, following Simondon, calls the organism's milieus of interiority and exteriority.<sup>3</sup> "To belong to interiority does not mean to 'be inside,' but to be," in Simondon's words, "on the 'in-side' of the limit."<sup>4</sup> Put otherwise, the limit is precisely that which is responsible for the constitution of interiority as a topological space distinct from that which is exterior to it. The membrane is, therefore, the first moment of organismic spatiality. It is the foundation of the organism as an entity spatially distinct from its environment. Far, however, from a static or passive boundary, the membrane is discriminatory and asymmetric: a concept, I claim, best understood by way of a discussion of affectivity. This is the chapter's second step: an understanding of how the membrane brings the organism's interior milieu into contact with the outside requires an analysis of its capacity to affect and to be affected by its environment. The membrane is, in this sense, an affective apparatus. In developing this concept, I rely in large part upon a reading of Spinoza and Bergson. To appreciate the compositional implications of affectivity, I bring, in the chapter's third section, the concept into conversation with Maturana

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<sup>1</sup> Claire Colebrook, "On the Specificity of Affect," *Deleuze and Space*, eds. Ian Buchanan and Gregg Lambert (Edinburgh: Edinburgh University Press, 2005), 195.

<sup>2</sup> A modified version of this chapter is forthcoming under the title of "Organismic Spatiality: Membranic Affectivity and the Composition of Space" in *Environment and Planning D: Society and Space*, ed. Peter Gratton, 2015.

<sup>3</sup> Simondon deploys his conception of the membrane across the majority of his writing, from technological being and the transduction of crystals, to the individuation of living things. I am concerned here, however, only with the membrane's organismic connotations and implications. As such, this concept will be read selectively and mobilized toward a purpose that is wholly my own, which is to say that the implications I derive from the membrane may appear at times antithetic to Simondon's own trajectories of thought.

<sup>4</sup> Gilbert Simondon, *L'individu et sa genèse physico-biologique* (Paris: Presses Universitaires de France, 1964), 260-264; quoted in Deleuze, *The Logic of Sense*, 104.

and Varela's work on autopoietic systems theory. Conceived autopoietically, the organism's activity as a living system constructs its own milieu of exteriority.<sup>5</sup> Space is composed membraneously, affectively, and autopoietically. This triple synthesis serves to structure the chapter's analyses. Together, these concepts constitute the *here*, as opposed to the *now*, of organismic subjectivity.

## I. THE MEMBRANE

In invoking the membrane in his discussion of individuation in *The Logic of Sense*, Deleuze claims—in what is an important, if slightly provocative, turn of phrase—that “it is necessary to understand [following Paul Valéry] that ‘the deepest is the skin’.”<sup>6</sup> This is because it is the surface, the skin, the membrane or limit that brings a milieu of interiority into contact with what is exterior to it. “The internal and the external, depth and height, have biological value only through this topological surface of contact.”<sup>7</sup> Milieus converge topologically, simultaneously differentiated from, and placed into contact with each other by means of the membrane between them. The membrane is, then, precisely the means by which the organism sets itself apart from its environment. If its internal milieu, the system of relationships that structures the organism's body, is to interface with an environment outside of it, there must first exist some boundary between the two, some means by which the two are first separated, then rendered capable of interaction. In the absence of such a separation, the organism is more a drop of water in a pond than it is one of the tadpoles inhabiting it. Milieu, ecology, environment: all are meant to denote the systems of relations, the flows, processes and entities, that together constitute the context in question. The milieu of the human organism is, for example, defined in terms of the sub-milieus

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<sup>5</sup> Exteriority is conceived here as an affective spatiality, an informationally meaningful milieu with which the organism in question can interface.

<sup>6</sup> Deleuze, *The Logic of Sense*, 103.

<sup>7</sup> *Ibid.*

that constitute it: internal, external, intermediary and annexed—organic structure, environment, the exchanges between and across the two, and the flows of energy the organism draws upon in sustaining itself.<sup>8</sup> To speak of the milieu as an ecology of relations is to pay special attention to the multiplicity of processes and interactions of which it is comprised. Although the organism's interior is composed of a number of divergent functional structures and rates of synthesis, the network of these organic rhythms, seen from the perspective of the organism—instead of, for example, the perspective of the ecosystem in which it plays a role, or of one of the constituent organs of that network—together composes a single milieu. Heart, lungs, liver, brain and so on: a multiplicity of organic relations constitutes the human organism, itself but one element in a larger ecology of relationships, an ecosystem. The question of the membrane is therefore the question of the interface between two ecologies, between the organism's interior milieu and the relations into which it enters with entities and flows outside itself, its milieu of exteriority, ecology or environment.

The individuality of the organism is not so much a mark of finitude as it is a relative and variable limit.<sup>9</sup> No organic limit is static or rigidly definitive, “because,” in the words of Muriel Combes, “insofar as any individual is capable of growth, what was exterior to it can become interior.”<sup>10</sup> Limits expand and contract. They distend, growing porous and less discriminatory, or shrink and become more selective as the organism in question exerts the effort of living. It is for this reason that the membrane is a variable topological limit, and is to be opposed conceptually to the inelastic rigidity of an anisotropic boundary. The theoretical work done by an appeal to topology resides, for the purpose of this project, in its ability to think the fold. If it were, for

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<sup>8</sup> I take these terms from Deleuze and Guattari, *A Thousand Plateaus*, 313.

<sup>9</sup> Finitude connotes, for Simondon, a lack of the potential to grow. Finite borders are rigid, static.

<sup>10</sup> Muriel Combes, *Gilbert Simondon and the Philosophy of the Transindividual*, trans. Thomas LaMarre (Cambridge: MIT, 2013), 20.

example, the case that living beings had only solitary, single interiors, set apart from everything outside of them, then the fold would nowhere come into play. This may in fact hold, to be fair, in the case of single-celled organisms, for Simondon writes that “the simplest organism, which we can call ‘elementary,’ is that which does not possess a medial interior milieu, but only an absolute interior and exterior.”<sup>11</sup> But in more complicated organisms, milieus proliferate. What was originally the limit of an absolute interiority folds in upon itself, giving rise to a medial series of interiorities, each exterior to the other, and yet all interior to the organism as a whole. Consider the structure of a protein. Before assuming its functional three-dimensional shape—its native or conformational state—protein molecules exist as linear chains of amino acids. As a result of the distribution of acids and bonds in the chain, the protein molecule is capable of folding in a number of different ways, transforming a chain into a complicated arrangement of pleats and folds.<sup>12</sup> What was initially a linear sequence of acids conforms, by folding, into a three-dimensional structure. Folded, the protein molecule is capable of distinguishing its interior from bodies external to it. In terms more properly Simondonian, “the polarized membrane therefore folds its organic pellicule and curves around itself in order to rediscover, at the terminus of this torsion, its own milieu of interiority.”<sup>13</sup> The fold is, in other words, responsible for the distinction between inside and outside, and this distinction is itself responsible for the very existence of an inside—as the outside of the outside, in Deleuze’s formula.<sup>14</sup> Folded and spatially differentiated, the molecule is now capable of functioning as a protein. To speak of the topology of the

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<sup>11</sup> Simondon, *L’individu et sa genèse physico-biologique*, 224; translation by John Protevi, modified July 19, 2010, accessed July 17, 2013, <[http://www.protevi.com/john/Simondon\\_topology\\_ontogenesis.pdf](http://www.protevi.com/john/Simondon_topology_ontogenesis.pdf)>

<sup>12</sup> Bruce Alberts et al, “The Shape and Structure of Proteins,” *Molecular Biology of the Cell*, 4th Edition (New York: Garland Science, 2002), accessed July 24, 2013, <<http://www.ncbi.nlm.nih.gov/books/NBK26830/>>

<sup>13</sup> Anne Sauvagnargues, “Crystals and Membranes: Individuality and Temporality,” trans. Jon Roffe, *Gilbert Simondon: Being and Technology*, eds. Arne De Boever, Alex Murray, Jon Roffe, and Ashley Woodward (Edinburgh: Edinburgh University Press, 2012), 67.

<sup>14</sup> “The fold simultaneously produces interiority and exteriority, inside and outside, such that the inside is formed as ‘the outside of the outside’, to adapt Deleuze’s beautiful formula;” *ibid.*

membrane is to denote precisely this: its productive flexibility, its capacity to fold back onto itself, to bifurcate and multiply, generating and complicating interior spaces.

A series of medial interiors are separated one from the other by the asymmetric polarization of the membranes between them. “The human body is thus characterized,” in Anne Sauvagnargues’ words, “by the diversity of its interior spaces, the digestive cavities remaining exterior to the blood, which itself turns out to be relatively external to the glands that discharge their secretions into its flux, and so on.”<sup>15</sup> The selective permeability of the membrane is why the kidneys can concentrate waste toxic to the organs with which they otherwise relate. This is also why neurons are capable of de- and repolarizing by exchanging sodium for potassium ions. The permeability of the neuronal barrier relaxes, letting sodium ions in. When its charge becomes positive, the neuron is capable of transmitting an electrical impulse. In the same way, the neuron is also capable, in the absence of a stimulus, of inhibiting the transfer of sodium across its barrier.<sup>16</sup> “The membrane is polarized, letting pass,” in Simondon’s own words, “one kind of body [and] opposing the passage of another kind of body.”<sup>17</sup> Its asymmetry is essential. Wherever there is a selective point of contact between two spaces—wherever there is a distinction between what is made to pass from one space into the other, and what is allowed to traverse that boundary in the opposite direction—there is a membrane.<sup>18</sup> This relatively broad conception of

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<sup>15</sup> Ibid. Cf. Simondon, *L’individu et sa genèse physico-biologique*, 224; translation by John Protevi.

<sup>16</sup> Takeshi Yoshimura et al, “Signaling Networks in Neuronal Polarization,” *The Journal of Neuroscience*, Vol. 26, Issue 42 (2006): 10626-10630.

<sup>17</sup> Simondon, *L’individu et sa genèse physico-biologique*, 223; translation by John Protevi.

<sup>18</sup> Although I confine my reflections here to the case of the organism, it is worth noting that this claim might apply more comprehensively. The existence of a membrane need not, in other words, imply the existence of a skin-like boundary. Entities as heterogeneously complicated as governments or corporations must nonetheless interface with bodies and flows outside of them. They draw upon these external resources—just as they produce information, material, or energy—in ways particular to their own constitutions. One cannot interact with a bureaucratic agency except through paperwork, although the agency may interact with bodies external to it in different ways. There exists, then, an essentially asymmetrical porosity at the agency’s border. This is its membrane. It lets some things in; it lets others out. And in so doing, it distinguishes the agency’s inside (as that which is affected by its outside) from its outside (as that which its inside affects). ‘Affect’ is a concept that will find a more comprehensive expression in the sections that follow. For more on the far-reaching implications of conceiving boundaries as porous membranes, see

the membrane makes possible, as in the case of the human body, an analysis of nested interiorities: membranes within membranes. And yet, the dynamically intricate terrain of these multiple interiorities is nevertheless to be distinguished from a milieu of exteriority.<sup>19</sup>

The membrane is relational through and through. It is this relativity that, beyond producing and configuring the organism's interior, actually organizes its external milieu as well, structuring it in accordance with the anatomy of the organism's inside. "The functional and active polarity of the membrane configures," in the words of Sauvagnargues, "the external milieu as much as it constitutes its internal milieu."<sup>20</sup> Indeed, the very concept of interiority implies a spatiality external to it, a milieu relative to which an interior space can function as such. The individual cannot be, in other words, by itself alone. "It is always coupled or coordinated," in Steven Shaviro's words, "with a milieu [...] and cannot subsist as a unity without it."<sup>21</sup> Although the kidneys are, for example, relatively exterior to the arteries that feed them, they are worthless without a blood supply. "Unless we grasp the importance of its relation with an associated milieu, we do not understand what the reality of the individual consists in: [...] by itself alone, it is an incomplete reality."<sup>22</sup> The question is, however, one of how the limit between the two configures the exterior space. It does this, I claim, by distinguishing in what is external to it, what can affect its milieu of interiority—what can be integrated into it, what is to be rejected as harmful—from what is incapable of making a difference to it, of posing a problem to which the body in question can venture a response. This is the first distinction: what is affectively significant from what is not.

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Stacy Alaimo, *Bodily Natures: Science, Environment, and the Material Self* (Bloomington: Indiana University Press, 2010). Cf. Levi Bryant, "Stacy Alaimo: Porous Bodies and Trans-Corporeality," *Larval Subjects*, modified May 5, 2012, accessed July 20, 2013, <<http://larvalsubjects.wordpress.com/2012/05/24/stacy-alaimo-porous-bodies-and-trans-corporeality/>>

<sup>19</sup> There is no absolute inside to the complicated organism, only a variable meshwork of folds—capable of expansion, diversification, torsion, and inversion—the interiority of which is relative always to an outside.

<sup>20</sup> Sauvagnargues, "Crystals and Membranes: Individuality and Temporality," 67

<sup>21</sup> Steven Shaviro, "Simondon on Individuation," *The Pinocchio Theory*, modified January 16, 2006, accessed August 3, 2013, <<http://www.shaviro.com/Blog/?p=471>>

<sup>22</sup> Combes, *Gilbert Simondon and the Philosophy of the Transindividual*, 21.



It determines what is ecologically meaningful for a given organism, what is part of its world. The second distinction is nested within the first, and determines what is destructive from what is complementary or enlivening. Together, these distinctions are responsible for the configuration of the organism's world. "The polarity of the membrane distinguishes," in Sauvagnargues' words, "the favourable (which it integrated and retains) from the unfavourable (which it avoids and rejects) in a Spinozist manner."<sup>23</sup> It is therefore an analysis of Spinoza's concept of affect to which the next section turns.

First, it is worth dispelling a common theoretical error. In the configuration of its exterior milieu, the organism does not impose sensibility on a matter initially formless. To posit this imposition is to fall prey to the strictures of what Simondon calls hylomorphism, a model of individuation that presupposes, in Simondon's own words, "the existence of a temporal succession: first there is the principle of individuation, then this principle undertakes an operation of individuation, and finally the constituted individual appears."<sup>24</sup> The individual is, however, emphatically not initially indeterminate, fully determined only subsequently; the individual is caught up from the beginning in an ongoing process of individuation.<sup>25</sup> What is said of the individual must be ascribed to its milieu as well, which is to say that the process of living is the process of individuation, and that the process of individuation is itself an ongoing coevolution that brings the individual together with its milieu. The milieu does not fully individualize the

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<sup>23</sup> Sauvagnargues, "Crystals and Membranes: Individuality and Temporality," 67.

<sup>24</sup> Gilbert Simondon, "The Position of the Problem of Ontogenesis," trans. Gregory Flanders, *Parrhesia*, Issue 7 (2009): 5. This is the hylomorphic claim that matter is formed applied to individuation: the individual is first indeterminate and only later determined by the imposition of some principle, more as an application than a process.

<sup>25</sup> Pascal Chabot, *The Philosophy of Gilbert Simondon: Between Technology and Individuation* (London: Bloomsbury Press, 2013), 76.

individual in one fell swoop, and neither does the individual configure completely the layout of its milieu.<sup>26</sup> The two coevolve.<sup>27</sup>

## II. AFFECTIVITY

“The contact between individual and milieu is mediated by *affect*.”<sup>28</sup> It is affect that determines the space lived by a given organism, because it is affect that names the particular mechanism of relation between organism and environment. For Spinoza, affectivity refers primarily to changes in a body’s power of action. “By affect,” he writes, “I understand affections of the body by which the body’s power of acting is increased or diminished.”<sup>29</sup> In Protevi’s terms, “affect is what a body can do and what it can undergo.”<sup>30</sup> Bodies compose with others, whether favourably or not. In these compositions, they enact and undergo changes in power. As such, affect is a thoroughly relational concept: to increase one’s power of acting, one must enter into a complementary relation with something external to oneself; when the relation is decompositional, one’s power diminishes.<sup>31</sup> When I ingest coffee and am able to think and write at far greater a velocity, it is because my body has composed beneficially with the caffeine. It affects me favourably and my power of acting increases. When, on the other hand, I ingest too great a quantity of alcohol, my thinking slows, my vision blurs, I become inarticulate. My body composes unfavourably with the alcohol and my power of acting diminishes. In the throes of this relation, I am literally less capable of action. This is what it means to be affected, whether constructively or

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<sup>26</sup> Indeed, the claim that individuation happens as if all at once effaces individuation itself, for it leaves unexplained how it is the individual is supposed to be formed, just as it leaves unexplained how it is this individual is supposed to distinguish itself (or come to be distinguished) from its milieu. See Gilbert Simondon, “The Genesis of the Individual,” *Incorporations*, eds. Jonathan Crary and Sanford Kwinter (New York: Zone Books, 1992), 299.

<sup>27</sup> In the third and final chapter of this thesis, I draw out the processual implications of this reading for thinking the dynamism of organismic subjectivity.

<sup>28</sup> Shavero, “Simondon on Individuation.”

<sup>29</sup> Spinoza, *Ethics*, I11D3.

<sup>30</sup> John Protevi, “Ontology, Biology, and History of Affect,” *The Speculative Turn: Continental Materialism and Realism*, eds. Levi Bryant, Nick Srnicek, and Graham Harman (Melbourne: re.press, 2011), 393.

<sup>31</sup> Gilles Deleuze, *Spinoza: Practical Philosophy*, trans. Robert Hurley (San Francisco: City Lights Books, 1988), 49-50.

not, by a body external to one's own. What it means to affect another body is the inverse: when I enter into a relation that changes the power of another body, I am affecting it. Regardless of the direction of this movement, the relation is primary: whether affecting or affected, the body in question must relate with a component of its exterior milieu.<sup>32</sup> "Affect marks a body's *belonging* to a world of encounters."<sup>33</sup> It is, at its core, a relational concept. A body's affects are defined by the environment with which that body relates, even if the environment is, in turn, defined by the affects it is capable of producing. "The capacity of a body is never," in other words, "defined by a body alone but is always aided and abetted by, and dovetails with, the field or context of its force-relations."<sup>34</sup> It is therefore only in its relations with its environment that one learns what a body can do and undergo.

Relation is not perception. Affect, to be clear, is not feeling. Neither is it emotion. I do often feel my affects, whether enthusiastically or otherwise, but "affect extends beyond feeling."<sup>35</sup> This is because feeling, emotion, and perception all designate the subjective appropriation of what is originally an unconscious modification of the body's power to act.<sup>36</sup> "Affect," writes Protevi, "has two registers. First, it is being affected, that is, undergoing the somatic change caused by encounter with an object."<sup>37</sup> And somatic change need not involve conscious perception: I may lose the ability to feel pain in my legs, but they will still bleed when pricked. "Second," he continues, "affect is the felt change in power of the body [...], felt as sadness or

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<sup>32</sup> While Spinoza's concept of affect culminates in an analysis of bodily passions (joy, sadness), and the way the proportion of one to the other varies relative to a given body's ratio of activity to passivity, it is the primacy the concept affords to relations between a body and what is external to it that I wish here to emphasize. By no means do I intend for this to serve as a comprehensive representation of Spinoza's theory of affect. Instead, I take the concept as a starting point, and push it into territory foreign to Spinoza's own trajectory of thought in order to draw from it a set of implications indispensable to the present study.

<sup>33</sup> Gregory J. Seigworth and Melissa Gregg, "An Inventory of Shimmers," *The Affect Theory Reader*, eds. Melissa Gregg and Gregory J. Seigworth (Durham: Duke University Press, 2010), 2.

