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The Substance of Health: Aristotle, Deleuze and Guattari on the Dynamic Materiality of the Living Body and Its Influence on Medical Concepts and Practices

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Abstract of the Dissertation

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by

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Western medicine relies on a mechanistic conception of matter as passive and inert. Yet matter, and especially living matter, is actually dynamic and agential. This has transformative implications both for our quest to understand what health is and for determining what kinds of practices best promote health. I draw on a diverse set of philosophical thinkers to articulate a dynamic conception of living bodily matter that can enable us to define health more robustly and promote it more effectively. First I discuss the theoretical framework put forth by contemporary feminist accounts of materiality (“new feminist materialisms” or “material feminisms”), which explains why we need to reconceptualize matter as dynamic, and offers some first steps toward doing so. Then, through sustained engagement with Aristotle and Deleuze and Guattari, I develop an account of the distinctly dynamic conceptions of matter at work in each of their ontologies. On the basis of these two accounts, I propose two dynamic features of living bodies that are particularly relevant to medicine: *teleology* and *permeability*. I explore what these notions mean, both separately and together, for conceptions of human health and the practices that seek to promote it. I conclude by discussing various economic, political, and ethical implications of this dynamic conception of living matter.

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Introduction

There must be a common, agreed-upon standard of judgment; and I think this will have to be health: the health of ecosystems and of human communities.

- Wendell Berry, *The Way of Ignorance*, p.124

As Wendell Berry indicates in *The Way of Ignorance*, the concept of *health* is a naturalized, normative principle that can provide the basis for social deliberation about actions involving the good, including the common good. But in order for the notion of health to serve this regulative capacity, we must first be able to agree on what health is - and in particular, what health means in reference to human beings. This is a significant challenge. Although it is primarily a theoretical challenge, it is one with deep practical ethical, political, and economic implications. Concepts of health are at stake determining not only what is good for communities and for the environment, but also what is good for the individual. What is the goal of medicine? What is the goal of health care? How can society promote the health of its citizens? Our ability to have meaningful debates about these issues, and also to come to consensus about what we ought to do to promote the common good, depend on the robustness and complexity of our understanding of what health is.

I am convinced that the conceptual resources circulating in society that provide a basis for debating and formulating concepts of health are deficient. The concept of health

is always up for interpretation, revision, and collective construction. In this sense, no one formulation can definitively solve the problem of health. Instead, trying to figure out *what health is* constitutes one of our foremost shared ethical/ political/ epistemological/ ontological projects. Philosophers and medical theorists play a crucial role in this project by offering robust theoretical resources that citizens and lay people can use when they think about, debate, and settle on definitions of health.

Western philosophical options for defining health

Western medicine, philosophy, and culture lack a robust concept of health. Health can be a difficult concept to pin down, as it takes on different meanings in different contexts, including in its everyday, scientific, and philosophical uses. For this reason, mainstream Western allopathic medical practice and theory tend to define health negatively, focusing on health as the absence of disease or dysfunction and the avoidance of premature death. Theoretical definitions of illness in Western contexts tend to group into two opposing poles. The objectivist perspective holds that disease is an objective state or process within the body. Boorse has formulated one of the most clear objectivist definition of health, according to which disease is a harmful departure from species-typical normal organ function (1977, 1997, 1997). Constructivists, on the other hand, argue that we first make a judgment that something is a disease, and then identify the bodily process that causes it. In this sense, thinkers like Foucault, Szasz, and Sedgwick define disease as a departure from a norm that society, culture, institutions, or individuals have defined as desirable. By calling what is accepted as normal “healthy” and what is not “unhealthy,” we try to naturalize what are in fact social value judgments. This perspective is most common in sociological critics of categories and diagnoses of mental

illnesses, but Sedgwick also extends it to other kinds of (somatic) diseases (Foucault, 1988; Sedgwick, 1973; Szasz, 2011). The objectivist and constructivist poles are also sometimes called naturalist and normativist, respectively.¹ The main question that is debated between the two opposing sides in either case is whether diseases are “real” entities or simply mental and social concepts that we tie (justifiably or not) to biological processes (Nordenfelt, 2001).

Despite a widespread focus in the conceptual literature on trying to define disease, pathology, and illness, a few significant attempts have been made to positively define *health*. The World Health Organization offers a positive definition of health as "a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity."² This definition has been criticized, however, as being vague, and indistinguishable from holistic definitions of well-being.³ Others have attempted more specific definitions. Gadamer argues that health is a naturally arising state of wholeness that allows us to be meaningfully involved with the world (Gadamer, 1996 p 96, 113).⁴ His definition intentionally inhabits a middle space between subjective and functional definitions of health, between norms as naturalized and norms as value-laden. Both

¹ This a distinction indebted to Canguilhem’s treatment of the difference between biological and social notions of norms in *The Normal and the Pathological*. Not all positions end up at one extreme or the other; thinkers like Caplan, Reznek, and Wakefield, aim to blend the two into a middle position (Ereshefsky, 2009).

² World Health Organization, Preamble to the Constitution of 1948.

³ See Engelhardt (1975), p. 175.

⁴ According to Gadamer, this explains why health it is easier to define disease than illness (1996), pp. 32-3, 39). Canguilhem’s mentor René Leriche promoted a similar perspective, that health is only seen in the “silence of the organs” (Canguilhem, 1991, pp. 91–2, 102, 118).

Nordenfelt and Whitbeck similarly combine these two poles by proposing definitions of health as the state that allows someone to fulfill her goals, including intentional and unintentional (L. Y. Nordenfelt, 1995; Whitbeck, 1981). Amplifying this approach even further, psychologists Ryff and Singer propose a holistic explanation of *health as engagement in the world*, including meaningful activities, quality connection to others, and positive self-regard and mastery (1998).⁵ Other approaches lean more heavily toward the experiential aspect of health, like Carel's phenomenological definition of health as the feeling of unified with one's body, regardless of the presence of disease (Carel, 2007).⁶

An Ontological Investigation Into Health

While these proposals for positive definitions of health are interesting, overall, philosophical debates about the meaning of health as a concept fail to offer robust theoretical tools that societies can use for defining health as a goal of both medicine and policy. This is clear in the debate between constructivist and objectivist perspectives. On the one hand, the objectivist view seeks to define health or disease using a set of defined, species-wide biological criteria, assuming that objective definitions must be timeless and universal. On the other hand, recognizing the immense variety of human bodies and experiences, constructivist definitions make health relative to the individual. They also take account of the influence of culture and society on definitions of health. This amplification of our understanding of health, however, comes at the expense of

⁵ This approach has much in common with the capabilities approach put forth by Sen and Nussbaum, although for them health is only one of a number of human capacities (Nussbaum, 2003; Sen, 2004).

⁶ See also Carel (2014). Another example of a phenomenological approach to defining health is Svenaeus's *The Hermeneutics of Medicine and the Phenomenology of Health* (1999).

objectivity. Ultimately, framing the debate in this way lands us in a position where we have to choose between two mutually exclusive options. This choice necessarily deprives us of the valuable resources of one perspective or the other. In the end, because of this polarization, these theoretical debates about the nature of health ultimately leave physicians, patients, and policy makers without useful tools for integrating a robust definition of health into their social and political agendas. Perhaps for the same reason, the discipline of bioethics does not sustain much of an engagement with questions about how to define health, even though the concept of health sits precisely at the conjunction of biology and ethics.

Positive definitions of health would seem to offer better resources, since they generally encompass both naturalist and normative perspectives. Indeed, this unification of nature and meaning is one of their most significant contributions. However, because they are focused framing health as an overall state or activity of a human being, including social, psychological, and intellectual aspects, these perspectives are not oriented toward providing a definition of *bodily* health. The most significant contribution of these perspectives is to remind us that it is people, and not just bodies, that experience health and illness. In this way, they can help medical professionals orient their work towards engaging more holistically with people, rather than just with medical conditions (Sturmberg, 2007; Sturmberg, Martin, & Moes, 2010). Yet because they consider health and disease as a feature of the whole person, these perspectives do not offer us many tools for thinking about what we, as a society and as individuals, mean when we talk

about the health of our *bodies* in particular. This is unfortunate, because it is *bodily* health that is most directly the object of medical practice and public policies regarding health.⁷

I believe that all of these attempts to define health and disease fail to provide us with the tools we need for robustly defining health as the goal of both medical practice and public policy because they do not engage in a philosophically rigorous way with ontological questions about the nature of the living body.⁸ Both subjective and objective notions of health ultimately refer to living bodies. As Canguilhem proposes, health is *the truth of the body* (2008a, pp. 469–72).⁹ Since living bodies have *material* dimensions, health has material dimensions. It is only by seeking to understand the nature of living matter, therefore, that philosophy can develop conceptual resources adequate for the task of creating conceptions of health that enable society to truly promote health through medical care and social policies. In order to formulate more robust philosophical resources for defining health, therefore, we urgently need a complex ontology of living

⁷ I certainly do not mean to suggest that holistic health is unimportant. While I think that any comprehensive definition of human health needs to take into account all the features of human life, the specific nature of *bodily* health is generally unspecified in these accounts, which constitutes an enormous theoretical gap that needs to be filled.

⁸ The work of Georges Canguilhem is a notable exception to this tendency, as he integrates the empirical and theoretical study of living bodies into his consideration about how to define health and disease (Canguilhem, 1991, 2008b, 2012). For this reason it is highly unfortunate that his work has not been widely read in anglophone philosophy of medicine and bioethics circles.

⁹ This is the case even though Canguilhem situates the health of organisms in relation to both their social and physical milieus (Canguilhem, 2012).

materiality.¹⁰ When we strengthen and complexify our conception of the nature of living matter, we open up new avenues for defining health. This in turn provides the basis, not only for a reorientation and renewal of medical theory and practice, but also for a more robust use of the concept of health in practical and communal deliberations about the common good.

To move towards such an ontology, and to show all of the theoretical and clinical implications that it implies, are the principle goals of this dissertation. To help with these tasks, I draw creatively from a diverse set of philosophical thinkers- contemporary feminist theorists, Aristotle, and Deleuze and Guattari. Each of these offers rich resources for transforming our understanding of the materiality of the living body. I begin by taking up the problem of the nature of matter itself. Contemporary feminist accounts of materiality, also called “new feminist materialisms” or “material feminisms” provide rich resources for understanding why and how we need to reconceptualize the matter of the living body as dynamic. Although in Western thought matter has traditionally been assumed to be inert and passive, we have important intellectual resources in the Western tradition for conceptualizing it as active and agential. Through a sustained engagement with Aristotle with Deleuze and Guattari’s notions of matter, I demonstrate that these very different thinkers offer us resources to better understand matter’s dynamism and agency. On the basis of their conceptions of matter I highlight two features of dynamic materiality that are particularly relevant to medicine: matter’s teleology, and matter’s permeability. I explore what these notions mean, separately and together, for how we

¹⁰ Ontology need not designate a rigid and fixed account of the structure of reality. By ontology, I simply mean a delineation of the *material structure* of the body, which, as I will show, is determinate but not unchanging. In this sense, it would be coherent to call this a phenomenological project in the Heideggerian sense.

understand living bodies, as well as their consequences for medical theory and practice. Finally, I conclude by discussing the ethical and political relevance of the onto-epistemological shift that this rethinking of living matter as dynamic, teleological, and permeable entails.

The pairing of Aristotle with Deleuze and Guattari requires some justification. There are important reasons for this juxtaposition. Aristotle is an appropriate choice for a work on the ontology of health, since throughout his work consistently uses health, both as a concept, a bodily reality, and a goal of medicine, as an example to illustrate his thinking. Not only this, but the resources that his work offers for thinking the causation of natural things, although underappreciated in Western thought since the modern era, are extraordinarily rich. For many years I have been fascinated by his account of nature. According to Aristotle, we cannot think natural things apart from their matter. This means that matter has an irreducible role in epistemology and ontology, and by extension, ethics and politics. Although many interpreters have concluded that Aristotle in the end prioritizes form over matter, I believe that Aristotle offers unique and largely unmined resources for thinking the ontological and epistemological contributions of matter.

Although they inhabit a very different place in the philosophical universe, Deleuze and Guattari are also an obvious choice for the task of investigating the dynamic nature of matter as it relates to bodies and health. The collaboration of Gilles Deleuze, a philosopher, and Félix Guattari, a clinical psychologist, instantiates the meeting of rigorous philosophical inquiry with clinical concerns. In their collaborations, and especially in *A Thousand Plateaus*, which forms the basis of my analysis of their work, they posit a philosophy and indeed an ontology of immanence. This means that all of

their work is a comment on the nature and possibilities of matter. They are also very concerned with the ethical and political implications of their ontology, and engage directly with questions of bodily health. Pairing their work with Aristotle's might seem surprising. Their style is quite different from Aristotle's, and there are not many who would try to read them together. There is a coherence between them, as Deleuze and Guattari's work actually is indebted indirectly to Aristotle through the influence of Bergson and Canguilhem on Deleuze. For this reason, reading Aristotle alongside Canguilhem might have seemed a more obvious option, but I chose Deleuze and Guattari for the contrast that they offer to Aristotle, especially in popular interpretations of the work of each. Aristotle is commonly understood to explain biological nature through recourse to notions like essence and finality, this latter usually understood in the sense of conscious intentionality or external purpose. Deleuze and Guattari on the other hand are understood to be anti-essentialist to the very core, rejecting the organism as a mode of explanation and proposing that we try to think and live through in terms of a model of reality where we embrace and find freedom by freeing stable layers of reality into more dynamic flows. We do this by creating lines of escape from structure and organization, a process that they call *deterritorialization* that is generally understood to be their strategy for liberation.

In this dissertation I thus put into conversation two very opposed notions of living matter: Aristotelian stability and predictability vs. Deleuzo-Guattarian freedom and escape. Clearly, traditional concepts of health as a normative ideal are more easily explained through recourse to Aristotle's conceptual apparatus, but Deleuze and Guattari's work has become very popular in recent years as a tool for thinking about and

promoting social and political transformation (most notably through the work of Hardt and Negri).¹¹ In large part, I put these three thinkers together in order to test the limits of their thinking. Is Aristotle's ontology of living things really essentialist? Do Deleuze and Guattari really give us an ontology of freedom and escape? I also wanted to see whether perhaps they, like the objectivist and constructivist views, inhabit too overly opposed poles. Could putting their work together enable us to reach some kind of middle position, one where we could formulate objective definitions of health that at the same time do not confine every human being to the same fixed essence? Indeed, this conversation I believe does enable such a view of health. But the surprising result of the conversation between Aristotle and Deleuze and Guattari is the realization that the general characterizations of their work outlined above are not terribly accurate. As I will show in the following chapters, Aristotelian teleology is not essentialist and final ends are not external to individual organisms. Neither do Deleuze and Guattari promote or encourage radical deterritorialization and destratification. I demonstrate that while these thinkers emphasize different aspects of material life, they have much more in common than you would ever think. The implications of this common ground for rethinking living bodies and health, including for transforming medical practice and theory and for strengthening the conceptual bases of public policy, are truly breathtaking.

Structure of the Dissertation

The dissertation is organized in three sections. The first section, entitled *Setting the Stage*, contains two chapters that orient the project and set up its basic theoretical foundations. In Chapter 1, I discuss how recent work in "feminist materialisms" offers both a robust critique of, and interesting alternatives to, the traditional Western

¹¹ For an excellent discussion of this, see Tampio, 2009.

conception of matter. An analysis of the work of thinkers like Karen Barad, Nancy Tuana, Elizabeth Grosz, and Elizabeth Wilson sets the stage for this dissertation, because they offer rich theoretical resources for motivating us to rethink our conception of matter as well as transform how we understand the relationship between ontology, epistemology, politics, and ethics. In Chapter 2, I build on this feminist foundation to show why the mechanistic understanding of the body and its materiality that dominates Western medicine is fundamentally insufficient for understanding, diagnosing, and treating many kinds of health problems and diseases. The fundamental flaw of the mechanistic approach is that the material body is *not primarily mechanistic* in nature. This assumption leads to important clinical impasses in how to address and cure chronic illness. In light of the distinctions made by feminist materialists about matter, I examine these clinical impasses as well as the objectivist/subjectivist impasse in defining health, showing them to be a direct consequence of Western medicine's mechanistic conception of matter.

The second section, entitled *Two Accounts of Dynamic Matter*, comprises Chapters 3-5. It engages in turn with Aristotle and Deleuze and Guattari to see what they can contribute to an understanding of matter's dynamism. Chapter 3 develops the notion of dynamic matter as it is seen in Aristotle's *Physics*, *Metaphysics*, and *De Anima*. While Aristotle is commonly understood to privilege form over matter as a cause of natural and living things, I show that a careful reading of his work shows matter to be causal and agentive. Chapters 4 and 5 engage thoroughly with Deleuze and Guattari's book *A Thousand Plateaus*, bringing to light the dynamic conception of materiality at the heart of their work. In these chapters I trace matter as it moves throughout their conceptual

apparatus, in the process offering an accessible account of the meaning of the most important and difficult concepts through which they construct their ontology of immanence, including *the body without organs*, *strata*, *assemblages*, and *deterritorialization*.

The third section, *Teleology and Permeability*, highlights two features of matter's dynamism that are particularly important for understanding the health of living bodies: teleology and permeability. Chapter 6 develops the significance of Aristotelian teleology for understanding health. I summarize Aristotle's conception of teleology and then analyze nutrition as an aspect of living bodies that, once understood teleologically, radically changes how we think about the relationship between nutrition and health. In Chapter 7 I do something similar with the notion of bodily permeability, which I derive from Deleuze and Guattari's account of matter. I discuss various issues in environmental medicine that demonstrate the dynamic permeability of living bodies and I show why this permeability constitutes a challenge to orthodox medical science. In Chapter 8, I bring these teleology and permeability together, exploring why Deleuze and Guattari think that their conception of matter can function without recourse to final ends. Ultimately I show that there is much more overlap between Deleuze and Guattari's and Aristotle's positions than Deleuze and Guattari think, and argue that this common ground has deeply transformative implications for medical theory and practice.

In the conclusion, then, I briefly discuss the practical import of this theoretical work on the material basis of human health. Going back to the work of the feminist materialists, I show why a renewed onto-epistemological understanding of the materiality of living bodies is crucial for the political, ethical, and economic challenges we face. The

ontology of living materiality as dynamic, teleological, and permeable that I provide in this dissertation offers new and important resources for addressing clinical and political issues relating to health and medicine, including the worldwide epidemic of chronic diseases, questions about how to distribute responsibility for health and illness between patients, and society, and the nature of the relationship between human health and the health of the environment.

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Section 1

Setting the Stage

Chapter 1

Feminist Materialist Critiques of the Mechanistic Conception of Matter

Introduction

Imagine a nursery. In it a young toddler of fifteen months sits on the floor, playing with a pile of brightly colored blocks. She moves the blocks around, stacks them on top of each other, unevenly. They fall to the floor. She rearranges them, tries again. The blocks have shape, weight, substance. They stack easily. They are easily moved. To the naked eye at least, those blocks fit the bill for a Newtonian unit of matter – extended, inert, dependable, manipulable stuff.

But what about the toddler? Can we consider the toddler and the blocks as sharing the same material nature? Yes, the toddler can be picked up and moved about like a block can (although she might not be very happy about it!). Yes, she has shape, weight, substance. But is this the best, most complete and accurate picture of her material substance?

For anyone who has ever known a toddler, comparing the matter of a toddler to the matter of her blocks seems so reductionistic as to be absurd. So much is left out by an account of growing human toddler bodily matter that only sees what is of the same nature as the blocks! The matter of the toddler, while she plays with the blocks, is growing at an incredible rate. It is changing form. She is developing teeth, her limbs are stretching out. She is developing and tuning motor skills and hand eye coordination. She is probably learning to walk. She is learning to control the sounds her vocal cords makes and is starting to pronounce a recognizable word or two in the language in which she is immersed. And, like every living human being, she is digesting, her blood is circulating,

her enzymes are reacting, and so on, material processes interacting with material processes ad infinitum. There is so much activity happening in her matter that is not and cannot be captured by an account of her matter as simply mechanistic.¹²

In the same way, the ontology of living bodies requires something more than a mechanistic account of matter. Mechanism simply cannot fully explain all of what happens in a living body because matter, and especially the matter of living bodies, is not actually inert. Living matter is dynamic. In living beings living matter is constantly growing, developing, changing, and moving. In order to better understand what health is, therefore, we need a more dynamic account of the materiality of living bodies. This quest begins with the task of reconceptualizing matter itself as dynamic.

Western thought has, at least since the time of Descartes and Newton, understood matter, including the matter of living bodies, to be basically and primarily mechanistic in nature.¹³ But in recent years, philosophers and theorists have been explicitly challenging

¹² Of course, the matter of the blocks is also dynamic. Even though this dynamism is much less obvious, it is in fact moving and changing by decaying slowly. But overall the mechanistic picture of matter neglects *less* in its account of a block that in its account of a toddler.

¹³ In the *Sixth Meditation*, Descartes' writes " [O]n the one hand I have a clear and distinct idea of myself, in so far as I am simply a thinking, non-extended thing [that is, a mind], and on the other hand I have a distinct idea of body, in so far as this is simply an extended, non-thinking thing. And accordingly, it is certain that I am really distinct from my body, and can exist without it" (1985, AT VII p. 78). Similarly, in his unfinished text *Description of the Human Body and All Its Functions*, Descartes states that the soul "is a substance which is distinct from the body" and that there are functions of the body that operate entirely separately from the influence of the soul (i.e. will, thought, and even sense perception) (1985, AT XI p. 225). Yet while Descartes' famous (or infamous) "substance dualism" of mind and matter has indeed shaped the 'modern' mechanistic understanding of matter, his own view of the nature of bodily matter was somewhat more nuanced than later mechanistic views. (I will discuss more of the details of his view below as they are relevant.) While Newton generally espouses a weaker form of mechanism than Descartes (2010, Optics Book III Query 28), it is nonetheless the case

dominant mechanistic conceptions of matter, including Cartesian dualism, representationalism, and scientific realism, seeking to put forth new, more dynamic theories of materiality. In this chapter I explore recent feminist efforts to theorize matter and materiality more dynamically. These theories, often grouped under the label ‘feminist materialisms’ or ‘new materialisms’ offer illuminating accounts of the limits of mechanistic understandings of matter and give some excellent examples of the theoretical and practical benefits of this renewed understanding of matter’s vitality. Their work sets the stage for a revolution in how we conceive of the matter of living bodies.

Thinking about and theorizing the nature of matter and materiality as it relates to human life has been a central preoccupation of feminist theory for many decades. This is because historically women have been understood to be closer than men to the material aspect of existence. The assimilation of women to matter most frequently functions either as a way to denigrate them as being the more passive sex, or as an explanation for why their subservient roles are fixed in nature and cannot be changed. In both cases, the nature of matter itself becomes a problem for women, and thus for feminist theory. As feminists seek to fight oppression and patriarchy, they have strong motivation to question the nature of materiality itself.

Feminist critiques of matter as mechanistic

Recent feminist work on the dynamism of matter, broadly labeled “feminist materialisms”, begins by locating and challenging two key presuppositions of the mechanistic view of matter: that matter is passive, and that matter is separable. In

that the time of Descartes and Newton marked the rise of a mechanistic science that has continued to dominate Western thinking up to the present time, despite the discovery of quantum physics.

Western thought, matter is passive in the sense that any impetus for change or dynamism must be given to it from without; it has no agency of its own. When matter moves or changes, it is only behaving according to fixed, universal, timeless laws, or as the product of accidental interactions with other matter also behaving according to these laws.¹⁴ Otherwise, any additional motion or change must come from the active input of an intentional (usually human) subject.¹⁵ Diana Coole describes it, “In Western thought, matter is essentially passive stuff, set in motion by human agents who use it as a means of survival, modify it as a vehicle of aesthetic expression, and impose subjective meanings

¹⁴ According to R.G. Collingwood, in the 17th Century both matter and the laws of nature were understood equally to be unchanging: “The world of nature as it appears to our senses was admitted to be unknowable; but it was argued that behind these so-called ‘secondary qualities’ there lay other things, the true objects of natural science, knowable because unchanging. First there was the ‘substance’ or ‘matter’, itself not subject to change, whose changing arrangements and dispositions were the realities whose appearances to our sensibility took the shape of secondary qualities. Secondly, there were ‘laws’ according to which those arrangements and dispositions changed. These two things, matter and natural law, were the unchanging objects of natural science” (2014, p. 11).

¹⁵ On this point Descartes’ view shows some nuance. He argues that there are some activities of the body that are entirely caused by its matter, with no influence from will or thought. These kinds of activities, like digestion, the pumping of the blood through the heart and the arteries, or even the convulsive movements of a damaged nerve, are simply the product of the “disposition” of the organs in question, (1985, p. 225). Nonetheless, Descartes is interested in these phenomena because he can use them to develop a mechanistic conception of the body in which the body can operate on its own, apart from the vital input of soul (1985, AT XI p. 226). Yet these same activities can also be construed as supporting the opposite view. It is telling to note that for Aristotle the nutritional activity of digestion is indeed a potency/activity of soul that is shared by all living things (2001, II 3, 415a25). It is most likely against an Aristotelian view that Descartes is arguing when he tries to establish the separability of bodily matter from soul, although for an interesting article defending the view that Descartes actually embraced an Aristotelian/scholastic view that mind and body are two component parts of one substance, see Skirry’s SEP article, “René Descartes: The Mind-Body Distinction” (2006). I will also explore some of Elizabeth A. Wilson’s research on digestion as an example of a non-mechanistic activity of bodies later in this chapter.

upon it.”¹⁶ This view has played an especially formative role in Western philosophy and science. Technological mastery of matter is an intended and logical consequence of the mechanistic view.¹⁷ Matter’s openness to being shaped at our will, its lack of agency implies that we can safely consider its desire, will, or volition to not be an impediment to accomplishing what we will, if only because matter has neither desire, will, nor volition.

A second, related element of the mechanistic conception of matter that influences Western medicine is that matter is *separable*. This conception entails two consequences. First, it presupposes a substantial divisibility between matter and mind. A good example of this view is Descartes’ (infamous and contested) claim that matter and mind are

¹⁶ She continues provocatively, “This view of inert matter as inherently devoid of agency or meaning and as heterogenous to consciousness has an elaborate provenance in classical science and philosophy, but it also seems congruent with, and indeed presupposes, a commonsense, naturalistic attitude which takes for granted a natural world ‘out there’ as an essentially given collection of objects. Yet is it not possible to imagine matter quite differently: as perhaps a lively materiality that is self-transformative and already saturated with the agentic capacities and existential significance that are typically located in a separate, ideal, and subjective realm?” (Coole, 2010, p. 92). It is precisely this agentic notion of matter, as developed in feminist theory, that I explore in this chapter.

¹⁷ Descartes is quite explicit on this point: ”They opened my eyes to the possibility of gaining knowledge which would be very useful in life, and of discovering a practical philosophy which might replace the speculative philosophy taught in schools. Through this philosophy we could know the power and action of fire, water, air, the stars, the heavens and all the other bodies in our environment, as distinctly as we know the various crafts of our artisans; and we could use this knowledge – as the artisans use theirs – for all the purposes for which it is appropriate, and thus make ourselves, as it were, the lords and masters of nature” (1985, AT VI p. 62). According to Descartes, this mastery is of greatest use for the pursuit of *health*. He continues, “This is desirable not only for the invention of innumerable devices which would facilitate our enjoyment of the fruits of the earth and all the goods we find there, but also, and most importantly, for the maintenance of health, which is undoubtedly the chief good and the foundation of all the other goods in this life” (*ibid*). This is particularly pertinent to the discussion of the mechanistic conception of matter in the following chapter.

different kinds of substances.¹⁸ This mind-body separation has permeated our self-understanding of what it means to be thinking subjects and led many to the conclusion that cognition and thought are not activities of matter or material bodies. As Vicki Kirby writes, “It seems that the Cartesian subject has to admit that s/he has a body (that *attaches* to the self), and yet s/he is somehow able to sustain the belief that *s/he is not this body*. This denial is necessary because to contest the latter and all its possible consequences would at least suggest that it might be in the nature of the biological body to argue, to reinvent, and rewrite itself – to cogitate” (2008, p. 221).

Second, a notion of matter as separable also assumes that we can also divide matter easily and unproblematically from other bits of matter, because matter is made up of parts that are essentially isolable. The classical understanding of the atom is an instantiation of this view. One pervasive consequence of the atomistic understanding of matter is that because matter exists in isolable entities, wholes are nothing more than the sum of their parts. The mechanistic view of matter, therefore, would indicate that the functioning of parts is sufficient to explain the existence and the functioning of the

¹⁸ “From this I knew I was a substance whose whole essence or nature is simply to think, and which does not require any place, or depend on any material thing, in order to exist. Accordingly this ‘I’ – that is, the soul by which I am what I am – is entirely distinct from the body, and indeed is easier to know than the body, and would not fail to be what it is, even if the body does not exist” (1985, AT VI p. 33). Of course, it is not so clear that his division between these two substances is very thorough, or how it functions. As he continues in the passage quoted above, “Even the mind depends so much on the temperament and disposition of the bodily organs that if it is possible to find some means of making men in general wiser and more skillful than they have been up till now, I believe we must look for it in medicine” (*ibid*).

whole. In fact, despite the non-mechanistic developments of quantum physics, modern biology and chemistry as a whole have continued to break material bodies into smaller and smaller constituent parts, assuming that if we do enough research on these parts, we will eventually be able to understand the whole of nature.¹⁹

Matter and social constructionism

Interestingly, these premises about the nature of matter have only recently come under suspicion for feminists. Historically, although feminists have fought the oppressive way that traditional conceptions of matter and nature have been used to delimit women's roles in society, they have done so without questioning the mechanistic understanding of matter as inert, passive, or separable. Nature or matter as "fixed" served as the starting point for contestations of essentialist and deterministic claims about women's inferior abilities, natures, and roles in society. Granting the traditional binary that pairs *passive* matter with *active* culture, some feminists attempted to differentiate women from materiality and fixed definitions of their nature by demonstrating the non-natural essence of these definitions (the "social constructionist" approach), while others embraced women's identification with the material aspect of existence, finding ways to valorize it (one kind of "essentialist" approach). The social constructionist approach has generally dominated feminist theory; nature, *as fixed*, has been eschewed, and cultural and social constructionist notions of identity, including sexual and gender identity, have been

¹⁹ There has been some discussion in recent years about the role of teleology in biology and the natural sciences as whole. Teleology, in contrast to atomism, assumes that there are some things about parts that can only be known in relation to the whole. I will discuss teleology and biology in particular at length in Chapter 6. Teleological reasoning is one of the features of Aristotle's approach to science that has been widely rejected since the Enlightenment, but I will argue that it has much to offer contemporary Western medicine, particularly if we can understand it in the context of a matter that is not mechanistic, but agentic and relational.

embraced. As Elizabeth Grosz describes it, “There has traditionally been a strong resistance on the part of feminists to any recourse to the question of nature. Within feminist scholarship and politics, nature has been regarded primarily as a kind of obstacle against which we need to struggle, as that which remains inert, given, unchanging, and resistant to historical, social, and cultural transformations” (2008, p. 23). It is only recently that feminists have begun to think about another path to freedom from overly restrictive conceptions of nature and biology, which is to begin rethinking the very nature of matter itself.

After many decades of struggling to combat problematic arguments and assumptions about the nature of materiality and women’s connection to it, feminist theorists began to recognize that the deep theoretical divide between the cultural and the natural may actually be the source of many struggles within feminist theory and politics. They point out that both the assumption that *naturalized* definitions are essential and timeless, and that critiques of these definitions *must reject a naturalized approach* and insist that definitions are entirely culturally or socially constructed, share the *same fundamental premise*: that nature and matter are essential and fixed. In both cases, nature, biology, and matter are presupposed to offer nothing to the quest for social transformation. In the powerful words of Elizabeth Wilson, “Biological inheritance has been stripped of the infectious, communicative, expansive characteristics that are routinely attributed to psychocultural systems” (2004b, pp. 68–69). *Biology in itself* offers no resources for thinking about difference as dynamic or open to change.²⁰

As feminist theorists of materiality point out, this view of matter inevitably leads to the elimination of the material aspect of existence from the theoretical equation. As a result, social constructionist theories of reality actually subsume nature into culture. Karen Barad describes the problem thus: “Language has been granted too much power...it seems that at every turn lately every ‘thing’ – even materiality- is turned into a matter of language or some other form of cultural representation” (2007, p. 132).²¹ Even when the topic at hand is the body, as in Foucault’s or Butler’s trenchant critiques of how bodies are constituted through discursive practices and forces, it is still discourse that holds the power to determine, and the body is a mere blank slate upon which discourse writes its stories, and biology itself has no agential force or dynamism.²² Stacy Alaimo describes the situation this way: “Predominant paradigms do not deny the material existence of the body, of course, but they do tend to focus exclusively on how various

²⁰ The implicit acceptance of biology as inert and fixed continues to play a pivotal role in the by now commonplace distinction between sex and gender. Sex, as it is commonly understood, refers to biological differences. Gender refers to the culturally and socially constructed component of difference. Because it is cultural, gender is open to contestation, resistance, and transformation, while biology offers none of these possibilities. Butler’s *Gender Trouble* is pivotal text that destabilizes this sex/gender distinction, without, however, attempting to rethink the nature of matter itself (2006).

²¹ As Kirby affirms, “There is little risk in most contemporary criticism, for example, of attributing agency and intelligent inventiveness (culture) to the capacities of flesh and matter (nature). In sum, nature is deemed to be thought-less, and political interventions into Cartesian logic are much more likely to preserve this assumption by expanding the category ‘culture’ to include whatever it is defined against. If the myriad manifestations of nature are actually mediations or representations, that is, second order signs of cultural invention, then nature, as such, is absent” (2008, pp. 216–7).

²² Butler’s *Bodies That Matter* (1993) is an effort to shift the conversation about gender and sex towards the temporal materialization processes of bodies, but Barad argues that her account does not succeed in adequately counter the “passive-active, nature-culture dualisms that her displacement of construction is in part meant to counter” (2007, p. 191).

bodies have been discursively produced, which casts the body as passive, plastic matter” (2007, p. 237). The body may be culturally or discursively shaped or determined, inscribed, politicized, or performed, but the biological body itself is simply a passive recipient of these activities. Bodily matter is therefore understood within these theories in a surprisingly disembodied way. Elizabeth Wilson sums up the situation succinctly: “The body at the center of these projects is curiously abiological- its social, cultural, experiential, or psychical construction having been posited against or beyond any putative biological claims” (1998, p. 15).

This view deeply impoverishes theory, however. As Claire Colebrook argues, “The pervasiveness of textuality is not an argument for rejecting real or material being” (2007, p. 81). The lack of understanding of the agency of matter is a source of deep theoretical difficulty across the natural and human sciences, according to feminist materialists. Karen Barad, for example, frames the linguistic turn in the humanities as being deeply bound up with this conception of matter. She asks, “Why are language and culture granted their own agency and historicity, while matter is figured as passive and immutable or at best inherits a potential for change derivatively from language and culture?” (2007, p. 132). Social constructionist theories affirm the constitutive force that language possesses, but they have no way to explain what, if anything, could constrain this power of language to shape and form. For the feminist materialists, this imbalance is a sign that something has been lost in the theoretical equation. Furthermore, as Susan Hekman argues, the political tools of social constructionism are won at a high price: “We

have learned much about the social construction of ‘woman’ and ‘reality.’ But the loss of the material is too high a price to pay for that gain” (2008, p. 88).²³

Against the tendency of both poststructuralist and social constructionist theorists to dismiss the active role matter plays in shaping our world, feminist materialists insist that we must reaffirm the ontological significance of materiality. In this section I briefly summarize the work of several key feminist materialist thinkers: Elizabeth Wilson, Karen Barad, and Nancy Tuana. These thinkers demonstrate that we cannot separate matter from mind or from other matter as if matter was an isolable, independently existing entity.²⁴ Feminist materialism highlights the dynamic relation between mind and matter (including will, intention, intellect, and social and cultural forces), showing how these *interact* in important and dynamic ways. This relational, interactive matter is not and *cannot be* inert and passive. Instead, matter is dynamic, and has its own kind of agency.²⁵ The agential view of matter put forth by feminist materialists in turn implies a renewed understanding of the relationship between ontology, epistemology, ethics, and politics.

²³ The basis of Hekman’s analysis is a discussion of Bruno LaTour’s article “Why Has Critique Run Out of Steam?” in which he argues that critical social theory needs to begin again to cultivate a “stubbornly realist attitude” about both material and social realities (2004, p. 231). Science studies, like feminism, has begun to be disenchanted with the overly linguistic slant of the social constructionist approach, and is looking for a way to do justice to the role of materiality in constructing the world.

²⁴ Einstein called this notion of matter the “separability condition.” For a discussion of this point, see Barad, 2007, p. 320.

²⁵ Agency, in the most general sense, implies an ability to cause some kind of change. While agency has traditionally been understood to be an attribute of *willing* beings alone, an agential account of matter emphasizes its agency by highlighting its activity, its ability to influence reality in dynamic ways. As we will see, Karen Barad offers the most precise definition of agency, as involving both possibilities for influencing what becomes, and responsibility for this influence.