<sup>34</sup> *Ibid.*, 3.

<sup>35</sup> Protevi, "Ontology, Biology, and History of Affect," 395.

<sup>36</sup> Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham: Duke University Press, 2002), 27-28.

<sup>37</sup> John Protevi, *Political Affect: Connecting the Social and the Somatic* (Minneapolis: Minnesota University Press, 2009), 49.

joy.”<sup>38</sup> The second moment of affect is therefore better understood as emotion or perception. If I am able to feel my legs, and they are pricked, alongside a somatic affect to their skin, I will also feel pain. Pain is a feeling, a subjective response to a bodily affect. But that bodily affect is primary. As such, when I invoke the concept, I intend what Protevi refers to as its first register, although in many cases (and in most human ones) the two registers bleed into each other. This point is crucial. Were affect to be tied solely to conscious perception, then any theory of affective spatiality would amount only to the claim that the environment of a body is constituted by what that body perceives in it. It is therefore worth repeating here Protevi’s claim that “affect extends beyond feeling.”<sup>39</sup> This means that a milieu of exteriority is constituted not by what a given organism is capable of perceiving in it, not what it is capable of feeling, but rather by what it is capable of registering affectively (in an unconscious, foundationally somatic sense). To take a relatively simple example, one might think of the way a pitch of sufficiently high frequency is capable of inducing headaches in human bodies that are otherwise incapable of registering the sound perceptually. To take a similar example, tissue damage is, in Protevi’s terms, “an objective phenomenon that is at first registered unconsciously, triggering reflexes, and then shows up as the conscious sensation of pain.”<sup>40</sup> Pain is, therefore, the feeling of a change in bodily integrity.<sup>41</sup> That underlying change is the affect, and is (at least initially) unconscious.

If affective registration underlies conscious perception, it is because the latter is only a special case of the former. All perception is perception of affect, but not all affective change is registered perceptually.<sup>42</sup> And when affects do become conscious, when they do break the surface

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<sup>38</sup> Ibid.

<sup>39</sup> Protevi, “Ontology, Biology, and History of Affect,” 395.

<sup>40</sup> Protevi, *Political Affect*, 45-46.

<sup>41</sup> Psychological disorders aside, affect is the condition for the possibility of feeling. One cannot feel consciously what does not first affect one on an unconscious register.

<sup>42</sup> This is to say that the human body is capable of registering affects in a vast array of ways, to a vast array of degrees that nevertheless do not break the surface of consciousness.

of perception, they are experienced differently. “The idea of any affection of the human body does not,” Spinoza writes, “involve adequate knowledge of the human body.”<sup>43</sup> There is, in other words, a disconnect between change in a body’s power and the conscious experience of that change. In reviving what is an emphatically Nietzschean motif, Jane Bennett notes the way dietary fats can alter—albeit unconsciously—moods, dispositions, and aptitudes.<sup>44</sup> “Several recent studies suggest that [...] the omega-3 fatty acids prevalent in some wild fish [...] can make prisoners less prone to violent acts, inattentive schoolchildren better able to focus, and bipolar persons less depressed.”<sup>45</sup> These fatty acids affect the body in powerful ways, all the while remaining beneath the threshold of its perceptual awareness. I call this disconnect the “opacity of affect.”<sup>46</sup> We rarely perceive the affects themselves. This is because the affects are opaque, difficult to access. It is their *effects* that we experience.<sup>47</sup> Indeed, what schoolchild perceives the chemical change realized in him during the metabolism of his dinner? The child may, to be sure, perceive the fact that he feels happier; he may notice an increase in his ability to focus. But no child is conscious of his metabolism. “No one,” writes Bryant, “has ever experienced metabolism, though everyone has experienced wakefulness and fatigue, and no one has ever felt [...] the

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<sup>43</sup> Spinoza, *Ethics*, IIP27.

<sup>44</sup> For remarks on the unconscious efficacy of physiological elements (diet, health), see Friedrich Nietzsche, *Daybreak: Thoughts on the Prejudices of Morality*, trans. R. J. Hollingdale (Cambridge: Cambridge University Press, 1997), 39. Cf. Friedrich Nietzsche, *On the Genealogy of Morals and Ecce Homo*, trans. Walter Kaufmann and R. J. Hollingdale (New York: Vintage, 1969), 130.

<sup>45</sup> Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010), 41.

<sup>46</sup> I take this term from Levi Bryant, “Reflections on the Opacity of Affect,” *Larval Subjects*, modified May 10, 2013, accessed September 1, 2013, <<http://larvalsubjects.wordpress.com/2013/05/10/reflections-on-the-opacity-of-affect/>>. Bryant reads the opacity of affect as an argument against the primacy of experience or the legitimacy of phenomenological description. The smoker’s lived experience is, on his account, marred by stress and unhappy encounters with others. But the cause of her moods is not to be found at the level of consciousness. It must be located in the body. “Is my depression the result of a neuro-chemical process, a bad diet, a lack of nicotine, or something else besides, or is it the result of something pertaining to my existential life project at the level of experience and lived consciousness? This question can never be answered from the standpoint of *lived experience*. Lived experience tells me of all sorts of affects that inhabit my embodied life, but tells me nothing of their causes;” Levi Bryant, “A Brief Remark on the Real of the Body,” *Larval Subjects*, modified May 13, 2013, accessed September 1, 2013, <<http://larvalsubjects.wordpress.com/2013/05/13/a-brief-remark-on-the-real-of-the-body-which-is-a-synonym-for-withdrawn-objects/>>.

<sup>47</sup> To put it somewhat provocatively, we perceive only the *effects* of *affects*.

impact of omega-3 fatty acids on their body.”<sup>48</sup> The child is aware of a change in mood, a perceptual *effect*, but ignorant as to its trigger, the metabolic affect that underlies it. Fatty acids therefore set into motion a series of qualitative changes in a body that nevertheless perceives them as something else or otherwise does not notice them at all. The case is similar with nicotine. In withdrawal, the smoker does not perceive its lack; she only feels irritable, anxious. She perceives the conscious effects (a change in mood) of what is primarily a bodily affect (the anticipation and satisfaction of a chemical desire).<sup>49</sup> As such, bodies lacking the cognitive equipment necessary for consciousness can still register changes in their constitutions and capacities. This is because before they can become conscious, before they can be redeployed at the perceptual level, affects are registered first as modifications.

The architecture of a body’s affective capacities, of what it can and cannot register in its milieu of exteriority, organizes the spatial terrain of its environment.<sup>50</sup> Deleuze and Guattari proclaim, in *A Thousand Plateaus*, that “we know nothing about a body until we know what it can do, in other words, what its affects are.”<sup>51</sup> I hasten to add that we know nothing about its milieu until we know what a body can undergo, by what it can be affected.<sup>52</sup> In Chapter 1, I discussed the tripartite affective structure of the tick. Recall that its skin is photoreceptive, that it senses

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<sup>48</sup> Bryant, “A Brief Remark on the Real of the Body.”

<sup>49</sup> This may be why smokers often attribute to their habit the ability to mitigate the stress of a bad day. They are, of course, unaware (at least at the time of the experience) of the fact that the habit is itself the cause of that stress. Bryant describes his own experiences in precisely this way: “I reflected on the nicotine fits I would experience when I was quitting smoking. In these moments, I would experience the world as a threatening and aggressive place, with people attacking me and starting fights. Was my nicotine fit the result of my existential being-in-the-world? Or was it rather simply that neurotransmitters my brain had come to rely on to engage in operations were not being produced as a result of the absence of nicotine and I was therefore experiencing irritation because I couldn’t properly filter the world?” Bryant, “Reflections on the Opacity of Affect.”

<sup>50</sup> It also structures the temporal terrain, since the time scale of a given body determines what it is capable of perceiving as relevant change outside itself, but I take it that this concept has already been explicated sufficiently.

<sup>51</sup> Deleuze and Guattari, *A Thousand Plateaus*, 257.

<sup>52</sup> Take, for example, an ultrasonic frequency vibrating above the human auditory system’s perceptual threshold. While humans are capable, on average, of registering pitches of approximately 20 kHz, bats can detect frequencies of up to 100 kHz. See Rick Adams and Scott Pederson, *Ontogeny, Functional Ecology, and Evolution of Bats* (New York: Cambridge University Press, 2000), 139-140. Sound that vibrates at a frequency of 80 kHz may therefore constitute part of a bat’s environment—for the bat is capable of being affected by ultrasonic frequencies—while failing to play any kind of role in an unassisted human one.

sweat, and that it detects blood the temperature of 37 degrees Celsius. These affective capacities allow the tick to climb a tree to its highest point, guided by its sense of the sun, where it will wait until it is affected by the sensation of butyric acid. Properly affected, the tick drops onto the body emanating the corresponding odor, and burrows into its flesh in search of the crucial temperature that means blood. This triple-affective capacity structures the tick's perceptual field. It organizes its milieu. To understand this is to understand what the environment is for the tick. Take the ant (*Myrmica ruginodis*) as another example. Its visual capacities are relatively rudimentary; yet, if the necessary perceptual cues are present, the ant is, however, capable of navigating a spatial field without relying too heavily on the pheromones it uses to mark its territory. Ants rely primarily on visual cues above them, registering differences in sky and canopy and adjusting their travel trajectory accordingly.<sup>53</sup> To play a role in the ant's spatial milieu, a body or force must be able to affect the ant in a way it is capable of registering—filtered through the affective porosities of the ant's membranes.

To take a relatively superficial example, an airplane in flight over the ant is not registered because it does not make significant enough a difference to its perception of the sky. Neither does its fuel emission affect the ant's olfactory system. As a consequence, the airplane plays no real role in the ant's environment. Indeed, for all practical purposes, from the perspective of the ant, the airplane does not exist at all. One could, however, imagine—for the sake of conceptual elucidation—a difference made, as a vulgar kind of butterfly-effect, in the air pressure surrounding the airplane. This difference might trigger, as a result, a change in local weather patterns—the airplane's path perhaps pushing intensities in temperature and pressure past their

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<sup>53</sup> Marie-Claire Cammaerts, "The Visual Perception of the Ant *Myrmica Ruginodis* (Hymenoptera: Formicidae)," *Biologia* Vol. 67, Issue 6 (2012): 1165-1174. Cf. Tom Collett and Paul Graham, "The Visually Guided Routes of Ants," *Spatial Cognition, Spatial Perception: Mapping the Self and Space* (New York: Cambridge University Press, 2010), 117-151.

critical thresholds and activating the potential for a change in wind and cloud behaviour. This change might, in turn, bring about an increase in precipitation and a subsequent softening of the soil of some particular area. The newly softened soil might play, as a consequence, some role in the way a colony of ants forge a path to their destination.<sup>54</sup> The airplane, in this hypothetical example, may indeed affect the ants, influencing the way they navigate a territory, but it can do so only within the strictures of the ants' own affective architectures, their own spatial landscapes. The ants do not, therefore, register the airplane as the massive, airborne vehicle that it is (for humans capable of using and perceiving it as such); they register only a difference it might make in the texture of soil and perhaps in the concentration of other organisms in the area as a result. And in so doing, it is the ants' own affective capacities that are responsible for the organization of their external spaces. Their bodies, the affective porosity of their membranes, shape and colour their ecologies.

The idea that an organism's capacities help determine the relevant features of its environment recalls what James Gibson, in *The Ecological Approach to Visual Perception*, refers to as affordances and abilities.<sup>55</sup> Tying affordances to abilities (affects or capacities) nuances the concept by adding to the discourse of affect variations in the environment's own aptitudes. The way an organism's environment gives itself to that organism is an affordance. "The *affordances* of the environment are," in Gibson's own terms, "what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill."<sup>56</sup> This computer affords me the ability to render digitized and coherent a stream of thoughts. The floor affords me a surface on which to walk, the door a means by which to isolate myself. Affect and affordance are, however, inextricably linked. They

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<sup>54</sup> Bernhard Stadler and Anthony Dixon, "Ecology and Evolution of Aphid-Ant Interactions," *Annual Review of Ecology Evolution and Systematics* Vol. 36 (2005): 345-372.

<sup>55</sup> James J. Gibson, *The Ecological Approach to Visual Perception* (Boston: Houghton Mifflin, 1979), 127-146.

<sup>56</sup> *Ibid*, 127.



are co-defining, which “implies the complementarity of the animal and the environment.”<sup>57</sup> Word-processing is a computational affordance only for organisms capable of operating a keyboard. An airplane, as I have shown, can only offer itself as a means for transportation to organisms capable of purchasing tickets and reserving seats. These latter capacities determine the airplane’s set of affordances. An airplane affords humans a means for transportation, but only because they are, in the first place, capable of operating airplanes. It might—as in my earlier scenario—afford ants a change in soil texture. It might afford birds the potential for high-altitude collisions. Its affordances vary relative to the affective capacities of whichever organisms relate with it. Affect and affordance are like sound and auditory system. One hears only the sounds one’s ears are capable of registering. Affordances are tied to affect, in other words, the way sounds are tied to their perception.<sup>58</sup>

Beyond adding nuance to the concept of affect, an analysis of affordances further foregrounds the primarily *spatial* relation between an organism and its environment. “The surface of a pond or lake may not afford a large animal a walking medium,” to take an example from Delanda, “but it does to a small insect which can walk on it because it is not heavy enough to break through the surface tension of the water.”<sup>59</sup> For an organism like a giraffe—too large to walk on its surface and unable to swim—a sufficiently large body of water defines the boundary of a traversable space.<sup>60</sup> It is a limit. While it might require a change in navigational activity, water is not, on the other hand, a barrier to the spatial extension of an elephant’s milieu.<sup>61</sup> For sufficiently small insects, there is no reason to suppose a locomotive distinction between water and soil at all. Spatially, they are continuous. The difference between them would have to lie in

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<sup>57</sup> Ibid.

<sup>58</sup> Sound is the perception of vibration. In the absence of perception, there are no sounds, just frequencies.

<sup>59</sup> Delanda, *Intensive Science and Virtual Philosophy*, 63.

<sup>60</sup> This example is, of course, speculative. It is not intended as a serious comment on the nature of giraffes. I invoke it only to make clearer the idea that the affordances of one’s environment defines its spatial landscape.

<sup>61</sup> Elephants are sophisticated swimmers.

other affordances. And it does, for soil affords an insect different dietary possibilities, as well as different predatory threats (among a vast array of other things), than does the surface of a pond. The benefit of these concepts is the way in which they allow the circumvention of the question of the environment's actual properties, as if it were a single, consistent thing for all bodies. While a pond's depth, for example, remains constant across organisms, in terms of what that pond affords a given organism, in terms of the way that organism interacts affectively with the pond, it has no one, true nature.<sup>62</sup> Put differently, horizontality, flatness, extension, and rigidity may be physical properties of a given surface, but as an affordance of support for a species of animal, "they have to be measured *relative to the animal*."<sup>63</sup> Different organisms organize one and the same physical landscape in different ways, and it affords those organisms correspondingly different possibilities. They live different spaces.

I noted the twofold spatial significance of affective capacity: first, the distinction between what a given organism can and cannot enter into relation with; and second, the distinction made between favourable and unfavourable relations. In turning now more directly to the second, it is worth taking a brief detour through Henri Bergson's philosophy of perception. Perception, for Bergson, "is the measure of our possible action upon bodies: it results from the discarding of what has no interest for our needs, or more generally for our functions."<sup>64</sup> The universe is vast. Its complexity exceeds the prehensional capacities of any one creature. Perception must therefore act selectively, a spotlight whose glow can illuminate only a narrow fraction of the world's shadows. The body's capacities narrow an overwhelming teem of ecological possibility down to a sliver of affectively viable space. Sensation is reductive. Objects reflect only, in Bergsonian terms,

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<sup>62</sup> "[Physical properties] have unity relative to the posture and behaviour of the animal being considered. So an affordance cannot be measured as we measure in physics;" Gibson, *The Ecological Approach to Visual Perception*, 127-128.

<sup>63</sup> *Ibid*, 127.

<sup>64</sup> Henri Bergson, *Matter and Memory*, trans. N. M. Paul and W. S. Palmer (Mineola: Dover Publications, 2004), 30.

my body's possible action upon them.<sup>65</sup> They mirror the ways my body can be affected. My environment is, however, constituted not only by the ways I can be affected, but also by the force and nature of those affects. It is constituted, in other words, by the distinction between what affects me favourably and what does not, as well as the distinction between what affects me forcefully and what makes only the weakest of impressions. Objects therefore “take rank in an order corresponding to the growing or decreasing powers of my body.”<sup>66</sup>

In terms decidedly phenomenological, Bergson describes the way objects seem to grow indifferent as he recedes from them. Conversely, “the more I narrow this horizon, the more the objects which it circumscribes space themselves out distinctly according to the greater or less ease with which my body can touch and move them.”<sup>67</sup> I can grasp, for example, the handle of a mug, manipulating it usefully. As a consequence, handles appear to me inviting. They are practical. This is a function of spatial scale and the affects it allows me. Were I too small a creature to utilize a drinking mug, I would have no reason to regard such an instrument usefully. It may not appear to me illuminated by any real significance at all. Indeed, it seems ludicrous to suspect that ants might regard drinking mugs with any interest. They are incapable of using them, and the mugs mirror this lack of function.

This is, to my mind, the ecological import of Bergson's theory of perception. The affects that constitute a body determine the way it shapes its environment, not only physically (as in its environment's affordances), but also perceptually (as in the way objects appear to it). Another way to understand this claim is virtually. Perception is, on this picture, like an echolocative tool. It maps the world for us in terms of the capacities we have to utilize its constituent features. If it is hungry, the bat ignores rocks and cobwebs, searching instead for creatures upon which it might

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<sup>65</sup> Ibid, 7.

<sup>66</sup> Ibid, 6.

<sup>67</sup> Ibid.

prey. But if it is tired, the bat ignores those creatures in favour of the nooks into which it might nestle and sleep. Echolocation provides it with a selective reflection of an environment tailored to its needs and functions, its affects. Bergson himself invokes a luminous metaphor, worth quoting:

When a ray of light passes from one medium into another, it usually traverses it with a change of direction. But the respective densities of the two media may be such that, for a given angle of incidence, refraction is no longer possible. Then we have total reflexion. The luminous point gives rise to a *virtual* image which symbolizes, so to speak, the fact that the luminous rays cannot pursue their way. Perception is just a phenomenon of the same kind. [...] The objects [of perception] merely abandon something of their real action in order to manifest their virtual action—that is to say, in the main, the eventual influence of the living being upon them.<sup>68</sup>

The organism’s environment is therefore something of a virtual image, a manifestation of the way the organism interacts with the world. “[Perception] is akin to a kind of ‘searchlight’ governed by our ongoing needs that ‘carves out’ portions of ‘sensible reality’ by identifying possible relationships that might serve as footholds in a mobile, ever changing reality.”<sup>69</sup> This is because “our space is constituted,” to borrow a line from Claire Colebrook, “through the sense we make of it, the mapping of our field of orientation.”<sup>70</sup> To say, however, that an organism’s environment is configured by its affective capacities is also to say that the organism composes or synthesizes its environment in the very act of making sense of it. Adding to the language of porosity a vocabulary of sense-making makes clearer the fact that the composition of space is not a wholly passive affair. To delineate more precisely the mechanisms by which an organism actively constitutes its milieu of exteriority, I turn now to this concept of sense-making, a concept that comes from the autopoietic systems theory of Humberto Maturana and Francisco Varela.

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<sup>68</sup> Ibid, 29-30.

<sup>69</sup> Steven D. Brown and Ian Tucker, “Eff the Ineffable: Affect, Somatic Management, and Mental Health Service Users,” *The Affect Theory Reader*, eds. Melissa Gregg and Gregory J. Seigworth (Durham: Duke University Press, 2010), 235.

<sup>70</sup> Colebrook, “On the Specificity of Affect,” 195.

### III. AUTOPOIESIS

Autopoiesis is a neologism introduced in 1971 by biologists Maturana and Varela to describe the self-producing, organizational activity of living systems.<sup>71</sup> They begin with the bacterial cell as the simplest instantiation of autopoietic life. As a system, the cell produces, by way of a continuous process of chemical reaction, the components necessary to distinguish it from its domain. The cell maintains a membrane, as I have explained above, that separates it from everything it is not. More specifically, the cell maintains *its own* membrane. This is a concept essential to any autopoietic analysis. The cell is an autopoietic system insofar as (1) its membrane organizes a network of components that define the cell as a distinct entity, and (2) its components are themselves involved in the regeneration of the boundary responsible for producing them.<sup>72</sup> To speak, then, of organismic autopoiesis is to speak of the organism's capacity to produce itself, to self-organize. Organisms are, on this account, machinic unities. Adopting a vocabulary of components, input, output, structure and production, Maturana and Varela convert talk of organisms into talk of machines.<sup>73</sup> As machines, organisms are organized by means of a particular set of relations that structure their components. It is, I think, worth quoting here the canonical definition of an autopoietic machine:

The relations that define a machine as a unity, and determine the dynamics of interactions and transformations which it may undergo as such a unity, constitute the *organization* of the machine.

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<sup>71</sup> Francisco Varela, "Autopoiesis and a Biology of Intentionality" (paper presented at Autopoiesis and Perception, Dublin City University, Dublin, Ireland, August 25-26, 1992), 1. The neologism combines the Greek αὐτο- (auto), meaning "self," with ποίησις (poiesis), meaning "production" or "creation," to refer to the way living systems produce and maintain themselves over time. Cf. Humberto Maturana and Francisco Varela, Introduction to *Autopoiesis and Cognition: The Realization of the Living* (Dordrecht: D. Reidel, 1980), xvii.

<sup>72</sup> Varela, "Autopoiesis and a Biology of Intentionality," 5.

<sup>73</sup> Of the counterintuitive character of applying a machinic vocabulary to the domain of the living, they write that "the beauty of life is not a gift of its inaccessibility to our understanding;" Maturana and Varela, *Autopoiesis and Cognition*, 83. To understand the organism as a machine is not to reduce it to mechanistic principles, but rather to concretize it by means of a robust set of conceptual determinations. That life is beautiful ought not to render it any less comprehensible—and if a machinic conceptual apparatus makes less inscrutable the organic world, then so much the better for that beauty. For the purposes of the present study, however, a brief foray into their conceptual grammar will suffice.

The actual relations which hold among the components which integrate a concrete machine in a given space, constitute its *structure*.<sup>74</sup>

A machine's organization refers to the dynamic capacities of its component relations. Its structure is the set of actually instantiated component relations that define the organism as a unified body, distinct from a larger milieu with which it must relate processually if it is to survive. Taken together, organization and structure cover the productive capacities of the machine, its *poiesis*. The fact, however, that it produces itself, that it is *autopoietic*, is embodied in the way the network of processes that define the machine (its structure and organization), "through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them."<sup>75</sup> Organismic life consists therefore in activity, in the fact that it must constantly realize itself if it is to continue to persist.<sup>76</sup> But more specifically, the organism is an autopoietic machine because its organization is, as is so clear in the case of cellular life, both cause and effect of its activity as a living system.

The organism is, in autopoietic terms, operationally closed, but informationally open. The autopoietic system can, in other words, receive information from its environment (it is informationally open), but only information that is first made meaningful by the system's own capacities (it is operationally closed).<sup>77</sup> Conceiving the organism as an autopoietic machine makes clear the fact that it is actively implicated in the composition of its spatial milieu. It does not just

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<sup>74</sup> Maturana and Varela, *Autopoiesis and Cognition*, 77.

<sup>75</sup> *Ibid*, 77-78.

<sup>76</sup> This life, in Varela's own words, "amounts to self-produced coherence: the autopoietic mechanism will maintain itself as a distinct unity as long as its basic concatenation of processes is kept intact in the face of perturbations;" Varela, "Autopoiesis and a Biology of Intentionality," 5. Pushed beyond its capacities, these processes break down and the autopoietic machine comes apart. Consider, for example, the way the human body can handle only temperatures of a certain range: either too hot or too cold a climate will push it beyond its homeostatic capacity, killing it. Consequently, autopoietic activity is structured by a singular aim: to maintain itself. The organism is a "system which has its own organization [...] as the fundamental variable which it maintains constant;" Maturana and Varela, *Autopoiesis and Cognition*, 79.

<sup>77</sup> Cf. Humberto Maturana and Francisco Varela, *The Tree of Knowledge: The Biological Roots of Human Understanding* (Boston: Shambhala, 1992), 47: "The most striking feature of an autopoietic system is that it pulls itself up by its own bootstraps and becomes distinct from its environment through its own dynamics, in such a way that both things are inseparable."

happen to inhabit an environment tailored to its bodily affects. The organism *enacts* its own identity by producing itself; and in producing itself, the organism lives a space of its own. Consider, for example, the operational closure of the nervous system and its colour-perceptual implications. The nervous system communicates changes of state to the organism of which it is a part only by interacting with an environment outside it. It is structurally open to this environment. This much is obvious. But it is also operationally closed, “for in each interaction it is the nervous system’s structural state that specifies what perturbations are possible and what changes trigger them.”<sup>78</sup>

The system’s network of processes is set into motion by a perturbation from the outside (it is structurally receptive), but the referents of its activity remain internal to the system itself (it is operationally recursive). “The qualification ‘operational’ emphasizes that closure is used in its mathematical sense of recursivity, and not in the sense of closeness or isolation from interaction, which would be, of course, nonsense.”<sup>79</sup> In the perception of colour, an optical image is formed by the machinery of the eye and projected onto a thin layer of photosensitive neurons, the retina. These cells are part of the central nervous system. The visual apparatus—its photoreceptors, rods, cones, and corresponding circuitry—works by first transforming the initially optical image into chemical and electrical information, and then by transmitting those signals to the brain through the optic nerve.<sup>80</sup> If the system as a whole is, however, only structurally receptive to its environment, if the system is operationally self-referential, then the consequences are inescapable: the images we form of the world outside us do not precede the process of their formation.<sup>81</sup> The same patterns of light and reflectance “lend themselves,” in Varela’s words, “to

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<sup>78</sup> Maturana and Varela, *The Tree of Knowledge*, 169.

<sup>79</sup> Varela, “Autopoiesis and a Biology of Intentionality,” 10.

<sup>80</sup> Mark Fairchild, “Human Color Vision,” *Color Appearance Models* (Chichester: Wiley & Sons, 2005), 4.

<sup>81</sup> Although this problematic does not figure in any significant way into my discussion here, it is worth making clear that operational closure does not necessitate a solipsism. We perceive only what we are capable of perceiving, but the

a wide variety of color spaces, depending on the nervous system involved in that encounter.”<sup>82</sup> There can be no representational correspondence between the perception of colour and the physical properties of one’s environment. “Color is,” on the other hand, “a dimension that shows up only in the phylogenetic dialogue between an environment and the history of an active autonomous self which partly defines what counts as an environment.”<sup>83</sup> Patterns of light and reflectance provide an occasion for perturbation. It is to these elements that the nervous system is structurally receptive. But once it is set into motion, the system itself forms the image of a colour that in no way preceded the processes of that formation, a colour that in no way corresponds to the external patterns that initiated the process. Indeed, “it is only after all this has happened, after a mode of coupling becomes regular and repetitive, like colors in ours [...] that we observers, for ease of language, say color corresponds to or represents an aspect of the world.”<sup>84</sup>

To speak at all of visual information prior to its reception in the body is misguided, a classically mistaken cart placed in front of the horse meant to pull it. “Information,” in the words of Varela, Thompson, and Rosch, is not “a prespecified quantity, one that exists independently in the world and can act as the input to a cognitive system.”<sup>85</sup> In striving to persist, the organism maintains its identity as an autopoietic system and “*makes sense* of the world from the perspective of that identity.”<sup>86</sup> What I have called composition, configuration, and constitution, Varela calls sense-making or the production of significance. Milieu, environment, ecology, spatial affordance:

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perceptual process still involves interaction with an outside world. It is a world made meaningful to us on our own terms, but a world nevertheless external. Operational closure seems to invalidate a realist metaphysic, but structural receptivity counts just as much against a thoroughgoing idealism. We are therefore left to negotiate a path somewhere between the two. For more on this middle way, see Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge: MIT, 1991), 172.

<sup>82</sup> Varela, “Autopoiesis and a Biology of Intentionality,” 12.

<sup>83</sup> Ibid.

<sup>84</sup> Ibid.

<sup>85</sup> Varela, Thompson, and Rosch, *The Embodied Mind*, 139. Cf. Cary Wolfe, “Systems Theory: Maturana and Varela with Luhmann,” *Critical Environments: Postmodern Theory and the Pragmatics of the “Outside”* (Minneapolis: University of Minnesota, 1998), 60-61.

<sup>86</sup> Evan Thompson, *Mind in Life: Biology, Phenomenology, and the Sciences of Mind* (Cambridge: Belknap Press of Harvard University Press, 2007), 153. Emphasis mine.



all denote the distinction between an extended physical space and a field of meaning, of affective viability, of sense and significance—relative always to the organism in question.<sup>87</sup> This distinction does not, however, preexist the organism’s own activity. It is *enacted*. “Living beings,” to take another line from Thompson, “shape the world into meaningful domains of interaction and thereby bring forth their own environments of significance and valence.”<sup>88</sup>

The process of living, of striving to maintain or increase one’s powers, is the process of partitioning indifferent features of the world into zones of the favourable, sites of the harmful, and deserts of neutrality.<sup>89</sup> Sense-making, in Varela’s words, “lays a new grid over the world: a ubiquitous scale of value.”<sup>90</sup> To say that the organism lays a grid over the world is to say that what was originally a set of physical features becomes a milieu in which the attractive is distinguished from the repulsive, the valuable from the useless. Crucial is the fact that “significance and valence do not preexist ‘out there,’ but are enacted, brought forth, and constituted by living beings.”<sup>91</sup> Sense-making is a phrase intended to emphasize the activity of sensation. Living beings do not discover sense; they constitute it. Describing enaction as the

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<sup>87</sup> This is also the distinction, in Deleuze’s later collaborations with Guattari, between the plane of immanence or consistency and a particular plane of organization. The latter determination denotes the way a given body narrows the chaos of the world into an organized network, a comprehensibly meaningful environment. For more on the relation between Deleuze and Guattari’s distinction between immanence and organization and the distinction I make here between extended physical spaces and meaningful milieus, see Hanjo Berressem, “Structural Couplings: Radical Constructivism and a Deleuzian *Ecologics*,” *Deleuze/Guattari & Ecology*, ed. Bernd Herzogenrath (New York: Palgrave Macmillan, 2009), 74-75.

<sup>88</sup> Thompson, *Mind in Life*, 154. “Instead of *representing* an independent world, they *enact* a world as a domain of distinctions that is inseparable from the structure embodied by the [autopoietic] system;” Varela, Thompson, and Rosch, *The Embodied Mind*, 140.

<sup>89</sup> Daniel Dennett, *Consciousness Explained* (Boston: Little, Brown, 1991), 174: “When an entity arrives on the scene capable of behaviour that staves off, however primitively, its own dissolution and decomposition, it brings with it into the world its ‘good.’ That is to say, it creates a point of view from which the world’s events can be roughly partitioned in the favorable, the unfavorable, and the neutral. And its own innate proclivities to seek the first, shun the second, and ignore the third contribute essentially to the definition of the three classes.” Cf. Varela, “Autopoiesis and a Biology of Intentionality,” 7: “what is meaningful for an organism is precisely given by its constitution as a distributed process, with an in-dissociable link between local processes where an interaction occurs (i.e. physico-chemical forces acting on the cell), and the coordinated entity which is the autopoietic unity, giving rise to the handling of its environment.”

<sup>90</sup> Francisco Varela and Andreas Weber, “Life after Kant: Natural Purposes and the Autopoietic Foundations of Biological Individuality,” *Phenomenology and the Cognitive Sciences* Vol. 1, Issue 2 (2002): 118.

<sup>91</sup> Thompson, *Mind in Life*, 158.

laying down of a path in walking it, Varela borrows the words of Antonio Machado: “Wanderer the road is your footsteps, nothing else; you lay down a path in walking.”<sup>92</sup> The wanderer’s path does not precede the trajectory of her steps. They are co-emergent. There is a path only in the wanderer’s walking it, and whichever direction she walks becomes her path. Wandering is path-making, just as life is sense-making.

The concept of sense is threefold, and involves sensibility, signification, and orientation.<sup>93</sup> Sensibility is the openness of a body to its environment, its receptivity to environmental cues. Signification is the value given to an environmental cue relative to bodily affect. And orientation is the ability of a body to comport itself in space relative to the presence of some significant thing. Even the simplest organisms can sense a difference in the presence of an attractant (a food). They can make sense of this difference in terms of their own needs, and orient themselves in space relative to what will benefit or harm them.<sup>94</sup> The activity of this triple-movement is sense-making. It is also, at its core, the prerequisite for maintaining oneself as a living body. To say, then, that sense is enacted is to say that, prior to the autopoietic activity of a given body, a bacterium say, sucrose is neither attractive nor repulsive. It is neither good nor bad, valuable nor useless. It is in its relation with the bacterium—a body with respect to which sucrose is nutritious—that the sucrose molecule takes on meaning as food. “Sucrose,” writes Thompson, “has significance or value as food, but only in the milieu that the organism itself brings into existence.”<sup>95</sup> This milieu is enacted autopoietically, for it is only in striving continuously to reproduce its identity that the

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<sup>92</sup> Ibid, 13.

<sup>93</sup> Thompson, “Living Ways of Sense Making,” 119.

<sup>94</sup> Protevi, *Political Affect*, 16-17.

<sup>95</sup> Ibid, 158. Cf. Evan Thompson, “Living Ways of Sense Making,” *Philosophy Today SPEG Supplement* 2011: 119.

organism interacts meaningfully with otherwise indifferent features of its environment.<sup>96</sup> It does so because it must do so, if it is to survive.<sup>97</sup> Living, in Varela’s famous formula, is sense-making.<sup>98</sup>

The organism lives its own space, just as it pulses to its own temporal rhythm: the *here* and *now* of organismic subjectivity.<sup>99</sup> Organismic spatiality therefore designates the spaces with which we interact as organisms, the fields across which our ecologies are distributed. It also designates the spatial dimension of subjectivity, a dimension that emerges out of the organism’s membrane(s), its affective capacities, and its autopoietic self-production—the processual activities of which serve as the conditions for the possibility of organismic space, a kind of Genetico-Transcendental Aesthetic.<sup>100</sup>

#### IV. CONCLUSION

This chapter began with an analysis of the membrane. It delineated the nature of the distinction between interiority and exteriority, the first moment of organismic spatiality. In the emergence of its membrane(s), an organism comes to be distinguished from its environment. In the same movement, the organism comes to have an environment with which it is placed into relation. The second section introduced the concept of affect, focusing on the affectivity of the membrane, its selective porosity. I described the relation between interior and exterior, between

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<sup>96</sup> “There is no food significance in sucrose except when a bacteria swims up-gradient and its metabolism uses the molecule in a way that allows its identity to continue;” Varela, “Autopoiesis and a Biology of Intentionality,” 7. There are Spinozist resonances here. It is a body’s endeavour or striving to persist in structure or being that Spinoza calls “conatus.” He writes that “the striving by which each thing strives to persevere in its being is nothing but the actual essence of the thing;” Spinoza, *Ethics*, IIP7. Read autopoietically, conative strife necessarily involves a corresponding configuration of a milieu of exteriority.

<sup>97</sup> “What the autopoietic system does—due to its very mode of identity—is to constantly confront the encounters (perturbations, shocks, coupling) with its environment and treat them from a perspective which is not intrinsic to the encounters themselves;” *ibid.*

<sup>98</sup> Varela and Weber, “Life after Kant.”

<sup>99</sup> To speak of the spatial subjectivity of the organism is to speak of the way it embodies its own spatial perspective on the world. There is, in this sense, a synthesis of space in the organism, just as there is a synthesis of time. Together, these concepts constitute an onto-biological account of organismic spatiotemporality.

<sup>100</sup> I set this phrase against Kant’s well-known Transcendental Aesthetic. For a more comprehensive distinction between the genetic foundation of spatiotemporality in organismic activity (especially metabolism) and Kant’s Transcendental Aesthetic, see John Protevi, “Mind in Life, Mind in Process,” *Life, War, Earth: Deleuze and the Sciences* (Minneapolis: University of Minnesota Press, 2013), 179-196.

organism and environment, as an affective interaction. As an apparatus of affectivity, the organism's membrane determines the ways by which it can relate to its environment. In shaping the interaction between organism and ecology, the organism's affective capacities configure the space of its exterior milieu. Turning to the concept of affordance, I stressed the way the environment plays a dynamic role in its organization. Bringing affect and affordance into conversation with Bergson's philosophy of perception, I discussed the way the particularity of the organism's body allows it to form a perceptual image of its environment. It is here that the way the organism lives its own space began to take shape. Moving to autopoietic systems theory in the third and final section, I conceived the organism as an emphatically active factor in the configuration of its environment. In making sense of, in composing, its environment, the organism defines the *here* of its subjectivity.<sup>101</sup> But the subject does not for this reason precede its environment. The organismic subject arises genetically; its temporal continuity is developmental. It does not unfold its world out of itself as if from nowhere. The subject is therefore no more (and no less) a transcendental condition of its environment than an effect of the environment's own conditioning. The next chapter brings this project to conclusion by situating the organismic subject in its world, the environment that shapes the subject just as it is in turn shaped by it.

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<sup>101</sup> It is in its embodiment of a perspective on space as well as time that I conceive the organism as subjective. It is a spatiotemporal subject.