Elizabeth Wilson's agential neurobiology

Elizabeth Wilson has been working for the last decade to develop accounts of neurological diseases like eating disorders and depression that take adequate account of the complex agency of biology in these conditions. She believes this work is critical to feminist theory and its attempts to understand the body. In her groundbreaking work on neurobiology and feminism, Wilson argues that feminism has been weakened because of its reliance on social constructionist arguments. According to Wilson, social constructionist accounts are inadequate precisely insofar as they exclude the possibility of equally dynamic and revolutionary natural or biological explanations. According to Wilson, feminists' ability to bring about concrete changes and to pursue a coherent quest for equality and change are impoverished because they fail to understand the complex agency of bodily matter. Wilson aims to bring biology and its active contributions back into the feminist lens, undermining the deep opposition between biological science and feminist politics defined by a subjectivist critique of social norms. As she writes: "It is my argument that biology – the biophysics of cellular metabolism, the microphysiology of circulation, respiration, digestion, and excretion – *needs to become a more significant contributor to feminist theories of the body*"(2004b, p. 8).²⁶

²⁶ This critique is not unique to Wilson, but is a shared theme across the feminist materialists. For example, Stacy Alaimo, in her article "Transcorporeal Feminisms and the Ethical Space of Nature," states, "It is clear that the notion of 'biology as destiny,' which has long haunted feminism, depends on a very particular – if not peculiar- notion of biology that can certainly be displaced by other models. Since biology, like nature, has long been drafted to serve as the armory for racist, sexist, and heterosexist norms, it is crucial that feminists invoke a counter-biology to aid our struggles. Only by directly engaging with matter itself can feminism...render biological determinism 'nonsense'" (2007, p. 241). Elizabeth Grosz also argues that feminists have political reasons to return

Wilson melds biology, psychoanalysis and evolutionary theory to show how the matter of living human bodies dynamically contributes to various psychological and psychosomatic conditions. She analyzes the way that hysterical patients have bodily, material transformations that are understood to be caused by what are classified as mental or non-somatic causes. She looks at the case of a patient of Freud's who could see in black and white upon hearing the click of a camera. While many, including Freud himself, have been more interested in the psychological factors at play, Wilson focuses on the *material mechanisms* by which this condition comes about. This leads her to raise questions that have not often been asked either in feminist commentaries or this history of medicine, such as, and I quote:

What kind of biological material (retina, optic nerve, visual cortex) stops processing color under the sway of a photographic seduction? Surely, one of the most curious things about [this] symptom is that the nervous system is able to function according to 'scenes, acts, tableaux, and intermissions, to perform on cue and on schedule with a click of the camera.' (2004b, p. 6)²⁷

Through attention to the biological detail of this condition, Wilson highlights the dynamic and agential nature of the matter of the body. Although traditionally psychosomatic conditions have been cited as an example of how the mind influences the body, Wilson demonstrates that there are incredibly dynamic material processes at work

to biology. In her words, "Biological discourses are no more 'dangerous', 'ideological', 'biased', or 'misleading' than any other discourses or models; we ignore them only at the expense of our own disciplinary discourses and political models, only at the expense of our own growth and self-transformation" (2008, p. 40).

²⁷ Ferenczi is one notable counterexample; he became very interested in the organic or biological mechanisms at work in hysteria and other mental illnesses. His approach is discussed in some depth in Wilson's article "Gut Feminism" (2004a).

that also merit interest and research. Rather than ignoring or repudiating the biological substrate of these conditions as uninteresting or uninformative as many feminists, following Freud, have done, Wilson argues that we can learn a lot about the flexible and dynamic nature of biological matter by paying close attention to how the biology of the body materially transforms itself in conversions. Furthermore, hysteric conversions bring to central stage the complexity of the dynamic relationships between mind and biological matter.²⁸

Wilson also analyzes examples of psychosomatic connections in which the patterns of influence operate more obviously from both the mind to the body *and* the body to the mind. In her article “Gut Feminism,” she discusses one such condition, bulimia. For Wilson, one of the most interesting features about bulimia is that it has a high correlation with depression and can be treated by the use of anti-depressants. She raises a key question about these accepted facts: What explains this correlation? While the clinical literature on the subject is split in a neat line between those arguing for psychological causation and those arguing for organic or flat biologic causation, Wilson argues the clinical data actually demonstrate a much more complex causality. According to Wilson, about 95% of the body’s serotonin exists in the neural networks in the gut. Serotogenic treatments have effects on mood not simply through influencing the brain,

²⁸ While the very notion of conversion implies an interactive relationship between mind and body, Freud does not emphasize the role of the material body in hysterical conversion. Wilson argues that Freud’s framework for explaining conversion first distinguishes the “hysteric body” (the body as understood by the hysteric) from the “organic body” and then privileges the psychogenic body, rather than the organic or neurological body, as the cause of conversion (“Gut Feminism” 66-8). This division between organic and psychological causes is still employed in the contemporary understanding of psychosomatic disease. For example, a New York Times article from 2006 entitled “Is Hysteria Real?” deploys it uncritically (Kinetz, 2006).

but by directly influencing the gut. This means that we can logically expand our understanding of the gut's activities to include not only digestion but also rumination and depression. This is not simply that mood and biology are connected, but that the two have a kind of co-constitutive relationship wherein neither can be thought separately from one another. Wilson argues that the biological, bodily processes of bulimia, their connection to mental states, and the fact that they can be treated using medicines designed to target *mood disorders* can only be explained using a model that adequately accounts for this reciprocal, dynamic relationship of causality between mind and matter. We need to conceive of the mood related aspects of bulimia as being originally embodied in the gut itself. In her words (I quote at length),

The efficacy of antidepressant medications in the treatment of bulimia can best be explained in a conceptual field where the relations between head and gut; between thinking and eating; among serotonin, appetite, and mood; among disgust and antiperistalsis and the esophagus; among anger and hunger and loneliness and the stomach are more than juxtapositions or utilitarian relations of otherwise disjunct realms... The bingeing and purging of bulimia, and its alleviation by the administration of antidepressants, is not explainable until a more plastic model of digestion, respiration, antiperistalsis, neurotransmission, and mood has been established... The gut is sometimes angry, sometimes depressed, sometimes acutely self-destructive; under the stress of severe dieting, these inclinations come to dominate the gut's responsiveness to the world. At these moments any radical distinction between stomach and mood, between vomiting and rage is artificial. Here, a clear indication of what is meant by radical (pertaining to the root: foundational, essential, originary, primary) is important. I am not arguing that organs are indistinguishable from one another, or that psyche and soma are the same thing. Rather, I am claiming that there is no a priori, fundamental demarcation between these entities. For this reason the routine critical response that bulimic etiology can be attributed to an interaction (mind plus body) is inadequate for the argument I wish to make here. The logic of interaction, addition, or complementarity presumes that the entities at stake are already, radically detached. I am arguing that antidepressants alleviate bulimia because there is no radical (originary) distinction between biology and mood. Mood is not added onto the gut, secondarily, disrupting its proper function; rather, temper, like digestion, is one of the events to which

enteric substrata are naturally (originally) inclined. (2004a, p. 85)

One of Wilson's main preoccupations is to complexify the widespread understanding of biology as being inflexible and rigid that dominates psychoanalysis, feminism, and other social constructivist approaches. Her work on the connection between the gut and the psyche exemplifies this. To adequately understand how the matter of the body can be so flexible and how it exists in a relation of mutual influence with psychological states of mind and moods, we need a theory of matter that is much more dynamic. Showing that psychosomatic conditions have dual causation - both material and psychological - opens up both new ways of understanding the etiology of illness and new avenues for treatment. For feminists, this attention to biology can provide crucial resources for fighting deterministic, oppressive, and highly gendered frameworks for the diagnosis and treatment of mental illness. Wilson's work highlights the revolutionary potential of a renewed attention to biological agency, and highlights the potential force of materiality for critical politics.

Karen Barad's Agential Realism

Like Wilson, Karen Barad offers an empirically grounded theoretical account of the dynamism and agency of matter.²⁹ While Wilson focuses on the impact of a more dynamic biology on feminism, Barad seeks to reinvigorate the theoretical links between ontology and epistemology. In her philosophical book on physics, *Meeting the Universe Halfway*, Barad elaborates the ontological and epistemological implications of Niels Bohr's philosophy of quantum physics. On the basis of Bohr's theories and discoveries, Barad puts forth a view that she calls "agential realism". Her view is like scientific

²⁹ Karen Barad is co-founder of the Science and Justice Research Center at UC Santa Cruz: <http://scijust.ucsc.edu/>

realism in that it accounts for a real material world. But unlike scientific realism, agential realism does not posit matter that is inert and exists separately from mind. Instead, Barad demonstrates that matter has agency and is interconnected with human knowers, shaped by them and shaping them as well. In her words,

In agential realisms' reconceptualization of materiality, matter is agentic and intra-active. Matter is a dynamic intra-active becoming that never sits still – an ongoing reconfiguring that exceeds any linear conception of dynamics in which effect follows cause end-on-end, and in which the global is a straightforward emanation of the local. Matter's dynamism is generative not merely in the sense of bringing new things into the world but in the sense of bringing forth new worlds, of engaging in an ongoing reconfiguring of the world. (2007, p. 170) ³⁰

She demonstrates this material agency by looking closely at some lessons to be drawn from Bohr's work about the entanglement not only of material particles with one another, but also of the matter that scientists study with scientific concepts, methods, and laboratory practices. One of the main issues in quantum physics that preoccupied Bohr was the wave-particle paradox that developed in the late 19th century. This refers to the

³⁰ Henri Bergson offers a strikingly similar account of matter in *Creative Evolution*, prefiguring this movement nearly a century earlier. As he writes, "We shall see that matter has a tendency to constitute *isolable* systems, that can be treated geometrically. In fact, we shall define matter by just this tendency. But it is only a tendency. Matter does not go to the end, and the isolation is never complete. If science does go to the end and isolate completely, it is for convenience of study; it is understood that the so-called isolated system remains subject to certain external influences. Science merely leaves these alone, either because it finds them slight enough to be negligible, or because it intends to take them into account later on. It is none the less true that these influences are so many threads which bind up the system to another more extensive, and to this a third which includes both, and so on to the system most objectively isolated and most independent of all, the solar system complete. But, even here, the isolation is not absolute. Our sun radiates heat and light beyond the farthest planet. And, on the other hand, it moves in a certain fixed direction, drawing with it the planets and their satellites. The thread attaching it to the rest of the universe is doubtless very tenuous. Nevertheless it is along this thread that is transmitted down to the smallest particle of the world in which we live the duration immanent to the whole of the universe" (1998, pp. 12–13).

idea that light, and other kinds of matter, behave both like waves and particles. The paradox comes in trying to decide which they definitively or ontologically are. Thought experiments by Einstein and Bohr about whether electrons were waves or particles were empirically tested in the 1990's when Young developed an experimental way to determinately capture the behavior of electrons in what is called a "two-slit" or "double-slit" apparatus (confirming, by the way, Bohr's theory). When we shoot electrons through a two slit apparatus, even when they are sent one by one, they produce an interference pattern, meaning that they behave like waves. However, if they are sent through an apparatus that can measure which slit they go through, otherwise known as a "which-path" experiment, the interference pattern disappears. The apparatus has made them behave like particles. The nature of the electron, therefore, seems to differ depending on the apparatus used to measure it.

Obviously, this calls into question the idea that "the world is populated with individual things with their own independent sets of determinate properties." According to Barad, the lesson we should take from quantum physics is that matter does not come in discrete, separate, pre-existing packages that already have concrete properties. Instead, within particular interactions, certain properties become determinate while others are specifically excluded (Bohr's concept of complementarity) (2007, p. 19). This means that the material arrangements of the experimental situation are an important and constitutive component of the physical reality they measure. Indeed, as Barad argues, the actual nature of the material world is constitutively underdetermined. The actual "nature" of any phenomenon being studied becomes determinate only within a particular context of

engagement (*ibid*, p. 20).³¹ In her reading of quantum physics, laboratory experiments designed to measure matter itself as a separate entity actually show that matter and mind (ideas, concepts, and social/scientific practices) are deeply interrelated. In fact, they are all part of the same physical reality. When we distinguish the material “objects” of our study, such as the “particle or wave” nature or “position or location” of particles that quantum physicists study, we can only delineate these objects by making intentional divisions in the world, through experimental or other kinds of apparatuses. Our “cuts” help to constitute these objects as what they are.

This might sound like Barad is floating toward the social constructivist view, where human beings determine at will what reality will be.³² However, objectivity is preserved, according to Barad, because these cuts are reproducible and communicable. Not only this, but such measurements also have definite meaning because matter and material agency contribute to how reality comes to be configured (and perceived). This is true both in the lab and in the world.³³ The shape, size, weight, and availability of

³¹ Objectivity is still possible, but only because certain values will always be “complementary”, meaning that they require mutually exclusive conditions of measurement. These measurements are reproducible and communicable, and thus are objective, but because they are complementary we cannot know both values at the same time.

³² Affirming both the contingency of scientific knowledge and the reality of the world is a difficult conceptual task. As Donna Haraway describes it, “I think my problem and ‘our’ problem is how to have simultaneously an account of radical historical contingency for all knowledge claims and knowing subjects, a critical practice for recognizing our own ‘semiotic technologies’ for making meanings, and a no-nonsense commitment to faithful accounts of a ‘real’ world, one that can be partially shared and friendly to earth-wide projects of finite freedom” (1991, p. 187, *emphasis in original*).

³³ Barad’s theoretical framework applies equally to social science, because this same objectivity can also hold true of other kinds of concepts, including socio-cultural ideas and norms. The important thing is to recognize that in both frameworks the

materials, the behavior of the matter we are studying (i.e. electrons) and other contingent material conditions actively shape the world we live in and study. In fact, the role of matter is so significant that Barad labels the relationship between humans and other agents and material reality as being one of “intra-action,” as opposed to the traditional “interaction.” Agents, human and material, “intra-act” to create specific material phenomena. Barad’s formulation of her view emphasizes the agency of matter. On this account, matter is not separate or inert. We are dynamically engaged with matter and it with us. Agency is not a feature of subjects or objects, since these do not preexist their active entanglement. Instead, agency is about making change through intra-activity; it is about “the possibilities and accountabilities entailed in reconfiguring material-discursive apparatuses of bodily production” (2007, p. 214).

Barad seeks to demonstrate the critical *epistemological* and *ethical* implications of the originary *ontological* relationality of matter. Western ontological conceptions of matter as inert and passive are deeply tied up with epistemological theories and assumptions about what can be known by whom and how knowledge is obtained. Traditionally Western epistemology operates on the basis of a subject/object divide in which the knowing subject looks out at a separate and independent material reality that corresponds to, or is represented by, the concepts and other epistemological data (beliefs, ideas, etc.) formed in his mind. In this schema, matter is construed simply as the inert “stuff” of which the known, non-cognitive world is formed. As Barad describes it, “The common-sense view of representationalism – the belief that representations serve a mediating function between knower and known – ... displays a deep mistrust of matter,

linguistic/discursive/intentional does not fully determine all; the material also plays an active, formative role in shaping reality.

holding it off at a distance, figuring it as passive, immutable, and mute, in need of the mark of an external force like culture or history to complete it” (2007, p. 133). Barad’s work shows that attending to the dynamic nature of material reality changes the possibilities of knowledge and certainty. She also insists that the ontological and epistemological relationality of matter means that we are always already engaged in a relationship of responsibility with the world. Our interactions with matter are ethically charged because of the mutually performative relationship between humans and matter.³⁴

We are not outside observers, nor the only intentional agents in the world, but we are always interactively responsible for co-creating what is (2007, pp. 182–185).³⁵

³⁴ As Barad notes, this understanding of the interactive performativity of the material world necessitates a rethinking of agency and ethics. Responsibility is not something we commit to or choose, but an “incarnate relation that precedes the intentionality of consciousness...[it] entails an ongoing responsiveness to the entanglements of self and other... A delicate tissue of ethicality runs through the marrow of being. There is no getting away from ethics” (2007, pp. 23, 392–396). She offers analyses of ultrasound technology and other technoscientific practices from this ethical perspective (see especially Chapter 5: “Getting Real: Technoscientific Practices and the Materialization of Reality”).

³⁵ This concern with not only the epistemological, but also the ethical, as well as political, implications of a renewed ontological understanding of the agency of matter is perhaps best exemplified in Haraway’s work. Since the publication of *Simian, Cyborg, and Women*, Haraway has been one of the founding figures of a strand of feminism that focuses specifically on this same need to undermine a strict dualism between biology and culture or the natural and the artificial, always with attention to the political roots and effects of these theoretical shifts. Most recently, Haraway’s work has focused on how think about non-human animals and machines in ways that do not reduce them to inanimate objects or reflections of humanity. She takes critical politics, and in particular Marxist humanism, as her starting point:

In 1973, Young sought a theory of mediations between nature and man. But nature remained either a product of human praxis (nature’s state as transformed by the history of people and events) or a pre-social category not yet in relation to the transforming relation of human labor. What nature could not be in these formulations of Marxist humanisms is a social partner, a social agent, with a history, a conversant in a discourse where all of the actors are not ‘us.’ A theory of ‘mediations’ is not enough. If ‘human praxis is the measure of all things,’ then

Nancy Tuana's Interactionist Ontology

Nancy Tuana's work is similarly oriented toward the epistemological and ethical implications of a more dynamic ontology. Tuana was one of the first feminist theorists to advocate a theoretical shift undermining the ontological and epistemological divide between the natural and the social or the cultural.³⁶ She calls her view an "interactionist ontology."³⁷ Like Barad, Tuana's call to "interactionism" involves the recognition that the social and the natural are not isolable, pre-existing entities. Instead, they are two forces that *interact* to bring about the world we know and are. It therefore requires that we take account of the *agency* of the material, even while we "rematerialize the social" (188). The epistemology called forth by this ontology is both viscous and porous, according to Tuana. Viscosity refers to the resistance of matter to changing form, which makes it thus somewhat reliable as an object of knowledge, while porosity acknowledges the mutual influence of the material and the social.

the conversation and its forms of life spell trouble for the planet... I think we must engage in forms of life with nonhumans – both machines and organisms – on livelier terms than those provided by both harvesting Darwinism or Marxism. Refiguring conversations with those who are not 'us' must be part of that project. We have to strike up a coherent conversation where humans are not the measure of all things and where no one claims unmediated access to anyone else. Humans, at least, need a different *kind* of theory of mediations. (2008, pp. 173–174)

The danger of understanding animals and other material things as inanimate is that this gives us a world in which all other non-human living beings cannot contest our ideas, our concepts, or perhaps most importantly, our actions. Haraway argues that agency must be extended beyond the sphere of intentional, rational, mindful human actors if our relation to the world is to be truly ethical.

³⁶ Nancy Tuana is the founding director of the Rock Ethics Institute at Penn State University: <http://rockethics.psu.edu/>.

³⁷ Note the similarity with Barad's view, although Barad wishes to push the onto-epistemological implications of agential realism slightly further by using the term "intra-action" to insist on the fact that neither nature nor culture as such preexist their engagement with one another (2007, pp. 33, 178, 201–212).

The assumed ontological divide between matter and mind, nature and culture, Tuana argues, has deeply impoverished our thinking. Understanding how these aspects interact can reinvigorate the stale debate between social constructionism and realism. As she states in her article “Viscous Porosity: Witnessing Katrina”,

I have argued that feminists must avoid the divide of realism vs. social constructivism, for neither framework is adequate. Both are embedded in a problematic nature/culture schism that does not do justice to the complexity of interactions of phenomena. Interactionism enables us to dissolve the divisions between these two poles and transform the terms of the debate... Interactionism is a metaphysic that removes any hard-and-fast divide between nature and culture, while at the same time troubling the division between realism and social constructivism... Interactionism posits a ‘world of complex phenomena in dynamic relationality. (2008, p. 191)

This interactionist ontology also necessitates a revolution in how we think about the study of the world. As this ontology undermines traditional divisions between “nature” and “culture,” it also undermines the divide between the sciences and the humanities. This makes interdisciplinary work across the sciences and the humanities not merely an option, but a necessity. In Tuana’s words,

The separation of nature and culture has impoverished our knowledge practices. We posit a reasonably predictable natural world and a far less law-governed social realm. The natural sciences emerged from this model of the natural, divorced from the social. The humanities and the social sciences have focused on the social divorced from the natural – representations, meanings, institutions. But the world in which we live cannot be divided in this way into two neat and tidy piles....it is the *interaction* between them that is the world that we know and are of (*ibid*, p. 209).

In “Viscous Porosity,” Tuana demonstrates how this multifaceted accounting for the agency of matter is also deeply bound up with both ethics and politics. For one thing, our understanding of what is ‘natural’ and what is ‘social’ is really a matter of choice,

and thus of ethics. Following Lorraine Code, she insists that these epistemological choices require the exercise of responsibility. In her words,

Interactionism acknowledges the robust porosity between phenomena that destabilizes any effort to finalize a nature/culture divide. We can, and often need, to make distinctions between such poles, but it is crucial not to see these distinctions as ‘natural kinds’ or to read them as reflecting a dualism. In other words, we do not simply ‘read’ such distinctions from nature, *but take epistemic responsibility for the distinctions we employ*. As Lorraine Code so persuasively argued, we cannot separate epistemic analysis from ethical analysis. To know well, we must be responsive to the differences articulating themselves in our experiences and practices, along with being attentive to how the distinctions we embrace, in part, construct our experiences, as well as how these distinctions are enacted in social practices, how they enable as well as limit possibilities and for whom, what they conceal as well as what they reveal, and so on. Knowledge practices themselves often involve articulations of differences, but with an interactionist understanding of these differences being fluid, unfolding, and situated, epistemic responsibility requires this enhanced responsiveness. ‘Knowing well is a matter both of moral-political and of epistemic concern’ {Code, 1991, p. 72. (2008, p. 192)

This responsibility is not only epistemological and ethical, but it is also political. Using Katrina as a salient example of an “environmental” event, Tuana argues that we have urgent ethical and political motivations to reconfigure our understandings of materiality and how it is related to sociality and culture.³⁸ According to Tuana, a “natural” disaster like what happened in Louisiana in the aftermath of Hurricane Katrina can only be properly *understood* and *prevented* if we account for the ways the social, political, and natural aspects of the situation interact historically. Not only the warm waters of the gulf,

³⁸ The similarities between Barad’s agential realism and Tuana’s interactionism run very deep. While Barad focuses on the theoretical account, Tuana’s work is more oriented toward providing a concrete, accessible example of how to use an interactionist or agential realist understanding of epistemology and ethics to evaluate contemporary (natural-cultural) events.

but also the geographical history of the region, the psychology of living below sea level, institutionalized racism and poverty, and the economics of the region and the nation are all part of what made Katrina what it was. She explains, “Witnessing the world through the eyes of Katrina reveals that the social and the natural, nature and culture, the real and the constructed, are not dualisms we can responsibly embrace... Nature/culture is a problematic ontology – not just for the human world, but for what is, as well as what might yet be” (*ibid*, 209-10).³⁹ The various aspects of the Katrina disaster are proof that we need a deeply interactionist ontology and epistemology if our ethics and politics are to be just and effective.

Katrina, herself, and interaction between what we have labeled the ‘social’ and the ‘natural,’ flooded us with thousands of interactions... Witnessing children and adults, the firm and the infirm, struggling to stay afloat, at first literally, and later regarding to finding adequate food, water, shelter, we watched a complex interaction between social structures – class,⁴⁰ governmental emergency reactions, and so forth – and thousands of human and non-human animals. (2008, 206)

³⁹ Alaimo similarly insists that political and ethical motivations are inseparable from epistemological ones: “By underscoring that ‘trans’ indicates movement across different sites, trans-corporeality opens up an epistemological ‘space’ that acknowledges the often unpredictable and unwanted actions of human bodies, non-human creatures, ecological systems, chemical agents, and other actors. Emphasizing the material interconnections of human corporeality with the more-than-human-world, and at the same time acknowledging that material agency necessitates more capacious epistemologies, allows us to forge ethical and political positions that can contend with the numerous late-twentieth-century/early–twenty-first-century realities in which ‘human’ and ‘environment’ can by no means be considered as separate: environmental health, environmental justice, the traffic in toxins, and genetic engineering, to name a few” (2007, pp. 238–9).

⁴⁰ Although she does not mention race in this list, in this article Tuana continues by problematizing the interaction between the “natural” disaster of Katrina, racism, poverty, disability, and what Charles Mills called “an epistemology of ignorance.” These, unjust, irresponsible epistemologies are precisely what an interactionist ontology addresses as it reconfigures our understanding of causality.

The poverty, the toxic spills, the breaks in the levees, even the strength of the hurricane – these require interdisciplinary, integrated, *interactionist* lenses if we are to not only make sense of what happened, but also build a world where another Katrina does not happen. Tuana’s “witnessing” of Katrina is a call to leave behind entirely the ontology division between nature and culture and to understand anew our life and being in the world (209).⁴¹

Conclusion

Feminist materialism is not simply an account of reality. It also entangles ontology with epistemology, politics, and ethics, showing how knowing the material world differently allows us to acknowledge its influence on experienced reality, thus enabling us to create new ways of doing politics and ethics that move beyond the dualism of biological determinism *or* unimpeded cultural determination. Reconstructing matter as having dynamic agency is therefore an ethical and political task, as well as an ontological and epistemological one. This is also true for medicine and health: ontology, epistemology, politics, and ethics are all part of the same reality. In the chapters that follow, I first follow in the footsteps of the feminist materialists to offer a critique of Western medical theory and practice on the basis of its problematic reliance on the mechanistic conception of matter. Then I draw on the resources of Aristotle, and Deleuze to develop a more dynamic concept of bodily matter. This rethinking of bodily matter has

⁴¹ Haraway describes the responsible vision of a witness thus: “Witnessing is seeing; attesting; standing publicly accountable for, and physically vulnerable to, one’s visions and representations. Witnessing is a collective, limited practice that depends on the constructed and never finished credibility of those who do it, all of whom are mortal, fallible, and fraught with the consequences of unconscious and disowned desires and fears (1997, p. 267).”

the potential to transform not only the ontology and the epistemology, but also the practice and the politics of health.

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Chapter 2

Matter and Mechanism in Health and Medicine

In the West the philosophy of science is based on the premise that humans are separate from nature, and that the world, like a machine, can be dismantled and reduced into constituent parts.

- Beinfield & Korngold, *Between Heaven and Earth*, p. 18

Introduction

Conceptions of health and disease necessarily involve material dimensions because the body is, at least in part, material. Definitions of health and disease therefore rely implicitly or explicitly on philosophical assumptions about the nature of bodily matter itself. These philosophical assumptions also guide our understandings of effective ways to intervene with the body to promote health and avoid disease. Medical practice is deeply shaped by philosophical conceptions of matter, even if those conceptions are rarely articulated explicitly or even understood as such by medical practitioners.

In this chapter I build on the conception of matter presented in Chapter 1 to argue that the mechanistic understanding of the body and its materiality that dominates Western medicine is fundamentally insufficient for understanding, diagnosing, and treating many kinds of health problems and diseases. I will explain this claim in more detail by looking at several impasses in contemporary Western medical practice and approaches to defining

health that are a direct consequence of the mechanistic conception of matter. To resolve these impasses about what health means and how it is defined, we need a more robust and dynamic understanding of the ontology of living materiality, which I will develop in subsequent chapters.

The mechanistic concept of matter in medicine

The mechanistic conception of matter has played a formative role in the development of Western medicine, from the time of Descartes until the present moment. Despite many advances in science that question this basic assumption (i.e. quantum physics), the mechanistic understanding of matter continues to dominate Western medicine and implicitly shapes its understanding of bodily health and disease.⁴² Just as the material world around us, our environment, is still largely understood in mechanistic

⁴² Joe Sachs, in the introduction to his translation of Aristotle's *Metaphysics*, affirms and contextualizes this point, contrasting this view of matter with Aristotle's: "The beginning of our philosophic tradition was a search for the inert, and this has never gone away. For Aristotle, such an account of things is never explanatory, since the inert cannot be responsible for its own changes and transformations. There must always be a second kind of source at work in things, and this realization reopens the philosophic task. Even in the most recent phases of the quest for wisdom, there is a persistent return to a faith in the inert among many thinkers, though it is followed always by the sort of failure that Aristotle claims must be forced by the truth itself. The physicist Newton identifies body with inertia, but then finds that body itself must also be a power that sets other bodies, and itself, in motion. The chemist Dalton identifies elements with atomic bodies so hard that they can suffer no change, but the discoveries of Rutherford compel an attempt to picture the atom as a stable system of bodies in motion. The biologists Watson and Crick identify the species of living things with molecules whose structure can be changed only by the slow effects of random mutation, but Barbara McClintock discovers that those molecules actively rearrange themselves, and the work of John Cairns in the last few years demonstrates that they even direct their own mutation. These remain mysterious for our contemporary sciences, since they confine themselves to a way of explanation that can never succeed. The very attempt to posit inertness in the cosmos, the atom, and the gene has disclosed that each of those things can only be at all if it is a being-at-work. What Aristotle describes at happening to the earliest seekers after truth has happened again among the most recent, as the truth itself that they have both sought and denies has unfailingly forced itself onto their path: being is being-at-work" (2002, pp. xxv–vi).

terms – as brute material open to rearrangement at whim- so does Western medical theory and practice conceive of the materiality of bodies in primarily mechanistic ways.

Yet this mechanistic conception of matter has entangled contemporary medical practice and theory in intractable impasses, both theoretical and clinical. Western definitions of health and medical treatments alike run have run aground on this conception of matter. In Chapter 1, we saw that feminist materialists criticize two main components of the mechanistic conception of matter matter as passive, and matter as separable. These conceptions of matter have exerted and continue to exert an enormous influence on Western medicine. These notions of matter as passive and separable simultaneously determine and delimit the possibilities embodied within Western medical practice.⁴³ Furthermore, our attempts to define health and disease are also embroiled in theoretical difficulties as a direct consequence of mechanistic thinking about matter.

The understanding of matter as passive strongly shapes Western medical practice, and in particular our expectations about how bodily health is to be achieved. If we want something to happen to a material body, we assume that we need to intervene to bring about that change. Furthermore, since matter has no agency of its own, we also assume that no harm is done to the matter itself if we can manage to bring it into our desired arrangement. Even if matter is functioning in some seemingly active way, an implicit

⁴³ This constitutes a very different view of medicine from that of Anne Marie Mol, who argues that practices *enact* diseases. I agree that practices and concepts mutually influence one another, but it is my contention here that that medical conceptions are in some way primary to medical practices (Mol, 2003).

assumption of its passivity leads us to believe that there is no ethical dimension to its rearrangement.⁴⁴

This conception of matter is so broadly disseminated in Western medical practice that it is easy to take it for granted, or miss it entirely (as it is rarely made explicit). Consider the principal tools of allopathic medical treatment, however: pharmaceuticals and surgical interventions. Allopathic medical practice begins with the premise that if there is a bodily problem, we can only solve it by acting proximally and mechanistically. This is usually attempted either by introducing a change in the structural arrangement of body tissues, through surgery, or by introducing a chemical (pharmaceutical) agent to bring about a change in molecular arrangement within the cells, disrupting and channeling in a new direction the chemical processes of the body.

Both approaches take for granted the passivity of the body. They assume that for something to change in the body, humans must provide the source of change through direct intervention into its structure (whether macro or micro). These approaches also assume that pharmaceutical and surgical techniques ought not meet resistance, because there cannot be agential resistance or movement on the part of passive matter.⁴⁵⁴⁶ In fact,

⁴⁴ It is no surprise that one concern shared by thinkers who are developing more dynamic understanding of matter (like those discussed in Chapter 1) is the relationship that this kind of thinking about the material world has with environmental and conservationist causes. The material “environment” (water, air, trees, animals, etc.) radically resists our attempts to enforce this view upon it, and we notice this resistance because of the harm we notice that our actions have on various ecosystems and their integrated parts. If we hope to continue to live on the earth for many more years to come, we cannot just continue to rearrange it at will. In order to “save the environment” we need to find a way to understand why the matter of the earth is not just passive stuff open to being rearranged at will, but is instead active, and has its own agency, desires, and needs.

⁴⁵ Organ transplant is a notable counterexample in which Western medicine must reckon with the activity and agency of the body when attempting to make mechanistic changes

this presupposition is so pervasive that a recognition of the body's desire, activity, or agency is all but impossible under the current dominant allopathic framework.⁴⁷ Instead, we have come to understand our bodies as open to rearrangement at will.⁴⁸

(i.e. replacing one failing or failed organ with another more functional one). If doctors cannot somehow counteract the activity of the immune system, the body will reject the organ because it is attempting to protect itself from the intrusion of unknown tissue. Organ transplants, necessarily therefore involve significant attempts to work *with* the agency of the body, rather than assuming it to be a passive entity that can be rearranged at will. Yet this phenomenon is not understood as being a feature of bodily matter in general, as laying the groundwork for all of medical practice.

⁴⁶ Weight loss is another example of the limits of this kind of approach. We commonly believe (or at least most pop culture and medical advice about weight loss assumes) that body weight is explained by a simple mathematical formula of calories consumed versus calories burned. So we believe that we can eat less or exercise more and our bodies will respond by becoming smaller. Or we think that we can take a pill to block the normal, mechanistic processes of fat production, or to lower our appetites, which should reduce our intake of calories, which should make the body smaller. Or if that doesn't work, or we don't want to change our habits, we manually remove the fat tissues from the body through liposuction and/or mechanistically reduce the size of the stomach (which, we generally believe, should reduce the quantity of food we intake, and therefore should reduce the size of the body). We also think that we can change the shape of our bodies – maybe not our bones, but the curvy, muscular parts, by finding the right equation of which exercises to do and which foods to eat, how much, and how often. But anyone who has attempted to live by this belief that there are rules you can follow to get your body to take on a particular shape and size knows from experience the resistance that bodily matter gives to such attempts. Bodies just do not work in the mechanistic way that we keep trying to believe that they do. I will discuss the way bodies *do* process food in great detail in Chapter 6.

⁴⁷ Many other forms of medicine talk about the intention or agency of the body. In Chinese medicine, for example, each person's bodily matter has *tendencies* and patterns of movement (heat or cold, dryness or dampness, excess or deficiency, etc.) that are a product of both natural inclination and environmental influences. Healing is brought about by influencing the body's matter to *tend* in another, more harmonious direction, but it is recognized that sometimes these bodily tendencies are just too strong and will continue despite human intervention. Western herbalists also talk about working *with* the body and listening to what the body is trying to say and what it wants. Allopathic medicine, on the other hand, is almost entirely devoid of these kinds of references.

⁴⁸ Cosmetic surgeries are a paradigmatic example of this kind of material rearrangement of the body, but other kinds of surgeries employ the same tactics and thinking.

Unfortunately, these assumptions are contradicted daily by the obvious violence that these medical interventions inflict on living bodies. Both surgical and pharmaceutical approaches systematically create additional health problems, many of them serious or even fatal. A quick Internet search about “surgical complications”, for example, reveals scholarly and popular articles about common complications of every kind of surgery imaginable. Whole books devoted to this subject are required reading for physicians.⁴⁹ Yet despite the best attempts of health professionals to prevent such complications, studies from 2011 and 2012 show that about 17 percent of surgery patients still experience complications (Kazaure, Roman, & Sosa, 2012, p. 1000) and as many as one in three hospital patients experience “adverse events” (Classen et al., 2011, p. 581). Many commonly used drugs can and do cause adverse reactions that can be life threatening. Just a few categories of these drugs bring about adverse events that cause an estimated at 700,000 emergency room visits per year in the U.S. (Budnitz et al., 2006, p. 1858). This is not including mistakes made by acting human agents. According to an article published in *JAMA* in 2000, altogether, inadvertent practitioner errors and adverse reactions (collectively known as iatrogenic causes) account for at least 225,000 deaths a year in the U.S., making them the third highest cause of death after heart disease and cancer

⁴⁹ The existence of extensive medical literature on surgical complications belies this problem. Oxford University Press has a “concise” book of about 550 pages, currently entitled *Post-operative Complications*, that has been published in various versions since 2003 and marketed as “essential reading for all those involved in caring for surgical patients” (Leaper & Whitaker, 2010). Similarly, Mulholland and Doherty recently released the second edition of a book entitled *Complications in Surgery* (2011). Many more resources focus especially on the surgical complications possible with each *kind* of surgery: spine, bladder, colorectal, vascular, bariatric, transvaginal mesh, hip arthroplasty, etc. Across the board, although these resources aim at helping medical practitioners avoid complications, they acknowledge that such complications are also *to some extent* inevitable.

(Starfield, 2000, p. 484). According to the World Health Organization's 2009 Guidelines for Safe Surgery, adverse events affect between 3 and 16% of all hospitalized patients worldwide and are becoming a major issue of public health concern because they are, at least in theory, a *preventable* cause of injury and death (2009, p. 9).

One of the implications to draw from a philosophical analysis of the conceptions of matter underlying Western medicine is that these all too common surgical “complications” and drug “side effects” are not simply the random excess of these techniques. They are the demonstration of bodily agency, of bodies resisting our attempts to rearrange their matter. They are the material proof that our theoretical conception of bodily matter is not only inadequate but also ethically problematic; they show evidence that we have a partner in medical dialogue, matter itself, whose contributions and needs ought to be taken into account.

Not only does Western medicine understand matter to be passive, but it also understands it to be separable. The separability of mechanistic matter entails two components. First, it sometimes indicates a substantial divisibility between matter and mind. Western medicine is a direct inheritor of Descartes' conception of matter. Not only does Descartes posit matter's separability as a way to establish the eternal nature of the human soul (i.e. in the *Sixth Meditation*), but he also argues for it as a way to improve medical understanding and practice.⁵⁰ In the *Description of the Human Body* he tries to establish an understanding of the functioning bodily matter that, at least to his understanding, requires no active influence of soul. As he states, “So I will now....give such a full account of the entire bodily machine that we will have no more reason to think

⁵⁰ *C.f. Discourse on Method* (1985, AT VI p. 62).

that it is our soul which produces in it the movements which we know by experience are not controlled by our will than we have reason to think that there is a soul in a clock which makes it tell the time... The purpose is to enable us to know distinctly what there is in each of our actions which depends only on the body, and what there is which depends on the soul. This will enable us to make better use both of body and of soul and to cure or prevent the maladies of both” (1985, AT XI pp. 226–7).