## CHAPTER 3: GENESIS

*The organism unfolds into its ecology, but its ecology enfolds back into the organism; the organism is outside itself shaping its world, and its world is inside the organism shaping its body.*<sup>1</sup>

This chapter's task is to situate the organismic subject in a dynamic ecology, the environment in which it develops and out of which it emerges. While the subject does—as has been the aim of Chapters 1 and 2 to demonstrate—generate its own spatiotemporal environment, it does not for this reason precede it. In discussing subjective time and space, I have taken care not to let the echoes of a Kantian Aesthetic drown out the immanentist tone of these concepts.<sup>2</sup> And while Chapter 2's analysis of Gibsonian affordances relieved the organismic subject of some of its transcendental agency, there still remains work to be done. It is, as I have shown, the double-movement of affect and affordance that codetermines the structure of the organism's environment. To this extent, the environment plays as much a role as does the subject in the structure of the organism's milieu. But in order to think the process of this codetermination dynamically, in order to articulate the development of organismic subjectivity out of, within, and against its environment, the introduction of a Deleuzian distinction between the virtual and actual is now necessary. This chapter offers a means by which to think the affect-affordance relation as a ground for the entangled geneses of organismic subjects and their subjective environments.<sup>3</sup> The chapter begins, accordingly, by developing the distinction between actuality and virtuality as it emerges out of Deleuze's *Difference and Repetition*. In Deleuzian terms, affects

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<sup>1</sup> Adam Robbert, "Earth Aesthetics: Knowledge and Media Ecologies," *Knowledge Ecology*, modified July 14, 2013, accessed September 9, 2013, <<http://knowledgeecology.files.wordpress.com/2013/07/earth-aesthetics-8.pdf>>

<sup>2</sup> I take it that a subjectivity that produces space and time for itself might seem to the inattentive reader transcendently ideal. But informed as this work is by an empirically materialist ethic, it is, I think, worth making a point of the distinction between my theory of the relation between subject and world, and Kant's own. Accordingly, I intend for the term "immanentist" to stand against the transcendentalism of subjective idealism. The paragraphs that follow should make clearer the force of this distinction.

<sup>3</sup> To be clear, Chapter 2 offers an analysis of how this relation plays a role in the configuration of the organism's environment. But it does not establish the developmental grounds of that relation. That is my task here.

and affordances together comprise a virtual differential meshwork of dynamically linked rates of change, capacities, and tendencies that are actualized in terms of individual instances of organismic behaviour, environmental configuration, and coevolution. Armed with these conceptual tools, I turn, in the chapter's second section, toward a genetic analysis of the dynamic reciprocity between organismic abilities and the recursive configuration of their subjective worlds. I conclude the chapter by complicating the orthodox biological vision (and concomitant philosophy of subjectivity) whose methodology works to separate the organism from its environment, fitting the former into the latter as if to contain without contaminating it. In thinking what I call the enfoldment and enmeshment of the two terms together, I turn to dialectical and developmental biological analyses, drawing from them implications for thinking the dynamic entanglement of subject and world such that the distinction between the two ultimately breaks down almost completely. If the preceding chapters have located the genesis of the environment in the subject, then it is the task of this chapter to think the genesis, development, and entanglement of the two terms together.

## **I. DIFFERENCE DOUBLED**

In the face of what has grown rapidly into a veritable industry of interpretive scholarship, Deleuze's concept of virtuality remains ambiguous. By no means do I intend to explain away its difficulty here. Instead, my aim is to develop the concept at a length sufficient (and in a style appropriate) for the purposes of this study: to think dynamically the relations between organismic affect and environmental affordance. It will, therefore, be through the lens of this concern that this section undertakes an excursion into Deleuze's metaphysics. The structure of his system is tripartite: the virtual is actualized through processes of intensive individuation. The actual is what we commonly take to be the real, the local, the individual and extended. Deleuze invokes a second ontological register in order to account, at least for the purposes of this project, for the

status of the capacities, abilities, and tendencies harboured by actual individuals (and systems), independently of (or prior to) their manifestation or exercise.<sup>4</sup> This is the virtual. The intensive is the reciprocal, open-ended process by which what Deleuze calls virtual “Ideas” modify and become actual events.

It is easiest to begin by setting the virtual against what it is not. It is a realm of Ideas, but it is not a Platonism. It precedes the actual, at least in concept, but does not resemble or prefigure it. The virtual is not the possible. Neither is it appropriate to speak straightforwardly of the virtual as potential. “Exactly what Proust said of states of resonance must be said of the virtual: ‘Real without being actual, ideal without being abstract’.”<sup>5</sup> The virtual is real without being actual the way a wooden desk’s capacities to burn, splinter, expand, or crack are real without being actual. Before it is set aflame, the desk’s capacity to burn exists, but in unexercised form. Borrowing a terminological distinction from *The Logic of Sense*, the desk’s capacities are better described not as *existing*, but *insisting*.<sup>6</sup> They are not currently actual, but in different conditions, they tend toward actualization; they insist.<sup>7</sup> Capacities exist as if on a spectrum of insistence: submerged in water, the desk’s capacity to catch fire is especially far from becoming actual. Its capacities to expand, warp, and eventually decay are, on the other hand, a lot nearer actualization.<sup>8</sup> The virtual is not, therefore, a simple inverse of the actual: one reaches the level of

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<sup>4</sup> To be sure, Deleuze appeals to the virtual for an array of reasons, toward an array of purposes. It is a robustly pluripotent concept, and this is part of its difficulty. I leave much of its metaphysical utility to one side. For my purposes here, I am content to speak of the virtual primarily in terms of a system’s unactualized capacities and the differential relations that structure it.

<sup>5</sup> Deleuze, *Difference and Repetition*, 208.

<sup>6</sup> Deleuze, *The Logic of Sense*, 81. Cf. John Protevi, “Adding Deleuze to the Mix,” *Life, War, Earth: Deleuze and the Sciences* (Minneapolis: University of Minnesota Press, 2013), 148.

<sup>7</sup> Under cold, dry conditions (and depending on its constitution), the desk is likely to crack. Soaked in gasoline, the desk’s capacity to burn is especially ripe. And so too for each of its other abilities: their tendencies to exist, their insistences, vary relative to a variety of other factors.

<sup>8</sup> This example should be qualified: the virtual is also pre-individual; it is not made of the already individuated capacities of specific bodies, it precedes them. Pre-individuality will be explained in the paragraphs that follow.

virtuality neither by depriving the actual of its reality, nor by subtracting from it its concrete existence.

While it may initially seem intuitive to speak of virtuality as possibility, doing so effaces both the degree to which capacities can insist into actual existence as well as the fact that, prior to the advent of their actualizations, virtual capacities do not resemble their concrete manifestations, unlike possibilities. To sharpen this point, it is worth looking to Henri Bergson's critique of the possible, a critique that plays no small role in Deleuze's own conception of virtuality.<sup>9</sup> "The possible," writes Bergson, "is only the real with the addition of an act of the mind that throws its image back into the past once it has been exacted."<sup>10</sup> In order to arrive at the possible, we start, in other words, with the real, with what already exists. We subtract from it its existence, project its image backward and proclaim that it existed first as a possibility subsequently "realized" in the real. The process of this realization is subject, however, to the rule of resemblance.<sup>11</sup> The real is supposed to resemble the possible, to be actualized in its image.<sup>12</sup> But, to borrow a line from Daniel Smith, "if the real is supposed to resemble the possible, is it not because we have retrospectively or retroactively 'projected' a fictitious image of the real back into the possible?"<sup>13</sup> Exactly so. It is not the real that resembles the possible, but precisely the opposite: the possible is formed in the image of what already exists. It is a purely negative concept, a negation of the actuality that it is supposed to found. The virtual is, however, both real as well as

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<sup>9</sup> Virtuality was used already in Chapter 2, in my discussion of Bergson's concept of perception. There, the virtual referred to that which is real but only inasmuch as it pertains to the way a particular body refracts the world. Bergson does, however, employ the term in a wider sense. It is this wider sense that Deleuze takes as his own. There are also resonances between Bergson's critique of the possible as a false problem and Deleuze's inversion of the Platonic Idea. Far from essences, Ideas, for Deleuze, are problems—albeit positive, productive ones.

<sup>10</sup> Henri Bergson, *The Creative Mind: An Introduction to Metaphysics*, trans. Mabelle L. Andison (Totowa: Littlefield, Adams, 1975), 118.

<sup>11</sup> Daniel W. Smith, "Deleuze's Concept of the Virtual and the Critique of the Possible," *The Journal of the Society for Philosophy and Literary Studies of Nepal: A Cross-Disciplinary Inquiry*, Vol. 4, Issue 9 (2009): 36.

<sup>12</sup> The means by which a possibility is realized is, however, thoroughly ambiguous: as Deleuze puts it, "a brute eruption, a pure act or leap that always occurs behind our backs;" Deleuze, *Difference and Repetition*, 211.

<sup>13</sup> Smith, "Deleuze's Concept of the Virtual and the Critique of the Possible," 26.



non-actual. And it is for this reason that the language of possibility is not adequate to the task of accounting for capacities, tendencies, and relations that are not actual, that do not resemble the actual, and that are furthermore differentiated from each other as well as from their actualizations.

If it does not suffice to speak of the virtual in terms of possibility, then it is equally misguided to attribute to it the status of potential.<sup>14</sup> This is because potentiality is defined either by its telos, the purpose or end to which it is always oriented, or else by an identity to its actual exercise (as is the case with possibility). “We speak of perceiving in two ways,” writes Aristotle, “for we say that something sees or hears both in the case of something that has the potentiality for seeing or hearing, even though it is asleep at the time, and in the case of something that is actually seeing or hearing at the time.”<sup>15</sup> This is, then, the identitarian distinction between potential and actual: the closed eye sees potentially, the open one, actually.<sup>16</sup> Potentiality therefore refers, in the first sense, to the horizon of identity a dormant capacity shares with its actual manifestation. While the difference between possible and actual is one of existence, understood in this way, potential differs from actual only in terms of employment, application, or exercise. And yet, “Deleuze never tires of reminding us,” to take a line from Protevi, that the virtual “does not resemble its actualization; there is nothing identical in its being—it is fully differential.”<sup>17</sup> But, afforded a differential definition, potentiality falls prey instead to the snare of teleology. Taking as a model the way we speak of knowledge, Aristotle distinguishes two ways by

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<sup>14</sup> I take it that potentiality canonically refers to Aristotle’s conception of the term. To say, then, that it is misguided to speak of the virtual as the potential is to say that Deleuze’s virtual is decidedly non-Aristotelian. It is therefore Aristotle to whom I will look in setting the virtual against the potential.

<sup>15</sup> Aristotle, “De Anima,” 2. 5. 417a10-13, *Selections*, trans. Terence Irwin and Gail Fine (Indianapolis: Hackett Company, 1995), 188.

<sup>16</sup> I take the term “identitarian” from Protevi. He holds that Deleuze’s metaphysics aims to develop a philosophy of difference “that counters many forms of what we might call ‘identitarian’ philosophy [...] in which identities are metaphysically primary and differences are seen within a horizon of identity;” John Protevi, “Introduction I,” *Life, War, Earth: Deleuze and the Sciences* (Minneapolis: University of Minnesota Press, 2013), 4

<sup>17</sup> Protevi, “Adding Deleuze to the Mix,” 143.

which potentiality is actualized. We say, in one sense, that “a man knows because man is a kind of thing that knows and has knowledge;” and, in another, that a man “who has grammatical knowledge knows.”<sup>18</sup> To know the rules of grammar is to harbour an identitarian potential for knowledge; it is to already have the knowledge that demonstration or explanation actualizes. “But in the first case, we [pass from potential to actual knowledge] by being altered through learning, and by frequent changes from the contrary state.”<sup>19</sup> This is potentiality freed from the strictures of resemblance, for “alteration” and “frequent change” denote a difference between the potential for knowledge and its actual products. But this difference comes at the expense of an invocation of teleology: we are, no doubt, altered in the process of learning, but this is an end-directed change; it is guided, and its aim is present already before learning occurs. If the subject has, in other words, the potential to know before learning, this is because the acquisition of knowledge “is a change into possession of a state and into the fulfillment of the subject’s nature.”<sup>20</sup> This state is not prefigured before its actualization (as in identitarian potentiality), but the potential for its possession is nevertheless oriented toward it. This conception of potentiality is one of what I call *monotonous disposition*, for it conceives potential as state-specific.<sup>21</sup> The potential for a state—say, for having read Nietzsche’s *Thus Spoke Zarathustra*—is, on this account, the specific capacity to attain that state, a capacity structured by a singular disposition toward it. But this is emphatically not the case for Deleuze’s virtual. The virtual is neither identitarian, nor teleological. It is not structured in terms of resemblances or *monotonous dispositions*.

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<sup>18</sup> Aristotle, “De Anima,” 2. 5. 417a23-24, 189 and 25-26, respectively.

<sup>19</sup> Ibid, 417a31-32, 189.

<sup>20</sup> Ibid, 417b16-17, 189.

<sup>21</sup> I use the term “monotonous” not to denote a lack of interest or excitement, but in its etymological sense: from the Greek *monotonos*, “of a single tone or sound;” Douglas Harper, “Monotonous,” *Online Etymology Dictionary*, modified 2013, accessed December 3, 2013, <<http://www.etymonline.com/index.php?term=monotonous>>. To say that my capacity to operate a computer (or, in Aristotle’s terms, my potential to possess the state of operating it) is a *monotonous disposition* is to say that it is oriented solely toward the state of operating the computer—and not, for instance, toward a more general technological proficiency. Indeed, the capacity is defined in terms of that telos.

The virtual is, now speaking positively, a differential field whose dispositions vary relative to the specific conditions under which actualizations take place. As such, the virtual counterpart of the state-specific potential to read *Zarathustra* is a differential set of relations between capacities—say, between literacy of a sufficient degree, access to the necessary resources, free time, literary interest, and so on—that together constitute a “problematic field” the resolution or actualization of which may be, in certain conditions, a person’s having read the book.<sup>22</sup> But this field neither prefigures that state, nor does it tend monotonously toward it. To take this example seriously, consider Jonathon Dayton and Valerie Faris’ *Little Miss Sunshine* (2006). Dwayne Hoover, one of the film’s central characters and a classically miserable teenager defined by his existential malaise, is in one scene shown with a copy of Nietzsche’s *Thus Spoke Zarathustra*. Dwayne seems sufficiently literate, he spends a lot of time alone, and he longs for a life of value. This particular conjunction of factors and circumstances makes likely a turn to Nietzsche. But if he finds *Zarathustra*’s prose difficult, if Nietzsche’s aphorisms do not open up before him, he might just as well turn instead to Camus. He might opt for the catharsis of music or painting. He might resolve his restlessness in the pursuit of a love interest. It is clear, in other words, that if Dwayne does decide to take up the task of reading Nietzsche’s epic, it will not be because he harboured from the beginning a potential to attain the state of having read it, whether that potential is understood as an unactualized possibility, a dormant capacity, or a monotonous disposition. Conversely, if Dwayne reads the book, it will be because his literacy, his malaise, his aspiration, and his free time (among various other factors and conditions) together constitute a “problematic

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<sup>22</sup> I place the phrase “problematic field” in quotations to mark it for elucidation in the paragraphs that follow. It is a key component of Deleuze’s concept of the virtual. Virtuality is “problematic” in the sense that it admits of multiple “solutions.” While virtual fields make certain actualizations more or less likely (certain dispositions *insist* more than others), there is nevertheless always a creative gap between problem and solution. See Protevi, “Adding Deleuze to the Mix,” 144.

field” resolved by the actual act of reading *Zarathustra*.<sup>23</sup> No one condition either resembles, prefigures, or tends monotonously toward the state of having read Nietzsche. Further, no condition is on its own sufficient to account for the manifestation of that state. Neither, however, does the conjunction of all of them result inevitably in the state of having read the book.<sup>24</sup> It is for this reason that, beyond a differential and ateleological structure, the virtual is also defined as a *problem*.<sup>25</sup>

The virtual is Ideal; it is the realm of Ideas, and “problems are Ideas themselves.”<sup>26</sup> If it makes sense to speak of the problematic nature of virtuality, it is because the advent of an actualization is best understood as the creativity of a resolution or response. But problems do not for this reason preexist their solutions; they are immanent to each other. Indeed, “a problem is determined at the same time as it is solved.”<sup>27</sup> This is the key to virtuality: problem and solution co-emerge in a single movement, but “the two elements differ in kind, the determination

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<sup>23</sup> For an application of these concepts to a nonhuman example, see Levi Bryant, “On Problems, Multiplicities, Regimes of Attraction, and Ethics,” *Larval Subjects*, modified May 19, 2012, accessed December 3, 2013, <<http://larvalsubjects.wordpress.com/2012/05/19/on-problems-multiplicities-regimes-of-attraction-and-ethics/>>. Bryant writes that the problematic field resolved by the growth of a wine grape “consists not only of the seed and its genes, but also the amount of rainfall that growing season, other plants that grow in that region, insects, microbes, worms and other wildlife in the region, the pesticides and fertilizers used, the nutrients in the soil, the amount of sunlight that the growing grapes receive, various gases and pollutants in the atmosphere, etc. The *assemblage* of all these actants is the problem [...], and the characteristics that the grape comes to embody will be the solution.” I cite this example in emphasis of the fact that human development represents only one (narrow) instance of actualization.

<sup>24</sup> Indeed, “problems have an immanent organization of their own irreducible to any particular case of solution;” Levi Bryant, *Difference and Givenness: Deleuze’s Transcendental Empiricism and the Ontology of Immanence* (Evanston: Northwestern University Press, 2008), 167. In other words, the structure of a given problem (the relation among its elements) does not entail any one actualization. “In this respect, all solutions are absolutely creative insofar as they represent novel actualization of the problematic field;” *ibid*.

<sup>25</sup> More accurately, the virtual is defined as a *set* or *series* of problems, the realm of all problematic fields.

<sup>26</sup> Deleuze, *Difference and Repetition*, 162. The full line reads: “Not only is sense ideal, but problems are Ideas themselves.” Cf. *ibid*, 168. Deleuze’s use of the term “Idea” recalls Plato, for whom Ideas are transcendent essences. It goes without saying that Deleuze’s conception of the Idea as a problematic field immanent to its actualizations could not be further from the Platonic sense of the term. This is, of course, no accident. Deleuze seeks to think concrete particulars genetically, not as instantiations of immutable essences (Platonic Ideas), but as creative resolutions to a differential web of dynamic relations (virtual Ideas) whose structures are determined in the same movement as they are resolved. Thus, Deleuze’s declaration that the task of modern philosophy is to overturn Platonism comes as no surprise. “That this overturning should conserve many Platonic characteristics is not only inevitable but desirable;” *ibid*, 59.

<sup>27</sup> *Ibid*, 163.

amounting to the genesis of the concomitant solution.”<sup>28</sup> Put differently, processes of actualization structure the problematic fields they resolve. Consider again Dwayne’s interest in Nietzsche. The process of reading *Zarathustra* determines the elements whose relations comprise the problem at hand: literacy, existential unrest, free time, philosophical ability, and so on. When literacy or the process of learning to read is itself the solution, then the problem it resolves is structured in terms of cognitive condition, perceptual ability, access to educational resources, patience, and so on. Problems are therefore nested, fitted one inside the other, together constituting an expansive virtual terrain.<sup>29</sup> The borders between one problem or Idea and another blur, fading into what Deleuze calls “zones of shadow.”<sup>30</sup> Obscurity (or shadow) marks Ideal distinction precisely to the extent that one and the same solution can come in response to two widely divergent problematic fields, while one and the same problematic field can resolve itself in two widely divergent solutions.<sup>31</sup> Ideas are therefore interwoven one with the other.<sup>32</sup> Just as literacy is both an element in the problematic field resolved by the process of reading *Zarathustra* and the resolution of a problem of its own, so too do the elements of that field come as resolutions to still more distant problems. And it is the process of learning to read that assembles a web of relations linking cognitive capacity to an access to educational materials, a familiarity with language, and so on. Thus, Deleuze’s claim that the problem is simultaneously determined by, while serving as the genetic condition for, its solution. Dwayne cannot read Nietzsche without setting a network of elements into relation with each other and thereby constructing a problematic field. The process

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<sup>28</sup> Ibid.

<sup>29</sup> “Ideas are varieties which include in themselves sub-varieties;” *ibid*, 187.

<sup>30</sup> Ibid.

<sup>31</sup> One might read *Zarathustra* because it is required for class credit, resolving a problematic field of courses, syllabi, assignments, schedules and so on in the act of reading the book. Conversely, one might resolve that same problematic field by turning instead to an online summary of the book’s themes, effectively passing the course without reading the book.

<sup>32</sup> Deleuze’s word for this relation among Ideas is “perplication;” Deleuze, *Difference and Repetition*, 187.

of reading the book is therefore made possible on the basis of a problematic field constructed in the very process of resolving it.

Ideas are structured in terms not only of a relation of elements, but also by a specification of singularities internal to each. In the dramatic diction of *The Logic of Sense*, “singularities are turning points and points of inflection; bottlenecks, knots, foyers, and centers; points of fusion and condensation, and boiling; points of tears and joy, sickness and health, hope and anxiety, ‘sensitive’ points.”<sup>33</sup> Singularities are thresholds. Every particular board of wood will, for example, crack under a certain amount of weight. This “sensitive point” or threshold is specific to the board in question. Different people can tolerate different intensities of pain before flinching, different intensities of melancholy before crying, different volumes of toxic material before falling ill. These singularity thresholds emerge out of relations with other elements, as in the case of the threshold between my sickness and health, a sensitive point crossed only in contact with bodies outside of me. And they can change, “as in the case of land that is over-farmed by one crop, becoming barren for that crop or taking on capacities to support other crops.”<sup>34</sup> The elements of a given problem therefore already contain their own singularities or points of sensitivity and alteration, but it is the solution at hand that specifies their relevance.<sup>35</sup> Each of a problem’s elements must surpass a threshold specific to it in order to make possible its resolution: Dwayne’s literacy, ambition, and philosophical capability must reach singularities internal to each if he is to succeed in reading Nietzsche. If he is, for example, lacking in ambition, the foreboding prose may push him in the direction of an easier writer. If his literacy does not meet a certain threshold, he may abandon his aspirations entirely, opting instead for a less demanding interest.

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<sup>33</sup> Deleuze, *The Logic of Sense*, 63.

<sup>34</sup> Levi Bryant, “What are Singularities?” *Larval Subjects*, modified June 14, 2012, accessed December 3, 2013, <<http://larvalsubjects.wordpress.com/2012/06/14/what-are-singularities/>>. “Previous singularities appear, others disappear, and often the entity is destroyed altogether as a result of operations that were too much for it;” *ibid.*

<sup>35</sup> “In this manner the distinction of singularities belongs entirely to the conditions of the problem, while their specification already refers to solutions constructed under these conditions;” Deleuze, *Difference and Repetition*, 163.

“The Idea is thus defined as a structure [...] of multiple, non-localisable connections between differential elements which is incarnated in real relations and actual terms.”<sup>36</sup> This is difference doubled: the Ideal structure is itself thoroughly *differentiated*, a field of relations between different elements; and this structure is *differenciata* in its incarnation in actual terms.<sup>37</sup> Take, for example, the difference between education system and prison complex, two incarnations of what Protevi calls the “Disciplinary Idea.”<sup>38</sup> There is nothing prisonlike in the Idea. Nor is there anything in it resembling a school. Instead, the Idea “contains only the relations and singularities into which a human population to be controlled is put”: “corporeal distance, succession of exercises, precision of movement, degree of obedience to command, and so on.”<sup>39</sup> The prison actualizes these elements in terms of a high degree of control, intolerance for defiance, a systematically regimented schedule, the restriction of bodies to cells or small rooms, and so on. A school actualizes the same elements to a lower degree of intensity of control: bodies are still restricted to specific spaces, movement is still regulated, obedience is still expected, but defiance is met with a difference in grade or a note home, not solitary confinement or corporeal punishment (or so one hopes).<sup>40</sup>

The intensive processes by which the Idea comes to be embodied in an actual structure refer to changes in the singularities at play in each element of the problem. If teachers began handcuffing students to their desks during class time, what was first a school would rapidly fade

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<sup>36</sup> Ibid, 183.

<sup>37</sup> “We call the determination of the virtual content of an Idea *differentiation*; we call the actualization of that virtuality into [...] distinguished parts *differenciata*,” *ibid*, 207. Incidentally, it is secondary difference, or *differenciata*, that entails the pre-individuality of the virtual: virtual difference differs from actual incarnation, so the elements of a problematic field differ from their individuation in actual terms and are therefore pre-individual—or, what amounts to the same, impersonal.

<sup>38</sup> Protevi, “Introduction I,” 10.

<sup>39</sup> Ibid. Cf. Smith, “Deleuze’s Concept of the Virtual and the Critique of the Possible,” 40.

<sup>40</sup> In a disturbing demonstration of the shadowy border between prison complex and education system, some Canadian primary schools have begun to isolate defiant students, confining them to small, dark rooms for extended periods of time. See “Should Isolations Rooms be banned in B.C. Schools?” *CBC News*, British Columbia, November 21, 2013, accessed December 3, 2013, <<http://www.cbc.ca/news/canada/british-columbia/should-isolation-rooms-be-banned-in-b-c-schools-1.2434512>>.

into something closer to a prison. This change represents an intensification in degree of control, a shift in the singularity of one element of the problem (assuming, of course, a threshold between vocal suggestion and physical restraint corresponding, at least in part, to the difference between school and prison).<sup>41</sup> This is not, however, to suggest that Ideal structures are static: their elements are dynamic, the relations between one and another constantly shifting. This is precisely what it means to say that problems are not given ready-made, that Ideas are not essences, and that, on the contrary, every problematic field is constructed on the basis of the solution that resolves it. A proliferation of less tolerant teachers represents a change in a school's restriction of the movement of its students just as it embodies a shift in the intensity of an element of its Idea.<sup>42</sup> And just as every Idea corresponds to a problem that resolves it, every actual structure individuates the elements of a virtual problem "as though the [actual] had one part of itself in the virtual into which it plunged."<sup>43</sup> Armed with this conceptual distinction, the next section turns back toward the main thread of the thesis.

## II. RELATIONALITY

Chapter 2 introduced Gibson's theory of affordances in order to grant the environment its own agency in the configuration of the subject's world. I argued there that underneath the structure of organismic subjectivity exists a relation between bodily affect and environmental affordance. While this analysis sufficed for a discussion of spatiality, in order to round out the theory of organismic subjectivity the question of development must be brought to bear on the affect-affordance relation. Recall that affordances are defined by a relation between the features

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<sup>41</sup> There are, of course, more complicated examples of intensive processes of individuation, but the model is the same: the degrees of intensity in the elements of an Idea, as well as the linked rates of change between them (in dynamic systems), cross thresholds determining the individuated structure of their actualizations. For more sophisticated, dynamic models, see Delanda, "Intensive Science and Virtual Philosophy," 82-116, as well as Esra Atamer, "Dissipative Individuation," *Parthesia*, Issue 12 (2011): 57-70.

<sup>42</sup> Deleuze calls this kind of embodiment "vice-diction" to indicate the way processes of actualization effect or impact the virtual problems they resolve. See Deleuze, *Difference and Repetition*, 189-191.

<sup>43</sup> Deleuze, *Difference and Repetition*, 209.



of a given environment and the capacities of a present animal. Climbability is, in the famous example, only an affordance of staircases for animals able to climb them.<sup>44</sup> Abilities, too, are defined by this sort of relation: in the absence of an affordance of climbability, no animal can climb. So the structure of organismic subjectivity, the relation between organism and environment, emerges out of a set of affect-affordance relations, each term of which is itself also a relation between organism and environment. Further, in order to foreground the dynamism of these relations, in order to think them developmentally, it is necessary to posit both their causal interaction over time as well as their causal dependency on, or entanglement with, one another.<sup>45</sup> This dynamism comes in two temporal iterations: developmental and behavioural. “Over developmental time, an animal’s sensorimotor abilities select its niche—the animal will become selectively sensitive to information relevant to the things it is able to do.”<sup>46</sup> And on a behavioural time scale, “the animal’s sensorimotor abilities manifest themselves in embodied action that causes changes in the layout of available affordances.”<sup>47</sup> Most significant is, however, the processually reciprocal nature of this relationship: the way changes in a layout of affordances imply correlative changes in the way capacities are actualized.<sup>48</sup> But this is nowhere near as straightforward as its proponents suggest, for, as Protevi indicates, “only the act of climbing a tree, not the unactualized ability to climb, can knock some bark off the tree or strain a muscle.”<sup>49</sup>

The task, then, is first to understand both affects and affordances as relations without rendering

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<sup>44</sup> See, for one among many examples, Poala Cesari, F. Formenti, and P. Olivato, “A Common Perceptual Parameter for Stair Climbing for Children, Young and Old Adults,” *Human Movement Science*, Vol. 22, Issue 1 (2003): 111-124.

<sup>45</sup> Anthony Chemero, *Radical Embodied Cognitive Science* (Cambridge: MIT Press, 2009), 151. Cf. Protevi, “Adding Deleuze to the Mix,” 150.

<sup>46</sup> Chemero, *Radical Embodied Cognitive Science*, 150-151.

<sup>47</sup> *Ibid.*, 151.

<sup>48</sup> *Ibid.*

<sup>49</sup> Protevi, “Adding Deleuze to the Mix,” 151. The implication is that if abilities are as relational as are affordances, then the claim that changes in one imply changes in another does not so easily follow. Only actual activities can affect actual features of the environment. It is unclear how the unexercised capacity to act can be causally affected by a change in the layout of unactualized affordances, a position implied by the claim that abilities and affordances are causally related. This position’s primary proponent is Anthony Chemero (2009).

incoherent the claim that they causally interact over time; and, second, to trace the implications of this dynamic reciprocity for the genesis of organismic subjectivity.

As my invocation of actualization suggests, the problem of relational causality is to be resolved by way of the metaphysical resources developed above. First, abilities (or potential affects) ought to be conceived virtually. This resolves several puzzles in the cognitive-science literature: it relieves the tension Anthony Chemero sees between conceiving abilities, on the one hand, as “effectivities” (or potentialities) and, on the other, as possibles prefigured prior to actualization without recourse to Chemero’s own concept of function.<sup>50</sup> Abilities are inappropriately understood as possibilities precisely because they emerge out of a relation between animal and environment and are manifested only under specific conditions. In the absence of water, no animal can swim. Even in an encounter with water, being able to do so is a skill, one developed in certain circumstances and beholden to a set of conditions.<sup>51</sup> Bergson’s criticism is relevant here: to claim of a professional swimmer that her skill was possible before actual is to project the actuality of her ability backward, deprive it of reality, efface the process of its actualization, and conclude that it existed first as possibility. Abilities are not possibilities. Neither, however, are they effectivities (or potentialities), because abilities are not inevitably predisposed.<sup>52</sup> Effectivities, however, “when coupled with the right enabling conditions, [...] are guaranteed to become manifest.”<sup>53</sup> Chemero is right to dismiss this conception on the basis that abilities are not so straightforwardly actualized, even under the necessary conditions. “Having

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<sup>50</sup> Chemero, *Radical Embodied Cognitive Science*, 145. Chemero will serve as the main cognitive-scientific source for this chapter, since his is an embodied theory capable of accounting for development, and therefore provides resources necessary for the task at hand.

<sup>51</sup> In such cases that an animal knows how to swim as if by instinct, the relevant conditions may include embryonic development.

<sup>52</sup> “Effectivities” are a popular interpretation of abilities in the ecological-psychological literature. They are used synonymously with potentialities and dispositions. See, for example, Michael Turvey, “Affordances and Prospective Control: An Outline of the Ontology,” *Ecological Psychology*, Vol. 4 (1992): 173-187.

<sup>53</sup> Chemero, *Radical Embodied Cognitive Science*, 145.

the ability to walk does not mean,” in his words, “that one will not fall down even in the ideal conditions for walking.”<sup>54</sup> But Chemero turns illegitimately from a condemnation of effectivity toward an appeal to teleology. Claiming for abilities a status as “functions,” he yokes them to a principle of normativity: “individuals with abilities are,” he writes, “supposed to behave in particular ways, and they may fail to do so.”<sup>55</sup> If functions are not inevitably predisposed, they are, however, *monotonously* so—and for that reason also fail to do justice to the nature of unexercised abilities. As in my previous example, Dwayne’s capacity to read Nietzsche does not have as its teleological principle the completion of the book. He is not, in other words, beholden to any one exercise or individuation of that capacity; he is not supposed to behave any one way.

If abilities are to be understood as virtual, it is because they come as resolutions to tensions, problems, latent in differential fields. Climbing is the exercise of an ability to the extent that it resolves (or integrates) a “fully differentiated neuro-somatic-environmental web” that neither resembles or prefigures the activity of climbing, nor tends inevitably or monotonously toward it.<sup>56</sup> The unexercised ability to climb exists as a distributed field of relations between a given animal’s body (the somatic), its perceptual-sensorimotor system (the neural), and various details of its environment.<sup>57</sup> This is what it means to say that, like affordances, abilities are relations. Not because the animal needs a staircase to climb in order to exercise the ability it has to do so, but because that very ability emerges out of (while at the same time bringing together) a network of differential elements, a problematic field, an Idea. And, to reiterate, each element of an Idea fluctuates in tune with changes in the others, implying a difference in actualization (a differentiation): given a staircase of a larger size, a climbing animal’s legs must be longer, its

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<sup>54</sup> Ibid.

<sup>55</sup> Ibid.

<sup>56</sup> Protevi, “Adding Deleuze to the Mix,” 143.

<sup>57</sup> While Chemero is right to want to safeguard ability from a reduction to body scale, the size of an animal’s body does, in fact, figure into the differential field at hand. See Chemero, *Radical Embodied Cognitive Science*, 143.

muscles stronger, its will to climb greater than might be necessary for a smaller staircase. The activity of climbing is a resolution, a creative response to a problem structured in accordance with the animal's body and its environment. Given that problem, the exercise of an ability in response is creative to the extent that it comes always as one option among an array of many.<sup>58</sup> While certain solutions, the manifestation of certain abilities, insist more so than others, the advent of any one of them is never inevitable.

Problematic fields are nested, perpllicated: the staircase's height, an element in the problem resolved in the act of climbing it, is itself the resolution of another problematic field entirely. The staircase is, however, not an ability, but an affordance. It is no surprise, then, that affordances too ought to be conceived as virtual. Doing so does, as I have already indicated, make possible an analysis of the causal relations they share with affects; it also resolves the question of how affordances can exist independently of the animals that perceive them. Organismic subjectivity is not a Kantian transcendentalism, so it should go without saying that animals do not project affordances or features of environmental meaning onto an indifferent, unknowable world. Even with my back turned, the climbability of my staircase persists no less than does my capacity to climb it. Further, the properties that together afford climbability existed before the dawn of human consciousness and may, hypothetically, even outlive it—which is all just to say that affordances are *real*. But, like capacities, they are only *actual* under certain conditions.<sup>59</sup> This is a claim the implications of which are far-reaching and seldom appreciated. Chemero holds that it makes necessary a nuanced ontological realism, one that ties the subject to

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<sup>58</sup> Bryant, *Difference and Givenness*, 154.

<sup>59</sup> No staircase can afford climbability if all the animals capable of climbing it ceased to exist, but that affordance does not surge into existence alongside the lives of the relevant animals; rather, those animals *actualize* the affordance. Prior to its actualization, the affordance exists (or *insists*) virtually.

its world and situates experience somewhere between the two. This ontology is, as I will show, best understood in Deleuzian terms.

Affordances do exist prior to, and in the absence of, the presence of animals capable of perceiving them. Affordances exist not as prefigured identities, but as meshworks of differential relations. These meshworks are resolved into concrete affordances by the local perception of appropriately capable animals. Affordant actualization repeats the actualization of capabilities because the mechanism is, in each case, identical. The unactualized environmental affordance *climbability* exists first as the same distributed field of relations resolved in the act of climbing. To afford climbability, a staircase must be climbable. To be climbable, there must exist animals capable of perceiving in it that affordance. To ascribe an animal-independent reality to the affordance is to claim that, prior to the resolution of its Idea, the staircase is structured in such a way that, were the right animal present, it would be climbable. In the same way, animals are capable of climbing to the extent that their bodies are structured in such a way that, were the right affordance present, they would be able to climb. Implicit in the structure of each is a relation between organism (body) and environment (layout).

Experience (or sensorimotor action) happens between the two, simultaneously actualizing an affordance as it expresses an ability, effectively tying together subject and world, organism and environment. Or, in Alva Noë's phenomenological description:

Experience isn't something that happens in us [that is, in the subject]. It is something we do; it is a temporally extended process of skillful probing. The world makes itself available to our reach. The experience comprises mind and world. Experience has content only thanks to the established dynamics of interaction between perceiver and world.<sup>60</sup>

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<sup>60</sup> Alva Noë, *Action in Perception* (Cambridge: MIT Press, 2004), 216. Interestingly enough, Noë invokes a language of “virtuality” to account for what perceptual content “manifests” as the subject explores its world by means of its body. He does so, however, without the benefit of Deleuze's ontology, and so falls frequently back into the trap of conceiving the virtual as the possible or potential, forcing it into a structure that inappropriately mirrors the actual.

Supplementing Noë with Deleuze, the “dynamics of interaction” need to be conceived intensively, relative to the singularities in each element of a neuro-somatic-environmental field. Different organisms actualize different affordances out of the same physical layouts. Certain spiders can, for example, walk along the surface of a pond inside of which fish breathe, bacteria replicates, and frogs drown. Organismic ability therefore operates as an intensive individuation that actualizes an environmental affordance relative to the organism (and ability) in question. And the apparatus of each individuation therefore varies along with a given affect-affordance couple. In interacting with its environment, the organism does not merely *recognize* a set of affordances, but individuates and actualizes them. The mechanism of this individuation is emphatically not, however, simply hylomorphic: perception does not impose itself on a formless and inert matter. There is form (which is to say, affordance) already there, insistent on the virtual level, prior to the advent of organismic activity.<sup>61</sup> It is in precisely this virtuality that the reality of affordances consists: they do not *exist* (actually) so much as they *insist* (virtually); it is the organism that guides them into actuality.<sup>62</sup>

Changes in any one element of the affective-affordance field imply corresponding changes in the others, both in the Idea as well as in its actual counterparts. These changes and interactions take place first, it is true, on the level of the actual. The animal’s ability to climb only impacts the layout of its environment when exercised. “It is,” in Protevi’s words, “only these individuated actions that can change the web of relations structuring the intensive processes that

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<sup>61</sup> Ibid, 105.