The separability of matter secondly entails that we can divide matter easily and unproblematically from other bits of matter, because matter is made up of parts that are essentially isolable. Descartes’ philosophy of physics was a radical mathematization of the physical world. As he states in the conclusion to Part II of the *Principles of Philosophy*, “The only principles which I accept, or require, in physics are those of geometry and mathematics; these principles explain all natural phenomena, and enable us to provide quite certain demonstration regarding them” (1985, AT VIII A p. 78). Geometrical, purely mathematical matter is homogenous and its continuity is of contiguity, so its units are replaceable, isolable, and moveable.⁵¹

Both of these facets of the “separable” conception of matter still permeate Western medicine. The “mind-body divide” continues to plague Western medical theory and practice, making it nearly impossible to understand the ways that psyche and soma relate. This has led to a medical practice that is largely materialist, and cannot take into account the role of interactions *between* the material body and seemingly ideal aspects of a person, including will, emotion, desire, and even knowledge. There are incontestable

⁵¹ For an interesting comparison between Descartes and Aristotle on this point, see Yves Simon, *The Great Dialogue of Nature and Space* (1970, pp. 10–14).

aspects of bodily life in which these connections come to view, however, and Western medicine remains baffled by all of them. The placebo effect and psychosomatic conditions are two obvious examples of mind-body connections that Western thinking about health and disease cannot explain. The inability of Western medical theory to explain the placebo effect, which is nonetheless widely accepted to be *the* cause of a reliable 30% of all positive results in drug trials, is clear evidence that its theoretical framework is inadequate. Not only drugs, but even fake “surgeries” have been shown to be as effective as in solving mechanical problems like as arthritic knees. How can a mechanistic conception of the body explain this phenomenon?⁵²

Psychosomatic conditions, in which the body shows symptoms which seem to be psychologically caused, prove a to be similarly baffling challenge to Western medicine. Most commonly, the term “psychosomatic” is used when *no material cause can be identified*. In these cases, medicine thus defaults to a psychological explanation. Alternatively, neurobiology can only look at material causation, and thus looks to the anatomical structure of *the brain*, the material form of mind, to explain these conditions. As we saw Chapter 1, most attempts to understand and treat them thus still rely on *either* psychology (mind), to the exclusion of neurobiology, *or* psychiatry and neurobiology (matter), to the exclusion of psychology. This indicates a deep conceptual divide between mind and body. Because Western medicine lacks any complex, non reductive theoretical framework to link matter with psychic, (‘immaterial’) phenomena like emotions and thought, however, these conditions continue to elude effective explanation and treatment. As with the placebo effect, acknowledgment of the relationship between mind and body

⁵² See Bruce Lipton’s *The Biology of Belief* (2007, pp. 107–114).

is forced upon the medical establishment by the phenomena of psychosomatic illness, but it has no framework to explain exactly how this relationship functions.

In terms of matter's separability, Western medicine conceptualizes the body atomistically, assuming that body parts, or, at its *most* holistic, body systems, are essentially separable, disparate units.⁵³ The result of this is that Western medicine generally does not understand and solve problems on the basis of the whole, but on the basis of the parts. As Andrew C. Ahn et al write in their article "The Limits of Reductionism in Medicine: Could Systems Biology Offer an Alternative?", "The science underlying our medical practices, from diagnosis to treatment to prevention, is based on the assumption that information about individual parts is sufficient to explain the whole" (2006, n.p.). These underlying currents of atomistic thinking about bodily matter have concrete and pervasive effects on how allopathic medical practice and treatment are configured.

For one, the conception of matter as atomistic undergirds what is by now a deeply ideological fracturing of Western medical practice into increasingly discrete specializations. If you have a heart problem, you see a heart specialist. If you have asthma, you see a lung specialist. If you have knee trouble, you see an orthopedist. If you have menstrual problems, you see a gynecologist. Hearts and lungs and knees and uteruses are conceived as separable parts that can be understood and manipulated in

⁵³ As Foucault describes it in *Birth of the Clinic*, the modern medical gaze first individualizes disease and illness by focusing on the death of individuals, and then further separates the matter of the body by looking inward to the way certain organs are resisting this death (1994, pp. 169–170).

isolation from other parts. In general, this system is understood as a way to *maximize* knowledge and make medical practice more efficient and effective. Generalists who can understand how the body works as a whole, have become less common, not simply because knowledge has proliferated but because we understand the material nature of the body as requiring specialized and isolated knowledge.⁵⁴

In practice, however, this system makes it difficult for practitioners and patients to understand or even perceive the relationships that body parts have with one another and the mutual influence they might exert on one another.⁵⁵ One simple example is antibiotic treatment. When most doctors prescribe a round of antibiotics for an infection, they do not generally take into account the effect that a round of these drugs will have on the gut of the bacteria, subsequent digestive function, and related functions like immune functioning. Why? Because the body is understood to be made of atomistic, separable units. In reality, however, commonly prescribed antibiotics wipe out not only the bacteria that is infecting the body in a negative way, but also all the other kinds of bacteria that live in the body, mainly in the gut, and thus can actually contribute to gut function.

The assumption that that a body is nothing more than the sum of its parts also renders mechanistic intervention the primary and often the only medical “solution” to

⁵⁴ Of course, there are many undercurrents within the medical system of practitioners who are trying to take a more holistic view, such as Functional Medicine and Environmental Medicine. Physicians Assistants are an interesting example within mainstream allopathic practice of a more holistic approach. PA’s have an alternative training and do not specialize as M.D.’s do. Yet they are able to effectively treat all kinds of common complaints because they “specialize” in how bodies work as wholes.

⁵⁵ Another example is that a commonly overlooked side effect of certain kinds of medication for high blood pressure is a cough. Yet according to Hyman and Liponis, neither patients nor doctors notice this link because they are looking for a problem within the lungs, or at most, the respiratory system (2005, p. 330).

various health issues. This is not always problematic. In some cases, mechanistic interventions are obvious and effective solutions. Doctors routinely replace knees and hips in older patients, for example, because these body parts have strong mechanical elements and are prone to wearing out just as any mechanical part does. But the same approach guides intervention into other, more chronic conditions. For example, when we discover cancerous breast cells we cut them out or kill them with chemotherapy or radiation. If we find plaque in someone's veins, we scrape it out. When blood pressure is too high, we thin the blood. If a uterus prolapses we take it out or put plastic nets in the body to hold it back in place. When a back inexplicably curves, we attach it to metal rods and screws and fuse it together to straighten it. If Crohn's disease is causing someone to have auto-immune reactions in the gut, we cut out the offending part of the intestine. Even for complex, multi-function diseases like Alzheimer's, the main target of research is to find a drug that can prevent the formation of the plaques that seem to somehow be linked with the disease since their presence is detected in the brains of people with the disease.⁵⁶

⁵⁶ Alzheimer's is one of the best examples of a disease that evades all our current attempts to understand, prevent, and treat it using a mechanistic model. According to the Alzheimer's Association, despite having known about and researched the disease for over 100 years, Alzheimer's is one of the only leading causes of death in the United States that we can *still* do nothing to prevent or cure. There are a few drugs that may help slow down the symptoms, but they cannot prevent the disease from continuing to develop ("Alzheimer's Association," 2014). Our current thinking is focused on mechanistic conceptualizations of the brain with Alzheimer's. It appears from MRI and other brain scans that people with Alzheimer's have some kind of plaques in their brains. We assume that these plaques mechanistically impede proper brain functioning, and current pharmaceuticals are targeted at preventing the plaques from forming or breaking them up once they have formed. Yet we really are making no progress using this approach. Important research questions are not being asked, such as: What causes plaques to

This list could go on indefinitely, because mechanistic intervention, whether through surgery or pharmaceuticals, is the dominant framework for medical treatment in the West. One of the most remarkable features of this kind of approach is that it neither requires nor encourages an investigation into the deeper causes of the conditions it is trying to treat. Why cells in a particular part of the body have turned cancerous, why blood pressure is high or a uterus has prolapsed, why a spine would curve or an immune system turn against itself, why plaques are building up in the veins or in the brain, none of these questions are really that important to the doctors making the intervention. A mechanistic understanding of medicine implicitly encourages ignorance about complex causality. It does not seek to intervene at the source of the problem, but at the level of its appearance, not at the level of cause but at the level of symptoms. Causes themselves are often not relevant. Within this framework, the ultimate causes of a bodily arrangement or phenomenon do not really matter unless they somehow prevent or undermine a particular mechanistic intervention. If a mechanistic intervention like scraping, diluting, or removing is feasible, it is generally the only one considered because it is the most likely to remove the visible sign of the problem.⁵⁷

develop in the first place? How exactly are they related to the overall, systemic dysfunction that results from Alzheimer's – not only memory loss, but changes in emotion and expression, detachment in social relationships, and eventually the deterioration of function in the digestive and other systems? Just because plaques are there does not mean they indicate a primarily mechanistic disruption in function. To assume that they do is to limit the range of possibilities that we have for prevention and treatment of this disease.

⁵⁷ This focus on the visible in Western medicine has a history; Foucault discusses this history in *The Birth of the Clinic* and shows how this concern with making disease (the invisible) visible is what constituted Western clinical theory and practice as such (1994, esp. Chapter 9 and pp. 195–6).

Of course, this means that the intervention has done nothing to prevent the problem from recurring. We can remove the cancer, but since we don't know why it happened in the first place, there is no guarantee that it won't come back. We can scrape the plaque from the veins, but that won't keep it from accumulating again. We can take out an overreactive piece of intestine, but we can't prevent more intestine from developing the same overreactivity. We can thin the blood, but at the expense of dependence on blood-thinning drugs that have systemic side effects. We can try to keep plaques from building up in the brain, but we do not know what they are doing there in the first place, so we still do not understand how the disease itself works.

This is one of the most pervasive negative impacts of the mechanistic view of matter on Western medicine, that it actually encourages medical theory and practice *not to look* for holistic causes. Western medicine understands and can treat single causes, like a bacterium or an abnormally developing cell, because those are simple to target and remove. But it cannot look for holistic, systemic patterns of causation because it does not have the theoretical framework to account for them. The body's whole, for Western medicine, is no more than the sum of its separable parts. Because it only recognizes mechanistic symptoms of parts and not underlying patterns of the whole, this medicine cannot intervene early in the process to prevent chronic illness from occurring. It can remove the signs of the problem but it cannot keep the problem from developing in the first place. It cannot explain why some people develop illness and others do not, even under the same conditions. Even a seemingly straightforward mechanistic problem like a

worn out hip cannot be fully explained mechanistically. Why do some people's hips wear out, when others' don't, even under similar conditions of use?⁵⁸

These examples show the wide variety of medical conditions and problems that cannot be explained using current mechanistic accounts. Western medicine's deep dependence on a mechanistic view of matter is the reason why it is effective at treating mechanical problems and states of crisis that can be resolved at the level of symptoms (orthopedic surgeries and emergency room medicine), but utterly fails when it comes to dealing with chronic disease, such as auto-immune disorders like Crone's Disease, digestive difficulties like irritable bowel syndrome, heart disease, cervical dysplasia, uterine prolapse, cancer, atherosclerosis, chronic back pain, infertility, hormonal imbalances, and Alzheimer's disease, just to name a few. Existing therapies for these diseases continue to conceive of the body in mechanistic ways. They isolate component parts and attempt to intervene by interrupting growth or movement, or manually removing problematic parts from the body.⁵⁹ Because chronic diseases are systemic and

⁵⁸ In accord with the mechanistic conception of bodily matter, the most common way account for these differences is to chalk them up to genes. Some people have the genes for cancer, or for weak knees, and some people don't. This, however, as Bergson has pointed out, is simply another version of mechanism (1998, p. 25). In this case, the mechanism is wrapped up in the gene and simply unfolds over time.

⁵⁹ An example of the allopathic reliance on mechanistic intervention is how it engages with cervical dysplasia, a condition in which cells in the cervix develop abnormally. If left unchecked, these cells will mutate to the point that they become cancerous. The typical medical treatment for this condition is to check each adult woman once a year, via a pap smear, to see if her cervix contains abnormal cells. If it is found that it does, the treatment options are only observation - to continue to check the cervix for increased mutation, usually at a more frequent rate (once every 3-6 months), or mechanistic intervention - to cut out the offending cells when their abnormalities reach a dangerous threshold. If a woman does not have regular pap smears and the cells are allowed to mutate unchecked and she develops cancer, the only options for treatment are, as with all cancers, once again to mechanistically remove the offending, cancerous cells, and then to

holistic, these diseases continue to mystify researchers, elude treatment, and generally fail to be helped by mainstream medical interventions. Chronic diseases are quickly becoming the top causes of death around the world (and especially in industrialized, “developed” nations). Mightn’t we need to rethink the basic premises of our approach to the materiality of the body? A new framework for understanding health and disease is desperately needed.

Mechanistic thinking in defining health and disease

Not only does the mechanistic understanding of matter pervade medical practice, but it also governs how health and disease are defined. Defining health and disease is a communal task that has crucial social, political, and economic consequences. For this reason, definitions of health and disease are hotly contested. These contestations draw attention to the very human – semantic, theoretical, ethical, and political - ways that we frame health and disease. They attest to the fact that health and disease are not simply empirical states, but are also *concepts* that we use to guide our decision making, as individuals and as communities. As concepts, their definitions are fundamentally open to determination, and therefore they solicit discussion and debate. Yet the terms of this debate are quite narrow, since as I will show below, *all* mainstream definitions of health are bound up with mechanistic thinking about matter. As I noted in the introduction,

poison these cells, along with many others in the body, to kill them so that they cannot continue their growth. The main explanation given is that a virus (human papilloma virus or HPV) causes the cells to develop abnormally (“Cervical Dysplasia,” 2014). Two vaccines to protect against the most common strains of HPV have been developed and marketed as protecting against cervical cancer (“HPV Vaccine,” 2014). What this approach does not explain, however, is why the virus is also found in many healthy cervixes. In fact, some alternative practitioners question whether HPV is really the cause of cervical dysplasia and cervical cancer, or at the very least, whether other environmental factors might play a crucial role in determining whether HPV develops into dysplasia and dysplasia into cancer (Weed, 2011).

when definitions of health and disease are formulated, two main approaches dominate: the “objective” or scientific realist approach, and the “subjective” or social constructivist approach. Both of these approaches are grounded equally in a mechanistic understanding of matter, even if one affirms matter as such and the other flees into the purely social.

The “objectivity” of the “objective” or “scientific realist” view is deeply bound up with a traditional, mechanistic conception of materiality. Scientific realism is perhaps the best known version of the objective approach. Scientific realism is an anti-idealist position that assumes that matter or materiality is real. It generally incorporates both ontological and epistemological components. The ontological component of realism is that matter is *external* to mind. This view obviously affirms a Cartesian separation between mind and matter. The benefit of this separation is that it seems to make matter independent of mind, which means that we can measure it as an independently existing substance. This independence also grounds the epistemological component of scientific realism, since matter’s ontological independence from mind is thought to guarantee that our knowledge of it can be *objective*, instead of *subjectively* grounded in or dependent on in mind or thought. Like scientific realism, objective approaches to health also take as their starting point the separability of mind and matter. Objective definitions of health are therefore assumed to be mind-independent, timeless, and universal. This “objective” or “scientific realist” understanding of health and disease is the dominant, common sense view; it permeates the biomedical field.

As we saw in Chapter 1, there are several impasses endemic to the scientific realist perspective that arise from its mechanistic view of matter. Because the objectivity of scientific realism depends on a representationalist model in which matter is not only

inert but also external to mind, it cannot explain how we can actually know the material world, if it is completely external to us. The objective or realist approach to health also has its own impasses that arise from its dependence on mechanistic thinking about matter. Since it assumes matter to be independent of mind, a scientific realist account of health cannot explain whether or how mind and body are related. Because it assumes matter to be mind-independent, neither can it account for the subjective and social influences on either definitions of health or health itself. It also has a difficult time explaining individual and other kinds of difference, as well as historical variations in bodies and in disease and illness, because a mechanistic view of matter assumes matter to be universal and timeless.

There also exists an opposing approach to health, which I broadly label the “subjectivist” approach. The “subjectivist” approach to defining health begins from the opposite premise as the “objectivist” approach. It argues that definitions of wellness and illness are subjectively defined. What is “healthy” and what is “sick” are defined by the human mind, whether in concert within a society, or individually. Social constructivism is probably the main version of what I label broadly as the subjective approach to health. There are certainly merits to the social constructivist approach, since health and disease do have subjective and social components that an objectivist account cannot explain. But the subjectivist approach also has a significant weakness, in that it cannot account very well for the objective aspect of health problems. Illness in any understandable sense involves some kind of harm, and the social constructivist approach leaves space only for subjective harm caused by stigma and censure, and not objective harm caused by the condition itself. This is why subjectivist approaches to health and disease, like those of

Michel Foucault or Thomas Szasz, are often applied to mental illness, where it is easier to explain the harm as being social and thus constructed.⁶⁰

Social constructivism has its own impasse related to the mechanistic conception of matter. Social constructivism, especially in its feminist and post-structuralist forms, struggles with a deep political impotence as a result of its belief that matter and materiality can offer nothing to the quest for social transformation. Matter and biology themselves have no agential force or dynamism,⁶¹ which means that there is no way that an individual or individuals can resist the discursive or constitutive power of society on their bodily lives. Society determines all. When it comes to defining health, the social constructivist view shares the same danger of making human minds the total determinant of reality. But as the growing field of environmental medicine shows, this is simply not empirically accurate. There is much about our bodily situation that none of us can choose or define. There are limits and consequences to our bodily engagements and interactions in the world that have direct relationships with our ability to thrive. Put simply, we cannot and do not fully define what is healthy for us at will. Not even societies have that power.⁶²

Both objectivist and subjectivist accounts of health, though they are diametrically opposed, rely equally on a mechanistic conception of matter. In particular, they both

⁶⁰ See Foucault, *Madness and Civilization* (2013) and *Psychiatric Power* (2008); Szasz, *Law, Liberty, and Psychiatry* (1989), and *The Myth of Mental Illness* (2011).

⁶¹ In the powerful words of Elizabeth Wilson, “Biological inheritance has been stripped of the infectious, communicative, expansive characteristics that are routinely attributed to psychocultural systems” (2004, pp. 68–9).

⁶² This is not to say that societies should not try to define health. My point is simply that they do not exercise full control over what health can be; this definition is also materially conditioned by living, bodily reality. See Chapter 8 for a further discussion of this point.

conceive of matter as being inert, passive, and without agency. Just as the objectivist view of health assumes matter to be inert and unchanging, the “subjectivist” view of health ignores the material aspect of health or reduces it to an effect of social forces because matter is itself passive and without agency. On the basis of this view of matter, both realist and constructivist views of health assume that natural, biological, or objective *definitions* of health must be universal and unchanging. The social constructivist view further assumes that since matter lacks agency and dynamism, the resources that will enable us to contest these definitions and to bring about creation, change and transformation in *what health is* must be *cultural* or social *rather than* natural or biological. Critiques of objective definitions of health generally end up *rejecting what is natural or material*, in order to insist that definitions are *entirely* culturally or socially constructed. This implicit view of matter as unyielding undergirds subjectivist critiques permeates feminist thought and other strains of poststructuralist (social constructivist) thought, including psychoanalysis.⁶³

The mechanistic conception of matter thus leads both sides into a collective impasse about how to understand and define health. Framing matter mechanistically means that there is no way to reconcile the subjective and objective aspects of well-being. Therefore, a deep, irresolvable divide between subjective and objective accounts of health persists. This further leads to irreconcilable differences in how we frame, narrate, and make policies about health. Ultimately, it entails an impasse about who gets to define health. Since there is no way to reconcile these views, the task of defining health is

⁶³ As Lynda Birke describes it, “The underlying assumption that some aspect of ‘biology’ are fixed becomes itself the grand narrative (albeit implicit) from which feminist and other social theorists are trying to escape” (1999, p. 44).

construed as a power struggle rather than a debate. The possibilities for dialogue and consensus between the two opposing views are all but nonexistent.

An assumed opposition between the agency of the social and the passivity of matter is at the root of this contemporary deadlock over how to define health, forcing us to choose between a definition of health that is entirely fixed, knowable, and eternal, and a definition of health that is entirely socio-culturally constructed. Neither of these options is plausible. At their cores, both of these options actually dismiss the body and its forces, powers, and possibilities from the theoretical equation for defining health. It is no wonder that we are faced with innumerable deadlocks about health and medicine. To develop truly robust and effective definitions of health, we need something that actually does justice to the agential materiality of the body. In other words, we need an ontology of matter that can account for its dynamism.

Rethinking Matter Beyond Mechanism

Not only are health and disease conceptualized under the assumption of a mechanistic materiality, but Western medicine is also effectively rendered unable to explain, treat, or prevent chronic illness as a direct result of its reliance on mechanistic thinking about matter. These practical and theoretical impasses are unsolvable within the current conceptual paradigm. Materially and socially, ethically and politically, we urgently require a rethinking of the nature of matter itself, and in particular, bodily matter – living materiality.

This rethinking is not a matter of arguing that bodies are non-mechanical in nature. Mechanism is certainly part of the picture of how a body works and how

materiality itself works. Mechanism has been our primary means of conceptualizing matter as long as it has because it works, at least *to some extent, in some cases, and in some ways*, as an explanatory device. It is undeniable that mechanism explains a part of the movement and change in matter and in a material body of any sort. Yet while mechanism might be part of the picture about bodies, it simply cannot fully explain all of what happens in a living body.⁶⁴ Some problems cannot be solved mechanistically because they are not caused mechanistically. The mechanistic conception of matter presupposes separable, independent parts, but living bodies are wholes that are not reducible to the sum of their parts.⁶⁵ As Ahn et al explain: “There are circumstances in which the complex interplay between parts yields a behavior that cannot be predicted by the investigation of the parts alone.” (2006). The mechanistic approach can explain how parts function and fail to function, but it cannot explain how a problem that involves the integral workings of the whole arises.

In the previous chapter, I discussed how feminist materialism demonstrates that a relational, ‘interactionist’, or ‘agential realist’ ontology undermines the deep conceptual divide between “nature” or “biology” and “culture” or “society”. This same conceptual

⁶⁴ Kant recognizes this in the Third Critique: “Some production of material things cannot be judged to be possible in terms of merely mechanical laws. (Judging them requires a quite different causal law – viz., that of final causes)” (1987, §70, p. 387).

⁶⁵ In other words, not all parts of wholes are independent and separable, relating by addition to make their wholes; there are important cases in which parts are dependent upon the wholes, and their wholes also depend upon these parts. Husserl makes this distinction in his third *Logical Investigation* (2001, p. 441)(441). According to Husserl, all objects, including mental states, share ontological features of unity, dependence, and self-sufficiency. Although the permeability of living materiality that I will discuss in Chapter 7 qualifies this idea of the “self-sufficiency” of living bodies, Husserl’s understanding of certain foundational wholes as having relationships of unity and dependency with their parts generally coheres with the picture of living materiality I wish to put forth in this dissertation.

shift makes it possible to escape the twin impasses of the scientific realist and social constructionist approaches to defining health. A more dynamic, interrelated concept of matter can help us move toward a better understanding of the placebo effect and psychosomatic illnesses, as well as other seemingly non-psychological bodily conditions.

Furthermore, a dynamic understanding of the agency of matter helps to combat the tendency in social constructivism to assume that non-material forces determine everything, not only our practices but also our bodies themselves. A relational, agential concept of matter is a powerful antidote to the all-encompassing agency that social forces are understood to enact, and has very significant implications for the task of defining health. Even when we recognize the subjective influence of psyche, culture, and society on the concept of health and on bodies themselves, an acknowledgment of the agency of matter means that culture and society cannot and do not fully determine what health is for living bodies. Dynamic matter is also a significant factor of influence that must be adequately addressed and understood.

Thinking matter dynamically, therefore, can provide a way out of the impasse that arises between “objective” and “subjective” approaches to defining health. This bioethical and theoretical debate about the terms of defining health is also a matter of politics and ethics, because it involves deciding both *who* defines health, and *how*. A more dynamic conception of matter provides ways to think about health as *both* objective and subjective, *both* universal and singular. Proper attention to the dynamism of matter stabilizes questions of health in a testable, empirically verifiable realm while still leaving space for individual differences and psychocultural influences. This conceptual shift can enliven political debates about health and give us tools to talk about the important roles

that both universal values and individual and cultural differences play in making medicine and health care just and effective for all.

Not only this, but the theoretical shift from a mechanistic to a more dynamic understanding of materiality helps to address the deep *clinical* impasses of Western medicine. Decentering the mechanistic understanding of matter will help us to expand our view of what happens in bodies so that we can start to highlight and investigate a broader and more temporally dispersed set of causal relations. An understanding of matter's dynamism allows us to adequately theorize the relationship of human bodies to their environments and integrate environmental and nutritional aspects of medicine more thoroughly into research and practice. Rather than monitoring cells until they turn cancerous and then mechanically removing them, when we fully understand matter's dynamism and relationality, we will be more likely to be able to begin to understand why cells turn cancerous to start with and how the body's own healing response can be enhanced to prevent them from proliferating. We can begin to look at the complex ways that subtle levels of nutrition influence cellular development so as to promote disease or health in the heart and other related body systems. A more dynamic concept of bodily structure and function can help us begin to think about why the bones of the body start to curve in unbalanced ways or why internal organs like the uterus might sink from their places, and what can be done to help the body readjust itself back into balance. It can help us understand the complex logic and patterns of the body's auto-immune response or the development of plaques in the heart or in the brain. Our chances of getting to the root of these conditions will be much improved if we modify the brute, mechanistic understanding of matter that governs current medical practice and really think rigorously

and systematically about the complex relationality and agency of the matter of our bodies.⁶⁶

Conclusion

My claim is very simple: the assumption that bodies are mechanical “all the way down” is not a good route to follow, if our aim is effective medical practice and robust definitions of health. Instead, we need to look at the ways bodies act in ways that exceed or transcend mechanism. Growth, development, and dynamic, unpredictable changes are more than the sum of mechanistic interactions. To fully account for the health of living bodies, we need an account of the materiality of which they consist that can fully account for the dynamic vitality of materiality. An agentic conception of matter can solve the impasses that plague contemporary Western medicine and its quest to define health.

In the next section, I discuss two dynamic accounts of matter from the Western philosophical tradition: Aristotle and Deleuze and Guattari. Their work provides challenging resources that will nourish our attempts to rethink the dynamism of materiality, particularly as it intersects with a quest to reformulate a more robust definition of health. In the final section, I will put their thought into dialogue with one another, using their concepts of matter to two important conceptual frameworks for thinking the dynamic materiality of living bodies: teleology and permeability.

⁶⁶ An environmental understanding of perception, such as that described in the work of J.J. Gibson, also dismantles the dualism between body and mind by situating both in a relational web of mutual influence with the physical world, or perceptual environment (1986). I formulate an environmental understanding of health, but by beginning with the matter of the body. Understanding the *relational*, permeable nature of this matter allows us explain both *why* and *how* the body relates constitutively with its environment.

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Section 2

Two Accounts of Dynamic Matter

Chapter 3

Aristotle's Dynamic Materiality

But since nature is twofold, and is both form and material, we must consider it as though we were inquiring about what snubness is. As a result, such things will be neither without material, nor determined by their material. And in fact, since there are two natures, one might be at an impasse about which of them belongs to the study of nature. Or is it about that which comes from both?" But if it is about that which comes from both, it is also about each of the two. Then does it belong to the same study or different ones to know each?...If art imitates nature, and if it belongs to the same knowledge to know the form and the material to some extent (as it is the doctor's job to know health and also bile and phlegm, in which health is, and the house builder's to know both the form of a house and its material, that it is bricks and lumber, and in like manner with the rest), it would also be part of the study of nature to pay attention to both natures.

- Aristotle, *Physics* II, 1, 194a10-27

Introduction

As we saw in the last chapter, formulating robust definitions of health requires us to rethink materiality because living beings are *both* material *and* dynamic. This undermines the possibility that their matter is passive and inert.⁶⁷ It also raises

⁶⁷ This simple common sense statement contradicts most of the history of Western philosophical thinking about material bodies. Western thinkers have generally neglected or denied the dynamism of matter. To give a few examples: the material world for Plato, while in flux, does not behave in predictable ways, which is why he argues that the forms are the only knowable entities. For Kant, matter behaves in lawlike, deterministic ways, while mind is the only realm of freedom (1996). Even vitalist thinkers like Bergson, at least in *Matter and Memory*, attribute the dynamism of living beings to spirit (*élan vital*, in the case of Bergson), rather than to matter, which is thought in accordance to Newtonian physics, to be characterized primarily by its *inertia* (*lack of agency* and

fundamental questions about why and how the matter of living beings is dynamic. In living beings we see living matter grow, develop, change, and move. While Cartesian-influenced allopathic medicine still functions on the assumption that matter is mechanistic (and thus has no internal agency of its own), if we are to understand living bodies and what health is for them, we need a more dynamic understanding of the matter of living beings.

Aristotle on dynamic materiality

I believe that these concerns are central to Aristotle's writings in the *Physics*, *On Soul*, and the *Metaphysics*. Natural things are one of Aristotle's most common objects of investigation. The question of what makes natural things *be what they are* is one of Aristotle's central preoccupations in his work.⁶⁸ Not only this, but according to Aristotle, one of the main features of natural things is that they change. For a natural thing to be able to continue to change while staying itself requires it to be constituted, at its very core, by an internal source of purposive, orderly, self-directed change. Because Aristotle

dynamism) (2007). Interestingly, however, Bergson's later analysis of living bodies in *Creative Evolution* offers a more dynamic account of matter, which in turn influences the work of Deleuze and Guattari (1998). In this same vein, in this chapter and in those that follow, I show that close attention to Aristotle and Deleuze opens up an alternative way to think the materiality of living bodies that is both more coherent with how bodies actually function and offers better possibilities for more robust and effective definitions of health.

⁶⁸ As he states in *On Soul* 412a14, "The things that seem most of all to be independent things are bodies, and of these, the natural ones, for these are sources of all the others" (2001). Similarly, at *Metaphysics* VII, Chapter 2 1028b10-12, he states, "Now thinghood seems to belong most evidently to bodies (and therefore we say that animals and plants and their parts are independent things, as well as natural bodies such as fire and water and earth and each thing of that kind" (2002).

views natural things as also being necessarily material, one implication of Aristotle's work is that we must therefore understand this internal source of change as being integrally and intimately bound up with the material element of natural beings.⁶⁹ This issue has not gotten enough attention in most interpretations of Aristotle; furthermore, proper attention to this idea *still* has the potential to revolutionize the natural sciences, which as Joe Sachs points out, continue to rely overwhelmingly on inert conceptions of matter.⁷⁰ In what follows I show that the active role of matter in nature is clearly a

⁶⁹ See *Physics* Book I, Chapter 9, 192a10: "For the nature that persists is a co-cause with the form of the things that come into being"; Book II, Chapter 2, 194a11: "Since nature is twofold, and is both form and material..."; and Book II, Chapter 2, 194b9: "In things that come from art, then, we make the material for the sake of the work, but in natural things it is there from the beginning" (1995). As we will see below, Aristotle affirms that natural things are a composite of matter and form. He spends a great deal of his writings trying to figure out exactly how these two interact to shape the becoming of natural things, but for the purposes of this investigation the crucial element of his thought is that he affirms the necessity of the material to natural things. This makes his notion of what materiality *is* absolutely foundational to understanding what health is for those natural beings, since materiality is part of what causes a natural thing to be what it is.

⁷⁰ As Sachs writes in the introduction to his translation of the *Metaphysics*, "The beginning of our philosophic tradition was a search for the inert, and this has never gone away. For Aristotle, such an account of things is never explanatory, since the inert cannot be responsible for its own changes and transformations. There must always be a second kind of source at work in things, and this realization reopens the philosophic task (984a17-23, 984b9-18). Even in the most recent phases of the quest for wisdom [including physics, chemistry, and biology], there is a persistent return to a faith in the inert among many thinkers, though it is followed always by the sort of failure that Aristotle claims must be forced by the truth itself. The physicist Newton identifies body with inertia, but then finds that body itself must also be a power that sets other bodies, and itself, in motion. The chemist Dalton identifies the elements with atomic bodies so hard that they can suffer no change, but the discoveries of Rutherford compel an attempt to picture the atom as a stable system of bodies in motion. The biologists Watson and Crick identify the species of living things with molecules whose structure can be changed only by the slow effects of random mutation, but Barbara McClintock discovers that those molecules actively rearrange themselves, and the work of John Cairns in the last few years demonstrates that they even direct their own mutation. These discoveries all remain mysterious for our contemporary sciences, since they confine themselves to a way of explanation that can never succeed. The very attempt to posit inertness in the cosmos

problem that deeply concerns Aristotle and that is at the heart of many impasses he tries to solve.

Aristotle is clear across his works that all natural things have a material aspect. In fact, natural things are the primary example of independent things, which are always *composites* of material and form.⁷¹ Aristotle struggles continually throughout his work to frame, clarify, and articulate the composite relationship between form and matter. This composite nature of natural things, their hylomorphism, is crucial to situating Aristotle's concern with the dynamism of matter. Although some readings of Aristotle seem to show that he universally privileges form as the internal source of change (indeed, this has been the dominant interpretation of his work for many centuries), careful attention to his working through of these ideas in the *Physics*, the *Metaphysics*, and *On Soul* demonstrates that matter must be the source, at least in part, of the capacity of natural things to change purposively and predictably.

the atom, and the gene has disclosed that each of those things can only be at all *if it is a being-at-work*. What Aristotle describes as happening to the earliest seekers after truth (984a18-19, 984b9-11) has happened again among the most recent, as the truth itself that they have both sought and denied has unfailingly forced itself into their path: *being is being-at-work*" (2002, pp. xxv–xxvi, *emphasis mine*). (See footnote 15 for an explanation of Sachs' term "being-at-work.")

⁷¹ *Physics* II, 1, 192b32-34: "Nature then is what has been said, and as many things have a nature as have such a source. And every thing that has a nature is an independent thing, since it is something that underlies [and persists through change], and nature is always in an underlying thing" (1995). See also *Met.* VII, Chapter 11, 1037a12-13: "For it is for the sake of this that we are also trying to mark out the boundaries of those independent things that are perceptible, since in a certain way the study of perceptible beings is the work of the study of nature," and *Met.* VIII, Chapter 2, 1043a26-29: "It is clear what a perceptible thing is, and also in what manner it has being; for in one way it has being as material, and in another way as form and being-at-work, while in a third sense it is what is composed of these."

The Physics

In the *Physics* Aristotle outlines several key aspects of what it is for natural things to be themselves. He clarifies the connection that matter and form have within natural things, and he defines what it is to have a nature or to be a natural thing. As we will see, in the course of these discussions Aristotle comes to some very important and overlooked conclusions about the nature of matter and the role it plays in the being/becoming of natural things. Unlike his predecessors and later thinkers like Descartes and Kant, Aristotle notices and attempts to account for the role that matter plays in *causing* the dynamism of living beings. Interestingly, these passages are also the source of some of the most common misconceptions about and misinterpretations of Aristotle's understanding of materiality.⁷² In the following paragraphs I highlight several of the most significant passages of the *Physics* that demonstrate that Aristotle's conception of matter is indeed a dynamic one.

Matter and form – the hylomorphic analysis

According to Aristotle, *hule* (most often translated into English as “matter”) is a potency that underlies all things. In Aristotle's words, “My definition of matter is just this—the primary substratum of each thing, from which it comes to be without qualification, and which persists in the result” (*Physics* I, 9, 192a30-31, trans. 2008).

⁷² My reading of Aristotle is not the first to question this long-standing interpretative tradition. I am deeply indebted to the translations and commentaries of Joe Sachs (1995, 2001, 2002) and Monte Ransome Johnson (2008), who also read Aristotle in this way. See also the preface of Christopher P. Long's book, *The Ethics of Ontology*, pp. xi-xii, for an explanation of why and how to step outside of “orthodox” interpretations of Aristotle, and especially how reading Aristotle for his thought process rather than for his system leads one away from the traditional interpretations (2004), as well as J. Klein's *Aristotle: An Introduction*, especially the introduction (1964), and Heidegger's essay “On the Being and Conception of *Phusis* in Aristotle's *Physics* B, 1” (1998).

Matter, as a primary substratum, and as what persists as a thing comes to be itself, might already seem in Aristotle's view to be a passive entity. Yet this is not so clear in other translations. Joe Sachs renders the same passage in this way: "By material I mean what first underlies each thing, *out of which something comes into being, which is present all along, but not incidentally*" (192a30-31, trans. 1995, *emphasis mine*). Not only does the material underlie the thing, but it is that *out of which* the thing becomes what it is, and that which *integrally persists in the development* of that thing.⁷³ Sach's slight shift in wording highlights the idea that for Aristotle, matter plays an active role in what something becomes. This possibility is also present in the Hardie and Gaye translation cited above, when it describes matter as the "primary substratum", that "from which" each thing comes to be, and what "persists" in the final version of the thing (trans. 2008). Yet it is easy to miss this possibility in Aristotle's work when we already conceptualize matter as being passive. Sach's translation brings the possibility of matter as an active agent to the fore.⁷⁴

⁷³ In English translations and commentary this is commonly called the "material" cause (as opposed to the "formal," "efficient," or "moving" causes).

⁷⁴ This shift illuminates the untapped power of Aristotle's true understanding of matter for philosophical thought. Sachs' choices as a translator are deeply rooted in what he understands to be Aristotle's understanding of the material element of being. In his perspective, Aristotle's notion of matter is so unlike the modern notion of matter that Sachs chooses to translate *hule* as 'materiality', rather than 'matter'. He explains this choice in his introduction to the *Metaphysics*:

Material is described as that which, by its own nature, inherently yearns for and stretches out toward form. This should never be called matter, by which we mean something that stands on its own with a determinate set of properties (has weight, occupies space, preserves its state of motion in a straight line). What Aristotle means by material, on the contrary, is (1) not inert, (2) not necessarily tangible, (3) relative to its form, which may in turn be material for some other form, [and] (4) not possessed of any definite properties" (21). These remarks have great significance for how

What it means for something to come to be out of something else is fundamental for understanding Aristotle's conception of the natural world.⁷⁵ According to Aristotle, matter or materiality is the "out of which" that makes it possible for every thing to come to be itself. It plays an integral, not an incidental role in this coming to be. To understand this role more thoroughly, we need to grasp how Aristotle understands matter and form to relate to one another in the becoming of natural things. Both material and formal causes had been recognized by Aristotle's predecessors. As have philosophers after them, they debated between themselves about which was the true case of being – materiality or form. Material causes were most often understood by Aristotle's predecessors (like

we interpret Aristotle's notion of materiality. Sachs wants to separate *hule* so thoroughly from the modern mechanistic understanding of matter that he offers a different English term entirely. This conceptual register is exactly what makes Aristotle so important to rethinking matter. Precisely because I seek to call into question the notion of matter as inert, passive, and possessing predictable inhering properties by reading Aristotle, I wish to retain the term 'matter' as interchangeable with "materiality. (1995, pp. 23–24)

It may help Sachs' translation to unburden himself of the modern notions of matter, but it does not aid the modern thinking mind to begin to think both matter and materiality differently. Nevertheless, because of the way a dynamic concept of matter shapes its translation choices, in what follows I quote exclusively from Sachs' translations, except where other translations can help clarify Aristotle's meaning within a certain passage, such as above.

⁷⁵ Generally Aristotle identifies matter or materiality as *hypokeimenon*, which is often rendered into English as "underlying condition" or "primary substratum." As he states at 192a30: "For by material I mean what first underlies each thing, out of which something comes into being, which is present all along, but not incidentally" (1995). Matter as *hypokeimenon* is also foundational to Aristotle's understanding of the materiality of nature. I discuss this in further depth in the context of *On Soul* 412 later in this section. However, in *Metaphysics* VII, 3 and VIII, 1, Aristotle also argues that form, material, and thinghood (*ousia*) are all underlying things (1028b34-1029a12, 1042a26-33) (2002). That Aristotle claims materiality, form, and independent thinghood to all be in a sense underlying shows the depth of the integration of form and matter in composite things, and it indicates the crucial role that matter plays in natural things.

Empedocles and Democritus) to be dominant, while Plato maintained that form was preeminent. In contrast, Aristotle is not satisfied with *either* alternative. He thinks that neither sufficiently explains the coming into being of natural things. To fully explain the causation of natural things, Aristotle seeks a more complex, nuanced account of how form and matter *work together*. In *Physics* Book II, Chapter 1, he offers this analysis of the issue (also quoted at the beginning of this chapter):

But since nature is twofold, and is both form and material, we must consider it as though we were inquiring about what snubness is. As a result, such things will be neither without material, nor determined by their material. And in fact, since there are two natures, one might be at an impasse about which of them belongs to the study of nature. Or is it about that which comes from both? But if it is about that which comes from both, it is also about each of the two. Then does it belong to the same study or different ones to know each? If one looks to the ancients, it would seem to be about material (for only a little bit did Empedocles and Democritus touch on form or the what-it-is-to-be of things). But if art imitates nature, and if it belongs to the same knowledge to know the form and the material to some extent (as it is the doctor's job to know health and also bile and phlegm, in which health is, and the house builder's to know both the form of a house and its material, that it is bricks and lumber, and in like manner with the rest), it would also be part of the study of nature to pay attention to both natures. (194a12-25)

Aristotle's main concern here is how we are study nature. Must we study the material of nature, or its form? It is absolutely essential to clearly perceive that he concludes that we must know *both*. His examples in this passage, health and house building, make a very strong case that the identity of a natural thing cannot be known apart from its material. There can be no way to understand health apart from material aspects of bodies, or a house except as a material shelter. The form and the material are so bound up together that the thing cannot be thought except in reference to both. The concept of snubness that Aristotle highlights at the beginning of this passage is a linguistic way to cue us into to the depth of the compositeness of form and matter in natural things. Just as there can be

no formal definition of snubness that does not take into account its material (because it is always a form or shape *of a nose*), so can there be no definition of a natural thing that does not take into account its material.⁷⁶

What are the implications of this hylomorphic analysis of natural beings that we find in the *Physics*? Certainly, if all matter were as it is defined in the modern mind, that is to say, passive and inert, there would be no need to study the material of a natural thing in order to know it. By being always everywhere the same, matter would be theoretically negligible. It would contribute nothing integral to the definition of a natural thing as that thing itself. It would simply be the blank canvas that receives the form.⁷⁷ If, on the other hand, as Aristotle insists, we must know the material aspect of a thing in order to know what that thing itself is, then the material must actually contribute something important and integral to its definition. Aristotle is clear about this when he asserts that not just any matter can be the matter for just any form. As he states at II, 1, 194b8-9, “In things that

⁷⁶ To clarify that form and matter cannot be extricated from one another in natural things, Aristotle contrasts his view with the separability of matter and form in mathematical objects and with Plato’s view of the forms at 193b33-194a7: “The mathematician does busy himself about the things mentioned, but not insofar as each is a limit of a natural body, nor does he examine their properties insofar as they belong to them because they pertain to natural bodies. On account of this also he separates them. For in his thinking they are separated from motion, and it makes no difference, nor do they become false by being separated. Those who speak of the forms also do this, but without being aware of it, for they separate the natural things, which are less separable than the mathematical ones. This would become clear if one should try to state the definitions of each of these things, both of themselves and of their properties. For the odd and even, and the straight and the curved, and further, number, line, and figure will be without motion, but no longer so with flesh, bone, or human being, but these are spoken of like a snub-nose and not like the curved.” In *Metaphysics* VII, 11, 1036b21-33 and VIII, 1 1042a26-31, Aristotle also confirms this perspective on the role of materiality in natural things.

⁷⁷ This is the Platonic perspective, although for Plato, materiality is theoretically negligible because it is in constant flux and thus unknowable (see *Met.* I, 6, 987a40-987b1).

come from art, then, we make the material for the sake of the work, but in natural things it is in being from the beginning. Further, material is among the relative things: for a different form, a different material.”⁷⁸ Because the material of every natural thing is differentiated and specific, knowing this material specificity is absolutely crucial to understanding how a natural thing becomes what it is.

Nature and motion - the internal source of change

Aristotle establishes that both form and matter contribute integrally to the being itself of a natural thing. The question then becomes: what does it mean to be natural, to have a nature? Aristotle investigates this by looking into how ‘nature’ is a *cause* of natural things. In Book II, Chapter 1, he states:

Of the things that are, some are by nature, others through other causes...[Of the natural things like plants and animals] Each of these has in itself a source of motion and rest, either in place, or by growth and shrinkage, or by alteration; but a bed or a cloak, or any other such kind of thing there is, in the respect in which it has happened upon each designation and to the extent that it is from art, has no innate impulse of change at all. But in the respect in which they happen to be of stone or earth or a mixture of these, they do have such an impulse, and to that extent, since nature is a certain source and cause of being moved and of coming to rest in that to which it belongs primarily, in virtue of itself and not incidentally. (192b10-22)

Looking through *the lens of causality*, Aristotle concludes that being a natural thing means *having the ability to be able to change primarily in virtue of one’s own resources and impetus*.⁷⁹ This is absolutely crucial. Natural things, which as we have seen are

⁷⁸ As I discuss below, this conclusion about the particularity of matter is developed further in *Physics* II, 1 and *On Soul* II, 1.

⁷⁹ Impetus, for Aristotle, is a source of motion whose cause may be immanent to the natural moving object. It is not until later in the history of philosophy, such as in the work of Avicenna, Buridan, and Galileo, that impetus is conceived of being given to a moving

caused by both form and matter, are natural insofar as within themselves they have the resources and cause for change.⁸⁰

Although it has been customary for philosophers to try to pin down the source of change as *either* form or matter, the implication of Aristotle's definition of nature is that because natural things are composites of form and matter, therefore the resources for self-directed change are a result of both their form *and* their matter. Aristotle's conclusion at 192b33-36 confirms that the source of natural change is within the materially independent (hylomorphic) things themselves: "Nature then is what has been said, and as many things have a nature as have such a source. And every thing that has a nature is an independent thing, since it is something that underlies [and persists through change], and nature is always in an underlying thing." Since each independent thing is dually caused by specific matter and form, matter must play an integral - and not an incidental - role in the nature, or resources and impetus for change, of that thing.

Why, then, does Aristotle state a bit later in this chapter that form is nature more than material is (II, 1, 193b6-8)? Some interpreters have assumed this to be Aristotle's definitive conclusion about the primacy of form over matter in defining a thing's nature. However, because Aristotle tends to sort conceptually through his options, trying each of them out as if they were true, we must look at the statement in its context. In this passage as a whole, Aristotle is discussing whether either form or matter might be primary in a thing's nature (193a10-193b25). First he discusses an idea of his predecessors that the

object from without, such as that of a projectile moving through space because of the impetus given to it by an external mover.

⁸⁰ This is completely opposed to a mechanistic/Newtonian view of natural things, according to which material objects are passive and are defined by the principle of inertia (Sachs, 1995, pp. 14–16).

materiality is primary, i.e., a bed is *wood* in a particular shape (if a bed is left to disintegrate it might sprout into a tree but it will never make another bed). Then he investigates the opposite option, whether form, or the shape or look, might be primary (a bed is not a bed unless it is wood *in a particular form*). He points out that in the case of a human being, the materiality –flesh and bones - are only potentially a human being; what makes them living is their activity (193b1-5). So when he states at 193b6-8 that form is nature more than matter, Aristotle is highlighting that it is the activity (*energeia*) of the matter, and not its potentiality, makes it what it is. He concludes by offering another reason one might see form as more nature than matter; nature is that into which something grows, the “into which”, the end goal. This is also form; in this context again, form is more than “shape” (as *eidos* is commonly rendered into English); it is the activity of matter in a particular configuration that keeps it being what it is (i.e., flesh and bones in living activity as a human being). For this reason, Aristotle assimilates form to *energeia* (see *Met.* VIII, 2, 1043a26-29). Sachs’ rendering of *energeia* into English as being-at-work further illuminates that for Aristotle, form is inseparable from activity.⁸¹

Aristotle’s argument is that the nature of the thing consists more in the activity of the matter than in the potentiality of the matter. In other words, it is not simply having the source of change that matters, but whether that source is active that is the primary determiner of what a thing is. Yet this does not mean that the matter is unimportant to the being of that thing. Not only does Aristotle conclude the discussion by noting that this his

⁸¹ “Being-at-work” (*energeia*, conventionally translated “activity”) includes all activity, both activities that are motions and those that are not, such as seeing, knowing, and being happy. For further explanation of this choice of English terminology, see Sachs’ “Ways of Translating” in the introduction to his translation of the *Metaphysics* (2002, pp. xxxix–xli).

notion of form as primary must be further limited and contextualized, because form can also mean deprivation and he is not sure whether in the case of generation there is deprivation or its opposite, but in the following chapter he reaffirms that natural things are always a composite of *both* form and matter and *again* poses the question of whether a physicist should be more concerned with the matter or with the form (II, 2, 194a11-16).⁸²

However, even if Aristotle *does* affirm the primacy of form in nature at *Physics* II, 1, 193b6-8 (or in other passages, such as in *Metaphysics* IX, 8, 1049b3 and 1050b2, where he states that being-at-work takes precedence over potency), this does not undermine my argument that materiality is still integral to the being of natural things. Nowhere in this passage does Aristotle deny this. On the contrary, his examples of beds and human beings are carefully constructed to affirm the importance of both a specific

⁸² Similarly, at *Metaphysics* VII, 7, 1032a15-23, Aristotle affirms that both matter and form are nature:

“Natural comings-into-being are those of which the origin is from nature, and that out of which they come to be is called material, that by the action of which is any of the natural beings, and what they become is either a human being or a plant or anything else of that sort, which in fact we most of all say are independent things – and *all things that come into being by either nature or art have material*, for each of them is capable of being or not being, and this potentiality is the nature in each - and in general, that out of which they come is a nature and that toward which they come is a nature (for the thing that comes into being, such as a plant or animal, has a nature), and that by the action of which they come to be is the nature that is meant in the sense of the form and is the same in form as what comes into being (though it is in another, as a human being begets a human being” (*emphasis mine*).

The material potentiality, that out of which, is the nature of thing, but so is the activity through which the thing comes to be and the “toward which” of that activity. Because of this fundamental plurality in how Aristotle understands what it is to have a nature, I think it is plausible to see these passages as exploring both ways of looking at generation - materiality as primary and form as primary - without concluding definitively for either one.

kind matter and the activity of this matter. It is not just the “into which” that counts, but also the matter that transforms to be the “into which.” The “into which” or form may govern the growth (or nature) of a living thing, but the “out of which” or the material also plays a causal role (see Sachs’ commentary to Book II of the *Physics*, 1995, p. 56). This is substantiated in Book II, Chapter 3 when Aristotle discusses the four causes (material, form, instigator, end) at 194b17-195a30, and also in *Metaphysics* VII, 8, 1033b18-19, where Aristotle demonstrates the necessity of matter to the becoming of all things that are generated and argues that form does not exist separately from the independent being of particular things: “So it is clear from what has been said that what is spoken of as form or thinghood does not come into being, but the composite whole that is named in consequence of this does come into being; and it is clear that there is material present in everything that comes into being, so that it is not only this [form] but also that [matter].”

Aristotle’s true goal in this passage is to show that natural things are independent. This is primarily an argument against the Platonic theory of forms, according to which the source of change comes from an external form, and not from the individual, material thing.⁸³ Aristotle proves his point by showing that what it is to have a nature is always in

⁸³ Aristotle explicitly contrasts the position he is developing with the notion of form and matter developed by mathematicians, for whom form is also separable. As he states at II, 2, 193b33-194a7: “The mathematician does busy himself about the things mentioned, but not insofar as each is a limit of a natural body, nor does he examine their properties insofar as they belong to them because they pertain to natural bodies. On account of this also he separates them. For in his thinking they are separated from motion, and it makes no difference, nor do they become false by being separated. Those who speak of the forms also do this, but without being aware of it, for they separate the natural things, which are less separable than the mathematical ones. This would become clear if one should try to state the definitions of each of these things, both of themselves and of their properties. For the odd and even, and the straight and the curved, and further, number, line, and figure will be without motion, but no longer so with flesh, bone, or human being, but these are spoken of like a snub-nose and not like the curved.”

the individual thing itself, i.e., crucially, in the *composite of form and matter*. While arguing for the vital potential of matter was not an explicit goal for Aristotle (as Sachs insists, Aristotle assumes matter to be this way), his argument for the independence of the source of change demonstrates along the way for us the role that matter plays in constituting the internal source of change of natural things.⁸⁴ Since all nature is always a composite of form and matter, this also means that self-direction for growth lies within the material thing itself, and not in an external or ideal form.⁸⁵

Against Material Determinism

The composite of form/matter allows Aristotle to refute Plato's idea of the separate existence of forms. But it also serves as an effective argument against another, contrary sort of causality espoused by some of his predecessors: material determinism. In Aristotle's time, as in Western thinking since the modernist era, the idea that matter contributed a kind of brute necessity to the world was a popular form of explanation for the being of natural objects. But in Aristotle's model, matter cannot function in an inert, lawlike way. Instead, the "necessity" of matter lies in that it offers itself as a necessary underlying substance to the functioning of the form. It is absolutely imperative to understand Aristotle's argument about the role of material necessity because it utterly distinguishes his view of matter from that of traditional material determinism. Aristotle

⁸⁴ See Sachs (1995), p. 21.

⁸⁵ Aristotle's notion of materiality as potency, as he develops it in the *Metaphysics*, is another strong support for this argument. Since potency is by definition being a source of change or motion (IX, 1, 1046a4-1046a11 and IX, 8, 1049b3-1050a14), and matter is thinghood *in* potency (VIII, 2, 1042b9-11 and IX, 8, 1050a15), matter is itself a certain kind of source of motion and change within natural things (VIII, 2, 1046a20-29, and IX, 1, 1046a25).

explicitly argues against a material determinism in which the thing is what it is because it is made out of a kind of brute, necessary matter. This is because there is always a more complex causality involved in natural things, a causality that involves the matter but is not reducible to simple linear material determinism. Aristotle sums up this argument in Book II, Chapter 9 (I quote at length):

For now people suppose that what is by necessity is in the coming into being of things, as if someone were to think that the wall of a house came into being by necessity, because the heavy things are of a nature to be carried downward and the light ones on top, so that the stones and foundations are at the bottom, the earth above on account of its lightness, and at the very top the wood, since it is lightest. But even though it did not come into being without these things, it surely did not do so as a result of them, except as by means of material, but rather for the sake of enclosing and sheltering certain things. And similarly with everything else, in whatever being-for-the-sake-of something is present, each thing is neither without things having necessity in their nature, nor as a result of them other than as material, but for the sake of something. For example, why is a saw thus? In order to do this and for the sake of this. But this which it is for the sake of would be incapable of coming about if it were not made of iron. It is necessary, therefore, that it be of iron if the saw and its work are to be. So the necessary is conditional, unlike the end ... It is clear that the necessary in natural things is the so-called material and its motions. And both must be stated as causes by the one who studies nature, but more so that for the sake of which. For this is responsible for the material, but the material is not responsible for the end. And the end is that for the sake of which, and the beginning comes from the definition and that which is grasped in speech; just as in things that come from art, since the house is such, these things must come into being or be present necessarily, and since health is such, these things must come into being or be present necessarily - so also if a human being is such, these things, but if these, these others in turn. Perhaps the necessary is even in the definition. For the work of sawing having been defined as a certain kind of dividing, this will not be unless it has teeth of a certain kind, and these will not be of that kind unless they are of iron. For even in the definition there are certain parts, as material of the definition. (200a1-15, 33-200b8)

In this passage, Aristotle establishes two ideas that distinguish his view from material determinism. First, the necessity of materiality is not universal or passive. Matter makes an integral, necessary contribution to the functioning of natural things, but it does

so in utterly particular and expressly active ways.⁸⁶ As Aristotle argues, a saw needs a particular material configuration to function as a saw. *Physics* II, 9, 200a11-15 offers a particularly clear statement of Aristotle's position: "For example, why is a saw thus? In order to do this and for the sake of this. But this which it is for the sake of would be incapable of coming about if it were not made of iron. It is necessary, therefore, that it be of iron if the saw and its work are to be." Not just any matter can be the matter of a saw. But it is not the case that by being a certain matter, it is also by necessity a saw. Any particular matter that has the *potential* for being a saw (i.e., iron) must also be in a particular form (i.e., having teeth).⁸⁷ Similarly, health has particular material functioning.⁸⁸ Certain particular matter must be present and functioning in certain ways

⁸⁶ Christopher Long also defends this idea on the basis of I, 7, 190b1-5, where Aristotle states: "Only thinghood is not predicated of something else which underlies it, but all the other [ways of being] are predicated of an independent thing.) But that independent thing too, as well as whatever else simply is, come into being from some underlying thing, would become clear to those who examine them. For always there is something that underlies, out of which the thing comes into being, as do plants and animals from seed" (trans. Sachs). In Long's words, "Already in *Physics* I.7 with the introduction of the example of the *hypokeimenon* as *sperma*, seed, Aristotle indicates a tendency to ascribe a certain active force to matter... What has emerged in our investigation of the *Generation of Animals* is a more complex conception of the relationship between form and matter, one that in fact requires not only the presence of matter, but its active engagement with form as a determining moment of the being of the offspring. This already calls into question the ability of form, on its own, to account for continuity through substantial change. More significantly, however, it also suggests that a model of generation predicated primarily on the hegemony of form cannot do justice to the individuality of the individual that manifests itself as a complex constellation of both paternal and maternal characteristics" (2004, pp. 46–47).

⁸⁷ In Aristotle's terms, this material has the potency (*dunamis*) to be a saw. See the following discussion of *On Soul* for a full discussion of the concept of potency.

⁸⁸ *Physics* II, 9, 200b1-3: "Since the house is such, these things must come into being or be present necessarily, and since health is such, these things must come into being or be present necessarily-so also if a human being is such, these things, but if these, these others in turn."

for health to be what it is in a living body.⁸⁹ In both cases, the particular shape and contributions of the matter are crucial to the thing being what it is.

Second, the necessity of matter is not absolute and deterministic, but conditional. The matter contributes a kind of functionality that is necessary to the thing only in virtue of that *for the sake of which* the thing is what it is.⁹⁰ The necessity of materiality involves the motions and configurations of a particular matter that are always oriented toward its *for the sake of which* (end).⁹¹ Both matter and form (end) contribute causally. But the

⁸⁹ See *Met.* VII, 7, 1032b18-29: “I mean, for instance, if the subject is to be healthy his bodily state must be made uniform. What then does being made uniform imply? This or that. And this depends on his being made warm. What does this imply? Something else. And this something is present potentially; and what is present potentially is already in the physician’s power... As in the doctoring in particular, the start was perhaps from the warming (and one produces this by rubbing). Accordingly, the warmth in the body is either a part of health, or else something of a similar kind follows it, which is a part of health, or it follows it by a number of steps; and the last of these is what produces the part, and is in this way itself a part of health, or in the case of a house it is, say, stones, and so too in other things.”

⁹⁰ Aristotle also explicitly ties nature to the *for the sake of which* (teleological) structure at *Physics* II, 2, 194a27: “Further, that for the sake of which, or the end, as well as whatever is for the sake of these, belong to the same study. But nature is an end and a that-for-the-sake-of-which.” This teleological structure of nature is extremely important to understanding Aristotle’s account of the materiality of natural things. In what follows and in Chapter 6 I discuss Aristotle’s concept of teleological causation in nature and the role it plays in determining what health can be for living beings.

⁹¹ Material causality is not deterministic because it is not the primary *for the sake of which*. As Aristotle states at *Physics* II, 8, 199a31-33, “And since nature is twofold, both material and form, and the latter is an end but the former is for the sake of an end, the form would be the cause for the sake of which.” He also confirms this perspective in the *Met.* IX, 8, 1050a7-1050b6, where he argues that matter is the potency to be at work, and form is the being-at-work-staying-itself (*entelecheia*) of natural things. Since being-at-work is the end of matter, form is the for-the-sake of which of natural things. For a further discussion of Sachs’ rendering of *entelecheia* into English, see footnote 35, as well as Sachs’ “Ways of Translating” in the introduction to his translation of the *Metaphysics*, as well as the glossary to the same (2002, pp. xxxix–lii). I discuss *entelecheia* as an end in more detail in Chapter 6.

material cause is not deterministic because the end, the *for the sake of which*, plays a causal role with respect to the material. The end determines which are the “necessary” materials, even if it does not fully determine how those materials function (this comes partially from their own potentialities).⁹² The necessity of matter is conditional upon the *for the sake of which* structure at work in living bodies.⁹³

The dynamic materiality of living beings

In Aristotle’s account of natural substances in the *Physics*, the role of matter is crucial. It has active agency without mechanistically determining everything of which it is a part. The matter of living materiality matter is intimately involved in a teleological structure that is immanent to the independent (material) natural thing itself. This active, conditional material necessity is precisely what we are after when we seek a more dynamic materiality. Aristotle further develops this conception of material dynamism in *On Soul*, where he works specifically to elaborate the activities of life (soul) and how they interact with material potencies.

On Soul

⁹² These particular materials are necessary precisely because they play an active role in the becoming of the natural thing. If those materials do not function as they need to, the thing will not be able to fulfill its natural end or will fulfill it differently. For example, if heavy stones and a lighter roof are necessary to making a house that can effectively provide shelter, but the material of the roof has holes in it, that necessary material will actively prevent the house from fulfilling its purpose of providing shelter. If certain necessary vitamins or minerals are not present in the food or body of a pregnant mother, her developing fetus will not be able to fulfill biological *for the sake of which* of species normal health. These kinds of deficiencies can cause developmental problems both in utero and after precisely because their activity is necessary to the successful transformation of potentially human matter into its human *for the sake of which*.

⁹³ On the conditionality of material to its *for the sake of which*, see also *Met.* VIII, 4, 1044a28-29.

In *On Soul* Aristotle works out his theory of what it means for a body, a particular kind of natural substance, to be *alive*. His writings about soul are an important extension of his work in the *Physics*. Just as in the *Physics* he defines natural objects as having an innate source of change, in *On Soul* Aristotle defines *life* as “self-nourishing, as well as growth and wasting away” (II,1, 412a16-7). This definition narrows in on a particular kind of natural thing that changes in a particular way, the kind of natural thing that changes through the *activities* of nourishment, growth, and decay.⁹⁴ These internally sourced activities of change in living beings Aristotle groups under the name *psuche*, or soul.

In Aristotle’s exploration of soul, a theme he inherits from predecessors like Plato, Aristotle investigates the kind of being that soul has. Is it matter, or is it form (or is it some third kind of thing)?⁹⁵ He repeats his conclusion from the *Physics* that natural things are composites of matter and form. In the context of the inquiry into *living* natural things, Aristotle discovers that this means that soul is not separable from matter, as some earlier thinkers believed (and as do many of our contemporaries). Neither is the soul reducible to the body (as materialists of Aristotle’s time and ours believe).

Matter’s potency for the activities of soul

This investigation is absolutely crucial for understanding the deep differences between the Aristotelian and the Cartesian or mechanistic view of materiality. According to Aristotle in *On Soul*, matter is the *hypokeimenon* or underlying substance of soul, and

⁹⁴ Other natural substances may change over time due to external influences, but this does not make them alive.

⁹⁵ This is a very relevant question that still plagues modern biology, which continues to be haunted by a matter-form (materialist-vitalist) dualism.

soul is the *activity* of matter in a certain configuration and with certain potencies (namely the potency for life).⁹⁶ This account of soul as *the activity of matter* gives a certain primacy to matter that is not generally recognized in Western philosophical accounts of the interaction between life and materiality.⁹⁷ The activities of soul, the activities of life, are deeply tied to the *potency of the material* of the living being. Just as in the *Physics* the matter of natural things is the “out of which” that makes possible activity oriented toward becoming and staying the “into which” of form, in living things material potencies are the condition of possibility of the activities of life.

Dunamis, or potency, is an innate capability or source of change. Aristotle talks of the sensory capacities of living beings, for example, by talking about what capabilities their bodies have for engaging with sensory media and motion. For the activity of hearing to happen, there are certain capabilities that the sounding thing and the hearing animal each must have, and both of these require a medium with certain material capabilities that allows the sound to travel through it in order to be heard. The reason an animal can hear, according to Aristotle is that it has an organ that has the necessary medium (air) within it, in such a space and configuration that its motion can be disrupted to transmit the sound

⁹⁶ See *On Soul* II, 1, 412a14-21, quoted below. Aristotle also alludes to form as the active bodily being of living things at *Met.* VII, 10, 1035b15-20: “And since the soul of an animal (for this is the thinghood of an ensouled thing) is its thinghood as disclosed in speech, and *its form, and what it is for a certain sort of body to be (at any rate, each part of it, if it is defined well, will not be defined without its activity, which will not belong to it without perception)*, either all or some of the parts of the soul are more primary than the whole animal as a composite, and similarly with each particular kind, but the body and its parts are derivative from the thinghood in this sense, and it is not the thinghood but the composite whole that divides up into these as material” (*emphasis mine*).

⁹⁷ Bergson is an important counterexample to this tendency in Western philosophy. In his work, and in particular *Creative Evolution*, he analyzes the living body and investigates the complex relationship that life has with matter (1998).

from the sounding object (II, 8, 419b-420a19). It is utterly impossible to understand the living activity of hearing without very particular material potencies.

It is possible to read Aristotle to be arguing in the opposite direction, as positing that even though they are ultimately inseparable, matter is simply a passive recipient of the active, enforming influence of soul. Many have read him this way. On this view, soul is form and body is matter, and the *life* of living bodies comes from the soul, not the body. If we take at face value (and out of context) some of his statements about the relation of soul to the body, this appears to be Aristotle's view. For example, he writes at II, 1, 412a16, "It is not the body that is in an underlying thing, but rather the body has being as an underlying thing and material. Therefore it is necessary that the soul has its thinghood as the form of a natural body having life as a potency." If we understand this to mean simply that the soul is the form of a material body, then this statement appears to align Aristotle neatly with a Cartesian view in which the soul animates a mechanistic body. Yet a more nuanced understanding of what Aristotle means by soul as form and body as matter shows that his view utterly opposed to Descartes'.⁹⁸

For Aristotle, soul is not conceptually – and certainly not ontologically – separate from the materiality of bodies. To see why, we must look carefully at the passage from which the previous statement was taken as a whole:

So every natural body having a share in life would be an independent thing having thinghood as a composite [of material and form]. And since this is a body,

⁹⁸ In fact, Descartes was explicitly trying to distance himself from the Scholastic philosophy he had studied, and especially from method of thought employed by Aristotle, which Descartes belied was ineffective and inconclusive (see *Discourse on Method* AT VI (1985, pp. 112–128). Johnson also highlights this opposition when he highlights the value of Aristotelian natural science for critiquing Descartes' conception of bodies as machines (2008, p. 291).

and one of a certain sort, namely having life, the soul could not be a body, since it is not the body that is in an underlying thing, but rather the body has being as an underlying thing and material [for something else]. Therefore it is necessary that the soul has its thinghood as the form of a natural body having life as a potency. But this sort of thinghood is a being-at-work-staying-itself of such a body. (II, 1, 412a14-21)⁹⁹

What is at stake in this discussion of the *thinghood* of natural bodies and of soul? What is “thinghood”? The Greek term Aristotle is using, *ousia*, was translated into Latin as *substantia* and has thus traditionally been rendered in English as *substance*. But while substance merely means something that can have predicates or attributes, Aristotle uses *ousia* to designate something that has attributes (rather than something is attributed) and that is separate and a *this*. In other words, the things that have being in this way are independent things, such as animals and plants and other natural bodies. This is why Sachs translates *ousia* as thinghood.¹⁰⁰ Aristotle understands thinghood as what makes each independent thing be what it is (*Met.* VII, 2. 1028b38-9, 1029a27-8). In *Metaphysics* Book VII, Chapter 3, Aristotle considers the possibility that the material is the thinghood

⁹⁹ “Being-at-work-staying-itself” is Sachs’ way of rendering Aristotle’s neologism *entelecheia* into English. In Aristotle’s work, this term refers to the active wholeness of identity of things being themselves as themselves (Sachs 2004, p. 9). As Sachs explains it, Aristotle creates *entelecheia* by merging three common words: the noun *energeia* (built on the root *erg-*, signifying “to work”), the verb *echein* (which means “to be by continuing or holding on in some way”), and an adjective *enteles* (which means “completeness”). Thus Aristotle’s *entelecheia* gives fuses a notion of completeness with that of persistence or continuity. For this reason Sachs renders *entelecheia* “being-at-work-being-itself.” Aristotle uses *entelecheia* to further illuminate form as *energeia*; form is not just activity, but the activity actively being oneself. *Entelecheia* is commonly rendered into English as “actuality”, which fails to capture the dynamic unity that *entelecheia* attempts to encapsulate (*ibid.*, p. 189).

¹⁰⁰ For further explanation of this choice of English terminology, see Sachs’ Glossary in his translation of *On Soul*, (2001, p. 201) and his discussion of “Ways of Translating” Aristotle in the introduction to his translation of *The Metaphysics* (2002, pp. xxxiv–xxxix).

of the independent thing, but he then shows that this is impossible, since independent things are most of all that which have both form and matter.¹⁰¹

Similarly, in the above passage from *On Soul* Aristotle first rejects the materialist view that the matter is the thinghood of the body, or, in other words, that soul and matter are the same. Since to be a living thing is to be *a body that has life*, to have life or soul cannot simply mean to have a body. This definition would be circular and redundant: to be a body that has life would be to be a body that has a body. Aristotle then explicitly assimilates soul to form. Living beings are material bodies that have the potency for life and that have soul as their form.

This assimilation might seem quite compatible with a Cartesian view of soul and matter. But the crucial piece of information that can easily be lost in this passage is that Aristotle does not think of soul or form in the same way that Descartes does. What does it mean when Aristotle says that living things have soul as form? Form is not an immaterial, separable substance for Aristotle. On the contrary, soul is the activity of matter. Having soul as form means that the living body is *at work, persisting as itself*. Soul is thus this *self-sustaining activity* of bodies that have the potency for life. As we see in the *Physics*, for Aristotle the *form* of living beings is actually activity; the soul as the form of a living

¹⁰¹ “In a sketch, what thinghood is has been said, that it is what it not in an underlying thing but that in which everything else is: but it is necessary to say only this, since it is not sufficient, for this itself is unclear, and what’s more, what else it is eludes us, since, when everything else is stripped away, it does not seem that anything is left; for some of the other things are attributes of bodies, or things done by them, or capacities of them, while length, breadth, and depth are certain quantities but not independent things (for how much something is not thinghood), but it is rather the first thin in which these are present that is an independent thing. But when length, breadth, and depth are taken away, we see nothing left behind, unless it is what is bounded by these, so that, to those who look at it in this way, the material must seem to be the only independent thing. By material I mean that which, in its own right, is not said to be either something or as much or anything else by which being is made definite” (*Met.* VII, 3, 1029a8-27).

thing is therefore the active being-at-work-staying-oneself of a material body that has the potency of life.¹⁰² The implication of this understanding of living bodies is that matter is an important contributor to what it is for these bodies to be. The underlying condition of life is materiality; therefore, material bodies with particular potencies are the first and essential element of life. Soul is the active being-at-work-staying-what-they-are (*entelecheia*) of these bodies. Soul, or life, is not separable from matter because its thinghood, its way of being itself, is to the activity of matter.

In this way, Aristotle's argument that materiality is the underlying condition of soul directly confronts and undermines a Cartesian view of body and soul in which souls are substantial entities that have ontological priority over the mechanical bodies that they (somehow, mysteriously) inhabit. According to Aristotle, the underlying stratum of life is not soul, as if souls were floating around waiting to pick up a random body somewhere or other. As he states in Book 1 Chapter 3:

But the following absurdity goes with both this account and most of those that concern the soul. They attach the soul to the body and set it into it, determining no further what the cause of this is or what the condition of the body is, and yet this would seem to be necessary, for by the partnership of soul and body the one acts and the other is acted upon, and the one is moved while the other moves it, but none of these things belongs to just any two things in relation to each other. But people put their effort into saying what sort of thing the soul is, while they determine

¹⁰² As Sachs notes, the notion that form is *activity* is clearly at work in the *Physics*, especially II, 1, 193b5-6, and Aristotle posits an argument for this view of form in the *Metaphysics*, Book VIII, Chapter 1. He also outlines it clearly in *Met.* VIII, 6, 1045b19-23, where he states: "But as was said, the highest level of material and the form are one and the same thing, the former potentially, the latter actively, so that looking for what is responsible for their being one is like looking for a cause of one thing; for each of them is a certain one, and what is in potency and what is in activity are in a certain way one thing. Therefore there is nothing else responsible, unless in the case of something that moves it from potency to being-at-work." See also *Met.* IX, 8, 1050a15-1050b6, where Aristotle clearly assimilates form to *entelecheia*, (rendered by Sachs as "being-at-work-staying-itself") of a material independent thing.

nothing further about the body that receives it, just as though, in the manner of the Pythagorean myths, any random soul were to be clothed in any random body. For while each body seems to have its own proper look and form, they talk as if one were to say that carpentry is transmigrated into flutes; but the art has to use tools and the soul has to use the body. (407b13-20)

The problem with the Cartesian/Pythagorean view Aristotle reminds us, is that it leaves the materiality of bodies completely unspecified. It contributes nothing to the understanding of what life is, and it tells us nothing of the nature of the relationship between body and soul.¹⁰³

Here again, just as in the *Physics*, Aristotle shows that it is not blank or passive matter that serves as the underlying substance for living bodies.¹⁰⁴ According to Aristotle, soul can only come to be active or at work in something that has the *particular material tendencies* necessary for certain particular activities of soul. As he states, “The being-at-work-staying-itself of each thing naturally comes to be present in something that *is* it in potency and in the material appropriate to it. That, then, the soul is a certain being-at-work-staying-itself and articulation of that which has the potency to be in that way, is clear from these things.” (412a19-21).¹⁰⁵ *Potencies for life* (soul), therefore, are *material*

¹⁰³ A more thorough knowledge of this relationship is precisely what we gain by a more attentive view to the specificities and potencies of matter, which is why it is so interesting for helping us understand what health is for living bodies.

¹⁰⁴ Since Aristotle explicitly assimilates soul to form, the deep similarities between the view of form and matter put forth in the *Physics* and the view of soul and body put forth in *On Soul* confirm my reading of Aristotle’s view of materiality as developed in the *Physics*.