<sup>62</sup> It is worth noting that Protevi draws from this reading of Deleuze a novel realism: “the interesting sense of realism for Deleuze is,” he writes, “that the world has structure, but that structure is the structure of multiply realizable processes, not the structure of fully individuated things that result from those processes;” Protevi, “Adding Deleuze to the Mix,” 148. It is easy to see, then, why some commentators go too far in attributing to Deleuze the position that the products of individuation are in some sense derivative and therefore less real than the processes that drive them. (See Peter Hallward’s otherwise brilliant work *Out of this World: Deleuze and the Philosophy of Creation*, 2006.) It is, to my mind, most productive to locate, as does Protevi, “realism” *in between* fully realized individuals on the one hand, and, on the other, the virtual processes of individuation that produce them. It is therefore the ongoing interactions between the two that constitutes the reality of each. Neither is derivative; they are, instead, complimentary.

integrate differential fields and produce action.”<sup>63</sup> There are two claims at work here: first, that the exercise of an ability is the actualization of a virtual field of relations; and, second, that this field is comprised of elements impacted by actual activity. The actual not only individuates the virtual, but in so doing rewrites the lines of differentiation available to future actualizations. This reorientation lets other potentialities insist to different degrees.<sup>64</sup> Now, given that affective individuations refer back to virtual affordances—and that the manifestation of affordances necessitates the presence of affects—changes in the actual, whether somatic or environmental, correspond to reorientations in the layout of the virtual Ideas they resolve. Changes to these Ideas manifest as changes *both* to organismic capacity *as well as* to the environmental affordances that complement them. Thus, when actual organismic activity means an impact in the physical layout of an environment (as when a species alters its niche over evolutionary time), those changes reorganize the virtual field individuated in that activity. A different virtual field means a corresponding change in actual activity. Thus, the causal relation runs from the actual, through the virtual, and back.

Causal relations span both developmental as well as behavioural timescales. Developmentally, animals develop selective sensitivities, in tune with their sensorimotor abilities, to relevant environmental features in a niche.<sup>65</sup> The animal’s niche will, in turn, also “strongly influence the development of the animal’s ability to perceive and act.”<sup>66</sup> The animal’s activities

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<sup>63</sup> Protevi, “Adding Deleuze to the Mix,” 152.

<sup>64</sup> Although, given the task at hand, a more comprehensive exegesis is unnecessary, it is perhaps worth noting, only briefly, that Deleuze defines the mechanism of this kind of reorientation in terms of “the specification of adjunct fields” and “the condensation of singularities;” Deleuze, *Difference and Repetition*, 190. Adjunct fields refer to the perplication of an Idea with others, the way virtual affects blend into virtual affordances. The condensation of singularities refers to the way changes in an Idea correspond to different degrees of potential insistences.

<sup>65</sup> Chemero, *Radical Embodied Cognitive Science*, 150. Chemero defines an organism’s niche as “the set of situations in which one or more of its abilities can be exercised [...] this collection of situations forms the organism’s cognitive, behavioral, and phenomenological niche;” *ibid*, 148. Cf. John Odling-Smee, Kevin Laland, and Marcus Feldman, *Niche Construction: The Neglected Process in Evolution* (Princeton: Princeton University Press, 2003).

<sup>66</sup> *Ibid*, 150. The claim that an animal’s environment affects its development is, of course, a biological platitude. Classical Darwinism, however, renders development a product only of the collision between forces internal to the

alter its niche, and its niche influences the development of its abilities, affording certain possibilities and constraining others.<sup>67</sup> Without delving too far into the minutiae of Niche Construction Theory (NCT), it is worth noting how organismic activity impacts the organism itself, and therefore the future of that very activity. David Post and Eric Palkovics take as an object of study two populations of guppies, observing the way differential patterns of predation lead to different populations in each, the implications of which include the fact that different patterns of excretion produce fluctuations in algae growth and potentially modify selection on guppy colour through an increase in carotenoids derived from the algae.<sup>68</sup> While a change in colour alone does not imply a corresponding change in ability, it requires no stretch of the imagination to conceive of a case that does. Consider, for instance, the way the activity of one organism alters the layout of affordances available to another. Earthworms are known to alter the makeup of the soil in which they live. A change in soil can mean a difference in selection pressure on local plants. Different plants mean different vegetal ecologies, different niches, and therefore a difference in the kind of sensorimotor abilities local organisms are able to manifest. Thus, in the very manifestation of those abilities, the layout of an organism's environment is changed, both for itself (the earthworm) as well as for others (species of plant).

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organism (the gene) and the external forces of its environment. As a result, “in a curious way the organism, the object of these forces, becomes irrelevant;” Richard Levins and Richard Lewontin, “The Organism as the Subject and Object of Evolution,” *The Dialectical Biologist* (Cambridge: Harvard University Press, 1985), 88. This is too large a price to pay for dynamism. If it is true that the organism is the *medium* through which selection pressures act on the gene, then “it is also the *locus* of their interaction;” *ibid.*, 89, emphasis mine. To take seriously the question of organismic development is therefore to think evolution dialectically, to think the organism not only as a passive object of evolutionary forces (whether internal or external); but also as “the subject,” in the words of Levins and Lewontin, “of its own evolution;” *ibid.*

<sup>67</sup> On the temporal nature of this kind of development, Levins and Lewontin write that “the environment as it is relevant to a developing organism is a temporal sequence of events in which the exact order is critical. If a heat shock is given to some strains of *Drosophila* [the common fruit fly] during a critical four-hour period of their development, the patterns of veins in the wing will be altered. A shock given before or after this critical period will not change the wing veins but may affect other traits such as eye size;” *ibid.*, 95.

<sup>68</sup> David Post and Eric Palkovacs, “Eco-evolutionary Feedbacks in Community and Ecosystem Ecology: Interactions Between the Ecological Theatre and the Evolutionary Play,” *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, Vol. 264, Issue 1523 (2009): 1629-1640. This is called evolutionary feedback.



On the developmental scale, this reciprocity is manifested in the operation of natural selection upon the genetic composition of a population of organisms relative to its environment. And, in the words of Richard Lewontin, “as that composition changes it forces a concomitant change in the environment itself. Thus organisms and environments are both causes and effects in a coevolutionary process.”<sup>69</sup> Put differently, as genetic composition changes, so too do the abilities of which organisms are capable; and as those abilities change, so too do the environmental affordances to which they correspond. Further, the way these rates of change are linked, the way genetic composition and environmental layout influence each other over time, is itself a temporal affair. In order to interact with a feature of its environment, in order to perceive an affordance, the timescale of a given organism must correlate with the timescale of that feature. Affordances are, in other words, temporally relative to the organisms with which they interact. A mountain, for example, can afford climbability only on sufficiently short timescales. Over geological time, its contours become viscous. In a line that recalls Chapter 1, Manuel DeLanda writes:

the objective relativity of affordances with respect to temporal scales makes them the ideal candidate to define the ‘lived present’ of a particular individual, that is, what this individual ‘perceives’ within its own time scale as the relevant capacities of the other individuals [or environmental features] interacting with it.<sup>70</sup>

As a consequence, the elements and relations that constitute the virtual Ideas underlying affects and affordances are themselves dynamic. Organismic ability therefore fluctuates in tune with rates of change in environments, species, and their coevolutionary interaction.

If the developmental relation between affects and affordances concerns the way organisms shape and are shaped by their environments in the activity of living, on a behavioural scale, an animal’s activities “alter the world *as the animal experiences it*, and these alterations to the

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<sup>69</sup> Richard Lewontin, *The Triple Helix: Gene, Organisms, and Environment* (Cambridge: Harvard University Press, 2000), 126.

<sup>70</sup> DeLanda, *Intensive Science and Virtual Philosophy*, 91.

phenomenological-cognitive-behavioral niche, in turn, affect the animal's behavior and the development of its abilities to perceive and act, [...] and on and on."<sup>71</sup> What Chemero calls the phenomenological-cognitive-behavioural niche, I call the organism's practical field. Given the organism's functional concerns (say, swimming), its practical field is composed of those features (both affective and affordant) salient for the ongoing navigation of its environment (that is, the water). The organism has to coordinate its kinesthetic activity with changes in its practical field. Deleuze speaks of a "conjugation of singularities" that has to take place between one's body and the Idea of water if one is to succeed in swimming. "Our real acts," he writes, "are adjusted to our perceptions of the real relations [in the practical field], thereby providing a solution to the problem [of how to swim]."<sup>72</sup> In order to successfully negotiate a practical field, "the trick," writes Protevi, "is to maintain the coordination of changes in the organism [the swimmer] with changes in the environment [the water]."<sup>73</sup> It is to synchronize the rate at which what one can do changes—for how long can I hold my breath, how many strokes can I perform before needing rest, against how strong a current can I move, and so on—with changes in environmental affordances (strength of current, temperature of water). Behavioural and developmental time scales are related reciprocally. Indeed, developmental causality is itself constituted by the affect-  
affordance relations that occur on the behavioural timescales of individual organisms. Further, developmental changes constrain the way organisms behave practically. Affects and affordances therefore causally relate in two temporal iterations, though each scale refers to the other.

In sum, somatic-environmental networks resolved in the manifestation of local affects and affordances are reorganized by the actual interaction of organismic activity with environmental

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<sup>71</sup> Chemero, *Radical Embodied Cognitive Science*, 152. Emphasis mine. Unfortunately, this is all Chemero has to say on the matter. He offers the quoted passage as proof that radical embodied cognitive science can be productively integrated with developmental systems theory, but he does not himself work toward fleshing out such a project.

<sup>72</sup> Deleuze, *Difference and Repetition*, 165.

<sup>73</sup> Protevi, "Adding Deleuze to the Mix," 152.

layout. The processes of this kind of reorganization occur beneath the structure of organismic subjectivity or experience.<sup>74</sup> At bottom, affects and affordances are sets of relations between, on the one hand, bodily structure and the way capacities to act can be actualized in a given environment and, on the other, the environment's physical features and the way those features are actualized relative to the activities of local organisms. These are the genetic conditions for the emergence and development of the subject. The condition of organismic subjectivity is therefore the experiential manifestation of a virtual field that links the subject with its world. And as these relations change, so does the structure of subjective experience, the sensorimotor-perceptual affects by which experience is defined. Organismic subjectivity is, as a consequence, relentlessly dynamic and tied at its foundation to the organization of its own world.

### III. ENTANGLEMENT

At a fundamental level organisms do not merely *inhabit* their environments, nor do their environments merely *contain* the organisms that live within them.<sup>75</sup> The two are not only codependent, not only related reciprocally, but irreducibly intertwined, integrated, entangled—which is to say that, ultimately, the boundary between organism and environment, subjected to close enough an analysis, breaks down almost completely. To speak, along these lines, of the organism as a distinct entity is to refuse to zoology an insight formative for the microbial and botanical sciences; namely, that the concept of biological individuality falsifies a whirlwind of

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<sup>74</sup> This is to say that physical features of the environment pressure selectively the physicality of an organism's body. The activities of these bodies also organize and impact the development of the physical features of their environments.

<sup>75</sup> On the reciprocal nature of organismic-environmental relations, it is worth noting that “the environment is not a structure imposed on living beings from the outside but is in fact a creation of those beings. The environment is not an autonomous process but a reflection of the biology of the species. Just as there is no organism without an environment, so there is no environment without an organism;” Levins and Lewontin, “The Organism as the Subject and Object of Evolution,” 99.

foundational ecosystemic interactivity.<sup>76</sup> In “A Symbiotic View of Life: We Have Never Been Individuals,” Gilbert, Sapp, and Tauber claim, with all due gravitas, that a thoroughgoing appreciation of the discovery of symbiosis “is fundamentally transforming the classical conception of an insular individuality into one in which interactive relationships among species blurs the boundaries of the organism and obscures the notion of essential identity.”<sup>77</sup> Unqualified talk of organismic-environmental relations belies the speciousness of the division on two levels: first, the organism is an ecology of relationships spanning the boundaries thought to separate it from its world; and, second, the environment is not an independent container that houses the organism but “is itself,” in the words of Adam Robbert, “one of the entities produced by the activity of other entities—both living and nonliving—and is only composed of other kinds of entities (e.g., other species, particular geological features, or other chemical agents).”<sup>78</sup> The organism enfolds into itself the symbiotic relations of which it is constituted and on which it depends. It is also enmeshed in them, enfolded into an environment no less unruly. This play between enfoldment and enmeshment constitutes the structure of entanglement.

Enfoldment occurs on several conceptual planes simultaneously: anatomy, genetics, development, physiology, immunology, and evolution.<sup>79</sup> An analysis of anatomical enfoldment

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<sup>76</sup> In the microbial world, protists, heredity symbiosis, and the inheritance of acquired symbionts complicate any straightforward understanding of individuality. Similarly, discoveries of rhizobia, mycorrhizae, and endocytic fungi have long since challenged botanical conceptions of individual autonomy. See Scott Gilbert, Jan Sapp, and Alfred Tauber, “A Symbiotic View of Life: We Have Never Been Individuals,” *The Quarterly Review of Biology*, Vol. 87, Issue 4 (2012): 325-341.

<sup>77</sup> *Ibid.*, 326.

<sup>78</sup> Adam Robbert, “Ecology is the Break Down of Structure and Content,” *Knowledge Ecology*, modified May 26, 2013, accessed January 5, 2013, <<http://knowledge-ecology.com/2013/05/26/ecology-is-the-break-down-of-structure-and-content/>>. “Organisms,” for Robbert, “in part modify their own selection pressures by tampering with the ecological dynamics in which they participate. In other words it’s not strictly the case that organisms are *in* the environment; the structure (the environment) and the content (the organism) exist as blurry zones of interactions between specific entities;” *ibid.* Setting one term against the other therefore hides not only the complex, multifarious relations between the two, but also (and more fundamentally) the ways by which they are ultimately integrated.

<sup>79</sup> I take the concept of enfoldment from Deleuze’s fascination with “the fold,” a concept that allows him “to think creatively about the production of subjectivity, and ultimately about the possibilities for, and production of, non-human forms of subjectivity;” Simon O’Sullivan, “Fold,” *The Deleuze Dictionary*, ed. Adrian Parr (Edinburgh: Edinburgh University Press, 2010), 107. “To ‘have’,” O’Sullivan continues, “is to fold that which is outside inside.”

will, however, suffice for the purposes of the present study, given that many other analytic models take as a starting point the organism's anatomy.<sup>80</sup> Anatomically, a typical organism of any species shares its body and cells with a multiplicity of other bacterial species. Far, then, from a structured whole, it is instead a veritable swirling ecosystem of its own.<sup>81</sup> Such an individual does not merely happen to share its body with other forms of life as if it could be what it is without them, as if it could be purified of all that it is not. Take, for example, the common coral and its algal symbiont, *Symbiodinium*. The coral derives up to 60 percent of its nutrients from the algae.<sup>82</sup> A prolonged increase in sea-surface temperatures can break the symbiosis, bleaching and killing the coral. As a host, the coral folds into itself an algal symbiont, and this relationship literally serves as the condition for the possibility of sustained coral life. This is not an isolated case. Indeed, "in addition to the mitochondrial vestiges of ancient symbiosis, thousands of bacterial 'species' (themselves genetic composites) live in intimate association with our own eukaryotic cells."<sup>83</sup> Current anatomical estimates set the number of bacterial cells enfolded within the human at levels as high as 90 percent.<sup>84</sup> Metagenomic sequencing reveals the integration of over 150 bacterial species into the human intestinal tract. This microbiome alone contains approximately

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[...] Here matter is folded in the manner of origami, whereby caverns containing other caverns, in turn contain further caverns. The world is superabundant, like a lake teeming with fish, with smaller fish between these fish, and so on ad infinitum. There is no boundary between the organic and the inorganic here as each is folded into the other in a continuous texturology;" *ibid*, 108.

<sup>80</sup> This is to say that, given anatomical enfoldment, the way an organism enfolds its symbionts through its developmental lifecycle, through the evolution of its species, at the level of its genes, its physiology, and its immune system. For reference, these models of symbiotic analysis are all catalogued at some length in Gilbert, Sapp, and Tauber, "A Symbiotic View of Life."

<sup>81</sup> "The entity we call a cow is an organism whose complex ecosystem of gut symbionts—a diverse community of cellulose-digesting bacteria, ciliated protists, and anaerobic fungi—informs its specialized anatomy, defines its plant-digesting physiology, regulates its behaviors, and ultimately determines its evolution;" Gilbert, Sapp, and Tauber, "A Symbiotic View of Life," 327. Cf. D. N. Kamra, "Rumen Microbial Ecosystem," *Current Science*, Vol. 89, Issue 1 (2005): 124-135. To attribute to the organism an enfoldment of other forms of life is to therefore speak to the significance of symbiosis.

<sup>82</sup> Gilbert, Sapp, and Tauber, "A Symbiotic View of Life," 327.

<sup>83</sup> *Ibid*.

<sup>84</sup> Fredrik Bäckhed, Ruth Ley, Justin Sonnenburg, Daniel Peterson, and Jeffrey Gordon, "Host-Bacterial Mutualism in the Human Intestine," *Science*, Vol. 307, Issue 5717 (2005): 1915-1920. Cf. Ruth Ley, Daniel Peterson, Jeffrey Gordon, "Ecological and Evolutionary Forces Shaping Microbial Diversity in the Human Intestine," *Cell*, Vol. 124, Issue 4 (2006): 837-848.

1000 major bacterial groups. The gene set enfolded within the intestinal-bacterial metagenome is roughly 150 times the size of the entire human eukaryotic genome.<sup>85</sup> “And this does not include the symbionts of human airways, skin, mouth, or reproductive orifices.”<sup>86</sup> It is, then, anatomically more appropriate, as has been recently proposed, to speak not of a host-symbiont relation, but of a “holobiont” that effaces the boundaries between the two.<sup>87</sup> This sort of symbiosis is what I call organismic enfoldment.

By contrast, what I call enmeshment occurs on a different ecological scale, designating the way the organism is itself enfolded into an ecosystem exterior to it. Just as it cannot rid itself of the symbionts that contribute to its anatomy and blur the boundaries between other bodies and its own, neither can the organism be set apart from the environmental conditions in which it develops and is enmeshed.<sup>88</sup> “The ontogeny of an organism is,” for Lewontin, “the consequence of a unique interaction between the genes it carries, [and] the temporal sequence of external environments through which it passes during its life.”<sup>89</sup> Both elements are integral: organismic development can be reduced neither to blueprint nor to selection pressure. The question, then, of genetic determinism—a question at the core of the nature/nurture debate—is (or, perhaps, should be) dissolved in the complicated entwinement of organismic development and environmental flux, of gene, gene product, and world. “We cannot emphasize this point too strongly,” write Varela, Rosch, and Thompson; “this supposedly dead issue of nature versus nurture will actually refuse to go away unless we learn to see organisms and environments as

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<sup>85</sup> Jian Qin et al., “A Human Gut Microbial Gene Catalogue Established by Metagenomic Sequencing,” *Nature*, Vol. 464, Issue 7285 (2010): 59-65.

<sup>86</sup> Gilbert, Sapp, and Tauber, “A Symbiotic View of Life,” 327.

<sup>87</sup> Eugene Rosenberg et al., “The Role of Microorganisms in Coral health, Disease and Evolution,” *Nature Reviews Microbiology*, Vol. 32, Issue 5 (2007): 355-362. To recall the membrane: there is no absolute point of distinction that separates interior from exterior; there is only a medial series of interiorities, each external to another—a blurry network of exterior interiorities whose outsides are always relative, expanding, distorting.

<sup>88</sup> The environment does not act “as a landing pad for organisms that somehow drop or parachute into the world;” Varela, Rosch, and Thompson, *The Embodied Mind*, 198.

<sup>89</sup> Richard Lewontin, *Biology as Ideology: The Doctrine of DNA* (New York: HarperPerennial, 1991), 17-18. By “ontogeny,” Lewontin means an organism’s origin and development from embryo to adult.

mutually unfolded and enfolded structures.”<sup>90</sup> In *Biology as Ideology: The Doctrine of DNA*, Lewontin urges us to remember that talk of DNA’s self-replicating power is but metaphor: while DNA does provide the information required for the production of amino acids, a slew of various proteins, as well as the cell body as a whole, play an integral part in their actual material construction.<sup>91</sup> Further, protein production varies relative to the cells’ environment and the states of already existing proteins, as well as the larger ecological relations in which the organism is entangled.<sup>92</sup> These relations are contingent, temporally sensitive, and pluripotently significant in the organism’s development.<sup>93</sup>

Development occurs, to reintroduce a Deleuzian vocabulary, as an actualization of virtual tendencies. These tendencies exist, prior to their manifestation in concrete characteristics, as distributed fields of relations linking the temperature differentials in an environment with critical stages in an organism’s ontogenetic processes, nutrients present, genetic information, random developmental noise, and so on. Take, for example, the ontogenetic topology of the fruit fly, *Drosophila*. Held long enough in an embryonic, undifferentiated state, “clumps of embryonic tissue normally destined to become genitalia, legs, wings, or eyes of adults, can develop into a different adult tissue.”<sup>94</sup> Topological capacities structure possible developmental trajectories, insisting to varying degrees under varying conditions: “embryonic leg and antenna cells can change reversibly to wing, and wing reversibly to eye, but embryonic eye will never change to

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<sup>90</sup> Varela, Rosch, and Thompson, *The Embodied Mind*, 199.

<sup>91</sup> “Genes are made by a complex machinery of proteins that uses the genes as models for more genes. When we refer to genes as self-replicating, we endow them with a mysterious, autonomous power that seems to place them above the more ordinary materials of the body;” Lewontin, *Biology as Ideology*, 36.

<sup>92</sup> “Outside its cellular milieu, the DNA is biologically inert, if not useless. Genes may provide a switchboard for life, but complexity of life will depend on something else: how the same genes may be recruited to make different products, how the developmental networks change and evolve, and how apparently trivial events such a gene duplication and protein isoforms open immense new territories for biological exploration;” Simon Conway Morris, *Life’s Solution: Inevitable Humans in a Lonely Universe* (Cambridge: Cambridge University Press, 2003), 324.

<sup>93</sup> Levins and Lewontin, “The Organism as the Subject and Object of Evolution,” 95.

<sup>94</sup> *Ibid*, 96.

antenna.”<sup>95</sup> Further, these developmental pathways are themselves constrained probabilistically by the states out of which they emerge. Far from a linear series of stages, development is a set of pathways fluidly morphing and branching. Each step in the process is a precondition, but not a determinant, of the next. Ontogenetic trajectories are therefore creative resolutions to, or individuations of, problematic fields consisting of interactive linkages in rates of change and structured in terms of the singularities that mark transitions from one pathway into another.<sup>96</sup> The relation of phenotype to genotype is itself emblematic of the morphogenetic individuation of a virtual set of tendencies and potentials. For while “the same genotype gives rise to many different organisms, and the same organism can correspond to many different genotypes,” it is nevertheless the case that certain phenotypic actualizations are characterized by “norms of reaction” that indicate the way the genotype tends to respond to the presence of environmental influences.<sup>97</sup> And yet, no norm is totalizing; about this, Levins and Lewontin are explicit. “First,” they write, “the phenotype depends on both genotype and environment. Second, the form and direction of the environment’s effect upon development differs from genotype to genotype.”<sup>98</sup>

As a consequence, one can say with considerable force, against the likes of Syd Brenner, that even with a computer powerful enough, the organism cannot be computed.<sup>99</sup> This is because the environmentally mediated characteristics an organism acquires through the course of its development are indistinguishable from the ones it inherits genetically. Both fluctuate correlative

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<sup>95</sup> Ibid.

<sup>96</sup> To remain with the fruit fly, recall an aforementioned example in which a specific singularity in the relation between heat shock and temporal sensitivity modifies wing development: “If a heat shock is given to some strains of *Drosophila* during a critical four-hour period of their development, the pattern of veins in the wing will be altered. A shock given before or after this critical period will not change the wing veins but may affect other traits such as eye size;” *ibid*, 95.

<sup>97</sup> Ibid, 94.

<sup>98</sup> Ibid, 93.

<sup>99</sup> Lewontin, *The Triple Helix*, 17.



with an assortment of conditions and produce in the organism a range of effects.<sup>100</sup> “What all this means,” as Susan Oyama so nicely puts it, is

not that genes and environment are necessary for all characteristics, inherited or acquired, *but that there is no intelligible distinction between inherited and acquired characteristics* [...] What is required for evolutionary change is not genetically encoded as opposed to acquired traits, but functioning developmental systems: ecologically embedded genomes.<sup>101</sup>

What Oyama calls “ecologically embedded genomes” are actualized in holobiontic terms and relative always to the environments in which they are enmeshed. The holobiont internalizes the exterior world, perceiving, consuming, and digesting it before externalizing it through a practical coordination of sensorimotor behaviour with environmental affordance.<sup>102</sup> That the world passes through the holobiont foregrounds the way enmeshment and enfoldment efface the categories that typically designate the organism—and, as a consequence, the organismic subject—as an entity distinct from the world it acts upon. Indeed, “we see features of this environment, such as sunlight or oxygen, as independent of the organism only because our frame of reference is relative.”<sup>103</sup> It is relative, of course, to our own mode of subjectivity, our own affects, perceptual capacities, and structures of enfoldment and enmeshment—for how could it be otherwise?

#### IV. CONCLUSION

Organismic subjectivity is more a zone of affective-affordant, symbiotic, genetic, and environmental confluence than it is the perspective of a distinct entity, even if the organismic subject does live its own space and time. In this chapter, I have brought the recursive,

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<sup>100</sup> Levins and Lewontin, “The Organism as the Subject and Object of Evolution,” 95. Cf. Gregory Mengel, “The Future Is and Is Not the Past: Heredity, Epigenetics, and the Developmental Turn,” *The Evolutionary Epic: Science's Story and Humanity's Response*, ed. C. Genet (Santa Margarita: Collins Foundation Press, 2009), 213-217.

<sup>101</sup> Susan Oyama, *The Ontogeny of Information: Developmental Systems and Evolution* (Cambridge: Cambridge University Press, 1985), 122. Emphasis mine. Parentheses designating the biological foundation of inherited characteristics and the environmental foundation of acquired characteristics omitted.

<sup>102</sup> “Because mutual selectivity, reactivity, and constraint take place only in actual processes, it is these that orchestrate the activity of different portions of DNA, that make genetic and environmental influences interdependent as genes and gene products are environments to each other, as extraorganismal environment is made internal by psychological or biochemical assimilation, as internal state is externalized through products and behavior that select and organize the surrounding world;” *ibid.*

<sup>103</sup> Varela, Rosch, and Thompson, *The Embodied Mind*, 199.

developmental meshworks of organismic affect and environmental affordance to bear on Deleuze’s concept of the problematic field. This chapter put the subject into motion, tying it dynamically to fluctuations in a neuro-somatic-environmental web individuated in concrete organismic behaviour and actual environmental layout. I recast the question of dynamic (affect-affordant) relationality as the question of virtual embodiment, displacing recent efforts in cognitive science to account for the ontological status of affordances in the absence of the present perception of local animals. I temporalized the dynamism of these relations both behaviourally as well as developmentally, underscoring the practical coordination an organism must maintain with changes in its environment as well as the way those changes affect, evolutionarily, the actualizations of the organism’s capacities, and the way those actualizations contour the niches in which the organism lives.

Taking account of what I have called entanglement confirms that the ostensibly unified subject is composed of a plurality of contractions, relations, affects, and perceptions. Subjectivity is multiple, not only spatiotemporally or phenomenologically, but biologically as well. The subject needs therefore to be thought not only as point of view, but as multitude, or even swarm.<sup>104</sup> The condition of worldly access is therefore neither the transcendent (Sartre) nor transcendental (Kant), but rather the entangled. The subject bleeds into its world; it is *of* its world—and so opens onto it as such.<sup>105</sup> Subjectivity is not contemplative; it is enactive. It is

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<sup>104</sup> To draw a line of resonance, it is worth noting Simon O’Sullivan’s claim that “one’s subjectivity for Deleuze is a kind of Nietzschean mastery over the swarm of one’s being;” O’Sullivan, “Fold,” 108.

<sup>105</sup> In a particularly fascinating study conducted on mice, it has been shown that behaviour and brain development are influenced profoundly by the colonization of the gut by bacteria. The subject’s activity *in*, its perception *of* the world, are made possible by an entanglement *with* the world. Mice bred free from enfoldments of the right microorganisms displayed in many circumstances uncharacteristically risky behaviour—undercutting the phenomenological primacy classically ascribed to mood or situational disposition. The study suggests, instead (as I claim above) that beneath experience swarms an enfoldment of the very world one experiences. The subject is not, then, distinct from its object; it does not transcend it, and it is not the object’s transcendental condition of possibility. See Rochellys Diaz Heijtz, S. Wang, F. Anuar, Y. Qian, B. Bjorkholm, A. Samuelsson, M. L. Hibberd, H. Forssberg, S. Pettersson, “Normal Gut Microbiota Modulates Brain Development and Behavior,” *Proceedings of the National Academy of Sciences*, Vol. 108, Issue 7 (2011): 3047-3052.

neither specifically human, nor necessarily conscious. The subject is not an entity distinct from the swirling visceral ecologies constitutive of the natural world. These are the implications of a subjectivity turned organismic, of the organism turned holobiontic. To be a subject is to inhabit a spatiotemporal realm actualized out of a tornado-like flux of relations; it is also to enfold into oneself an explosive plurality of nonhuman life, and to be enfolded, in turn, into ecological systems complicated enough to do irreparable damage to those timeless philosophical dichotomies—mind and body, action and perception, nature and nurture, human and nonhuman, self and other, individual and world—that plague, even now, the attempt to articulate a thoroughgoingly bodily philosophy, an ecological ontology, an organismic subjectivity.

## FINAL REMARKS

*...you call yourself realists and insinuate that the world really is the way it appears to you...<sup>1</sup>*

Framed ecologically, set against a background of imminent global crisis and the imperative to reorient our ecological world-image, it is the goal of this thesis to think the subject anthropo-eccentrically, to free it from its implicitly conscious-agential connotations and to foreground instead the active organism (as opposed to the contemplative mind). But, in so doing, I have relegated to parentheses the question of human access—the question, that is, of the relation between the human subject and its world—a question that refuses its brackets, given the fact that this theory is a specifically human endeavour. If bodily affects underlie the structure of organismic perception, then the framework of human perception (and, given the right parameters, of knowledge) is made possible on the basis of conditions equally material. As a consequence, the human and its subjective perspective cannot be subtracted from the biological analyses of this thesis. These studies were carried out by human agents operating an assortment of technological apparatuses (laboratories, institutions, and so on), and their research was funded by grants to which they had to apply. Their findings had to be peer-reviewed and accepted for publication before they could be considered models for nonhuman life.<sup>2</sup> All of which is to say that there is no metaphysical magic to be found secreted away in the folds of the cerebral cortex, no ontological immunity that safeguards scientific practice from the question of perceptual mediation, no matter its degree of technological amplification. “Rather than continuing to approach ‘knowledge’ from the Cartesian assumption of a separation of subject and object, we

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<sup>1</sup> Friedrich Nietzsche, *The Gay Science: With a Prelude in German Rhymes and an Appendix of Songs*, ed. Bernard Williams, trans. Josefine Nauckhoff (Cambridge: Cambridge University Press, 2001), §57.

<sup>2</sup> Bruno Latour calls this model of knowledge production Actor-Network Theory. See Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge: Harvard University Press, 2004). Cf. Bruno Latour, *Science In Action: How to Follow Scientists and Engineers through Society* (Cambridge: Harvard University Press, 1987).

shall have to concede,” in the words of Alf Hornborg, “that our image-building actively participates in the constitution of the world.”<sup>3</sup> Indeed, this is a point worth emphasizing: *the human subject lives a world of its own*, a world configured on the basis of its own structure of subjectivity—of its own body, its own capacities and developmental entanglements. Words, concepts, technologies, and institutions are, to put it somewhat provocatively, enfolded into the human subject no less intimately than algal symbionts are enfolded into coral. Consequently, if this thesis speaks of the nonhuman world, it does so nevertheless in terms specific to the human.<sup>4</sup> A comprehensive articulation of the human dimension is, of course, beyond the purview of this closing section. I wish to conclude, however, with a brief consideration of some of the possibilities opened by the understanding that we can no longer speak of the world as it is “in itself.”<sup>5</sup> Realism, if it is indeed a title worth retaining, will have to be cast anew. Against an orthodox realism that claims a direct access to the world, Nietzsche writes the following:

In every experience, in every sense impression there is a piece of this old love [of reality]; and some fantasy, some prejudice, some irrationality, some ignorance, some fear, and whatever else, has worked on and contributed to it. That mountain over there! That cloud over there! What is ‘real’ about that? Subtract just once the phantasm and the whole human contribution from it, you sober ones! Yes, if you could do that! If you could forget your background, your past, your nursery school—all of your humanity and animality! There is no ‘reality’ for us—and not for you either, you sober ones...<sup>6</sup>

The naïve realists are capable, so they say, of seeing the world for what it is, as it is, as if from nowhere. But how could they? Every impression, perception, observation, every theoretical

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<sup>3</sup> Alf Hornborg, *The Power of the Machine*, 10.

<sup>4</sup> One of the key lessons of this thesis is that unmediated access is, for all intents and purposes, an oxymoron.

<sup>5</sup> I use the term “realism” to denote the thesis that descriptions of the world are not merely expressions of the categories of human cognition. “Naïve” realism takes such descriptions to be faithful expressions of the in itself, as if the human perspective could be simply filtered out. “Idealism” is the inverse: descriptions of the world reflect only the image of human thought back at itself, telling us nothing at all about the world beyond its horizons. What I call “new realism” seeks to carve a trajectory between the two—thinking the world in its construction, but without ascribing to it the status of ideality. See Bruno Latour, *Pandora’s Hope: Essays on the Reality of Science Studies* (Cambridge: Harvard University Press, 1999).

<sup>6</sup> Nietzsche, *The Gay Science*, §57.

pronouncement, every pretense to truth is made possible by the same confluence of conditions that mediates its access to “reality.”

What Nietzsche calls one’s “humanity and animality” intervenes between the subject and the world, rendering untenable the realist’s claim to direct correspondence. This thesis has, to stay with Nietzsche’s terms, presented a study only of the “animality” of the subject—its bodily capacity, metabolic rate, frequency profile, membranic affections, perceptual apparatus, developmental trajectory, ecological entanglements, and so on. It is therefore in the subject’s “humanity” that a path toward a more comprehensive realization of an organismic-subjective thought is to be traced, for the human subject amplifies and extends its perceptual apparatuses, intervenes into its frequency profiles, modifies its spatial perspectives, and multiplies its entanglements. Beyond *organism*, the human subject is, to take a word from Donna Haraway, also *cyborg*: a hybrid of animal and machine, simultaneously natural, artificial, social, technological.<sup>7</sup> Accordingly, the human adds to organismic subjectivity another ecological dimension. A more complicated cartography is therefore required if the cyborg-like mechanisms of human subjectivity are to be properly theorized, a cartography capable of tracing not only the interactions between sensorimotor ability, metabolic rate, perceptual system, and so on, but also the ways by which these animal abilities are modified and fed into networks of laboratories, concepts, theories, and techniques the net effect of which is the construction, reification, and dissemination of our points of view, our perspectives—indeed, of our very world(s).<sup>8</sup> If this kind of theory is to remain a realism, then it will have to be a new, *constructive* realism; a realism that *builds*

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<sup>7</sup> Donna Haraway, “A Cyborg Manifesto: Science, Technology, and Social-Feminism in the Late Twentieth Century,” *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), 149-181.

<sup>8</sup> See Isabelle Stengers, *The Invention of Modern Science*, trans. Daniel W. Smith (Minneapolis: University of Minnesota, 2000).

the world; a realism—to speak one last time with Nietzsche—that neither forgets its background nor seeks solace in a subtraction of the human contribution.

If I began by bracketing the human, if I have only gestured toward its reintroduction after having described a theory of *nonhuman* subjectivity, it is because subjective worlds are no less real than the organisms that configure them. By analogy and extension, it can no longer make sense to speak of the human world by recourse to the familiar terminology of idealism—as if organismic-environmental relations were one thing, but human-world ones another.<sup>9</sup> Scientific practices ought, as a consequence, be conceived as participating in an organization of the world in much the same way that organisms are caught up in the construction of their environments. Neither term is free from an entanglement with the other. This, then, is the planetary image of a fully formed organismic-subjective thought, a theory of organismic subjectivity integrated with the human technoscientific conditions of its possibility: the earth fluoresces with a univocal, anarchic distribution of affective spatiotemporalities, meshworks of dynamic, coevolutionary entanglements between organismic subjects, the environments they shape and that bring them into existence and the human-technological hybrids whose scientific paradigms enfold the systems they study just as those systems, those sprawling holobiontic ecologies, shape the paradigms that render them intelligible.

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<sup>9</sup> Contemporarily speaking, Continental thinkers are inclined more so toward an identification with “anti-realism,” although its structure is essentially identical to what is more commonly thought to be idealism. On this point, see Lee Braver, *A Thing of This World: A History of Continental Anti-Realism* (Evanston: Northwestern University Press, 2007).

## BIBLIOGRAPHY

- Adams, Rick, and Scott Pederson. *Ontogeny, Functional Ecology, and Evolution of Bats*. New York: Cambridge University Press, 2000.
- Agamben, Giorgio. *The Open: Man and Animal*. Stanford: Stanford University Press, 2004.
- Alaimo, Stacy. *Bodily Natures: Science, Environment, and the Material Self*. Bloomington: Indiana University Press, 2010.
- Alberts, Johnson, Lewis, Raff, Roberts, and Walter. “The Shape and Structure of Proteins,” *Molecular Biology of the Cell*, 4th Edition. New York: Garland Science, 2002. Accessed July 24, 2013. <<http://www.ncbi.nlm.nih.gov/books/NBK26830/>>
- Ansell-Pearson, Keith. *Deleuze and Philosophy: The Difference Engineer*. London: Routledge, 1997.
- . *Geminal Life: The Difference and Repetition of Deleuze*. London: Routledge, 1999.
- Aristotle. “De Anima.” *Selections*. Trans. Terence Irwin and Gail Fine. Indianapolis: Hackett Company, 1995. 169-205.
- Atamer, Esra. “Dissipative Individuation.” *Parrhesia*. Issue 12 (2011): 57-70.
- Bäckhed, Fredrik, Ruth Ley, Justin Sonnenburg, Daniel Peterson, and Jeffrey Gordon. “Host-Bacterial Mutualism in the Human Intestine.” *Science*. Vol. 307, Issue 5717 (2005): 1915-1920.
- Bennett, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press, 2010.
- Bergson, Henri. *Creative Evolution*. Trans. Arthur Mitchell. New York: Random House, 1944.
- . *Matter and Memory*. Trans. N. M. Paul and W. S. Palmer. Mineola, New York: Dover Publications, 2004.
- . *The Creative Mind: An Introduction to Metaphysics*. Trans. Mabelle L. Andison. Totowa: Littlefield, Adams, 1975.
- Berg, Howard. *E. Coli in Motion*. New York: Springer, 2004.
- Berressem, Hanjo. ‘Structural Couplings: Radical Constructivism and a Deleuzian Ecologies.’ *Deleuze/Guattari & Ecology*. Ed. Bernd Herzogenrath. New York: Palgrave Macmillan, 2009. 57-101.
- Bray, Dennis. *Wetware: A Computer in Every Living Cell*. New Haven: Yale University Press, 2009.
- Braver, Lee. *A Thing of This World: A History of Continental Anti-Realism*. Evanston: Northwestern



University Press, 2007.