¹⁰⁵ Particular living things have particular potencies, always including the potency for nutrition, and sometimes including other potencies like perception, motion, and intellect, and always in this order (*i.e.*, intellect always presupposes the three former potencies, motion the two former potencies, etc.) (*On Soul* II, 3, 414b33-415a16).

all the way down; they consist of materiality in particular configurations that offer particular possibilities for the activities of soul.¹⁰⁶ We cannot think the activities of life without matter, and not just any matter, but matter with specific capacities.¹⁰⁷

Matter and Causation

To think of matter as having *particular* potencies - and not just as pure undifferentiated potentiality - is to acknowledge that the input of matter to living beings matters a great deal. Soul is the active being-at-work of potencies that a particular body has *in virtue of its matter*. What then, do we make of Aristotle's statement in *On Soul* Book II, Chapter 4, that soul is the "cause and source" of the living body (415b8)? This statement seems to be a challenge to my argument that *matter* is constitutive for Aristotle.

Let's look at the passage as a whole:

Now the soul is the cause and the source of the living body. This is meant in many ways, but the soul is alike a cause in three distinct ways, for as that from which the motion is, that for the sake of which it is, and as the thinghood of ensouled bodies, the soul is the cause. That it is the cause in the sense of the thinghood is clear, for the thinghood is responsible for the being of everything, while the being of living things is life, and of this the cause and source is the soul. Also, it is the being-at-work-staying-itself that is the articulation of what has being in potency. And it is clear

¹⁰⁶ In the *Metaphysics* Aristotle also recognizes that material potencies are particular for and specific to each kind of being at work. For example, at VIII, 4, 1044a15-20 he states, "Concerning the thinghood of material things, one must not overlook the fact that, even if all things are made out of the same first constituent or the same primary elements, and the same material is the source of their coming-into-being, still there is some material peculiar to each kind of thing." See also *Met.* IX, 7, 1048b39-1049a5: "Now when each thing is in potency and when not must be distinguished, since it is not the case at just any time whatever. For example, is earth potentially a human being? Or is it not, but rather is so only when it has already become germinal fluid, and perhaps not even then? Then it would be just as not everything can be healed, by either medical skill or chance, but there is something that is potential, and this is what is healthy in potency."

¹⁰⁷ See *Met.* VIII, 4, 1044b2: "And one must state the nearest causes: What is the material? Not fire or earth but the material peculiar to the thing."

that the soul is the cause in the sense of that for the sake of which, for just as intelligence acts for the sake of something, nature too acts in the same way, and that for the sake of which it acts is its end. But the soul is such an end by nature in living things, since all natural bodies are instruments of the soul, the bodies of plants in just the same way as those of animals, as though having being for the sake of the soul; and the soul is that for the sake of which in the twofold sense of being that to which they belong and that for which their actions are. But surely also the soul is the first thing from which their motion with respect to place comes, though this potency does not belong to all living things; but alteration and growth also come from the soul...nothing that does not nourish itself either wastes away or grows naturally, and nothing nourishes itself which does not share in life. (415b8-415b31)¹⁰⁸

This passage demonstrates the complexity of Aristotle's reasoning about causality.

For Aristotle, soul is *what living beings have that makes them different* than non-living natural beings. He elaborates three ways that soul is the cause or source of the living body: soul is the cause of motion, it is the thinghood, and it is the *for the sake of which* of the living body. Soul is the *thinghood* of living things because thinghood is the cause of the thing being what it is; what defines living beings as living beings is life. Soul is also the *source of the motion* or activities of living beings (nourishment, alteration, and growth and wasting away) because these are the activities of life. Soul is the *for the sake of which* of a living body because it is that on which its materiality depends and the end for which it acts in order for the living body to be what it is, *i.e.*, alive. As we saw in the

¹⁰⁸ As Ed Casey explains in *The Fate of Place*, Aristotle assumes that place takes priority even over time, and especially in the study of the physical world (1998, pp. 50–53). For Aristotle, place is the “first thing surrounding a body” (*Physics* 209b1), and contains within itself a limiting power (potency) of “containing by surrounding”, which means that place and physical objects are co-present and co-active (1998, pp. 55–58). This passage from *On Soul* indicates that Aristotle understands there to be a special relationship between soul and place, which is to say between life and place. Living bodies and place are co-constitutive for Aristotle, which means that his view of matter offers rich resources for a deeply environmental view of health. I will explore these possibilities in Chapter 6.

Physics, this means that the materiality of the body is conditional on this *for the sake of which* structure of form in order to give coherency to the whole as an independent - and in this case - living being.¹⁰⁹ Similarly, the materiality of living bodies is dependent on soul because of this *for the sake of which* structure at work within them; the living body both is conditioned by soul and acts *for the sake of* soul (this is why Aristotle says in the passage quoted above that soul is the “for the sake of which” of living bodies in a twofold sense).¹¹⁰

Aristotle’s main point in this passage is that the activities of life define living beings as living. This may seem like both a common-sense statement and a tautology. Yet it need not be circular, for Aristotle is arguing against materialists like Empedocles who posit that *matter* is the source of all things.¹¹¹ If this were the case, if matter were the source of life, then all material things would be living, which is patently false, at least according to Aristotle’s view of the natural world. The mode of existence of natural things that are alive requires a more complex account of causality because they behave differently than non-living natural objects. When we look at a bean plant, for example, it is clear that the material potencies of water, air, and the various mineral elements of the soil cannot fully explain why or how the plant is what it is, doing what it is doing to be itself. “Brute” matter alone cannot explain why a bean plant puts out its particular kinds

¹⁰⁹ For a more detailed discussion of the parallels between form and soul as the ends of natural and living things, respectively, see Chapter 6.

¹¹⁰ This two-fold nature of the *for the sake of which* structure of causality is complex and merits an in depth discussion, which I broach both in what follows of this chapter and in Chapter 6.

¹¹¹ See *On Soul* II, 4, 415b32-16a18.

of roots or leaves, why it flowers when and how it does, why these flowers turn into pods and seeds. These activities distinguish it from the soil and water and air it once was. When the bean plant dies, it returns to these various material potencies and no longer functions in the same way as an active whole. Aristotle needs to find a causal explanation that can adequately account for the being of the bean plant as itself. Life, or soul, as the integrated and purposeful activity of these material potencies, provides him with a set of complex causal relationships that accounts for the being of living beings as alive.¹¹²

Despite this primacy of soul for explaining the being of living things, this passage does not undermine my argument that materiality is causally constitutive of living beings. For how can life do what life does in a body without the materiality of that body? This is a seemingly obvious point, but one that has gotten lost in the philosophy of the centuries since Aristotle. Yes, the activities of soul are more primary for defining what a thing is *as alive*, but those activities could never take place without the contributions of particular material potencies. *Soul consists in the activities of living matter*. That the material potencies function together “for the sake of” the soul that unites them does not make them ontologically secondary. On the contrary, it is clear from Aristotle’s writings in both the *Physics* and *On Soul* that material potency is actually ontologically co-constitutive with soul or form because it is the “underlying substratum” of both form and soul. In fact, in the list of ways that soul is the cause in the above passage, the “out of

¹¹² Aristotle says that soul is the “governing source” of life (Sachs’ translation, elsewhere translated as “principle” (i.e. trans. Hamlyn). It seems to me that we could reasonably think of these terms as equivalent, at least in the sense that soul is the explanatory term for all of life as it happens in the world. What could life be, if not soul, and what could soul be, if not life? This is particularly the case because, as I explain below, Aristotle assumes an irreducible continuity between the orders of explanation and being.

which”, or the material, is missing.¹¹³ This is one of Aristotle’s four modes of causation, and the fact that it is not attributed to soul shows that Aristotle is indeed reserving an important role for materiality to play in defining what a thing is.¹¹⁴

It is easy to overlook the fact that Aristotle also considers materiality to be constitutive of living things. To fully understand why this is the case, it is important to understand Aristotle’s understanding of causality. Causation, for Aristotle, is complex and multi-dimensional. As Monte Random Johnson explains in *Aristotle on Teleology*, the Greek term Aristotle uses to refer to cause is *aition*, of which the primary notion is one of *responsibility*. Commonly translated into English as either cause or explanation, what Aristotle means by *aition* is controversial and poorly understood because of the reigning notions of causation and explanation in our time and in our language. For example, we have problems aligning our own understandings of the temporality of causation, like the nearly ubiquitous axiom ‘causes precede effects’, with Aristotle’s understanding of causality that is multi-faceted and includes ends as causes (i.e., “final causes”). This is why a common critique of Aristotle is that his notion of “final causes” employs “reverse causation” (2008, pp. 40–42).

Perhaps the most important issue is the seeming opposition between the sphere of reference for explanation, on the one hand, and causation, on the other. To contemporary minds, explanation seems to be a term having to do with knowledge or even simply just

¹¹³ This is not to say that soul is immaterial; on the contrary, as the discussion below will show, soul is inseparable from matter because it is the activity of matter.

¹¹⁴ See Johnson (2008, pp. 42–49) for a helpful discussion of these four modes of causation as they are formulated throughout Aristotle’s works.

language, while cause seems to refer to ontology, to things.¹¹⁵ Yet a choice between these is not necessary. It is reasonable to think that Aristotle used the term *aiton* the way he did precisely because he believed that there was a deep coherency between modes of explanation and states of affairs, or to frame it in a more contemporary way, between epistemology and ontology (Johnson, 2008, p. 41). Yet ontological and epistemological causes are not exactly the same. In particular, they do not have the same ordering in time. Material causes come first in time ontologically, while formal, active, and “for the sake of which” causes come later ontologically. However, when we construct an explanation of the causes of a thing, the final or “for the sake of which” cause comes first (this is why we cannot attribute conditionality upon its end to materiality, even though the matter comes first in time).¹¹⁶

This is evident in the passage in question. As we have seen, in this passage Aristotle appears to attribute primacy to soul by attributing causation as thinghood, source of motion, and “for the sake of which” to soul. Just prior to this chapter, he states that in order to understand the *potencies* of life we must understand the *activities* of life and their objects (II, 4, 415a15-18). But he immediately follows this by saying that this is necessary for building an *explanation* of the potencies of life. In his words,

¹¹⁵ As Johnson notes, this same problem crops up with Aristotle’s discussion of categories: it is never clear whether Aristotle intends them to describe thoughts, words, or things (2008, p. 41). This multi-dimension analysis is one of the great strengths of the Aristotelian approach; it has much to offer our contemporary understandings that rely, as we saw in the previous chapter, on a problematic mind-matter divide that untethers epistemology from ontology.

¹¹⁶ Aristotle affirms that *thinghood* comes first in time at *Met.* VII, 1, 1028a32, but matter is also thinghood (*i.e.* *Met.* VIII, 2, 1042b9-11 and 1043a27-9), and *Met.* IX, 7, 1048b39-1049a18 suggests that material potency actually comes first in time.

But if one needs to say what each of them is, such as what the potency for thinking or perception or nutrition is, even before this one must say what thinking is and what perceiving is, for in an account, activities and actions come before the potencies for them. But if this is so, then even before that one needs to have examined the objects of them, needing first, for the same reason, to mark out what concerns, say, food, or the thing perceived, or the thing thought. (II, 4, 415a18-22)

In other words, the priority of soul as both the *for the sake of which* and the activities for which materiality has potencies is in terms of *order of explanation*. Soul does not come first ontologically in time, in the order of genesis of the living thing, but in the sense that we must first look at the *for the sake of which* and the activities of matter if we are to understand its potencies.

Aristotle demonstrates how this works using the example of the activity of nutrition. In order to understand the nutritive potency of a body we must first understand the activities of the ensouled body as they relate to food and being fed. Although the potencies come first ontologically in time, soul is given explanatory priority because it is only in relation to the activities soul that food can be understood:

But since nothing is fed which has no share in life, it would be the ensouled body that is fed, insofar as it is ensouled, so that the food too is related to what is ensouled, and not incidentally. And being food is different than being something that produces growth; for insofar as the ensouled thing is of a certain amount, what is added produces growth, but insofar as the ensouled thing is a *this* and an independent thing, what is added is food (for it preserves the independent thing, which has being just for so long as it is fed), and it is productive of coming-into-being, not of the thing fed but of one like the thing fed, since the thinghood of the thing fed is present already, and nothing itself generates itself, but it does preserve itself. Therefore, this sort of potency of the soul is a source such as to preserve the thing's holding on as the sort of thing that it is, and the food gets it ready to be at work; for that reason, when deprived of food it cannot *be*. And since there are three things - the thing fed, that by which it is fed, and the thing that feeds it - that thing that feeds it is the first sort of soul, the thing fed is what has this soul, and that by which it is fed is the food. And since the right way to name things is by their ends, while the end is begetting one like itself, the first sort of soul would be the

potency for something to beget one like itself. Now that by which something is fed has two senses, just as that by which the helmsman steers refers to both his hand and the rudder, the former both causing motion and being moved, the latter moved only. But all food needs to be able to be digested, and digestion is accomplished by something hot; for this reason every ensouled thing has heat. (II, 4, 416b10-30)

In this complex passage, Aristotle is arguing that we can only understand food and nutrition with reference to the activities and ends of ensouled beings. Nutrition is one way that an ensouled (alive) body maintains itself as itself. How can we then define food? Proper attention to the explanatory chain shows us that we cannot understand what it is to be food only in reference to the properties of the matter that is eaten.¹¹⁷ Instead, food is defined in reference to nutrition, because it is by definition something that the ensouled body can use for the end of maintaining itself as itself. We might be tempted to say that food has the property of causing growth, but Aristotle rejects this option. Instead, he argues, the only way we can attribute causality for something coming into being properly *to the food* is to say that through the activity of nutrition the ensouled body not only preserves itself, but also creates another like itself; in this sense, food is a material cause of something new, but only in conjunction with the activities and ends of soul at work in the matter of the body (II, 5, 416a35- 416b4).¹¹⁸ The body has the potency to maintain itself as itself, and to do this it needs food, which also has the potency to be used by the body in this way. In this sense, Aristotle affirms that we speak only approximately when

¹¹⁷ This position, which Aristotle credits to his predecessors, is analogous to why we can't understand what it means to be a table only in reference to the material properties of the wood of which it is made.

¹¹⁸ The goals of nutrition, for Aristotle, are not only maintenance of the individual organism but also reproduction. This is why he states in this passage that the proper way to understand nutrition is by the goal of the living thing (or soul) to “beget another like itself”; in other words, to reproduce (II, 4, 415a23-415b10). See Chapter 6 for further discussion of this issue.

we say that food nourishes the body, because soul is actually the thing that feeds the body, and food is *what it uses* to feed the body. In this sense we could say that the body is fed by two things: the food, and the activity that uses the food. The last line of the above passage is particularly important, for in it we see how the ends and activities of soul define the particular material potencies of the body. In order for the ensouled body to be able to use food, it needs to be able to digest, and for this it needs heat. The potential of a living body to generate heat, then, can only be understood in reference to the activities and ends of soul.

But although we may need to look to the activities of soul to build an explanation of what is responsible for nutrition, it is crucial to see that the nutritive potency is also not *reducible to soul*. Aristotle acknowledges that there are *three* important elements at work in nutrition— the living body that is fed, the activity that feeds it, and what is fed to the body (in other words, food). *All three* have important and particular material potencies that delimit what material can serve as *food* in the nutritive process. As Aristotle acknowledges, not just anything can be food for a particular kind of being.¹¹⁹ Food is *food* in virtue of its relation to something that is alive (having soul as the activity of

¹¹⁹ Just as the matter of a house is conditional to its form, so food is always conditional to the material potencies of particular bodies. At *On Soul* II, 4, 416a25-36 Aristotle further argues for the conditional particularity of food to each kind of body, demonstrating that we cannot a priori know what can serve as food for which: “It is evident that not even those that are a certain amount are nourishment for each other in the same way, for liquid [such as oil] feeds a fire, but fire is not food for a liquid. Now among the simple bodies it seems most of all to be the case that one contrary is food and the other is fed, but there is an impasse, since some people say that like is nourished by like, in the same way that something grows, while to others it seems just the opposite, as we were just saying, that contrary is nourished by contrary, since like is unaffected by like, and for everything change is into an opposite or something in between.” The important point here is that we cannot know in advance (as in a logical a priori) without reference to material particularities how these relationships are constituted.

nutrition), in virtue of the material potencies of the body of that living thing, and in virtue of its own material capacities to serve the needs of that being to preserve and reproduce itself.¹²⁰ The particular matter of each ensouled body and each morsel of food determine whether or not the processes of nutrition actually succeed.¹²¹ Nutrition, like souls in general, does not have a random or unpredictable relationship with living bodies. It is particular to the kinds of material potencies of various bodies, and although soul might hold a privileged role in the explanation of those activities, these specific material potencies also play an irreducible, causal role in the process.

Aristotle's goal in this passage is to solve a philosophical impasse of his time by showing that nutrition cannot be reduced to the material (fixed) properties of food, as if they could, *in virtue of themselves*, cause growth.¹²² To understand the material potencies

¹²⁰ To follow up with my example of a bean plant, we cannot understand the nutritive process of a bean plant simply in reference to the activity of nutrition that is at work generally in all living beings. We also need to understand the particular material elements of its particular process of nutrition. Bean plants need sunlight, like many plants. But unlike many other kinds of plants, beans and other legumes don't pull as much nitrogen from their soil as they (in symbiosis with the *Rhizobia* **bacteria**) fix into it. They seek other nutrients, like potassium and phosphorus as food (The Jefferson Institute, 2011).

¹²¹ It is easy to relate this understanding of nutrition to contemporary life. In how many people does the inflammation of stress prevent their digestive organs from fully assimilating the nutritive potential of the food they eat? For how many people who are gluten intolerant or have celiac's disease is *wheat* no longer a food, but a source of illness throughout the body? Or how many fast 'foods' or processed 'foods' do not actually nourish the body, but instead lead to chronic inflammation, obesity, heart disease, and other health problems? For this reason Michael Pollan, in his work on agriculture and food culture, calls fast and processed foods "edible foodlike substances", distinguishing them from *food* (2009, p. 23).

¹²² This same impasse is still present today in the idea that "a calorie is a calorie." Like Aristotle, Pollan rejects this idea. In his words, "Foods are more than the sum of their nutrient parts, and those nutrients work together in ways that are only dimly understood" (2009, p. 22). Also like Aristotle, Pollan talks about not only the *what*, but also the

of the body and of food, we need to understand the activity of nutrition. This is the order of priority of explanation, of understanding. However, for our purposes it is of vital importance to note that in this passage, Aristotle simultaneously (although implicitly) affirms that material potencies are also causally constitutive of this process. Ontologically, matter also plays a very central and we can even say *active* role in determining what the living body can and does do.^{123 124}

It is very important to recognize Aristotle's affirmation of the role matter plays in our knowledge of the physical world. As the above arguments show, in Aristotle's view, matter is a dynamic and constitutive causal force, both in shaping natural things to be what they are, and in explaining and understanding why these latter are is what they are. I

processes, the *how* of healthy eating; implying that there is a *for the sake of which* at work in such eating. I discuss all of these notions in more detail in Chapter 6.

¹²³ In one way, the matter and the form of an independent thing cannot be parsed out at the level of causes, because both are causes of the thing being what it is. As Aristotle states at *Met.* VIII, 6, 1045b19-2: "But as was said, the highest level of material and the form are one and the same thing, the former potentially, the latter actively, so that looking for what is responsible for their being one is like looking for a cause of one thing; for each of them is a certain one, and what is in potency and what is in activity are in a certain way one thing. Therefore there is nothing else responsible, unless in the case of something that moves it from potency to being-at-work." In the *Metaphysics* Aristotle is indeed interested in what moves beings from potency into activity, and since he sees that active beings activate other active beings (*i.e.* a human being comes from another [active] human being), he searches for a first mover that could be responsible for the fact that activity happens. For our purposes, whether or not there is a first mover or what Aristotle's conclusion was on the matter is inconsequential; what matters is his analysis of what makes individual living things be what they are, which he clearly concludes is both matter *and* form.

¹²⁴ For a thorough discussion of the dynamic and causal role played by matter in the generation and development of natural and living things in Aristotle's *Generation of Animals* and *Parts of Animals*, including its causation through simple and accidental necessity, see *Finalidad, necesidad, y accidente en Aristóteles: Un estudio sobre Partes de los animales y Generación de los animales* (González, 2010).

contend that the Aristotelian account of living bodies therefore demonstrates matter to be both *ontologically* and *epistemologically* constitutive. Ontologically, in the composite of a living body, there is only one substance – a material body that is actively at work staying itself. Conceptually, we can designate within such a body both form (or soul) and matter, but form/soul is simply the activity of the matter as it changes and self-sustains in particular ways that are influenced by the potencies of the matter itself. This also means that our epistemological access to living beings is dependent on matter as well. We cannot know a living thing simply with reference to its form. To know what a thing is, we must know what its matter is and can do.

Conclusion: Aristotle and Health

Aristotle offers rich resources to this study of living matter, because not only is he very interested in matter, but he is also interested in health. By way of conclusion, I would like to briefly analyze Aristotle's preoccupation with health. It is not a coincidence that Aristotle uses health so frequently as an example for his thinking. Aristotle's father was a physician, and some commentators have argued that medicine was a formative influence not only on his conceptions of life and nature, but also on his ethics.¹²⁵ Throughout the *Physics*, the *Metaphysics*, and (to a lesser extent *On Soul*), Aristotle turns to health dozens of times as a way to illustrate his notions about the relations between form and matter, potency and activity, experience and knowledge, causation and explanation. In fact, health is one of the most common examples he uses to illustrate his ideas (along with the (in)famous bronze sphere). Perhaps his interest was piqued by early

¹²⁵ For an interesting discussion of the role of medicine in Aristotle's ethics, see Jaeger's "Aristotle's Use of Medicine As a Model in His Ethics" (1957).

life experiences with his father. At any rate, Aristotle's philosophy is ripe with possibilities for rethinking living bodies, practices and theories of medicine, and concepts of health.

In the *Physics* and the *Metaphysics*, Aristotle often illustrates his ideas about how reality and knowledge work by using health as a relevant example. Why can health serve so many purposes for Aristotle? The concept of health is always ontologically and epistemologically relative to the natural things Aristotle is studying. Health does not exist separately, but is the active state of thriving of those same natural living things.¹²⁶ This has important consequences for how we understand what health is. As we have seen in this chapter, both natural and living things have are caused by a conjunction of complex and interacting causes. In the same way, health as an active state of being of these things also has multiple and complex causes. The state of being healthy an active, ontological state caused by various factors interacting; furthermore, the promotion and “accomplishment” of health is not simply the result of the interaction of factors *within* the body.¹²⁷ According to Aristotle, both internal and external factors cause health. Internal

¹²⁶ See *Met.* XII, 3, 1070a10-30 for a short discussion of why health is not an underlying subject and does not exist separately from living beings. This ontological relation undergirds my assertion that like living human beings, health is complexly caused. Health is dependent on living bodies for its existence, as a particular kind of state of those bodies, and thus it is sensible to expect the causes of health to be at least as complex as the causes of the body. As the above discussion shows, Aristotle actually understands health to be *more* complexly caused than living things, because in addition to all the causes that contribute to living things, health is also partially caused by intervening human agents, and thus its causes include human action, knowledge, and even culture.

¹²⁷ Even this way of describing health is problematic, since as a state of active being it can never be fully “accomplished.”

factors include natural impetus and sources of change, form or being-at-work, and material processes internal to the body. External factors include measures taken to create the conditions in the body conducive to health, such as warming or cooling the body. In this sense, even the external, intelligent, educated agents (like physicians) who promote health through these measures also contribute to bringing about health in a living body. Not only this, but Aristotle argues very explicitly that health is particular to each body, rather than universal to all living things or even all humans.¹²⁸ Health is thus a prime example of the complex, interactive causation that Aristotle is attempting to bring to the fore in his study of natural things.

This complexity makes health an incredibly rich concept. What does this complex causality entail for medical practice and theory, for defining, understanding, and pursuing health? While he does not discuss them at length, the consequences of Aristotle's account for medicine are many and profound. First, since paying attention to the contributions of matter is indispensable to knowledge, as Aristotle's work indicates, Cartesian and mechanistic theories of matter cannot be adequate, since they posit matter as knowable *a priori* and thus as a negligible element of what needs to be known (if it does not fall out of the knowledge equation entirely). This has important implications for health, especially as it is understood in contemporary Western medicine, which as we have seen still relies largely on a Cartesian metaphysic of matter. Aristotle's work shows us that our

¹²⁸ See also: A doctor as the cause of health: *Physics* II, 1, 192b, 2 and II, 3, 195a30-32. Health as the for-the-sake-of-which and the form: *Physics* II, 1 193b8-19; II, 3, 194b30-195a3; II, 9, 200a33-200b10; *On Soul* II, 2, 414a5-15. The role of matter and material processes in health: *Physics* II, 2, 194a11-25; II, 3, 194b30-195a3; and II, 5, 197a23-24; *On Soul* II, 2, 414a5-15; and *Met.* VII, 7, 1032a32-1032 1033a13; VII, 9, 1034a9-1034a32; IX, 7, 1048b39-1049a9. Health as particular rather than universal, *Met.* I, 1, 981a2-24.

knowledge of health and living bodies needs to pay attention to matter, because the matter of living bodies is neither negligible nor passive. It has potencies that shape what those bodies can do. In order to understand what bodies are and how they function in their being-at-work, we need an understanding of their matter in terms of both its potencies and its activities.

Second, in a related sense, Aristotle's analysis of the complexity of causation in natural things indicates that we need a suitably complex analysis when we try to understand health and how to pursue it. As Aristotle notes in the *Nicomachean Ethics*, we cannot expect to have more precision from an object than the object itself afford us (1094b13). One of the greatest conceptual/clinical problems of Western medicine is its desire to reduce all medical problems to single and proximate causes. As this chapter's analysis of Aristotle's notion of matter has shown, causation in living bodies is neither simple nor singular. It is multi-faceted and relates to both ontological and explanatory/epistemological registers. When we think about living bodies and health, we need to employ a method of thought is not reductive, that can address all of these aspects of causation. We need to think about matter, which is crucial, but we also need to think about how matter interacts with the other modes of causation that Aristotle delineates, including the sources that Aristotle identifies as the causes of motion, thinghood, and *for the sake of which*. Modern medicine has more or less reduced causality to what causes motion, i.e., "efficient causation." This understanding of causation forms the basis of the surgical and pharmaceutical interventions discussed in Chapter 2. If Aristotle is correct, however, living bodies are independent wholes whose matter and activity cannot be understood without recourse to their functions or activities (being-at-work) and ends (*for*

the sake of which). In fact, understanding the activities of living bodies in terms of their *teleology* (to use a much maligned word) is essential to the quest to define health.

Some attention has been given to functional causal explanations in health; “functional medicine” is one interesting practical and theoretical movement that has arisen from within allopathic medicine.¹²⁹ In general, however, teleological understandings of the human body continue to be repudiated by most biologists, medical theorists and medical practitioners.¹³⁰ Because of the importance of the *for the sake of which* structure for understanding both material and functional features of natural things, I believe it is absolutely imperative that we reopen the possibility of some kind of ends-oriented understanding of human bodies. This is a complex and contested issue that is the focus of Chapter 6. In that chapter I take up in great detail many of the subtleties of the issues relating to teleological causation in living and natural beings that I have only briefly mentioned here, offering in the process a thorough analysis of nutrition as teleological.

Finally, as the previous point indicates, Aristotle’s understanding of causation and natural things shows why ontology and epistemology are convergent domains of knowledge. This has significant implications for contemporary medicine. As the feminist materialists argue, the integration of ontology and epistemology is crucial to both ethics and politics. Aristotle shows us how to think why bodies are what they are, and what this

¹²⁹ Functional medicine is a branch of allopathic medicine that differs primarily in its approach to understanding and treating chronic disease. See the website of The Institute for Functional Medicine for a short description of this approach (The Institute for Functional Medicine, 2014).

Although its philosophical bases are not specified, Aristotle would certainly approve of functional medicine’s holistic thinking about causation.

¹³⁰ For more on this point see Chapter 6.

means for what health is and how to pursue it, in an account that brings coherency to ontology and epistemology. The fact that Aristotle's conception of causation unifies these at a very deep level makes his framework ideal for working out the political and ethical implications of a renewed understanding of the substance of living bodies. Health is all of these: an ontological reality, an epistemological framework and concept, a political issue, and an ethical task. By engaging deeply with what Aristotle has to teach us about thinking about living bodies, we will be able to rework the very foundations of our interactions with health.

Deleuze and Guattari are ideal dialogue partners to help us determine the value of Aristotle's thinking about bodies. In the remaining two chapters in this section, I explore Deleuze and Guattari's dynamic conception of matter. This is quite a jump. Stylistically, and in time, Aristotle and Deleuze and Guattari could hardly be more opposed. But they share an interest in exploring the significant role that matter plays in shaping our possibilities, both physical and conceptual. As we will see in what follows, this common ground sets the stage for a rigorous analysis of the differences in the way they ultimately construe matter's dynamism.

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Chapter 4

Deleuze and Guattari's Dynamic Materiality Part One: Structures

The wisdom of plants: even when they have roots, there is always an outside where they form a rhizome with something else – with the wind, an animal, human beings (and there is also an aspect under which animals themselves have rhizomes, as do people, etc.).

- Deleuze and Guattari, *A Thousand Plateaus*, p. 11

Introduction

In the work of Deleuze and Guattari, one encounters matter wherever one looks. This is because Deleuze and Guattari's analysis shows *being* to be *univocal* and *immanent*. All that has traditionally been considered immaterial – thought, concepts, ideas, society, and politics - is rendered immanent and material in their work.¹³¹ Because everything is material for them, untangling the Deleuzo-Guattarian notion of matter is a

¹³¹ One of the big questions in Deleuze scholarship is whether this immanence implies a wholesale materialism or if not, how immanence can include the immaterial. See Beistegui, 2012; Buchanan & Thoburn, 2008; Protevi, 2005; Tynan, 2012 for various perspectives on this issue. My view is that this immanence means simply that everything is in the same plane. It does not necessarily reduce everything to materiality, but it does indicate that everything in the world has a material aspect, and is interwoven with materiality. For example, we might think of the world wide web as immaterial, but it is unthinkable apart from material strata that allow it to be accessed: metals, letters on a screen, plastic keys on a keyboard, the heat produced by Google's servers, etc.

distinctly challenging task.¹³² However, precisely on account of their materialist ontology, their work also offers a distinctly rich array of conceptual and theoretical tools for thinking about the matter of health. Their work gives us tools to rigorously understand matter as both fluid and dynamic and structured and organized. In so doing, they offer an alternative to the mechanistic conception of matter that can explain the factors that account not only for the structure of living bodies but also how and why they change. They frame living bodies as dynamic, relational multiplicities that are embedded in interacting groups of material structures and flows. This gives rise to a deeply ecological frame for understanding health and opens up new possibilities for medical theory and treatment. These possibilities make it well worth the effort to track down their diffuse concept of matter, which requires grappling with their difficult terminology, opaque means of expression, and hefty body of work.

Deleuze and Guattari are an apt choice for this dissertation because they are also deeply interested in health. Although their clinical concerns are most directly addressed in other works, such as the first volume of *Capitalism and Schizophrenia, Anti-Oedipus* (1983) and Deleuze's *Critique et Clinique* project, my analysis of Deleuze and Guattari's conception of matter is built primarily on their book *A Thousand Plateaus*.¹³³ I focus on this text both because of its prominent place in Deleuze and Guattari's thought as the

¹³² As John Protevi writes, "By various terms built around the Word 'machine', Deleuze and Guattari offer a conceptual scheme that allows us to treat inorganic, organic, and social being with the same concepts. They thus strive for an ontological naturalism, a stance that would refuse to see humans as separate from nature" (2012, p. 248)

¹³³ See *Essays Critical and Clinical* (1997). See also Tynan (2010, 2012) for a discussion of the relation between health, critique, and literature in Deleuze's thought. Although Deleuze and Guattari's interest in health is important, for the purposes of this dissertation I am more interested in what we can glean ourselves from their account of matter than can serve as resources for defining health.

second and culminating work of *Capitalism and Schizophrenia*, and because it contains a systematic elaboration of the implications of their conception of matter and immanence across a wide range of fields. Therefore, where not specified all textual references are from *A Thousand Plateaus*. To clarify and enrich this analysis I also incorporate pertinent insights from other texts by both thinkers.

I set forth my analysis of Deleuze and Guattari's conception of matter in two basic parts. This chapter encapsulates part one, in which I begin by outlining two preliminary frameworks for understanding their conception of matter: their critique of the "hylomorphic model" and their notion of matter as metal. These analyses orient us toward thinking matter as dynamic. But their conception of matter is not pure flow. In the rest of the chapter I discuss a set of concepts that Deleuze and Guattari use to delineate matter's structures: *strata*, *assemblages*, *the body without organs*, *the plane of consistency*, and *the rhizome*. Chapter 5 tackles part two, in which I build on and enrich this account of matter's dynamic structures by analyzing a second set of concepts that highlight the forces and agency at work in matter's structured movement: *folding*, *speed*, *lines*, *detrterritorialization*, *affect*, and *desire*. This discussion brings up important questions about the role and place of the organism and of human agency in their account of matter, especially as it relates to both ethics and health.

A sustained and meaningful engagement with Deleuze and Guattari's concepts is a distinct challenge, especially for readers not familiar with their work, because many of these notions appear very abstract and inaccessible. Terms like *strata*, *assemblages*, *the plane of consistency*, *bodies without organs*, and *detrterritorialization* do not connect easily to our everyday conceptions of reality. This is intentional on the part of the

authors. These concepts stretch language and thought towards new ways of understanding reality. Perhaps even more challenging is the fact that each concept/term is nearly incomprehensible without the others. They thus form a web of notions that must be carefully delineated and connected if we are to understand Deleuze and Guattari's concept of matter.¹³⁴ My division of these terms into "structures" and "forces and agency" is meant to facilitate a thorough and clear comprehension of these difficult terms. This distinction is in many ways a false distinction, however, because Deleuzo-Guattarian structures are active, structuring agents. I hope that by the end of Chapter 5 it will be abundantly clear how all of these concepts and realities intimately and dynamically interconnect.

All of these concepts together provide a holistic, revolutionary framework for understanding the relationship between materiality, living bodies, and health. In these two chapters, therefore, I intersperse textual analysis with discussion of the significance and potential of Deleuze and Guattari's conception of matter for rethinking how we understand and define health, as well as for medical theory and practice. The concepts I analyze in these chapters then provide resources for the final section, Chapters 6-8, where I bring Aristotle and Deleuze and Guattari into dialogue about two aspects of living bodies that are crucial for defining health: permeability and teleology.¹³⁵

¹³⁴ This is why many glossaries explaining their terminology are filled with complex combinations of other terms. In this dissertation I attempt to show how their concepts interconnect while explaining them in other terms that are accessible to non-experts.

¹³⁵ Many scholars believe that Deleuze sets out a definitive dismantling of the Aristotelian metaphysics in *Difference and Repetition*, despite the fact that Deleuze actually builds his notion of difference in itself through an engagement with Aristotle's substantive concept of difference. He concludes that Aristotle does not yet think the essence of difference itself because the differences of being are analogical for Aristotle; Deleuze proposes that

Deleuze and Guattari's Critique of the Hylomorphic Model

In *A Thousand Plateaus* Deleuze and Guattari elaborate their conception of matter as *in motion, relational, and underdetermined*. To see how deeply their thought is related to that of Aristotle's, it is useful to situate this conception of matter within their critique of what they call "the hylomorphic model" (pp. 369, 408-9).¹³⁶ In the framework set forth in this model, matter is content, or raw material, while form is expression, or structure (p. 369).¹³⁷ Form is fixed, while matter only changes through the influence of form. This process of organization only and always proceeds unidirectionally; form orders matter. This pattern of influence implies and requires the existence of laws that subordinate matter to a particular form and realize in matter certain properties deduced from that form (pp. 369, 408-9). It is important to note that although it might share a name with Aristotle's hylomorphic analysis of natural things, the "hylomorphic model" more closely resembles a Platonic concept of form and an Enlightenment notion of matter.¹³⁸ As I

the univocal being of all differences is a better way to think difference itself (2012, p. 15)). Yet the fact that Deleuze uses Aristotle to build his notion of difference (even if through a critique of the latter) shows that both thinkers are deeply engaged in inquiring into the relations between matter, being, essence, and difference; both are metaphysical thinkers *par excellence*. These commonalities arise in Deleuze and Guattari's thought as well, and provide the fodder for an interesting discussion of matter's dynamism in relation to health and medicine. For the purposes of simplicity, I wait to elaborate and analyze these points of connection until Chapter 7.

¹³⁶ They take up both the notion and the critique of this model from Simondon's *L'individu et sa genèse physico-biologique* (Simondon, 1964).

¹³⁷ Deleuze adds *expression* to the notion of form as it appears in the traditional hylomorphic model.

¹³⁸ Plato seems to have endorsed a modified version of the Heraclitean notion of matter as radical flux (see *Theaetetus* 179-182), which ironically enough ends up in a very similar position to inert matter in terms of their epistemological value, because both are understood to contribute nothing meaningfully *knowable*: what matters to knowability,

argue in the previous chapter, Aristotle's conception is distinctly opposed to this kind of thinking about matter. In this sense, we can actually see Deleuze and Guattari's critique of the hylomorphic model as aligning them very closely with Aristotle's thought.

Deleuze and Guattari develop their critique of this model and its attendant notion of matter by drawing on Husserl's conception of a "protogeometry" that deals with "vague morphological essences", such as roundness (p. 367). Deleuze and Guattari describe vague essences as *extracting* a determination of corporality (*corporité*) from things (p. 367).¹³⁹ They use this conception to show the hylomorphic conception of matter to be deficient in three ways. First, according to Deleuze and Guattari, it fails to recognize that matter is fundamentally in motion. Husserl's vague essences, according to Deleuze and Guattari, are "vagabond or nomadic" rather than fixed or static (p. 367). In place of matter as a passive subject of determining laws and a passive recipient of form, this conception opens up the idea that materiality "possesses a *nomos*" and is therefore in motion (p. 408). Second, Deleuze and Guattari state that the hylomorphic model fundamentally misconceives matter and form as preexisting separately from one another. They highlight the *relationality* of matter and form, and the need to pay attention to the

certainty, and measurability are respectively form and fixity. For more on Plato's understanding of the material world and the epistemic possibilities it enables, see Reshotko (1994).

¹³⁹ They explicitly contrast this idea of corporality (*corporité* in French) with the ancient Greek concept of thinghood, which as we saw in the previous chapter, is central to Aristotle's conception of matter.

vague and determinative middle ground (*milieu*) between them where they both take shape.¹⁴⁰ In this sense, they go further than Husserl with his own notion. As they write,

Doubtless Husserl had a tendency to make the vague essence a kind of intermediary between the essence and the sensible, between the thing and the concept, a little like the Kantian schema. Is not roundness a schematic or vague essence, intermediary between rounded sensible things and the conceptual essence of the circle? In effect, roundness exists only as a threshold-affect (neither flat nor pointed) and as a limit-process (becoming rounded), through sensible things and technical agents, millstone, lathe, wheel, spinning wheel socket, etc. But it is only "intermediary" to the extent that what is intermediary is autonomous, initially stretching itself between things, and between thoughts, to establish a whole new relation between thoughts and things, a vague identity between the two. (1987, p. 408)

Third, precisely because of this intermediariness, Deleuze and Guattari argue that materiality is *essentially underdetermined*. Form is fixed, but morphological essences are “essentially inexact.”¹⁴¹ We can see the difference when we compare the form of a circle with the vague morphological essence of roundness. As Deleuze and Guattari write, “The circle is an organic, ideal, fixed essence, but roundness is a vague and fluent essence, distinct both from the circle and things that are round (a vase, a wheel, the sun).”¹⁴² As

¹⁴⁰ In this energetic and molecular space, *materiality* is “deployed through matter” in the form of particular traits that are capable of “expressing affects” (p. 409). I will analyze these terms in the following section.

¹⁴¹ They go on to discuss what kind of science might make these nomadic morphological essences its object. They conclude that while Royal science (which seeks exact, fixed essences and theorems) and nomad science (which focuses on problems and transformations that are rigorous but vague) are formally different conceptions of science, they interact in the *same ontological field* (p. 367). I will discuss these two methods for studying matter in more depth in my final chapter on the implications of the theory I develop in this dissertation for the practice of medicine.

¹⁴² In this sense Aristotle’s example of hylomorphism, *snubness*, is an apt example of a morphological essence. It is a corporeal essence, neither a determinate and disembodied form or unformed matter.

such, *roundness* exists in a middle ground between matter and form. This means that it is fundamentally underdetermined. Roundness, like other material essences, “is neither inexact like sensible things nor exact like ideal essences, but anexact yet rigorous (‘essentially and not accidentally inexact’)” (p. 367).¹⁴³

The hylomorphic model fails to recognize that matter is in motion, intermediary, and indeterminate. Deleuze and Guattari argue that the hylomorphic model must therefore be supplemented with two key insights about matter:

On the one hand, to the formed or formable matter we must add an entire energetic materiality in movement, carrying singularities or haecceities that are already like implicit forms that are topological, rather than geometrical, and that combine with processes of deformation: for example, the variable undulations and torsions of the fibers guiding the operation of splitting wood. On the other hand, to the essential properties of the matter deriving from the formal essence we must add variable intensive affects, now resulting from the operation, now on the contrary making it possible: for example, wood that is more or less porous, more or less elastic and resistant. (1987, p. 408)

To the idea of a matter that is *formable* we must add an energetic materiality in

¹⁴³ This understanding of matter requires a different kind of science. Science that is tied to the hylomorphic model is a science of laws and theorems. Deleuze and Guattari call this approach “Royal Science”, and they contrast it with “nomad science.” While nomad science is no less ‘scientific’ than Royal science, it orients itself towards following the flows of matter, toward problems rather than theorems (*c.f.* 367-74). Both are useful, but Deleuze and Guattari argue that the Royal approach does involve a necessary distortion: “Of course, it is always possible to ‘translate’ into a model that which escapes the model; thus, one may link the materiality’s power of variation to laws adapting a fixed form and a constant matter to one another. But this cannot be done without a distortion that consists in uprooting variables from the state of continuous variation, in order to extract from them fixed points and constant relations. Thus one throws the variables off, even changing the nature of the equations, which cease to be immanent to matter-movement (inequations, adequations). The question is not whether such a translation is conceptually legitimate—it is—but what intuition gets lost in it” (pp. 408-9). This view opens up some important and fertile space for thinking about how we might *do* medical science differently, in a more nomadic way. I will discuss these two approaches as they relate to medical science in more depth in the following chapters.

movement that carries with it implicit, “surface” singularities. “Singularities” refers to particular material traits: hardness, softness, brittleness, plasticity, etc. Matter in movement is also characterized by *variable intensive affects* that both result from and make possible its operations and movements.¹⁴⁴ In other words, matter does not just have properties, but also relational capacities to effect change and be changed. This is why Deleuze and Guattari state that material-forces is a more relevant distinction than matter-form (p. 369). I would argue that the rest of *A Thousand Plateaus* does just this: develops an understanding an energetic materiality in movement that carries with it surface singularities and is characterized by variable intensive affects. This book, and perhaps all of their thought, helps us to think more robustly and accurately about material-forces and how to interact with them. In this sense, all of the following concepts in both this chapter and the next illuminate Deleuze and Guattari’s conception of matter as in motion, intermediary, underdetermined, and singular.

Matter as Metal

Deleuze and Guattari illustrate this amplified and modified conception of matter in their discussion of matter as metal. For Deleuze and Guattari, matter is matter in movement, force, and flow. In the 12th “Plateau” of *A Thousand Plateaus*, Deleuze and Guattari develop this conception of matter in the context of a discussion of metallurgy, a practice/science/art that is *inseparable* from this notion of matter.

It would be useless to say that metallurgy is a science because it discovers constant laws, for example, the melting point of a metal at all times and in all places. For metallurgy is inseparable from several lines of variation: variation between meteorites and indigenous metals; variation between ores and proportions of metal; variation between alloys, natural and artificial; variation between the operations performed upon a metal;

¹⁴⁴ I discuss variation, affect, and intensity in Chapter 5.

variation between the qualities that make a given operation possible, or that result from a given operation (for example, twelve varieties of copper identified and inventoried at Sumer by place of origin and degree of refinement). (1987, p. 405)

Deleuze and Guattari say that the flow of matter is “*essentially metallic or metallurgical*” (p. 410). Why? This is a strange formation. What does metal have to do with organic matter, with plants and dirt and living bodies? Deleuze and Guattari insist that metal and metallurgy bring to our attention features of matter that we often lose sight of in other kinds of matter. As they state,

“Are there not flows of grass, water, herds, which form so many phyla or matters in movement?...It is as if metal and metallurgy imposed upon and raised to consciousness something that is only hidden or buried in the other matters and operations” (p. 410). While transformations in other kind of matter often take place from one seemingly static ‘threshold’ to another, like clay into a molded form, metallurgy situates itself in these zones of transition, where the matter is energetically in motion and qualitative transformations are more at work than static forms (p. 410).

While we still see the elements of hylomorphism, matter and form, at play in metallurgy, they are generally at work in a series of unending variations and operations, rather than in a fixed relation (p. 411).¹⁴⁵ Metallurgy highlights the force, the movement, and the particularities of matter.¹⁴⁶ In metallurgy, the energy of matter is made accessible and clear. It also highlights the particularities of matter, which form the basis of the art of metallurgy. It is not as if all metal behaves in the same way, or even all metals of the

¹⁴⁵ There is even a kind of metal trade that consists in melting down, reusing and “reducing” various metals into particular intermediate forms that are prepared for other operations. Ingot forms are an unfinished product, intentionally existing in a “threshold” between forms.

¹⁴⁶ In other words, matter is *at work*, as it is in Aristotle’s notion of *energeia*.

same type. The material particularities, their singularities and variations, provide the “fodder” with which the artisan interacts to bring forth her metal objects.¹⁴⁷ This is why, in the paragraph cited above, Deleuze and Guattari mention the fact that the ancient sumerians were able to make (at least) twelve different varieties of copper.

Deleuze and Guattari discuss the metallurgical process in some detail, clarifying exactly what is at stake in a metallurgical perspective on matter. Metallurgy takes up the particularities of the metal (singularities) and engages with metal *in motion* (through operations) to create objects that have certain functional and aesthetic qualities (traits of expression). Metallurgy engages with two different categories of specificities (“lines of variation”) at work in the metal. Deleuze and Guattari group into one category both the singularities (“spatiotemporal haecceities”) of the metal *and* the operations that transform or deform them.¹⁴⁸ For example, to make a steel saber, metallurgists make use of a singularity of iron, which is that it melts at a very high temperature. To make steel, metallurgists engage with this feature of iron through a refining process called decarbonation in which the molten iron is exposed to oxygen, which binds to and purifies out the carbon that naturally occurs with iron.¹⁴⁹ The second category of specificity comprises what Deleuze and Guattari call the “affective qualities or traits of expression”

¹⁴⁷ Deleuze and Guattari discuss both jewels and weapons as types of metallurgical objects (pp. 401-2).

¹⁴⁸ A *haecceity* is a medieval term first proposed by Duns Scotus for a non-qualitative *thisness* or property that is responsible for a thing’s individuation (Cross, 2010). We might understand this as a singularity responsible for making a particular thing what it is.

¹⁴⁹ *C.f.* Truran, 1855, p. 125.

that correspond to these singularities and operations (pp. 405-6).¹⁵⁰ Continuing with the example of the steel saber, the steel that results from the decarbonation processes has particular traits of expression, like hardness, sharpness, and finish, but also the “undulations or designs of crystallization” arising from the internal structure of the cast steel. A steel saber, made to hew from the side, owes both its aesthetic design and its functionality to these singularities. In contrast, although an iron sword is also made of iron, it is made in an entirely different way, drawing on different processes and movements: it is forged, cooled with water rather than air, made to attack from the front, and artistically designed through inlays (p. 406).

Lineages of metallurgical technology, what Deleuze and Guattari call *machinic phyla*, which are “technological lineages” that can be grouped according to these constellations of singularities that “converge upon one or several assignable traits of expression” (p. 405).¹⁵¹ For example, the steel saber is “descended” from the knife, while the iron sword is “descended” from the dagger (p. 406). What unites each phylum or line, what unites a saber with a knife or a sword with a dagger, is that they share some of the same singularities and operations that correspond to particular qualities and traits, making each weapon appropriate for certain types of uses and purposes. In Deleuze and Guattari’s words, the qualities and traits “determine the relation of desire to the technical

¹⁵⁰ I discuss this notion of *affect* in Chapter 5.

¹⁵¹ Note that throughout this discussion Deleuze and Guattari never speak of traits of expression as *produced* by the metallurgists. Instead, the traits *correspond to* or *converge with* the singularities of the metal and the operations of the metallurgists. This language indicates a very clear sharing of agency that makes the matter and the metallurgists co-producers of the finished object. I will discuss this idea more when I talk about *who* moves matter.

element” (p. 406).¹⁵² We can see commonalities and patterns among and between metal’s singularities; it is not as if every individual piece of metal is utterly unlike any others. But singularities form constellations not only within lines but also *across* them. We can also identify and analyze singularities that tie different lines or phyla together.

Commonalities between phyla are both possible and necessary because the singularities of metal form constellations with those of many other kinds of matter. In fact *all matter* is singularity, variation, movement, and the expression of traits. As Deleuze and Guattari put it, “At the limit, there is a single phylogenetic lineage, a single machinic phylum, ideally continuous: the flow of matter-movement, the flow of matter in continuous variation, conveying singularities and traits of expression. This operative and expressive flow is as much artificial as natural: it is like the unity of human beings and Nature” (p. 409). Metal is not a unique case. On the contrary, matter itself is a single phylum that runs through all reality, sociocultural, technical, and natural, down to and including metal.¹⁵³ It is a flow of matter, matter in continuous variation, *matter-movement*.¹⁵⁴

In metallurgy we see the activity and movement of matter, its specific capacities

¹⁵² I also discuss *desire* in Chapter 5.

¹⁵³ This is very similar to Tuana’s notion of the “viscous porosity, which highlights the shared agential, interactionist reality that unites the “natural” and the “biological” with the “cultural” or “social” (Tuana, 2008, pp. 188–92)

¹⁵⁴ The historical-material relations embodied in the processes of metalworking are very visible in the exhibits about metalworking at the Museo del Oro in Bogota, Colombia. Not only does each kind of alloy have particular properties, but these properties enable a particular history as the metal interacts with human politics, economics, and art. Their online introduction to their display gives quite a good feel for the exhibits (Banco de la República, 2012)

for transformation, at their clearest. For this reason Deleuze and Guattari argue that

What metal and metallurgy bring to light is a life proper to matter, a vital state of matter as such, a material vitalism that doubtless exists everywhere but is ordinarily hidden or covered, rendered unrecognizable, dissociated by the hylomorphic model. Metallurgy is the consciousness or thought of the matter-flow, and metal the correlate of this consciousness. As expressed in panmetallism, metal is coextensive to the whole of matter, and the whole of matter to metallurgy. Even the waters, the grasses and varieties of wood, the animals are populated by salts or mineral elements. Not everything is metal, but metal is everywhere. Metal is the conductor of all matter. The machinic phylum is metallurgical. (1987, p. 411)¹⁵⁵

It might seem counterintuitive to think that it is in *metal*, which we might think of as one of the most inert substances on earth, that we most clearly see the vitality and movement of matter. But it is crucial that we can recognize matter's dynamism even in metal.

Because in living things and moving things, like water, grass, or animals, it might be easy to attribute that vitalism to other causes: external forces like gravity might cause water to move, wind and animals might move grass, and in the case of animals, we might have some kind of internal but immaterial causation, like a soul or an intentional mind.

Metallurgy, on the other hand, shows us that matter itself, in its most "passive" and "static" forms, is already matter in movement, matter in variation. Matter's singularities vary, depending on the other chemicals and minerals in its environment, and the art of metallurgy makes use of these singularities to interact with and change metal, both its form and its composition. This is why it is significant that Deleuze and Guattari highlight that metal, matter construed as *matter qua flow*, is *coextensive with all matter*. There is no

¹⁵⁵ Note the parallel with alchemy, which also sees matter everywhere, in both gross and subtle forms.

inert matter in this account. All matter is flow, movement, variation. Matter not only has its own dynamism, but its vitality and its own *life*, a *material vitalism*.¹⁵⁶

Matter's Structures

This discussion of metallurgy has established one crucial fact. Matter is matter in motion, *matter-movement*. Now we turn to the problem of *how* matter moves. This is not yet a question of agency, of *who* or *what* causes matter to move (we will tackle that in the next chapter), but of the ‘structures’ or arrangements matter forms as it moves and the ‘forces’ involved in the production and creation these structures. While the distinction between structures and forces belies their complete inseparability for the purposes of understanding Deleuze and Guattari’s terminology, it is helpful to ‘pause the frame’ (to borrow a cinematic image) on the formations of matter in motion, making them seem for a moment more static than they actually are, so that we can untangle the complicated workings of matter’s structures and its structuring movement. In what remains of this chapter, we will tackle the ‘structural’ concepts of *strata*, *assemblages*, *body without organs*, *plane of consistency*, and *rhizome*, while the ‘forces’ concepts will be the focus of Chapter 5.

Strata

The first structure we see at work in *A Thousand Plateaus* is that of *strata*. Deleuze and Guattari, drawn as they are to grounding their conceptual framework in the inorganic, make use of geological stratification to highlight the processes through which matter is configured. In the second plateau of *ATP*: “The Geology of Morals: Who Does the Earth Think It Is?” Deleuze and Guattari articulate a vision of evolutionary history

¹⁵⁶ For this reason, it is a leading example for Deleuze and Guattari of a nomad science.

that unites organic and inorganic change in one continuum of change and motion (pp. 39-74). As we have seen, matter as *metal*, as flow, runs through all reality, both material and sociocultural (p. 409). In this plateau they explore the actual processes of this flow as it solidifies into the various configurations of the historical world. One term they use to help conceptualize this configuring and solidifying is *stratification*.

Stratification is the organizational process that brings matter and form into particular, unified layers. In Deleuze and Guattari's account of materiality we cannot escape, nor do we need to, making distinctions between form and matter. The unique perspective that emerges out of their critique of hylomorphism is that matter and form are relative distinctions that must be understood in relation to one another. This view is further developed in their discussion of strata, which are the space where the relations between matter and form are constantly being redefined. Exactly how these relations are formed is significant, because as we saw in the discussion of Aristotle's conception of materiality, opinions differ about which is a more primary cause of natural and living things: matter or form. Deleuze and Guattari take up this question when they ask about the causes of the unity and diversity of each stratum. Like Aristotle they reject this binary, but unlike Aristotle, who argues that the answer is *both*, Deleuze and Guattari argue that the answer is *neither* (p. 45).¹⁵⁷ Instead, strata are the articulators of the relations between form and matter. These relations are always relative to one another (we cannot think form without matter and vice versa) and to the stratum and its related strata

¹⁵⁷ In the organic stratum, for example, no single matter or form explains what makes all things alive. The organic stratum has a unity of composition, but it is composed of a variety of materials and forms that might also exist in other strata (pp. 45-6). Carbon might be present in all living things, for example, but it cannot be responsible for making them alive because it is also present in non-living things.

(form and matter are put into particular relations within and by each stratum).

For Deleuze and Guattari, what determines the unity of a stratum are the particular relationships *between* specific matters and forms as articulated in and by the stratum. We see this clearly in Deleuze and Guattari's discussion of matter, substance, and form in this third Chapter of *A Thousand Plateaus*. When they speak about strata, Deleuze and Guattari use the term *matter* cautiously to refer to only what is unformed, unorganized, the flow and singularity of the material, *substance* to refer to formed matter that has been coded and organized, and *form* to refer to what codes and decodes matter's flow in particular orders and arrangements (pp. 41-3).¹⁵⁸ Therefore, instead of *matter and form*, they speak of *substance and form*.

Strata are organized layers of material reality that always form through a process of "double articulation." This notion of articulation does not mean that strata speak, or are necessarily linguistic (although Deleuze and Guattari do reference linguistics to clarify the functioning of strata, in terms of 'content' and 'expression') (pp. 40-45). Instead, "double articulation" is a general model that describes a simple pattern at work in all stratification. As they describe this pattern,

The first articulation chooses or deducts, from unstable particle-flows, metastable molecular or quasi-molecular units {substances) upon which it imposes a

¹⁵⁸ They call unformed matter the "plane of consistency" or the "body without organs", terms that are very important to their understanding of matter. (I will analyze these in what follows.) This notion of matter as total disorganization is reminiscent of Aristotle's concept of prime matter. In this sense, matter *per se* is a limit concept for Deleuze and Guattari in the same way that prime matter is a limit concept for Aristotle. In both cases the only matter we can actually interact with is enformed matter (which Aristotle calls "hylomorphic"), because matter as pure flow and singularity and prime matter are simply theoretical constructs that help us understand the patterns we see in the world (rather than names for actual ontological entities). This is the difference between enformed matter (structures like strata, assemblages, and bodies without organs) and "pure" matter (the plane of consistency and the body without organs).

statistical order of connections and successions (forms). The second articulation establishes functional, compact, stable structures (*forms*), and constructs the molar compounds in which these structures are simultaneously actualized (*substances*). (p. 40)

In the formation of a stratum, orders of relation and succession are first imposed on very small (molecular or quasimolecular) units. This is the “first articulation.” Then larger, functional, stable structures are formed, while at the same time they are actualized within even larger material compounds (p. 40). This is the “second articulation.” Deleuze and Guattari describe sedimentation, when sand sized particles of minerals like quartz are deposited, as the first articulation in a geological stratification; this is followed by a second articulation that “sets up a stable functional structure and effects the passage from sediment to sedimentary rock”, a process of folding that turns the particles into rock, *i.e.* sandstone (p. 41).¹⁵⁹

Deleuze and Guattari are most interested in how we see this process at work in organic strata, *i.e.* in organisms, taking up the example of the production and use of proteins in the living body.¹⁶⁰ As they describe this process, first, through morphogenesis, molecular realities such in random relations are gathered or “caught up” into aggregates with a determinate order, such as a protein fiber.¹⁶¹ Second, these

¹⁵⁹ I discuss folding in Chapter 5.

¹⁶⁰ This same process is at work in language: to form the strata of language, an order of relation and succession is imposed on small units of sounds and letters, which then form stable, functional structures of words and phrases while being simultaneously actualized within the larger field of the language and communication as a whole (this includes nonverbal communication, relations to other languages, etc.).

¹⁶¹ In what follows I flesh out the slightly curtailed references Deleuze and Guattari make to these processes using well known information about biology to fill in their schema with familiar examples.

aggregates, i.e. the protein fiber, are then taken up into stable “molar” structures like blood, organs, or regulation and oversight mechanisms (i.e. the “transport” protein hemoglobin that transports oxygen in the blood, the “structural” proteins that form collagen and make up bones, hair, and teeth, and the “motor” proteins that regulate heart contractions); in this part of the process the protein fiber is re- (or doubly) articulated within a larger material whole (pp. 41-2). In other words, the first articulation “carves out chemical motifs” and the second articulation assembles them (p. 42).¹⁶²

According to Deleuze and Guattari, we can understand the double articulation of strata as happening in one sense on two levels: first the “molecular” (small), and then the “molar” (large). But within each “molecular” articulation we can also identify this same double operation, which undermines the purity of the distinction molecular/molar. For example, in the first (molecular) articulation outlined above, the formation of the protein fiber can also be understood to have internal to it two articulations: one, in which amino acids are formed, and a second, in which these are organized into protein molecules fibers. The protein is thus the molar to the amino acid molecular. But in another double articulation, the protein fiber becomes the “molecular” entity that is consolidated into larger “molar” structures like blood, bones, and hearts.

These same relations of articulations within articulations that undermine the molar/molecular distinction also undermine any strict distinction between substance and form. For Deleuze and Guattari, rather than referring to predetermined relations, the notions of substance and form provide us with conceptual tools to analyze the particular relations produced within and by strata. A protein fiber can be the form (of an amino

¹⁶² This conception is clearly indebted to Bergson’s *Creative Evolution* (1998).

acid) or can be the substance (of an organ).¹⁶³ These distinctions are relative to one another and are only defined in particular, articulated contexts. This account of the mutual constitution of relations of form and substance allow Deleuze and Guattari to account for a much more fluid, dynamic understanding of materiality.

Matter's fluidity is also seen in the fact that the same substance can be taken up in many forms, and the same formal relations can be at the heart of many different processes (p. 49). For example, Deleuze and Guattari explain that the cellular chemistry discussed above, which is responsible for the creation and ordering of proteins, is itself regulated by a third double articulation, that of the genetic code, which also articulates sequences of amino acids. In this first articulation, amino acids are composed into proteins, and in the second articulation these are organized into nucleic units that then regulate gene production. In this instance, amino acids are the "substance", but they are articulated differently, and thus function differently. Similarly, we see the same formal or chemical bonds in many different substances, but they are articulated differently in different strata (pp. 51-2). Picking up the example of organs as forms of proteins, we can find a heart in many living animals, but in each one the heart as form has a particular, context-dependent articulation; form is always dependent on its articulating stratum. Relations of form and matter are not predetermined or fixed; even when they recur in patterns, each relation is articulated anew within and by each stratum.

In the same vein, the distinctions between "content" and "expression" are also relative to one another within strata. Deleuze and Guattari show that *content*, normally understood in linguistics to be a synonym of substance, includes *both substance and*

¹⁶³ *C.f.* Murray, 2013.

form. Content is always formed matter (substance) that can thus be considered from both the point of view of its substance and that of its form. For example, a protein fiber is the “content” of particular organs and mechanism of the body as explained above, but it has one form in the first articulation, when it is a simple protein, and another in the second articulation, when it is gathered into an organ or a mechanism (p. 44). We cannot separate content from its expression. Similarly, *expression*, normally understood within linguistics to be a synonym of *form*, also plays the role of *content* in regards to other expressions. In the example of the genetic sequence, the nucleic sequence which is the expression (form) of the amino acids turns around and becomes the content for other expressions (forms), such as in the “messengers” that relay the genetic code to the rest of the cells to influence their development (pp. 43-5). We cannot separate expression from its content. In this respect, Deleuze and Guattari affirm Hjelmslev’s argument in his *Prolegomena to a Theory of Language*:

The terms expression plane and content plane ... are chosen in conformity with established notions and are quite arbitrary. Their functional definition provides no justification for calling one, and not the other, of these entities expression, or one, and not the other, content. They are defined only by their mutual solidarity, and neither of them can be identified otherwise. They are defined only oppositively and relatively, as mutually opposed functions of one and the same function. (Hjelmslev, 1961, p. 60, quoted in Deleuze & Guattari, 1987, p. 45)

The main point to gather from the above analyses of the double articulation of stratum is that form and matter and content and expression are not fixed, absolute entities or states, and neither term within the pair can explain the relation between the two. Instead, these pairs are always articulated in relation to one another within and by a stratum. This

relation gives the strata their overall unity.¹⁶⁴

This puts strata in a dynamic light. Where previous thinkers have seen fixed, hierarchical patterns of form and matter or content and expression, predictable patterns of development, lineage, and language, Deleuze and Guattari see strata as unified patterns of articulation that are constantly in the process of being produced and reconfigured in new and unexpected ways. As they write,

On the intensive continuum, the strata fashion forms and form matters into substances. In combined emissions, they make the distinction between expressions and contents, units of expression and units of content, for example, signs and particles. In conjunctions, they separate flows, assigning them relative movements and diverse territorialities, relative deterritorializations and complementary reterritorializations. Thus the strata set up everywhere double articulations animated by movements: forms and substances of content and forms and substances of expression constituting segmentary multiplicities with relations that are determinable in every case. Such are the strata. Each stratum is a double articulation of content and expression, both of which are really distinct and in a state of reciprocal presupposition. Content and expression intermingle, and it is two-headed machinic assemblages that place their segments in relation. What varies from stratum to stratum is the nature of the real distinction between content and expression, the nature of the substances as formed matters, and the nature of the relative movements (p. 72).

Even within the strata, relations of form and matter are not fixed, but are in constant motion (p. 72). One reason these relations are dynamic even within the strata is that the strata themselves are in relations of mutual influence and definition with other strata. Just as matter and form and content and expression are configured into various relations

¹⁶⁴ It is perhaps ironic, given Deleuze and Guattari's critique of the hylomorphic model, that in strata we see what Aristotle would call *hylomorphism* at work in Deleuze and Guattari's analysis of the world: matter and form at work in relation to one another, together shaping the world as it is. Neither form or matter is separable from the other, and neither is primary; instead, material reality is like a set of nesting dolls of various configurations of form and material, all the way through. Deleuze and Guattari's view, however, goes beyond hylomorphism by explaining that strata are the articulators of these configurations.

within strata, strata also enter into changing relations with other strata.¹⁶⁵ As Deleuze and Guattari describe this situation:

It would be a mistake to believe that it is possible to isolate this unitary, central layer of the stratum, or to grasp it in itself, by regression. In the first place, a stratum necessarily goes from layer to layer, and from the very beginning. It already has several layers. It goes from a center to a periphery, at the same time as the periphery reacts back upon the center to form a new center in relation to a new periphery (p. 50).

One stratum's center is periphery to another stratum and vice versa; the unity of a stratum is inseparable from these relations of relative exteriority and interiority with other strata.

This is another sense in which strata are multiple. Strata connect to one another, forming networks of neighboring strata, or what Deleuze and Guattari call parastrata and epistrata.

These terms, like form and substance and content and expression, are relative:

Each stratum serves as the substratum for another stratum. Each stratum has a unity of composition defined by its milieu, substantial elements, and formal traits (Ecumenon). But it divides into parastrata according to its irreducible forms and associated milieus, and into epistrata according to its layers of formed substances and intermediary milieus. Epistrata and parastrata must themselves be thought of as strata (pp. 72-3).

A given stratum only exists within its epistrata and parastrata, in some sense a part of the strata, and in another are strata in their own right (p. 52). *Epistrata* are substantial intermediary levels, states, or outgrowths of strata. These intermediary states or milieus are relatively "external" in a sense to the stratum, but they also interact with the stratum,

¹⁶⁵ For example, the strata that aggregates a "storage" protein is not defined in itself, but as a relation of substance and form in relation to other strata. A storage protein is thus defined as a protein whose share in the total cell is more than 5%, and displays at least one of the following characteristics: 1) it is usually built of a variety of peptide chain (chains of amino acids) 2) it usually has no enzymatic activities, 3) it serves as a nitrogen source for a germinating seed, and 4) it occurs in an aggregated state within a membrane vesicle. In this definition, we see particular substance and form (a variety of amino acid chains making up at least 5% of a cell) but integral to this definition are the relations of this form and substance aggregated with a number of other strata, like seeds, membrane vesicles, and cells (Sengbusch, 2004).

as flows go constantly between the stratum and the epistrata, which undermines any strict distinction between internal and external (49-50). *Parastrata*, on the other hand, are associated milieus that are neither external nor internal, not even intermediary, but are related to a stratum through annexation. By annexing associated milieus, for example, an organism captures energy sources that open it up to new material transformations; respiration is an example of such capture (pp. 51).¹⁶⁶

Implications of strata for understanding matter

One profound implication of this notion of the inextricability of strata from their epistrata and parastrata is that matter cannot possibly be thought, as it has been since Enlightenment science, and unfortunately still is in Western medicine, as separate and separable. Instead, all matter is structured by strata as related and relating. As Deleuze and Guattari indicate, this deep relationality of strata is particularly relevant to organic strata. As they write,

An animal milieu, such as the spider web, is no less ‘morphogenetic’ than the form of the organism. One certainly cannot say that the milieu determines the form; but to complicate things, this does not make the relation between form and milieu any less decisive. Since the form depends on an autonomous code, it can only be constituted in an associated milieu that interlaces active, perceptive, and energetic characteristics in a complex fashion, in conformity with the code’s requirements; and the form can develop only through intermediary milieus that regulate the speeds and rates of its substances ...Milieus always act, through selection, on entire organisms, the forms of which depend on codes those milieus sanction indirectly. (1987, pp. 51-2)

In other words, forms are like codes that require certain characteristics from their associated milieus and cannot develop apart from these characteristics. The unity of an organic stratum, therefore, cannot be understood apart from its interaction with all its

¹⁶⁶ This example is especially poignant given Deleuze’s sufferings from emphysema.

associated milieus. This becomes clear quickly, for example, when we consider evolutionary biology, in which the environment works directly on the formation of various living bodies, and in biology in general, in which a living organism's activities and form cannot be thought apart from interactions with the sun's energy and the nourishing nutrients of dirt, air, and water. Yet somehow the deep relationality of the strata of living human bodies with their associated milieus has not been thoroughly taken into account in the theoretical and practical aspects of Western medicine. This is a deep conceptual flaw that I will address more thoroughly in Chapter 7 on permeability and environmental medicine.

Assemblages

In the above discussion, we saw that strata are organized layers of matter that articulate dual relations of substance and form, content and expression. Yet we also saw in passing that Deleuze and Guattari state that a “*machinic assemblage*” puts content and expression into relation within a stratum:

Each stratum is a double articulation of content and expression, both of which are really distinct and in a state of reciprocal presupposition. Content and expression intermingle, and it is two-headed machinic assemblages that place their segments in relation. What varies from stratum to stratum is the nature of the real distinction between content and expression, the nature of the substances as formed matters, and the nature of the relative movements. (1987, p. 72)

Since, according to this passage, both *strata* and *assemblages* are responsible for articulating the relation between content and expression, substances and form, in order to really understand the functioning of strata we must unpack this notion of *assemblage*.¹⁶⁷

¹⁶⁷ *C.f.* p.67: “Fitting the two types of forms together, segments of content and segments of expression, requires a whole double-pincerred, or rather double-headed, concrete assemblage taking their real distinction into accounts.”

Assemblage is one of Deleuze and Guattari's most well known terms, but before we can grasp how assemblages are related to matter, we need to make a short linguistic pause to make sure we have the correct notion of assemblage in mind. Unfortunately, the English word "assemblage" carries certain connotations that the original French term *agencement* does not. In English, assemblage signifies a wide range of groupings that do not necessarily have any kind of organizational plan at work within them. *Agencement* on the other hand, indicates an active, intentional, organizational plan. In fact, it most commonly refers to a particular, intentional spatial arrangement, such as what is created by an interior designer within an office or a living room. The verb form is *agencer*, which means to construct, organize, or lay out, as in a well laid out apartment. Synonyms of *agencer* include *arrangement* and *disposition*, while its antonyms include *disorder*, *disorganization*, as well as the word *bouleverser*, which means to turn upside down or inside out, to disrupt drastically.¹⁶⁸ In other words, *agencements*, rendered into English as *assemblages*, are by definition intentionally structured and organized. Related English terms include *agent* and *agency*, terms especially appropriate to this investigation since we are exploring the *agential* nature of matter.

For Deleuze and Guattari, assemblages provide an explanation for the formation of strata. Strata are neither self-enclosed nor self-causing. Instead, according to Deleuze and Guattari, they are formed through the structuring operations of assemblages: selective groupings that exist on a variety of scales. As they write,

We will call an assemblage every constellation of singularities and traits

¹⁶⁸ All translations, definitions, and synonyms are taken from the Larousse Dictionnaire Française Online and Dictionnaire Française/Anglaise Online (2014a, 2014b; 2014a, 2014b).

deducted from the flow—selected, organized, stratified—in such a way as to converge (consistency) artificially and naturally; an assemblage, in this sense, is a veritable invention. Assemblages may group themselves into extremely vast constellations constituting "cultures," or even "ages"; within these constellations, the assemblages still differentiate the phyla or the flow, dividing it into so many different phylas, of a given order, on a given level, and introducing selective discontinuities in the ideal continuity of matter-movement. The assemblages cut the phylum up into distinct, differentiated lineages, at the same time as the machinic phylum cuts across them all, taking leave of one to pick up again in another, or making them coexist. A certain singularity embedded in the flanks of the phylum, for example, the chemistry of carbon, will be brought up to the surface by a given assemblage that selects, organizes, invents it, and through which all or part of the phylum passes, at a given place at a given time. (1987, p. 406)

Assemblages *select* combinations of traits and singularities that come together in an *organized* way to form a *consistent or convergent unity*.¹⁶⁹ In this way assemblages are responsible for the creation of strata, for organizing, selecting, and bringing into relation diverse elements into a unified layer (72). This process also explains why relations of content and expression and substance and form are in one sense articulated by strata, while in another sense these components are ultimately put into relation by *machinic* assemblages (p. 72).

Contrary to what we might think, the term *machinic assemblages* does not refer to machines but to the active, creative, productive role that assemblages play in the creation of strata. Assemblages do not only *select* and *organize* preexisting singularities into strata. Assemblages are themselves “veritable inventions” because they invent the relations of *consistency* that unify various singularities and cause the strata to form (pp.

¹⁶⁹ This unity is such an important aspect of assemblages that Deleuze and Guattari associate assemblages with unified totalities like organisms or qualities (pp. 3-4).

406-7).¹⁷⁰ Assemblages are also what bring strata into relation; they are thus also responsible for relating what is within a strata to what is outside of it, to other strata (epistrata and parastrata), helping to bring about the “corresponding changes in organization” that result from this relation (p. 72-3). Assemblages thus function as both a medium of communication and a causal organizational influence between a stratum and its “outside” (outside, as we have seen, is always relative).¹⁷¹

This relation to the outside is constitutive of assemblages. Not only does a machinic assemblage relate strata to other strata. It also situates itself between the strata and what Deleuze and Guattari call a *body without organs*, or a *plane of consistency* (pp. 72-3). They sum up the functioning of assemblages thus: “Assemblages are necessary in order for the unity of composition enveloped in a stratum, the relations between a given stratum and the others, and the relation between these strata and the plane of consistency to be organized rather than random” (p. 71).¹⁷² This function of organizing relations is why assemblages are characterized as machinic and inventive. In this sense, we can understand assemblages to be the concrete, productive, creative motor of materiality. Everything that is organized in the world is organized by and through an assemblage (or more often, by and through multiple assemblages). As we saw in the quote above (from p.

¹⁷⁰ Deleuze and Guattari distinguish between machinic assemblages and what they call the “abstract machine”, which is the general, diffuse force of structuration and complexity at work both within strata and in the plane of consistency. Assemblages have an active, constitutive relationship with the abstract machine, because they actually effectuate the abstract machine in and between particular strata. In other words, it is through particular, machinic assemblages that the abstract machine does its work (p. 71).

¹⁷¹ *C.f.* pp. 49-50.

¹⁷² This is why an assemblage is both a substratum and a metastratum (pp. 72-3).