- Brown, Steven D., and Ian Tucker. “Eff the Ineffable: Affect, Somatic Management, and Mental Health Service Users.” *The Affect Theory Reader*. Eds. Melissa Gregg and Gregory J. Seigworth. Durham: Duke University Press, 2010. 229-249.
- Bryant, Levi. “A Brief Remark on the Real of the Body.” *Larval Subjects*. Modified May 13, 2013. Accessed September 1, 2013. <<http://larvalsubjects.wordpress.com/2013/05/13/a-brief-remark-on-the-real-of-the-body-which-is-a-synonym-for-withdrawn-objects/>>
- . *Difference and Givenness: Deleuze’s Transcendental Empiricism and the Ontology of Immanence*. Evanston: Northwestern University Press, 2008.
- . “On Problems, Multiplicities, Regimes of Attraction, and Ethics.” *Larval Subjects*. Modified May 19, 2012. Accessed December 3, 2013. <<http://larvalsubjects.wordpress.com/2012/05/19/on-problems-multiplicities-regimes-of-attraction-and-ethics/>>
- . “Reflections on the Opacity of Affect.” *Larval Subjects*. Modified May 10, 2013. Accessed September 1, 2013. <<http://larvalsubjects.wordpress.com/2013/05/10/reflections-on-the-opacity-of-affect/>>
- . “Stacy Alaimo: Porous Bodies and Trans-Corporeality.” *Larval Subjects*. Modified May 5, 2012. Accessed July 20, 2013. <<http://larvalsubjects.wordpress.com/2012/05/24/stacy-alaimo-porous-bodies-and-trans-corporeality/>>
- . “What are Singularities?” *Larval Subjects*. Modified June 14, 2012. Accessed December 3, 2013. <<http://larvalsubjects.wordpress.com/2012/06/14/what-are-singularities/>>
- Buijs, R. M., C. G. Van Eden, V. D. Goncharuk, and A. Kalsbeek. “The Biological Clock Tunes the Organs of the Body: Timing by Hormones and the Autonomic Nervous System.” *Journal of Endocrinology*. Vol. 177, Issue 1 (2003): 17-26.
- Cammaerts, Marie-Claire. “The Visual Perception of the Ant *Myrmica Ruginodis* (Hymenoptera: Formicidae).” *Biologia*. Vol. 67, Issue 6 (2012): 1165-1174.
- Cesari, P., F. Formenti, and P. Olivato. “A Common Perceptual Parameter for Stair Climbing for Children, Young and Old Adults.” *Human Movement Science*. Vol. 22, Issue 1 (2003): 111-124.
- Chabot, Pascal. *The Philosophy of Gilbert Simondon: Between Technology and Individuation*. London: Bloomsbury Press, 2013.
- Chemero, Anthony. *Radical Embodied Cognitive Science*. Cambridge: MIT Press, 2009.
- Colebrook, Claire. “On the Specificity of Affect.” *Deleuze and Space*. Eds. Ian Buchanan and Gregg Lambert. Edinburgh: Edinburgh University Press, 2005.

- Collett, Tom, and Paul Graham. “The Visually Guided Routes of Ants.” *Spatial Cognition, Spatial Perception: Mapping the Self and Space*. Eds. Francine L. Dolins and Robert W. Mitchell. New York: Cambridge University Press, 2010. 117-151.
- Combes, Muriel. *Gilbert Simondon and the Philosophy of the Transindividual*. Trans. Thomas LaMarre. Cambridge: MIT, 2013.
- Delanda, Manuel. *Intensive Science and Virtual Philosophy*. London: Continuum, 2002.
- Deleuze, Gilles. *Difference and Repetition*. Trans. Paul Patton. New York: Columbia University Press, 1994.
- . *Empiricism and Subjectivity: An Essay on Hume's Theory of Human Nature*. Trans. Constantin V. Boundas. New York: Columbia University Press, 1991.
- . *The Logic of Sense*. Trans. Mark Lester. Ed. Constantin V. Boundas. New York: Columbia University Press, 1990.
- . *Spinoza: Practical Philosophy*. Trans. Robert Hurley. San Francisco: City Lights Books, 1988.
- Deleuze, Gilles, and Félix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*. Trans. Brian Massumi. Minneapolis: University of Minnesota Press, 1988.
- Dennett, Daniel. *Consciousness Explained*. Boston: Little, Brown, 1991.
- Eagleman, Tse, Buonomano, Janssen, Nobre, and Holcombe. “Time and the Brain: How Subjective Time Relates to Neural Time.” *The Journal of Neuroscience*. Vol. 25, Issue 45 (2005): 10369-10371.
- Fairchild, Mark D. “Human Color Vision.” *Color Appearance Models*, 2nd Edition. The Wiley-IS&T Series in Imaging Science and Technology. Chichester: Wiley & Sons, 2005. 1-34.
- Gerstner, Geoffrey, and Louis Goldberg. “Evidence of a Time Constant Associated with Movement Patterns in Six Mammalian Species,” *Ethology and Sociobiology*. Issue 15 (1994): 181-205.
- Gibson, James J. *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin, 1979.
- Gilbert, Scott, Jan Sapp, and Alfred Tauber. “A Symbiotic View of Life: We Have Never Been Individuals.” *The Quarterly Review of Biology*. Vol. 87, Issue 4 (2012): 325-341.
- Goldsmith, T. H. “Optimization, Constraint, and History in the Evolution of Eyes.” *The Quarterly Review of Biology*. Vol. 65, Issue 3 (1990): 281–322.
- Gregg, Melissa, and Gregory J. Seigworth. “An Inventory of Shimmers.” *The Affect Theory Reader*. Eds. Melissa Gregg and Gregory J. Seigworth. Durham: Duke University Press, 2010.

- Haraway, Donna. "A Cyborg Manifesto: Science, Technology, and Social-Feminism in the Late Twentieth Century." *Simians, Cyborgs, and Women: The Reinvention of Nature*. New York: Routledge, 1991. 149-181.
- Harper, Douglas. "Monotonous." *Online Etymology Dictionary*. Modified 2013. Accessed December 3, 2013. < <http://www.etymonline.com/index.php?term=monotonous>>
- Healy, Kevin, et al. "Metabolic Rate and Body Size are linked with Perception of Temporal Information." *Animal Behaviour*. Vol. 86, Issue 4 (Oct. 2013): 685-696.
- Hecht S., and Smith E. "Intermittent Stimulation by Light: Area and the Relation Between Critical Frequency and Intensity." *The Journal of General Physiology*. Vol. 19, Issue 6 (1936): 979-989.
- Heijtz, Rochellys D., S. Wang, F. Anuar, Y. Qian, B. Bjorkholm, A. Samuelsson, M. L. Hibberd, H. Forssberg, and S. Pettersson. "Normal Gut Microbiota Modulates Brain Development and Behavior." *Proceedings of the National Academy of Sciences*. Vol. 108, Issue 7 (2011): 3047-3052.
- Hornborg, Alf. *The Power of the Machine: Global Inequalities of Economy, Technology, and Environment*. Walnut Creek: AltaMira, 2001.
- . "Vital signs: An Ecosemiotic Perspective on the Human Ecology of Amazonia." *Sign System Studies*. Vol. 29, Issue 1 (2001): 125.
- Jurgens, Klaus, Fons, Roger, Peters, Thomas, Sender, Susanne. "Heart and Respiratory Rates and Their Significance for Convective Oxygen Transport Rates in the Smallest Mammal, the Etruscan Shrew *Suncus Etruscus*," *Journal of Experimental Biology*. Vol. 199, Issue 12 (1996): 2579-2584.
- Kamra, D. N. "Rumen Microbial Ecosystem." *Current Science*. Vol. 89, Issue 1 (2005): 124-135.
- Lampert, Jay. *Deleuze and Guattari's Philosophy of History*. London: Continuum, 2006.
- Latour, Bruno. *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge: Harvard University Press, 1999.
- . *Politics of Nature: How to Bring the Sciences into Democracy*. Cambridge: Harvard University Press, 2004.
- . *Science In Action: How to Follow Scientists and Engineers through Society*. Cambridge: Harvard University Press, 1987.
- Leitner, Helga, and Byron Miller. "Scale and the Limitations of Ontological Debate: A Commentary on Marston, Jones and Woodward." *Transactions of the Institute of British Geographers*. Vol. 32, Issue 1 (2007): 116-125.

- Levins, Richard, and Richard Lewontin. “The Organism as the Subject and Object of Evolution.” *The Dialectical Biologist*. Cambridge: Harvard University Press, 1985. 85-106.
- Lewontin, Richard. *Biology as Ideology: The Doctrine of DNA*. New York: HarperPerennial, 1991.
- . *The Triple Helix: Gene, Organisms, and Environment*. Cambridge: Harvard University Press, 2000.
- Ley, Ruth, Daniel Peterson, and Jeffrey Gordon. “Ecological and Evolutionary Forces Shaping Microbial Diversity in the Human Intestine.” *Cell*. Vol. 124, Issue 4 (2006): 837-848.
- Lukjancenko, O., Wassenaar, T.M., Ussery, D.W. “Comparison of 61 Sequenced *Escherichia coli* Genomes.” *Microbial Ecology*. Vol. 60, Issue 4 (2010): 708-720.
- Massumi, Brian. *Parables for the Virtual: Movement, Affect, Sensation*. Durham: Duke University Press, 2002.
- Maturana, Humberto R., and Francisco J. Varela. *Autopoiesis and Cognition: The Realization of the Living*. Dordrecht: D. Reidel Publications, 1980.
- . *The Tree of Knowledge: The Biological Roots of Human Understanding*. Boston: Shambhala, 1992.
- . “Mechanism and Biological Explanation,” *Philosophy of Science*, Vol. 39, Issue 3 (1972): 328-382.
- Mengel, Gregory. “The Future Is and Is Not the Past: Heredity, Epigenetics, and the Developmental Turn.” *The Evolutionary Epic: Science's Story and Humanity's Response*. Ed. C. Genet. Santa Margarita: Collins Foundation Press, 2009. 213-217.
- Morris, Simon Conway. *Life's Solution: Inevitable Humans in a Lonely Universe*. Cambridge: Cambridge University Press, 2003.
- Nietzsche, Friedrich. *Beyond Good and Evil: Prelude to a Philosophy of the Future*. Trans. Walter Kaufmann. New York: Vintage, 1989.
- . *Daybreak: Thoughts on the Prejudices of Morality*. Trans. R. J. Hollingdale. Cambridge: Cambridge University Press, 1997.
- . *The Gay Science: With a Prelude in German Rhymes and an Appendix of Songs*. Ed. Bernard Williams. Trans. Josefine Nauckhoff. Cambridge: Cambridge University Press, 2001.
- . *On the Genealogy of Morals and Ecce Homo*. Trans. Walter Kaufmann and R. J. Hollingdale. New York: Vintage, 1969.
- Noë, Alva. *Action in Perception*. Cambridge: MIT Press, 2004.

- Odling-Smee, John, Kevin Laland, and Marcus Feldman. *Niche Construction: The Neglected Process in Evolution*. Princeton: Princeton University Press, 2003.
- O’Sullivan, Simon. “Fold.” *The Deleuze Dictionary*. Ed. Adrian Parr. Edinburgh: Edinburgh University Press, 2010. 107-108.
- Oyama, Susan. *The Ontogeny of Information: Developmental Systems and Evolution*. Cambridge: Cambridge University Press, 1985.
- Pöppel, Ernst. “Time perception.” *Handbook of Sensory Physiology* 8: Perception. Eds. Held, Leibowitz, and Teuber. Springer Verlag, Berlin, 1978. 713-729.
- Post, David and Eric Palkovacs. “Eco-evolutionary Feedbacks in Community and Ecosystem Ecology: Interactions Between the Ecological Theatre and the Evolutionary Play.” *Philosophical Transactions of the Royal Society of London B: Biological Sciences*. Vol. 264, Issue 1523 (2009): 1629-1640.
- Protevi, John. *Political Affect: Connecting the Social and the Somatic*. Minneapolis: University of Minnesota Press, 2009.
- . “Adding Deleuze to the Mix.” *Life, War, Earth: Deleuze and the Sciences*. Minneapolis: University of Minnesota Press, 2013. 137-152.
- . “Deleuze, Jonas, and Thompson: Toward a New Transcendental Aesthetic and a New Question of Panpsychism.” Paper presented at Society for Phenomenology and Existential Philosophy, Montreal, Quebec 2010. <[www.protevi.com/john/NewTA.pdf](http://www.protevi.com/john/NewTA.pdf)>
- . “Deleuze and Life.” *The Cambridge Companion to Deleuze*. Eds. Daniel W. Smith and Henry Somers-Hall. New York: Cambridge University Press, 2012.
- . “Larval Subjects, Autonomous Systems and E. Coli Chemotaxis.” *Deleuze and the Body*. Eds. Laura Guillaume and Joe Hughes. Edinburgh: Edinburgh University Press, 2011. 30-50.
- . “Mind in Life, Mind in Process.” *Life, War, Earth: Deleuze and the Sciences*. Minneapolis: University of Minnesota Press, 2013. 179-196.
- . “Ontology, Biology, and History of Affect.” *The Speculative Turn: Continental Materialism and Realism*. Eds. Levi Bryant, Nick Srnicek, and Graham Harman. Melbourne: re.press, 2011. 393-405.
- Qin, Jian, et al. “A Human Gut Microbial Gene Catalogue Established by Metagenomic Sequencing.” *Nature*. Vol. 464, Issue 7285 (2010): 59-65.
- Robbert, Adam. “Earth Aesthetics: Knowledge and Media Ecologies.” *Knowledge Ecology*. Modified July 14, 2013. Accessed September 9, 2013. <<http://knowledgeecology.files.wordpress.com/2013/07/earth-aesthetics-8.pdf>>

- . “Ecology is the Break Down of Structure and Content.” *Knowledge Ecology*. Modified May 26, 2013. Accessed January 5, 2013. <<http://knowledge-ecology.com/2013/05/26/ecology-is-the-break-down-of-structure-and-content/>>
- Rosenberg, Eugene, et al. “The Role of Microorganisms in Coral health, Disease and Evolution.” *Nature Reviews Microbiology*. Vol. 32, Issue 5 (2007): 355-362.
- Ruck, Philip. “Electrophysiology of the Insect Dorsal Ocellus: III. Responses to Flickering Light of the Dragonfly Ocellus.” *The Journal of General Physiology*. Vol. 44, Issue 3 (1961): 605-627.
- Sauvagnargues, Anne. “Crystals and Membranes: Individuality and Temporality.” Trans. Jon Roffe. *Gilbert Simondon: Being and Technology*. Eds. Arne De Boever, Alex Murray, Jon Roffe, and Ashley Woodward. Edinburgh: Edinburgh University Press, 2012. 57-72.
- Shaviro, Steven. “Simondon on Individuation.” *The Pinocchio Theory*. Modified January 16 2006. Accessed August 3, 2013. <<http://www.shaviro.com/Blog/?p=471>>
- “Should Isolations Rooms be banned in B.C. Schools?” *CBC News*, British Columbia. November 21, 2013. Accessed December 3, 2013. <<http://www.cbc.ca/news/canada/british-columbia/should-isolation-rooms-be-banned-in-b-c-schools-1.2434512>>
- Simondon, Gilbert. *L'individu et sa genèse physico-biologique*. Paris: Presses Universitaires de France, 1995.
- . “The Genesis of the Individual.” *Incorporations*. Eds. Jonathan Crary and Sanford Kwinter. New York: Zone Books, 1992. 297-319.
- . “The Position of the Problem of Ontogenesis.” Trans. Gregory Flanders. *Parrhesia*. Issue 7 (2009): 4-16.
- Smith, Daniel W. “Deleuze’s Concept of the Virtual and the Critique of the Possible.” *The Journal of the Society for Philosophy and Literary Studies of Nepal: A Cross-Disciplinary Inquiry*. Vol. 4, Issue 9 (2009): 34-43.
- Spinoza, Baruch. *A Spinoza Reader: The Ethics and Other Works*. Trans. Edwin Curley. Princeton: Princeton University Press, 1994.
- Stadler, Bernhard and Dixon, Anthony. “Ecology and Evolution of Aphid-Ant Interactions.” *Annual Review of Ecology Evolution and Systematics* Vol. 36 (2005): 345-372.
- Stengers, Isabelle. *The Invention of Modern Science*. Trans. Daniel W. Smith. Minneapolis: University of Minnesota, 2000.
- Thompson, Evan. “Life and Mind: From Autopoiesis to Neurophenomenology. A Tribute to Francisco Varela.” *Phenomenology and the Cognitive Sciences*. Issue 3 (2004): 381-398.

- . “Living Ways of Sense Making,” *Philosophy Today* SPEG Supplement 2011: 114-123.
- . *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Cambridge: Belknap of Harvard University Press, 2007.
- Treisman, Faulkner, Naish, Brogan. “The Internal Clock: Evidence for a Temporal Oscillator Underlying Time Perception with Some Estimates of its Characteristic Frequency.” *Perception*. Vol. 19, Issue 6 (1990): 705-743.
- Turvey, Michael. “Affordances and Prospective Control: An Outline of the Ontology.” *Ecological Psychology*. Vol. 4 (1992): 173-187.
- Uexküll, Jakob von. *A Foray into the Worlds of Animals and Humans: With A Theory of Meaning*. Trans. Joseph D. O’Neil. Minneapolis: University of Minnesota Press, 2010.
- Varela, Francisco J. “Autopoiesis and a Biology of Intentionality.” *Autopoiesis and Perception*, Proceedings of a workshop held at Dublin City University, Dublin, Ireland. August 25-26, 1992. Eds. McMullin and Murphy, 1994. <ftp://ftp.eeng.dcu.ie/pub/alife/bmcm9401/varela.pdf>
- Varela, Francisco J., and Jean Pierre Dupuy. “Whence Perceptual Meaning? A Cartography of Current Ideas.” *Understanding Origins: Contemporary Views on the Origin of Life, Mind, and Society*. Dordrecht: Kluwer Academic, 1992. 235-63.
- Varela, Francisco J., and Andreas Weber. “Life after Kant: Natural Purposes and the Autopoietic Foundations of Biological Individuality.” *Phenomenology and the Cognitive Sciences*. Vol. 1, Issue 2 (2002): 97-125.
- Varela, Francisco J., Evan Thompson, and Eleanor Rosch. *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge: MIT, 1991.
- Veitch, J., and McColl, S. “Modulation of Fluorescent Light: Flicker Rate and Light Source Effects on Visual Performance and Visual Comfort.” *Lighting Research and Technology*. Vol. 27, Issue 4 (1995): 243-256.
- Williams, James. *Gilles Deleuze’s Difference and Repetition: A Critical Introduction and Guide*. Edinburgh: Edinburgh University Press, 2003.
- Wolfe, Cary. *Critical Environments: Postmodern Theory and the Pragmatics of the “Outside.”* Minneapolis: University of Minnesota Press, 1998.
- Yoshimura, Arimura, and Kaibuchi. “Signaling Networks in Neuronal Polarization.” *The Journal of Neuroscience*. Vol. 26, Issue 42 (2006): 10626-10630.