406), assemblages can also be as large as “cultures” or “ages” that select and combine strata, inventing particular flows (what Deleuze and Guattari call “phyla”). Assemblages can also be taken up and even invented by other assemblages; as the example of carbon in that passage indicates, living things are also part of the flow of a larger assemblages.¹⁷³

But assemblages are not pure organization; strata are the instantiation of organization. Assemblages are actually where the forces of organization and disorganization interact. As we will discuss in more detail in what follows, the body without organs and the plane of consistency are two terms employed by Deleuze and Guattari to describe a space or plane of total destratification and lack of organization.¹⁷⁴ By functioning between the strata and this plane, assemblages effectively carve out the “surface” where stratification takes place:

The surface of stratification is a machinic assemblage distinct from the strata. The assemblage is between two layers, between two strata; on one

¹⁷³ To elaborate one concrete example: this dissertation, which might seem to be a simple material object, is an assemblage that participates in and is organized by many other assemblages: the Microsoft Word software assemblage, itself a mix of coding, images, and structures; APA norms, an assemblage of ideas and structures for citing, by chapter divisions that adhere to common conventions in scholarly publishing in English; the guidelines provided to me by my university and my department; my advisor, Ed, and my three committee readers, whose engagement makes it a dissertation rather than just a document and whose feedback actually changes the dissertation; my colleagues who have read and commented on various drafts; all of the authors I cite and the subjects, ideas, people, chemicals, etc. they study; my laptop (or rather, the two or three I have used variously to write the dissertation) and all its material components, including many metal parts; my wooden desk and padded squeaky chair; my arms and fingers and eyes; the food and sleep that has nourished my efforts; the family members and friends who have encouraged me not to give up writing, etc. (the list is seemingly endless!). The dissertation is organized by these strata, but it also participates in them and contributes to them. This simple example shows why in the end, Deleuze and Guattari can claim that all matter is one flow, one lineage, since many seemingly different kinds of things participate in these assemblages.

¹⁷⁴ *C.f.* pp. 73, 507. I discuss these terms more in what follows.

side it faces the strata (in this direction, the assemblage is an interstratum), but the other side faces something else, the body without organs or plane of consistency (here, it is a metastratum). (1987, p. 40)

Through assemblages, therefore, strata are opened up to influence not only from related (sub- and epi-) strata but also from the entire plane of consistency: the totality of all unorganized, fuzzy, unformed and unindividuated reality, the plane of Nature (pp. 507, 254). This relation to the outside through machinic assemblages explains why strata, although they are in essence organized, are nonetheless dynamic, rather than static.

Implications of assemblages for understanding matter

What do assemblages tell us about matter? First, because assemblages occupy a unique middle space (milieu) between organization and disorganization, assemblages are also not static, but dynamic (pp. 3-4). This dynamism is at the very heart of matter, because all configurations and organizations effectuated and embodied by and through assemblages (which is everything) are in process and in motion. In assemblages a constant tension between organization and disorganization is always at play. On the one hand, interaction with the organization of the strata leads an assemblage to organize into a totality, while on the other, interaction with the plane of consistency or the body without organs leads the assemblage to unorganize, to dismantle itself or be dismantled. This is an unending process always at work within all assemblages, rendering them constitutively dynamic.

Another implication we can draw from the creative role played by assemblages in the selection and organization of matter is that matter is fundamentally *multiple*. Because assemblages are the creative source of all *putting into relation*, they are the instantiation of the way that matter, as it moves, always moves *relationally*, both entering into

relations and creating them. This relationality indicates a multiplicity that is *substantive*, rather than *attributive* (p. 3). The multiple is not one aspect of a reality that is fundamentally otherwise, but an ontological reality that forms the basis for all other kinds of material becomings. Assemblages, in their dynamic becoming, are nothing more or less than the creation and ordering of relations within and among multiplicities. This is why, according to Deleuze and Guattari, the whole of nature, as well as the individual things within it, are multiple:

Thus each individual is an infinite multiplicity, and the whole of Nature is a multiplicity of perfectly individuated multiplicities. The plane of consistency of Nature is like an immense Abstract Machine, abstract yet real and individual; its pieces are the various assemblages and individuals, each of which groups together an infinity of particles entering into an infinity of more or less interconnected relations. (1987, p. 253).

In this way assemblages both affirm and explain the deep multiplicity of living bodies. Bodies are made of various zones of organization (strata) in relation with other strata. We can only understand these relations in terms of the selective organization and inventive influence of the assemblages that pick up various strata and put them into relation. The same strata, forms, and substances can be part of various assemblages; it is the assemblages that are responsible for their particular configurations. To understand the organization of the matter, the strata, of living bodies, we must view them in the context of the selective activities of the assemblages of which they are a part. Not only are bodies assemblages, in other words, but these assemblages are also part of other assemblages (p. 4). What these assemblages are and how they organize living matter are empirical questions that I will discuss more in Chapter 7 on permeability and environmental medicine. The crucial theoretical point for Western medicine and definitions of health is

that we need to widen our angle of analysis to view the matter of living bodies in a much wider network of groupings that ultimately are responsible for making them what they are.

Finally, the dynamic, processual aspect of assemblages is a crucial element of Deleuze and Guattari's notion of matter. Assemblages show us that even when in structured, selected, and organized forms, matter is still in motion. It is always matter in the middle (*au milieu*), matter in process. This is why Deleuze and Guattari say that "becoming and multiplicity are the same thing" (249). Since living bodies are assemblages, this irreducible becoming, this in-betweenness, is an important feature of living materiality that needs to be taken into account in both definitions of health and medical practice.¹⁷⁵ Bodies are fundamentally underdetermined because they are always in process. What this underdetermination means for medicine will be discussed more thoroughly in Chapters 7 and 8.

Body without organs, plane of consistency,

One of the most crucial terms in Deleuze and Guattari's work, *the body without organs* (BwO), is the term they create to refer to this tendency.¹⁷⁶ Deleuze and Guattari

¹⁷⁵ As we saw in the quote from p. 406 above, assemblages can also be as large as "cultures" or "ages" that select and combine strata, inventing particular flows (or "phyla"). Assemblages can also be taken up and even invented by other assemblages; as the example of carbon in that passage indicates, living things can also be part of the flow of a larger assemblages. Delineating and distinguishing among various assemblages require an engagement two more features of matter that I discuss in the next chapter: *desire* and *affect*. The various relations between assemblages and their desires is a complex phenomena that is at the very heart of health.

¹⁷⁶ Body without organs is a term inspired by Artaud's poem "The Body Is the Body": "The body is the body/it stands alone/it has no need of organs/the body is never an organism/organisms are the enemies of bodies." *C.f.* Deleuze, 2005, p. 39.

describe the body without organs as “a powerful nonorganic life that escapes the strata, cuts across assemblages, and draws an abstract line without contour, a line of nomad art and itinerant metallurgy” (p. 507). The body without organs is a “component of passage.”¹⁷⁷ This is because it is fundamentally made up of plateaus: “Every BwO is made up of plateaus. Every BwO is itself a plateau in communication with other plateaus on the plane of consistency. The BwO is a component of passage” (p. 158). Deleuze and Guattari characterize *plateaus* as zones of intensity and proximity (p. 274).¹⁷⁸ The body without organs is defined by what it connects to and how it connects, rather than by its form or structures. This is why it is described as being *without organs* (even though it may actually have organs!) (p. 158).¹⁷⁹

Deleuze and Guattari maintain that the body without organs is ultimately an unattainable limit, that of absolute deterritorialization (pp. 149-50, 158-9). Because assemblages are inherently intermediary between the body without organs and stratification, all specific bodies without organs are constantly being restratified, which is why Deleuze and Guattari affirm that the body without organs is itself an unattainable

¹⁷⁷ This is why Deleuze and Guattari title the second volume of *Capitalism and Schizophrenia A Thousand Plateaus*: in it, they exemplify writing rhizomatically, rather than in a hierarchical, arborescent way (p. 22).

¹⁷⁸ This explains why Deleuze and Guattari call the chapters of *A Thousand Plateaus* plateaus. They are meant to connect to one another rhizomatically in zones of intensity and communication and can be read in any order (p.22).

¹⁷⁹ It is not actually important whether there are organs (which could be conceived of as plateaus), but that these organs do not provide a predetermined form and structure to the body (p. 158). As Deleuze writes in *Francis Bacon: The Logic of Sensation*, “The body without organs is not defined by the absence of organs, nor is it determined solely by the presence of an indeterminate organ; it is finally defined by the *temporary and provisional presence* of determinate organs (Deleuze, 2005, p. 42).

limit or tendency (pp. 161, 202). Connection and deterritorialization, the processes that characterize the workings of the body without organs, are inherently multiple. The instantiation of the body without organs is therefore through the multiplicity of *bodies without organs* (plural!) (pp. 4, 12, 157). This eponymy can be quite confusing, but it is important to pay attention to the plurality or singularity of the terms.

We can understand bodies without organs to be relatively unstratified, non-hierarchical bodies or plateaus, while the body without organs is the name Deleuze and Guattari give to the tendency within matter that creates these (p. 507).

The notion of the body without organs provides Deleuze and Guattari with a limit concept (we might even call it a criterion) that allows them to describe and evaluate material assemblages in terms of their potential for making and renewing connections (rather than in terms of their coherence based on a fixed substance and form or genetic pattern). Bodies that tend away from the body without organs are more stratified, while bodies that realize the tendencies of the body without organs are more deterritorialized. These latter are what Deleuze and Guattari call bodies without organs. Bodies without organs are not just organic bodies; any concrete material assemblage can be a body without organs. The important thing is that on a body without organs, intensities and flows are free and allowed to pass through it, enabled to make new connections (pp. 203, 269-70). The body without organs is produced by these flows, which are conjugated or put into relation by assemblages; this is why Deleuze and Guattari state that assemblages actually *fabricate* each body without organs (p. 158).

Furthermore, not all bodies without organs are of the same kind. We can also evaluate *bodies without organs* in terms of *how* they realize the body without organs.

There are also qualitative differences between specific bodies without organs. They can be either *full* or *empty*.¹⁸⁰ *Full* bodies without organs accomplish the goals of deterritorialization, which is making new connections for the passage of intensities, while *empty* bodies without organs deterritorialize but do not reconnect, and thus become bodies of abolition and death (pp. 284-6, 269-70).¹⁸¹

It is important to note that bodies without organs are never *personal* bodies (p. 161). Personal bodies are defined by the unity of the subject, and this is exactly what does not define a body without organs. Bodies without organs are defined by deterritorialization, non-hierarchical zones of intensity, and the circulation of flows. These processes undermine traditional notions of subjectivity and personhood, instead connecting assemblages with other assemblages and flows. Because both the body without organs and particular bodies without organs are *apersonal*, Deleuze and Guattari call them “an” nonorganic life (p. 507).¹⁸² As they write,

¹⁸⁰ This is why Gracieuse can argue, “If ontological immanence is an anti-hierarchical world stripped of transcendence, it is no less the case that this immanence necessarily involves postulating a practical hierarchy of individualities or of “bodies without organs” that stems from the manner in which each being exercises its power, invents new connections with its milieu and new combinations with other existents. It is necessary therefore to think power, at the level of beings, as being the object of an immanent exercise of composition with forces. We must think bodily experimentation, rather than judgment, as the ontological act *par excellence* through which beings distribute themselves in Being and create new vital connections, as so many transformations of life by the living” (2012, p. 15).

¹⁸¹ These qualitative differences imply an ethics of material deterritorialization, which I will discuss shortly.

¹⁸² *C.f.* Deleuze, 2005, p. 40: “Beyond the organism, but also at the limit of the lived body, there lies what Artaud discovered and named: the body without organs... The body without organs is opposed less to organs than to that organization of organs we call an organism. It is an intense and intensive body. It is traversed by a wave that traces levels

The BwO is never yours or mine. It is always a body. It is no more projective than it is regressive. It is an involution, but always a contemporary, creative involution. The organs distribute themselves on the BwO, but they distribute themselves independently of the form of the organism; forms become contingent, organs are no longer anything more than intensities that are produced, flows, thresholds, and gradients. ‘A’ stomach, ‘an’ eye, ‘a’ mouth: the indefinite article does not lack anything; it is not indeterminate or undifferentiated, but expresses the pure determination of intensity, intensive difference. The indefinite article is the conductor of desire. It is not at all a question of a fragmented, splintered body, of organs without the body (OwB). The BwO is exactly the opposite. There are not organs in the sense of fragments in relation to a lost differentiable totality. There is a distribution of intensive principles of organs, with their positive indefinite articles, within a collectivity or multiplicity, inside an assemblage, and according to machinic connections operating on a BwO. Logos spermaticos. (1987, p. 201)

This figure of “a” life places the emphasis on the dynamic processes responsible for life that simultaneously connect and dismantle coherent “things in themselves”, including subjects and persons.¹⁸³ So although Chapter (Plateau) 6 of *A Thousand Plateaus* is entitled “How To Make Yourself a Body Without Organs”, the idea is never that your own personal body will become a body without organs.¹⁸⁴ Instead, the goal of this

or thresholds in the body according to the variations of its amplitude. Thus the body does not have organs, but thresholds or levels.”

¹⁸³ *C.f.* Deleuze, 2001, pp. 25–29. As Marjorie Gracieuse writes, “We must not see, in the Deleuzian identification of the living body with earthly immanence, an apologetic for subjectivism or a return to solipsism. On the contrary, it is a matter of recovering, beyond the solitude of consciousness, the impersonal power of life *in* the lived body, and therefore to consider the body as complex of forces open to the outside. These forces merge with the *expressive* power of bodies, whose perceptive potentials are so many “possible worlds”, insofar as each body envelops and individuates the intensities of life differently” (2012, p. 8).

¹⁸⁴ I believe this point tends to be missed in interpretations of the relevance of Deleuze and Guattari thought for understanding health (*c.f.* Fox, 1999). It is worth noting that the English translation personalizes an impersonal (third person) reflexive verb in the

process is to connect your body to as many the other flows, connections, and assemblages you can.¹⁸⁵

This brings us to *the plane of consistency* (also called *the plane of immanence*), another crucial term in Deleuze and Guattari's work. The plane of consistency is nothing more or less than the enabling locale of all bodies without organs (pp. 40, 506).¹⁸⁶ It is called the plane of *consistency* because it unites the plateaus that make up bodies without organs and also unites various bodies without organs with each other through *zones of consistency* or *consolidation* (pp. 157, 507). Deleuze and Guattari describe the plane of consistency as the *mode of selective connection* that enables bodies without organs to be able to *become*, to forge new relations and qualitatively transform (pp. 507-8). The plane of consistency is constituted by a multiplicity of assemblages and individuals, all of which are themselves multiple (pp. 9, 251, 253). The relations within and between these multiplicities instantiate the unity of this plane, which is so significant that Deleuze and

original French title (*Comment se faire un corps sans organes*); a more grammatically accurate translation would be "How to Make Oneself a Body Without Organs." In either case, however, the language structure in question is ultimately ambiguous in terms of the relationship between the maker and the made, hovering between the idea of making oneself /yourself *into* a body without organs and making a body without organs *for* oneself /yourself. This ambiguity is practical for Deleuze and Guattari, who wish to situate personal bodies within a wider field of material becoming, but when understood only in the former sense it can easily lead to misinterpretations of their ethical framework.

¹⁸⁵ As Ian Buchanan argues, both Deleuze and Guattari's ethics and their concept of health have to do with increasing the body's capacity for connection (1997). I will discuss this question in more detail in the Chapter 5 in the context of Deleuze and Guattari's notion of affect.

¹⁸⁶ This is why Deleuze writes that the body without organs is a transcendental field, a "pure stream of a-subjective consciousness, a qualitative duration of consciousness without a self." It is *a life*, pure immanence (Deleuze, 2001, pp. 25).

Guattari sometimes call the plane of consistency *the body without organs* (singular) (pp. 40, 134, 254, 270).¹⁸⁷ In other words, the space that unites all matter that is participating in the tendency toward becoming a body without organs is the same as that becoming. Space and becoming are one. This is why the space of the plane of consistency and the body without organs is *flat*; all dimensions of multiplicities connect to one another within this single plane of becoming (p. 9, 251).¹⁸⁸

The multiplicities of the plane of consistency and the body without organs are of a particular qualitative kind: haecceities (singularities) (pp. 254-5, 263). This fact forms the basis for distinguishing the plane of consistency from the plane of organization. As Deleuze and Guattari write,

Then there is an altogether different plane, or an altogether different conception of the plane. Here, there are no longer any forms or developments of forms; nor are there subjects or the formation of subjects. There is no structure, any more than there is genesis. There are only relations of movement and rest, speed and slowness between unformed elements, or at least between elements that are relatively unformed, molecules and particles of all kinds. There are only haecceities, affects, subjectless individuations that constitute collective assemblages. Nothing develops, but things arrive late or early, and form this or that assemblage depending on their compositions of speed. Nothing subjectifies, but haecceities form according to compositions of nonsubjectified powers or affects. We call this plane, which knows only longitudes and latitudes, speeds and haecceities, the plane of consistency or composition (as opposed to the plan(e) of organization or development). (1997, p. 266)

The plane of organization and strata is characterized by forms and substances, while the

¹⁸⁷ Just as assemblages fabricate each body without organs, the abstract machine fabricates the plane of consistency (p. 158); see footnote 36 for an explanation of the relation of the abstract machine to machinic assemblages.

¹⁸⁸ Deleuze and Guattari characterize it as “smooth,” because everything is, so to speak, on the same level (*c.f.* p. 353).

plane of consistency and bodies without organs is characterized by the haecceities and individuation (507). Unlike substantial forms, haecceities are unique spatiotemporal individualities, points of connection and individuation; unlike determined subjects, haecceities are intermediary zones of becoming (p. 253). In Deleuze and Guattari's words, "A haecceity has neither beginning nor end, origin nor destination; it is always in the middle. It is not made of points, only of lines. It is a rhizome" (p. 263).¹⁸⁹ What exactly are haecceities? They include both assemblages and the milieus or zones of intersection and transformation between them (pp. 262-3, 507).¹⁹⁰ Deleuze and Guattari offer many examples of haecceities from literature and psychoanalysis: a degree of heat, a short or a long day, a climate, a season, an atmosphere, a wolf, a horse, a child, a street, and a dying rat (pp. 252-263). All of these combine, intersect, and connect to create the reality of *a* story, *an* experience, *a* life. In Deleuze and Guattari's view, all individuals, including people, are haecceities, and can only be understood as such (p. 262).

As these examples of haecceities suggest, one significant aspect of the plane of consistency and bodies without organs is that they are *immanent*. Haecceities are singular material becomings. This is why Deleuze and Guattari use the terms *plane of consistency* and *plane of immanence* interchangeably in their work. In Deleuze and Guattari's words, "The plane of consistency would be the totality of all BwO's, a pure multiplicity of immanence" (p. 157). According to Deleuze and Guattari, this plane is *nature* itself: a

¹⁸⁹ As we saw above in the discussion of assemblages, it is through interaction with this plane, this space of pure haecceities, that assemblages open up and transform the organization of strata (pp. 72-3). This is what makes them always *intermediary* and *in process*.

¹⁹⁰ See the preliminary definition of haecceity in footnote 18.

flat, unified plane of reality where everything is multiple and connected to other multiplicities through zones of consistency. They describe this plane as “A fixed plane, upon which things are distinguished from one another only by speed and slowness. A plane of immanence or univocity, as opposed to analogy”(p. 254).¹⁹¹ The plane of organization is a plane of transcendence because its organizing principle comes from without, but the principle of composition of the plane of consistency is *immanent to* what it composes (p. 281).

From this notion of immanence we can conclude that plane of consistency and bodies without organs are *material*. This might seem simple, but it is also a conceptual challenge. Since the plane of consistency and the body without organs is the space for all multiplicity, we might think that they constitute some kind of composite or even transcendent space where the material and the immaterial combine. But in fact, according to Deleuze and Guattari, the plane of consistency is immanent and the body without organs is matter itself. In *Anti-Oedipus*, Deleuze and Guattari make this explicit: “The body without organs and its intensities are not metaphors, but matter itself” (Deleuze & Guattari, 1983, p. 283). Similarly, in *A Thousand Plateaus* they assert that the plane of consistency is “peopled by anonymous matter, by infinite bits of impalpable matter entering into varying connections” (p. 255). As we saw above, the plane of consistency is flat because it is filled by the multiplicities on it. We can thus understand Deleuze and Guattari’s conceptions of bodies without organs and the plane of consistency to be

¹⁹¹ I discuss the significance of speed more in Chapter 5.

elaborations of their notion of matter itself (p. 43).¹⁹²

Rhizome

A final Deleuzo-Guattarian structure, one which has gained significant popularity and traction in current Deleuzian- scholarship is the *rhizome*. No discussion of Deleuze and Guattari's thought is complete without some mention of rhizomes, since they urge us to think rhizomatically and to build rhizomes (pp. 11-2, 14, 24-25). The *rhizome*, according to their usage of the term, is a particular kind of assemblage or multiplicity: "an acentered, nonsignifying system without a General and without an organizing memory or central automaton, defined solely by circulation of states" (p. 21). I believe that in Deleuze and Guattari's thought the terms *rhizomes* and *bodies without organs* can be understood as interchangeable. Rhizome offers a more visual and concrete way to think of bodies without organs (which can sound like a strange, otherworldly concept). We know what a plant rhizome is and how it grows; we can identify them in the world and we can begin to imagine what it would be like to try to build a notion of identity, politics, or the body that was rhizome-like. This is why their 'slogans' and exhortations sound like directions for gardening: "Make rhizomes, not roots, never plant! Don't sow, grow offshoots!" (p. 24).¹⁹³

In the introduction to *A Thousand Plateaus*, Deleuze and Guattari take up

¹⁹² As they write, "He [Challenger] used the term matter for the plane of consistency or Body without Organs, in other words, the unformed, unorganized, nonstratified, or destratified body and all its flows: subatomic and submolecular particles, pure intensities, pre-vital and prephysical free singularities" (43). ("Challenger" is the mouthpiece for Deleuze and Guattari's own view. As John Protevi explains, "'Professor Challenger' is the nom de plume adopted by Deleuze and Guattari in the 'Geology of Morals' plateau of *A Thousand Plateaus*" (Protevi, 2000)).

¹⁹³ *C.f.* p. 251.

examples of plant rhizomes such as couchgrass and tubers and use them to develop principles for understanding all of life and thought as rhizomatic (pp. 6-25). Such principles include principles of connection, heterogeneity and multiplicity, as well as one called “asignifying rupture” that refers to the fact that a rhizome is “a process that is perpetually prolonging itself, breaking off, and starting up again” (pp. 9-11, 21).

According to Deleuze and Guattari, rhizomes are always in the middle and are made of plateaus. They thus have a special relationship with the plane of consistency and the body without organs; haecceities, the individuations that occur in the plane of consistency are also called *rhizomes* (p. 263).¹⁹⁴

Deleuze and Guattari set the rhizome, both a process and a model, apart from another model for life and thinking, which they label “arborescent.” Arborescence proceeds according to lineages, genealogy, reproduction, and preestablished paths of development and change, while rhizomes are antigenealogical, acentered systems, and are produced through haecceities rather than through reproduction (pp. 12-21). The opposition between rhizomatic and arborescent models is at the heart of Deleuze and Guattari’s ontological, epistemological, ethical, political, and clinical project and has thus significant implications for how we understand their notion of matter. As they write,

We’re tired of trees. We should stop believing in trees, roots, and radicles. They’ve made us suffer too much. All arborescent culture is founded on them, from biology to linguistics. Nothing is beautiful or loving or political aside from underground stems and aerial roots, adventitious growths and rhizomes. (1987, p. 15)

This is a strong formulation and indicates an entire sea change not only in how we think

¹⁹⁴ “A haecceity has neither beginning nor end, origin nor destination; it is always in the middle. It is not made of points, only of lines. It is a rhizome” (p. 263).

of the reality of the world but also how we think about it and live in it.

Implications of the body without organs, the plane of consistency, and the rhizome for understanding matter

Knowing that Deleuze and Guattari understand the body without organs, the plane of consistency, and the rhizome to be matter itself, we can see how they use these concepts to illuminate the claim they put forth in their critique of the hylomorphic model: that matter in motion is relational, intermediary, and underdetermined. Strata, assemblages, and the body without organs/plane of consistency form a whole, together allowing us to understand the various structures that characterize and shape the flow of matter in motion, not only its relationality, intermediariness, and underdetermination, but also its constitution by singularity and an immanent principle of composition. As we saw above, Deleuze and Guattari's discussion of strata shows us that we have to understand all organization as relative and contextual. Assemblages, as that which organize and put strata into relation, bring to the fore matter's dynamism, relationality, and multiplicity.

The body without organs, the plane of consistency, and the rhizome confirm and expand our understanding of matter's inherent multiplicity and relationality. Since the plane of consistency is nothing other than connections between various bodies without organs, and every body without organs is a vehicle for the flow and creation of connections between multiplicities, matter itself is irreducibly multiple. Matter as the rhizome, the plane of consistency, and the body without organs thus reinforces and complexifies the idea that emerged from our analysis of strata and assemblages that matter is pure multiplicity always *in relation*, always *in the process of relating*. The fact that matter in all of these conceptions is constituted by *plateaus* demonstrates that what

connects or relates material assemblages and objects are zones of proximity, consistency, and consolidation, rather than predetermined relations of form and matter.¹⁹⁵ To pick up a few examples we have discussed in this chapter, a steel saber becomes what it is in interaction with the tools, the hands, and the techniques of the metallurgist; an amino acid can only become part of a hormone messenger-chain by first being taken up within a protein at the appropriate location within the body; a dissertation take form in consolidation both with computer software and hardware interfaces, and interactions with advisors, committees, and colleagues. In none of these cases is the organization of form a pre-ordained pattern; it only emerges through localized interactions.

This understanding of matter as flat, relational, and organized through zones of consistency rather than rigid forms or subjects undermines strict formal understandings of the *organism* as the dominant means by which to understand living bodies. The organism is a conception or judgment that leads us to believe that the body is defined by which organs it has and by a hierarchical self-organization of these organs.¹⁹⁶ Bodies without organs help us to see that organic bodies are formed by interactions between zones, which are in turn organized by assemblages into strata. This places organic bodies in irreducible relation with other material flows and structures. This definitively dismantles the possibility of a mechanistic understanding of living bodies, in which matter is everywhere the same and bodies are separable and separate from their environments. When we go about defining health and determining medical theory and practice, the

¹⁹⁵ These suggest a notion of “near space”, which as Ed Casey suggests in his most recent work, opens up the possibility of thinking space in terms of proximity rather than measurable distance.

¹⁹⁶ *C.f.* Deleuze, 2005, p. 41.

matter of the body must be reckoned with as inherently multiple and relational. As I will discuss at length in Chapter 6/7, this view of matter opens the door to a rigorously ecological understanding of living materiality and thus of health, because the matter of the living human body is not separate from, but is joined energetically to all other kinds and organizations of matter. It also sets the stage for considering the body as a qualitative multiplicity constituted by relations.¹⁹⁷ The idea of the body as multiple can potentially have profound transformative effects on medical practice because it opens the door for studying in a rigorous way the various assemblages, strata, and relations that make up the body.¹⁹⁸

Deleuze and Guattari's concepts of matter as rhizome, body without organs, and plane of consistency also demonstrate *how* matter is constitutively *underdetermined*. This is the case because, as we have learned from the analysis of assemblages, while all material strata are organized through assemblages, through these same assemblages matter is open to the radically destratifying influence of the body without organs. There is never a space of organization that is not simultaneously being disorganized through the intermediariness of assemblages, in which both tendencies toward organization and disorganization are at work. Material reality is always in process, and always being organized by assemblages but also disorganized by them, through the influence of the body without organs. This intermediary, rhizomatic nature of assemblages thus explains why matter is fundamentally *underdetermined*.

One implication of this is that we cannot understand the matter of living bodies

¹⁹⁷ This notion also comes directly from Bergson (2010; 1995).

¹⁹⁸ I will discuss this in more detail in Chapters 7 and 8.

apart from these two tendencies toward disorganization and stratification that are always at work *together* in matter. In contrast with the some common interpretations of Deleuze and Guattari's clinical work, total disorganization of the body and its structures is neither a goal nor a realistic norm for measuring the ethics or efficacy of either politics or clinical treatment. Some aspect of organization is necessary to the composition of bodies, even ones that are relatively close to actualizing the body without organs. I will discuss this issue in more depth in Chapter 5, because it is intimately connected to the forces and agency at work in these structures.

Third, matter as rhizome, the body without organs, and the plane of consistency illuminate an additional aspect of matter that has been neglectfully undertheorized in Western medicine: that the activity of matter is characterized by haecceities, individuation and singularity. This aspect of matter implies that the matter of living bodies is also characterized by individuality and singularity. Definitions of health and medical theory and practice thus need to be able to take into account the reality of the singularity and heterogeneity of living materiality. This brings a forceful conceptual challenge to traditional objective definitions of health, as well as to Evidence Based Medicine (EBM) based on double blind randomized trials, the dominant and currently the only paradigm in Western medicine for determining the scientific validity of various medical practices, insofar as they treat all bodies as interchangeable. Deleuze and Guattari's theory of matter helps to explain why this is a necessary task, as I will discuss in more detail in Chapters 7 and 8.

Conclusion

This chapter situates Deleuze and Guattari's account of matter through an

elaboration of their critique of the hylomorphic account, their notion of matter as *metal*, and a first set of concepts that they use to delineate matter's structures: *strata*, *assemblage*, *body without organs*, *plane of consistency*, and *rhizome*. Through these discussions we have learned that for Deleuze and Guattari, matter is in motion, relational, intermediary, and underdetermined, even when organized into structures such as strata and assemblages. These structures are always dynamic. In the next chapter, therefore, we turn the tables on these structures and look instead at the 'forces' at work in them. As we will see, analyzing the 'forces' of *folding*, *speed*, *lines*, *deterritorialization*, *affect*, and *desire* help us to better understand the dynamism of matter, and they also raise important questions about the role of human organisms and agency in matter's becoming.

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Chapter 5

Deleuze and Guattari's Dynamic Materiality Part Two: Forces and Agency

There is a rupture in the rhizome whenever segmentary lines explode into a line of flight, but the line of flight is part of the rhizome. These lines always tie back to one another. That is why one can never posit a dualism or a dichotomy, even in the rudimentary form of the good and the bad. You may make a rupture, draw a line of flight, yet there is still a danger that you will reencounter organizations that restratify everything.

- Deleuze and Guattari, *A Thousand Plateaus*, pp. 9-10

Introduction

As we saw in Chapter 4, Deleuze and Guattari show that matter forms different kinds of 'structures.' They indicate that we can differentiate between these various kinds of structures on the basis of the *forces* involved in their creation and production. In fact, these structures are unthinkable apart from the forces that animate them. In this chapter I unpack six terms that Deleuze and Guattari use in *A Thousand Plateaus* to describe the forces of matter's movement: *folding*, *speed*, *lines*, *deterritorialization*, *affect*, and *desire*.¹⁹⁹ By analyzing these terms we can better understand the processes that form the

¹⁹⁹ This is why they say that lines and speeds actually constitute assemblages: "Lines produce relations, phenomena of relative slowness and viscosity, or, on the contrary, of acceleration and rupture. All this, lines and measurable speeds, constitutes an *assemblage*" (Deleuze & Guattari, 1987, p. 4).

structures discussed in the last chapter, and thus have a more thorough grasp on how to distinguish qualitatively between the various ways that matter moves. This in turn is crucial to helping us understand the role of both human and material agency in moving matter. As we saw in the discussion of the body without organs and the plane of consistency, it is possible to conclude from a surface reading of *A Thousand Plateaus* that the path to human political liberation for to intentionally rearrange and change the flows of matter. Yet this reading does not do justice to the agency matter exerts in determining its own dynamic activities and movement. In this Chapter I demonstrate that engaging responsibly and properly with matter's agency is an essential component of their ontology/epistemology/politics/ethics, an approach they call *schizoanalysis*. I also show that matter's agency and dynamism require an epistemological orientation. This shift, which Deleuze and Guattari characterize as the move from *State* to *nomadic* science, has enormously important implications for medicine.

Matter's Forces

Folding

First, to truly understand the formation of strata we need to explore the concept of *the fold*. Folding is a way to understand matter's dynamism as encompassing both differentiation and connection, both fluidity and texture or structure. This, like some of the other terms in *A Thousand Plateaus*, was originally developed by Deleuze in an earlier work and then taken up with Guattari in *A Thousand Plateaus*. Deleuze's most important work on the concept of the fold comes from his book *The Fold: Leibniz and the Baroque* (1993). Describing Leibniz's conception of matter, he writes:

Matter thus offers an infinitely porous, spongy, or cavernous texture without emptiness, caverns endlessly contained in other caverns: no

matter how small, each body contains a world pierced with irregular passages, surrounded and penetrated by an increasingly vaporous fluid, the totality of the universe resembling a ‘pond of matter in which there exist different flows and waves.’ From this, however, we would not conclude, in the second place, that even the most refined matter is perfectly fluid and thus loses its texture (according to a thesis that Leibniz imputes to Descartes)...According to Leibniz, two parts of really distinct matter can be inseparable, as shown not only by the action of surrounding forces that determine the curvilinear movement of a body but also by the pressure of surrounding forces that determine its hardness (coherence, cohesion) or the inseparability of its parts. Thus it must be stated that a body has a degree of hardness as well as a degree of fluidity, or that it is essentially elastic, the elastic force of bodies being the expression of the active compressive force exerted on matter.” (1993, pp. 5-6)²⁰⁰

Matter, although fluid, has *texture* because it contains folds. Folding thus accounts for the coherence of various parts or aggregates of matter together. It offers a way to think matter’s multiplicity without separation, its diversity as not simply numerical but as connected and unified. Through folding, Deleuze characterizes matter as *elastic*, open to influence from outside forces. This influence does not work by *separating* bits of matter from one another (the mechanistic conception) but by causing the material body to form folds within itself (a dynamic conception). In Deleuze’s words,

That is what Leibniz explains in an extraordinary piece of writing: a flexible or an elastic body still has cohering parts that form a fold, such that they are not separated into parts of parts but are rather divided to infinity in smaller and smaller folds that always retain a certain cohesion. Thus a continuous labyrinth is not a line dissolving into independent points, as flowing sand might dissolve into grains, but resembles a sheet of paper divided into infinite folds or separated into bending movements, each one determined by the consistent or conspiring surroundings...A fold is always folded within a fold, like a cavern in a cavern. The unit of

²⁰⁰ In this passage Deleuze clarifies Leibniz’s critique of Descartes as being aimed at the latter’s problematic thesis that matter is inherently *separable*: “Descartes’ error probably concerns what is to be found in different areas. He believed that the real distinction between parts entailed separability. What specifically defines an absolute fluid is the absence of coherence or cohesion; that is the separability of parts, which in fact applies only to a passive and abstract matter” (1993, p. 6).

matter, the smallest element of the labyrinth, is the fold, not the point which is never a part, but the simple extremity of the line. That is why parts of matter are masses or aggregates, as a correlative to elastic compressive force. Unfolding is thus not the contrary of folding, but follows the fold up to the following fold. Particles are ‘turned into folds,’ that a ‘contrary efforts changes over and over again.’ 1993, (p. 6)

The smallest unit of matter is a fold, not an atom. This is why parts of matter are always aggregates. Folding thus puts relationality, plurality, and qualitative transformation indisputably at the core of materiality.

A relevant example of folding at work in matter is the folding that articulates organic strata. According to Deleuze and Guattari, a body becomes an organism when it is articulated into a particular functional structure. As they write, “The problem of the organism—how to "make" the body an organism—is once again a problem of articulation, of the articulatory relation... The entire organism must be considered in relation to a double articulation, and on different levels” (1987, p. 41). Just as rock is articulated in two phases, organic bodies also follow a two-step process of articulation. As we saw, the first articulation is at the level of morphogenesis, when molecular realities in random relations are caught up in ordered groupings or aggregates, like the sequence of a protein.²⁰¹ This is the first folding, which is followed by an infolding in the second articulation when

These aggregates themselves are taken up into stable structures that ‘elect’ stereoscopic compounds, form organs, functions, and regulations, organize molar mechanisms, and even distribute centers capable of overflying crowds, overseeing mechanisms, utilizing and repairing tools, ‘overcoding’ the aggregate (the folding back on itself of the fiber to form

²⁰¹ Morphogenesis refers to the shaping of an organism by embryological processes of differentiation of cells, tissues, and organs and the development of organ systems (Encyclopaedia Britannica, 2014b).

a compact structure; a second kind of segmentarity). Sedimentation and folding, fiber and infolding. (1987, p. 42)

Folding is thus the process that articulates each part of the double articulation that forms a stratum. The first consolidation of a multiplicity is a fold, and the second is another “infolding.”

Folding gives us a visually evocative way to understand the double articulation of strata. In *A Thousand Plateaus*, folding shows up in the third plateau as a crucial element of geology.²⁰² Within the geological context, we see that the first articulation (“sedimentation”) of a stratum layers various types of soil particles in particular formations: sandstone and schist, for example, within flysch.²⁰³ The second articulation is actually a *folding* that sets up a “stable functional structure” and “effects the passage from sediment to sedimentary rock” (p. 41). So the arrangement of matter is not simply through sedimentation, or layering, but also through a folding process that effectuates a stable functional structure. According to Deleuze and Guattari, we see this same folding process at work in all of energetic, physical, chemical, and geological strata. Just as metal brings forth the dynamism of all matter, the folding of geological strata show us that all matter stratifies through folding. In fact, Deleuze and Guattari are insistent throughout *A Thousand Plateaus* that inorganic, organic, and even cultural processes are all part of the

²⁰² This geological framework is already present in *The Fold*. Deleuze writes, “Folds of winds, of waters, of fire and earth, and subterranean veins of ore in a mine. In a system of complex interactions, the solid pleats of ‘natural geography’ refer to the effect first of fire, and then of waters and winds on the earth; and the veins of metal in minds resemble the curves of conical forms, sometimes ending in a circle or an ellipse, sometimes stretching into a hyperbola or a parabola. The model for the sciences of matter is the ‘origami,’ as the Japanese philosopher might say, or the art of folding paper” (1993, p. 6).

²⁰³ Flysch is a rock that consists of a sequence of shale interspersed with sandstone (Encyclopaedia Britannica, 2014a).

same reality. Thus it is coherent that the same folding we see in rocks, in artworks, and in philosophical texts, we also see in living organisms.

Implications of folding for understanding matter

Why is it important to understand the formation of strata as happening through folding? Precisely for the reasons that Deleuze describes in his analysis of Leibniz's conception of matter (quoted above). The structure of matter as articulated through folding cannot be an arrangement of atoms or discrete points. Instead, it is an internal arrangement of "elastic force." Within a geological strata we see layers folded within layers; within the organism, the folds of the material of the body connect to one another energetically, retaining certain cohesion between layers (1993, p. 6). Folding explains why we must understand all the matter of the body as interconnected, rather than as discrete elements. It puts the materiality of the body in thorough relation with itself. The cells of the heart, for example, are not separable units, but are folds of the multiplicities of amino acids that the process of morphogenesis folded into proteins and then folded again into an organ. Just as the parts of a fold are all connected, folding elastically connects the material of the body within itself. The structure (or strata) of the proteins of the heart, or of the amino acids of the protein, is inseparable from the process that folded them into the heart. Through folding amino acids and proteins retain a certain cohesion with all the other matter with which the fold joins them. Folding thus gives us a way to understand the formation and function of the elements of the body as radically embedded within each other.

Speed

Folding is not the only force at work in matter. Another important force that we

see at work in every structure is what Deleuze and Guattari call *speed*. As we saw in the previous section on structures, assemblages stratify material multiplicities, selecting and organizing singularities. But the account I built of assemblages did not yet explain how material singularities are differentiated within assemblages. What differentiates one zone of consistency different from another? In other words, how can we understand the heterogeneity of the singularities and multiplicities that assemblages organize?

In *A Thousand Plateaus* Deleuze and Guattari build on Spinoza to put forth a conception of material difference that is not based in form, but in varying relations of *speed and slowness*:

“There is a pure plane of immanence, univocality, composition, upon which everything is given, upon which unformed elements and materials dance that are distinguished from one another only by their speed and that enter into this or that individuated assemblage depending on their connections, their relations of movement. A fixed plane of life upon which everything stirs, slows down or accelerates... We must try to conceive of this world in which a single fixed plane—which we shall call a plane of absolute immobility or absolute movement—is traversed by nonformal elements of relative speed that enter this or that individuated assemblage depending on their degrees of speed and slowness.” (1987, p. 255)

Speed is an interesting Deleuzo-Guattarian notion that stands in thorough contrast to a Newtonian understanding of speed as the velocity of an object. Deleuze and Guattari use the term speed to delineate a force that is both qualitative and intensive. Speed as simple velocity (or lack thereof) is a *quantitative* notion, whereas Deleuze and Guattari’s definition of speed is *qualitative*. For them, speed has a particular definition: it designates any movement of a body that deviates from a straight line and thus transforms abstract, striated or linear space. As they write,

When we oppose speed and slowness, the quick and the weighty,

Celeritas and Gravititas, this must not be seen as a quantitative opposition, or as a mythological structure... The opposition is both qualitative and scientific, in that speed is not merely an abstract characteristic of movement in general but is incarnated in a moving body that deviates, however slightly, from its line of descent or gravity. Slow and rapid are not quantitative degrees of movement but rather two types of qualified movement, whatever the speed of the former or the tardiness of the latter... Laminar movement that striates space, that goes from one point to another, is weighty; but rapidity, celerity, applies only to movement that deviates to the minimum extent and thereafter assumes a vortical motion, occupying a smooth space, actually drawing smooth space itself. In this space, matter-flow can no longer be cut into parallel layers, and movement no longer allows itself to be hemmed into biunivocal relations between points. (1987, p. 371)

Speed can thus only be thought in terms of deviation from a straight line, in terms of vertical movement. In this sense speed is “lightness”, ability to move in original ways, as opposed to the “weighty” movement that follows predefined lines striated space.²⁰⁴

Defining speed in this way allows Deleuze and Guattari to do something very important for their project, which is to distinguish between matter’s intensive and extensive movement. Intensity refers to the qualities and movement internal to a body, such as temperature, while extensivity refers to properties that define the relation of the body to rectilinear space, such as length and depth (p. 31).²⁰⁵ Speed has nothing to do with velocity. Movement can be very fast – in terms of Newtonian time-measurement - without having true *speed*, if being fast is only the *extensive* movement of a body considered as a single unity going from point to point. Speed, on the other hand, is

²⁰⁴ In effect, this framework allows Deleuze and Guattari to replace the classical notion of Time with *speed* and the classical notion of Space with *the plane of consistency*.

²⁰⁵ Note that extensive traits are inherently divisible, while intensive traits are not; dividing an intensive trait like temperature results in a qualitative change in the body, such as a state change. See DeLanda (2005) for a discussion of extensivity and intensity in regards to space.

intensive. Because speed is intensive, rather than extensive, it is possible to be completely stationary while having speed. In Deleuze and Guattari's words,

The nomad knows how to wait, he has infinite patience. Immobility and speed, catatonia and rush, a "stationary process," station as process—these traits of Kleist's are eminently those of the nomad. It is thus necessary to make a distinction between speed and movement: a movement may be very fast, but that does not give it speed; a speed may be very slow, or even immobile, yet it is still speed. Movement is extensive; speed is intensive. Movement designates the relative character of a body considered as "one," and which goes from point to point; speed, on the contrary, constitutes the absolute character of a body whose irreducible parts (atoms) occupy or fill a smooth space in the manner of a vortex, with the possibility of springing up at any point. (It is therefore not surprising that reference has been made to spiritual voyages effected without relative movement, but in intensity, in one place: these are part of nomadism.) In short, we will say by convention that only nomads have absolute movement, in other words, speed; vortical or swirling movement is an essential feature of their war machine. (1987, p. 381)

Speed is about the *way* a body occupies space. This is why the synonym for speed is *intensity*. Deleuze and Guattari's description of speed as the way a body occupies or smooths space "in the manner of a vortex" helps them evoke the intensive occupying of a space. Think of a tornado or a hurricane and you have a notion of what intensive occupation of space looks like.²⁰⁶

Speed as *intensity* defines every element of the Deleuzo-Guattarian ontology. It is their relative speeds of deterritorialization that define and animate strata (p. 70). Speeds also differentiate various assemblages and individuals from one another and govern the relations into which they can enter (pp. 253-4). The body without organs and the plane of

²⁰⁶ The process of smoothing or intensively occupying space through vortical movement is also called *deterritorialization*, the force at work in the body without organs that I will discuss in the following paragraphs (pp. 70, 509).

consistency create flows and continuums of speeds (as intensity) (p. 153). In Deleuze and Guattari's words,

Beneath the forms and substances of the strata the plane of consistency *constructs continuums of intensity*: it creates continuity for intensities that it extracts from distinct forms and substances... The only intensities known to the strata are discontinuous, bound up in forms and substances; the only particles are divided into particles of content and articles of expression; the only deterritorialized flows are disjointed and reterritorialized. Continuum of intensities, combined emission of particles or signs-particles, conjunction of deterritorialized flows: these are the three factors proper to the plane of consistency. (1987, p. 70)²⁰⁷

As we saw in the discussion of the body without organs, plateaus are zones of intensity, that is to say, zones of speed.

Implications of speed for understanding matter

The fact that every material structure is constituted by relations of various speeds and intensities explains why Deleuze and Guattari can dismantle the hylomorphic model and insist that material reality is not governed by static relations of form and substance (p. 507).²⁰⁸ Deleuze and Guattari's understanding of speed shows us that we need to stop thinking of bodies as conforming to predetermined hierarchies of form and substance, and instead understand them as being defined by relations of speed and vertical movement in smooth, rather than striated space. This might sound abstract and chaotic. Speed allows us to understand, however, how within the multiplicities and haecceities of materiality, some speeds complement each other, enabling assemblages to organize them

²⁰⁷ "It is the plane of consistency or of composition of haecceities, which knows only speeds and affects" (p. 262).

²⁰⁸ This is why Deleuze and Guattari insist that the opposite of the body without organs is the *organism*: what defines the body without organs are its relations of speed, while organisms are defined by rigid configurations of forms (p. 157). I will discuss this notion of the organism more at the end of this chapter and in Chapters 7-8.

into zones of consistency and consolidation. Other variations in speed, on the other hand, are not complementary, making their consolidation into zones of consistency difficult or even possible. To put it simply, some combinations are materially possible, but others are not. Assemblages cannot order matter just any which way.²⁰⁹ Speed thus places the construction of bodies without organs and the plane of consistency securely in an empirical, experimental mode. We may not know in advance what kinds of assemblages and consolidations are possible, but they are materially engendered or prevented by concrete variations in speed that must be experimented with and discovered.

Lines

This brings us to the third force at work in matter's configurations: *lines*. Lines are the forces that *produce relations* (p. 4). We primarily see lines at work in assemblages, but Deleuze and Guattari also state that the movement of a body/bodies without organs can be understood as drawing an abstract *line*. As they state,

A body without organs, or bodies without organs (plateaus) comes into play in individuation by and haecceity, in the production of intensities beginning at a degree zero, in the matter of variation, in the medium of becoming or transformation, and in the smoothing of space. A powerful nonorganic life that escapes the strata, cuts across assemblages, and draws an abstract line without contour, a line of nomad art and itinerant metallurgy. (1987, p. 507)

Lines are thus a part of all material reality, which is why in the discussion of matter as metal, we see metal's material capacities discussed in terms of *lines* of variation (p. 405).

²⁰⁹ This is why assemblages are *agencements*, intentional orderings. These intentional orderings differ from mechanistic "laws" of matter because they are relative and dynamic. It might be helpful to think of mechanistic laws as attempting to express some of the patterns that certain material speeds take relative to one another (for example, in the case of pure copper, it slowly reacts with the oxygen in the air to form copper oxide, turning it a dark brownish-black color. This is not a simple form-matter relation, but a dynamic material process that follows predictable patterns. Deleuze and Guattari's point is that the patterns are due to intensive traits (speed) rather than extensive properties.

So what are lines? Despite the semantic ties between the two, lines are not the same as *lineages*. This is because, according to Deleuze and Guattari, lineages are simply made by charting between fixed points: “These lines, or lineaments, should not be confused with lineages of the arborescent type, which are merely localizable linkages between points and positions” (p. 21). Lines, on the other hand, are directions of *flow*. Lines are thus associated with the idea of *constant variation* rather than with *linearity* (p. 328).²¹⁰ As an example, they describe the line of variation that enables stonecutters to create vaults:

The static relation, form-matter, tends to fade into the background in favor of a dynamic relation, material-forces. It is the cutting of the stone that turns it into material capable of holding and coordinating forces of thrust, and of constructing ever higher and longer vaults. *The vault is no longer a form but the line of continuous variation of the stones*. It is as if Gothic conquered a smooth space, while Romanesque remained partially within a striated space (in which the vault depends on the juxtaposition of parallel pillars). (1987, p. 364)

The line of a vault is a not a linear line, but a directionality, a flow of constant variation that allows the stones to soar into the sky and hold one another up. This notion of line is therefore not only distinct from, but actually quite opposed to, the idea of a line as a static, two dimensional tracing between two points.²¹¹ Rather than tracing points, lines are forces that give shape and dimension to the intensive motion of speed. For this reason *vector* might be an appropriate synonym for the Deleuzo-Guattarian conception of line.²¹²

²¹⁰ The constant variations of lines is yet another example of the Bergsonian inheritance in Deleuze and Guattari’s work (see Bergson, 1998).

²¹¹ This is why Deleuze and Guattari state that “Speed turns the point into a line” (p. 24).

²¹² A vector is defined as “A quantity that has magnitude and direction and that is commonly represented by a directed line segment whose length represents the magnitude

Deleuze and Guattari delineate three main types of lines: 1) rigid, molar, segmentary lines, 2) supple molecular lines, and 3) lines of flight or deterritorialization. All lines are created, but not all lines are created equal. Specifically, Deleuze and Guattari affirm that even though all lines are *alive*, they are not equally dynamic. Both rigid molar lines and supple molecular lines are “segmented” or stratified (pp. 195-198). But molar and molecular segments do not behave in the same ways. Because molecular lines are microsegments, they are fluid and unpredictable, while molar segments are rigid, which makes them more predictable and able to control and stabilize identities, although their fluidity and rigidity are defined relative to one another (p. 195). Molar and molecular lines also differ in terms of their directionality. Molar lines are more stratified and striated, following predetermined trajectories, while molecular lines are more diagonal cutting across existing striations; molar lines connect points, while molecular lines run *between* points (pp. 505-6). Molar lines are aspects of life that define us in broad strokes, while molecular lines are small in-process segmentations that are more supple and flexible, that open up on a small scale alternative ways of living. They illustrate these two kinds of segmented lines with examples of love stories from the Henry James novella “In the Cage.” A telegraph operator protagonist interacts with her fiancé in molar lines: despite the differences between their lines (she’s a woman and he’s a man, she’s a telegraphist and he’s a grocer), their segments “conjugate” within the confines of their national and class lines and it seems that they will be able to successfully marry. Molar lines make everything predictable: the work, the vacations, the house, even the love. The

and whose orientation in space represents the direction” (Merriam-Webster, 2014). Note that the term thus designates objects that are not static but *in motion*.

telegraph operator also interacts with a rich male customer in secret molecular lines: small, nearly imperceptible possibilities and relations, cracks and fissures in the molar lines, small interactions that open up tiny windows of possibility for thinking her life differently, even if in the end these molecular relation dissolve and she follows the molar line of marrying her fiancé (p. 195).

Deleuze and Guattari oppose both kinds of segmented lines to lines of *flight*, which are *nonsegmented* lines of rupture and new connections (pp. 15, 198-200). Lines are flight are where we see the force, movement, and energy of lines as *vectors* at their best. As Deleuze and Guattari write, “There is nothing more active than a line of flight, among animals or humans” (p. 204). Lines of flight are unattached to points of arrival or departure (pp. 56, 293). They are lines of being fully in the middle, of being carried away, of qualitative transformation (pp. 293-4). A line of flight is a new line that explodes out of the others, like breaking through a wall, a complete dismantling of meaning and form (p. 197). This is why Deleuze and Guattari characterize this line as *abstract*; it is absolute becoming. Deleuze and Guattari highlight examples of lines of flight in Fitzgerald’s novella “The Crack-Up”: a jail break, a break down, a total rupture (pp. 198-200). These constitute an abandonment of everything that went before, a completely new trajectory, a signifying break (pp. 202-4).

Deterritorialization

As these characterizations indicate, the “operation” of lines of flight is *deterritorialization*. Bodies without organs and the plane of consistency cannot be understood apart from lines of *deterritorialization*, perhaps the most important force at work in material structures. Deterritorialization, as we might imagine, is a force related to

the notion *territory*. Like rhizome, in *A Thousand Plateaus* we see the term territory functioning as a concrete notion that helps us understand in a more concrete way the relation between Deleuzo-Guattarian structures and the world we inhabit and know. The term territory indicates any kind of space, be it a geographical territory, a book, an apparatus, an object, or a system. Lines of flight or deterritorialization are therefore the movement through which ‘one’ leaves a territory (p. 508). More than an escape, deterritorializations are actually part of every territory, both emerging from ‘within’ the territory and interacting with it from ‘without’ (just as the body without organs is at work disorganizing every assemblage, both from ‘within’ and ‘without’). *Reterritorialization* is the term Deleuze and Guattari use to describe the process of being obstructed in this leaving, of being reinscribed in the territory. We can thus understand the first two kinds of lines, segmented molar and molecular lines, as serving a reterritorializing, organizing, and stratifying function, while deterritorialized lines, or lines of flight, serve a destratifying function which is why they are also called lines of *flight* (p. 9).

Just as they do with bodies without organs, Deleuze and Guattari qualitatively distinguish various *kinds* of deterritorializations. Deterritorialization can be “negative”, which means it is ultimately unsuccessful at resisting immediate reterritorialization, or it can be “relative”, which means it “prevails over the reterritorializations which play only a secondary role”, but it nonetheless proceeds by *segments* and may eventually end up in “black holes” or catastrophe. “Absolute deterritorialization” exists only in the earth, which provides the matter for the creation of all life and all that is new (p. 509). The earth as the source of both all matter and life and all deterritorialization is the ultimate example of how deterritorialization is part of territory; we cannot think birth or any process of

production without recourse to the stratified matter provided by the earth and the force of deterritorialization that frees it for new forms of organization. In this sense, reterritorialization is also part of all deterritorialization and actually constitutes the multiple and composite nature of deterritorialization (pp. 9, 54-55, 508-9). Bodily decomposition is an excellent example of this phenomenon: when a body stops being a living organism, it deterritorializes as an organism but at this moment begin the processes through which all of its matter is taken up in new strata and assemblages: soil, plants, animals, etc.

In the end, therefore, all three kinds of lines are inseparable from one another: lines of flight and segmented molar and molecular lines are immanent both to one another and to all reality (pp. 9, 506). They constantly crisscross each other, are at work within one another, and constitute one another (pp. 202, 205). These interactions are the forces that instantiate the constant intermediariness and becoming of assemblages; it is these interactions that bring into relation strata and the body without organs. Because they are in constant interaction, the three kinds of lines are each themselves multiple and impure. Since the lines intermingle to the uttermost extent, there is no duality between segmented lines and lines of flight or between deterritorialization and reterritorialization (p. 198).

Implications of lines and deterritorialization for understanding matter

Lines account for the intermediariness and underdetermination of matter in the Deluzo-Guattarian ontology. Interactions between molecular and molar lines and lines of flight explain why there is no strict distinction between the molecular and the molar articulations within strata; as molecular lines deterritorialize, they are always being

reterritorialized as new molar lines of segmentarity (pp. 9-10, 13).²¹³ As Deleuze and Guattari argue,

The fact that there is no deterritorialization without a special reterritorialization should prompt us to rethink the abiding correlation between the molar and the molecular: no flow, no becoming-molecular escapes from a molar formation without molar components accompanying it, forming passages or perceptible landmarks for the imperceptible processes. (1987, p. 303)²¹⁴

Molecular lines thus instantiate zones of ambiguity or underdetermination between molar lines and lines of flight. They exist between the two, and tip back and forth from one side to the other (pp. 203-5).²¹⁵ In place of a strict division between form and matter, therefore, lines give us zones of transformation and relative definition. This is why Deleuze and Guattari assert that it is the molecular zone of becoming in the space of material flow that undermines the “hylomorphic schema”:

The critique of the hylomorphic schema is based on "the existence, between form and matter, of a zone of medium and intermediary dimension," of energetic, molecular dimension—a space unto itself that deploys its materiality through matter, a number unto itself that propels its traits through form. (1987, pp. 408-9)

²¹³ See p. 294: “A vector of deterritorialization is in no way indeterminate; it is directly plugged into the molecular levels, and the more deterritorialized it is, the stronger is the contact: it is deterritorialization that makes the aggregate of the molecular components ‘hold together.’”

²¹⁴ In this passage we see how Deleuze and Guattari’s thought ultimately diverges from Bergson’s, for whom *duration* is pure flow (Bergson, 1995).

²¹⁵ As they write, “You can begin with the rigid segmentarity, it's the easiest, it's pre-given; and then you can look at how and to what extent it is crosscut by a supple segmentarity, a kind of rhizome surrounding its roots... Supple segmentarity, then, is only a kind of compromise operating by relative deterritorializations and permitting reterritorializations that cause blockages and reversions to the rigid line. It is odd how supple segmentarity is caught between the two other lines, ready to tip to one side or the other; such is its ambiguity” (pp. 204-5).

It is also why they insist that all becoming is molecular (p. 275). Examples of molecular becoming in their work include cellular reactions and perceptions (p. 51) and particulate becoming, such as “becoming-animal” or “becoming-woman.” These becomings are molecular, rather than molar, because they do not attempt to reappropriate the form of animal or woman, but instead find small, nearly imperceptible material zones of proximity, composition, and indetermination (pp. 271-274). The zone of indetermination between a wasp and the orchid that mimics it and is pollinated by it is another example of molecular becoming (pp. 12-3, 69-70. 238-9).²¹⁶

Towards an ethics of lines

In the context of their discussion of lines that we can also start to discern how Deleuze and Guattari make ethical distinctions about material formations. On the one hand, in *A Thousand Plateaus*, Deleuze and Guattari affirm the creative superiority of lines of flight or deterritorialization over rigid, segmented molar and molecular lines. They identify lines of flight as being the line of abstract creative or specific causality at work within assemblages. It is on this basis that they argue that *nothing is more active* than a line of flight (pp. 283, 204).²¹⁷ In fact, lines of flight are the primary ontological determiners of reality; stratification and organization are secondary (p. 202).²¹⁸ As they

²¹⁶ See the BBC's Nature website (2014) for images of this phenomenon.

²¹⁷ Activity, which they take up from Spinoza, is an ethical goal because it means you are owning your own changes and becoming (see Buchanan, 1997).

²¹⁸ As Deleuze states in his lectures on Foucault, “I myself don't wonder about the status phenomena of resistance may have, since lines of flight are the first determinations. Since desire assembles the social field, power arrangements are both products of these assemblages and that which stamps them out or seals them up” (1995).

write, “It is also possible to begin with the line of flight: perhaps this is the primary line, with its absolute deterritorialization. It is clear that the line of flight does not come afterward; it is there from the beginning, even if it awaits its hour, and waits for the others to explode” (p. 205). It is impossible to conceptualize the dynamic fluid becoming of Deleuze and Guattari’s materiality without the creative force of lines of flight. For example, assemblages are defined by their outside, by lines of flight, because lines of flight are what causes qualitative transformations in them:

Multiplicities are defined by the outside: by the abstract line, the line of flight or deterritorialization according to which they change in nature and connect with other multiplicities. The plane of consistency (grid) is the outside of all multiplicities. The line of flight marks: the reality of a finite number of dimensions that the multiplicity effectively fills; the impossibility of a supplementary dimension, unless the multiplicity is transformed by a line of flight: the possibility and necessity of flattening all of the multiplicities on a single plane of consistency or exteriority, regardless of their number of dimensions. (1987, p. 9)

Deleuze and Guattari also describe the plane of consistency itself as being drawn and made of lines of flight (pp. 72, 270).

On the other hand, and this may seem paradoxical, in their account, lines of flight and deterritorialization do not have the priority over other kinds of lines in any absolute sense.²¹⁹ Even while they assert the creative force of lines of flight, Deleuze and Guattari also warn repeatedly of the danger of thinking that lines of flight are somehow *better* than the other lines or even less vulnerable to stratification.²²⁰ They emphasize instead the

²¹⁹ This is another point that is often misunderstood in appropriations of Deleuze and Guattari’s work.

²²⁰ As they write, “The plane of consistency does not preexist the movements of deterritorialization that unravel it, the lines of flight that draw it and cause it to rise to the surface, the becomings that compose it. The plane of organization is constantly working away at the plane of consistency, always trying to plug the lines of flight, stop or interrupt

interconnectedness of all the lines, which as we have seen, renders the processes of deterritorialization and reterritorialization always intertwined with and relative to one another (pp. 9-10).²²¹ Lines of flight not only interact with segmented lines, but can also actually become segmented themselves. This undergirds Deleuze and Guattari's repeated assertions that lines of flight or deterritorialization entail grave dangers. As they write, "The line of flight blasts the two segmentary series apart; but it is capable of the worst, of bouncing off the wall, falling into a black hole, taking the path of greatest regression, and in its vagaries reconstructing the most rigid of segments" (p. 205).

These warnings are intimately connected to the ethical view that Deleuze and Guattari take of the various kinds of bodies without organs. The dangers of lines of deterritorialization require us to proceed with caution when we experiment with speed to construct the body without organs and the plane of consistency. The elements liberated by lines of flight always need to enter into new relations that enable new becoming – in other words, new segmented lines (pp. 163, 260). In this view, a body without organs that pursues a line of flight or deterritorialization, without eventually making and realizing new connections and segmentations through molar and molecular lines, will end as a body of abolition and death. This explains why "full" bodies without organs never destratify too violently or too completely (pp. 284-6, 506). As they write, "But once again, so much caution is needed to prevent the plane of consistency from becoming a

the movements of deterritorialization, weigh them down, restratify them, reconstitute forms and subjects in a dimension of depth. Conversely, the plane of consistency is constantly extricating itself from the plane of organization, causing particles to spin off the strata, scrambling forms by dint of speed or slowness, breaking down functions by means of assemblages or microassemblages" (pp. 269-70).

²²¹ Even rhizomes, the model for emancipatory thinking and politics, are constituted by both segmented lines and lines of flight (p. 9).

pure plane of abolition or death, to prevent the involution from turning into a regression to the undifferentiated. Is it not necessary to retain a minimum of strata, a minimum of forms and functions, a minimal subject from which to extract materials, affects, and assemblages?" (p. 270).

Perhaps because of these grave dangers, nearly every example of a deterritorialized body that Deleuze and Guattari discuss in *A Thousand Plateaus* is actually an example of a *failed* or *empty* body without organs: the drug using body, the masochistic body, the cancerous body (pp. 152, 164). They justify this focus on negative examples:

Why such a dreary parade of sucked-dry, catatonicized, vitrified, sewn-up bodies, when the BwO is also full of gaiety, ecstasy, and dance? So why these examples, why must we start there? Emptied bodies instead of full ones. What happened? Were you cautious enough? Not wisdom, caution. In doses. As a rule immanent to experimentation: injections of caution. (1987, p. 150)

These examples demonstrate in a very visceral way why lines of flight and bodies without organs ultimately have no moral or ethical priority over molar and molecular lines and strata (p. 164).²²² As Deleuze and Guattari state, "Staying stratified – organized, signified, subjected - is not the worst that can happen" (p. 161). The worst that can happen is to fail to engage properly with the strata. When this happens, they collapse in dementia or suicide and end up being all the more oppressive (p. 161).

Experimentation with matter and bodies, with lines of flight and deterritorialization, require cautious attention and responsiveness to material structures and forces. Deleuze and Guattari's conception of bodies without organs thus calls us to pay attention to the crucial, constitutive agency of matter.

²²² Again, this point is missed in many reinterpretations of Deleuze and Guattari's work.

Matter's agency

Deleuze and Guattari's injunction to exercise extreme caution when pursuing lines of flight and deterritorialization indicates raises very important issues about agency. Since, as we have seen, all matter is dynamic and relational, *who* is responsible for choosing lines? In other words, how do we understand the role of human vs. non-human agency in matter's movements and transformations? I believe that this is where Deleuze and Guattari's conception of matter as dynamic becomes the most difficult to parse, and where many interpretations of the political and ethical implications of their work become mired in contradictions. As the previous discussion of the ethics of lines of light indicates, there is a clear sense in Deleuze and Guattari's work that humans can and ought to influence how material flows move and organize. Yet this understanding demands significant nuance, because their account also shows that in our interventions and choices we must be careful to be responsive and responsible to material forces and arrangements. To understand how the implications of matter's dynamism for ethics, politics, and health, therefore, we need to analyze two final concepts that articulate Deleuze and Guattari's understanding of the agency of matter in general: *affect* and *desire*. These two concepts show us that the capacity to change and the intention to do so are endemic to all matter. We can only situate the ethical and political role of humans in material transformations, including our need for caution in constructing bodies without organs, once we understand matter's agency.

Affect

As we have seen, matter's flow and movement in and through strata, folds, assemblages, and rhizomes are defined at their core by the *relations* matter embodies and

produces. While the previous chapter's analysis emphasized matter's relationality with itself – with other assemblages, lines, and strata, matter also forms relations with aspects of reality not customarily understood to be material per se, such as culture, art, language.²²³ As the flow of materiality in constant variation permeates assemblages, strata, lines, and folds, it draws together “human made” and “natural,” animate and inanimate realities.²²⁴ Deleuze and Guattari show that this “plane of Nature”, the immanent flow of materiality that runs through everything, undermines any possible ontological dualism between both living and inanimate and natural and cultural. The flow of matter in movement itself engenders all of these. Rather than existing in separate dimensions governed by unilinear causalities and hierarchies, all of reality is spread out in one flat, fixed plane of relations, the plane of *immanence* (p. 254). Deleuze and Guattari describe this plane as being equally natural and artificial:

At the limit, there is a single phylogenetic lineage, a single machinic phylum, ideally continuous: the flow of matter-movement, the flow of matter in continuous variation, conveying singularities and traits of expression. This operative and expressive flow is as much artificial as natural: it is like the unity of human beings and Nature. But at the same time, it is not realized in the here and now without dividing, differentiating. (1987, p. 406)²²⁵

²²³ This would seem to introduce already a human element; on their account, however, animals also share in these aspects of life (see Chapter 11, “Of the Refrain”).

²²⁴ I would argue that this relationality is conceptually identical to the respective interactionist and intra-actionist ontologies of Tuana and Barad. See especially Barad, 2007, pp. 33, 178, 207–12 and Tuana, 2008, p. 192.

²²⁵ Manuel DeLanda argues that the notion of *machinic phylum* is a means to explain the generation of form without recourse to external causation. He writes, “The concept of the machinic phylum was created in an effort to conceive the genesis of form (in geological, biological and cultural structures) as related exclusively to immanent capabilities of the flows of matter-energy-information and not to any transcendent factor, whether platonic or divine (e.g. the hylomorphic schema). Endogenously-generated stable states, capable of many different physical instantiations, furnish at least some the immanent resources

In other words, since the flow of matter in the plane of immanence produces *everything* in the same expressive flow, everything is related.²²⁶ This irreducible ontological relationality means that everything in the plane of immanence, whether we understand it to be “cultural” or “natural”, can, at least in theory, influence and be influenced by anything else in the plane (which is everything).²²⁷ Deleuze and Guattari capture this idea of being open to influence as well as able to influence through the term *affect*. Their conception of matter and all of its flows and formations can only be understood through affect.

Affects, for Deleuze and Guattari, are particular abilities to change and be changed. Given their preoccupation with matter’s movement and transformations, it is unsurprising that Deleuze and Guattari reserve a crucial role in their concept of matter for its capacity to undergo and cause change.²²⁸ The Deleuzo-Guattarian notion of affect is heavily indebted to Spinoza’s *Ethics*. It frames a concern they cull from Spinoza about

needed for such a theory. Moreover, because attractors are typically not unique (that is, several stable states may be available to a system at once) they form one context in which chance can play a "creative" role, by switching a system in a more or less random way from one deterministic state to another. And at certain critical points of intensity (called "bifurcations"), in which a set of attractors changes into another set, random fluctuations may also play a role, pushing the system from one path to another, giving indeterminism yet another role to play” (1997, n.p.).

²²⁶ This is why Spinoza’s and Scotus’ notions of univocity interest Deleuze and Guattari; in a univocal ontology, everything shares the same ontological status and the same material energy (p. 266; see Deleuze (1994), p. 35).

²²⁷ In reality, the way that structures like assemblages organize matter into zones of consistency and consolidation means that within the plane, the degree of mutual influence between various zones or assemblages varies.

²²⁸ As I discuss in detail in Chapter 8, affect is deeply related to Aristotle’s notion of potency (*dunamis*).

what bodies can do, their capacities to act.²²⁹ Brian Massumi explains Deleuzo-Guattarian affect as “a prepersonal intensity corresponding to the passage from one experiential state of the body to another and implying an augmentation or diminution in that body’s capacity to act” (1987, p. xvi). Affect includes both passive and active affect: not only what a body can do but what influences those capacities. In other words, a body’s being affected (passively) is measured in terms of a change in its ability to (actively) affect change. These two aspects of affect, being changed and causing change, are thus integrated into one another.²³⁰ For example, metal is able to be affected by heat, but what is affected is metal’s ability to affect other substances through its hardness, sharpness, etc.

Affects are material powers that arise from or correspond to relations or compositions of movement and rest, speed and slowness. This is why affects are described as *intensive*. For Deleuze and Guattari, affects correspond to, arise from, and organize material compositions or groupings. Parts that are grouped together in relations of speed and slowness have a corresponding intensity of affect, or power to change and be changed. In Deleuze and Guattari’s words,

To every relation of movement and rest, speed and slowness grouping together an infinity of parts, there corresponds a degree of power. To the relations composing, decomposing, or modifying an individual there correspond intensities that affect it, augmenting or diminishing its power

²²⁹ This is why they describe the *Ethics* as the book of the Body Without Organs (pp. 153-4). Smith (2007), p. 67.

²³⁰ Affection is the term for the encounter that produces this change. Massumi clarifies: “Affection is each such state considered as an encounter between the affected body and a second, affecting body (with body taken in its broadest sense possible to include ‘mental’ or ideal bodies)” (Massumi, 1987, p. xvi). See Smith (2012), pp. 152–60 for a discussion of Spinoza’s notion of affect and how it is taken up in Deleuze’s ethics.

to act; these intensities come from external parts or from the individual's own parts. Affects are becomings. (1987, p. 256)

Together, these combination of speeds and affects define and produce assemblages (p. 399).²³¹ This co-constitutive relationship between affect and assemblages is why the notion of assemblage takes central stage in their dynamic material ontology: assemblages are groupings of abilities to change and be change.

Because they are the active capacity to change and to be change, affects are also becomings. Assemblages are in constant variation, as affects simultaneously arise from and transform them. Furthermore, affects are not just becomings, but *interactive* becomings. The affects corresponding to groupings (strata, bodies, assemblages) modify and transform those groupings, both from within themselves, and through zones of proximity with other groupings (p. 266). In this sense, affect describes the forces at work in the constant deterritorialization and reterritorialization of assemblages, as well as the embedded foldings that group matter into aggregates and assemblages. The transformational nature of affect is also why affect constitutes individuations or haecceities; each becoming creates something materially singular and new (pp. 259, 261-4).

Desire

²³¹ Deleuze and Guattari credit Spinoza with the idea that bodies are defined by a localized set of material elements and their affects instead of by a fixed form or substance (pp. 256-7, 260). This combination of speed and affect gives bodies a contingent, spatialized, localized identity, what Deleuze and Guattari call its latitude and longitude. Latitude refers to the grouping of material elements that belong to that body in relations of movement, rest, speed, and slowness. Longitude refers to the intensive affects that body has in virtue of those elements in that relation (pp. 260-1). One fascinating implication of this idea is that bodies' capacities are location-dependent. I will discuss the relation between bodily permeability and place in detail in Chapter 7.

We can understand affect, then, as the intensive becoming at work in all assemblages. It is the force that guides both the formation and the transformation of strata and assemblages, their creation, maintenance, and dissolution, and their movement through folding and lines, whether molar, molecular, or of flight. Affect is both passive and agential. This dual nature of affect is crucial for developing a proper notion of material agency. The influence of modern philosophy and science in the West means that we readily think of matter as able to be affected, to passively absorb external influence. From Deleuze and Guattari's perspective, however, this is only part of affect. This ability to be changed can only be understood in terms of its impact on matter's ability to also exert influence and cause change. The two are inseparable: what is changed when matter is affected is its capacity to cause change.

To fully understand this second aspect of affect, we need to unpack one last Deleuzo-Guattarian term: *desire*. For Deleuze and Guattari, desire is not lack, but *passion*. It is not desire for an outside, missing object, but is joyfully immanent to itself (p. 154). In their words, "There is, in fact, a joy that is immanent to desire as though desire were filled by itself and its contemplations, a joy that implies no lack or impossibility and is not measured by pleasure since it is what distributes intensities of pleasure and prevents them from being suffused by anxiety, shame, and guilt" (p. 155).²³² For Deleuze and Guattari, the entire field or plane of the body without organs is desire (p. 153). Bodies without organs are inseparable from desire, and desire from bodies without organs (p. 149). As they write,

²³² Similarly, desire cannot be defined solely in terms of pleasure, because it is a positivity that includes and goes beyond pleasure, drawing and filling the entire plane of consistency (pp. 154, 156-7).

The BwO is desire; it is that which one desires and by which one desires. And not only because it is the plane of consistency or the field of immanence of desire. Even when it falls into the void of too-sudden destratification, or into the proliferation of a cancerous stratum, it is still desire. Desire stretches that far: desiring one's own annihilation, or desiring the power to annihilate. Money, army, police, and State desire, fascist desire, even fascism is desire. There is desire whenever there is the constitution of a BwO under one relation or another. It is a problem not of ideology but of pure matter, a phenomenon of physical, biological, psychic, social, or cosmic matter. (1987, p. 165)

Desire is the productive driver of the plane of consistency, of bodies without organs. This means that desire is much broader than just human desire; it is dispersed in the system. Desire exceeds persons and subjects, just as the intensities and singularities of the body without organs and the plane of consistency are neither personal nor extensive (p. 156). Desire is not a property of the subject but a feature that the subject shares with all of reality and through connection with which we can lose the narrow entrappings of subjectivity and selfhood. In fact, Deleuze and Guattari insist that subjectification canalizes and carries desire to an excess, to such a point that it can lead to self annihilation. Desire flows freely on the plane of consistency and the body without organs, on the other hand; the body without organs is the *place, plane, and collectivity* where *desires, flows, and intensities* connect (pp. 134, 161). The subjective "I" desires by joining with flows of desire in the body without organs, unifying with the dynamic multiplicity of the plane of immanence. For this reason we can understand desire to be fundamentally *rhizomatic*. Rhizomatic growths, connections, and structures allow desire to flow, while hierarchical, predefined forms, arborescent structures, kill desire. Deleuze and Guattari describe the difference thus:

Once a rhizome has been obstructed, arborified, it's all over, no desire stirs, for it is always by rhizome that desire moves and produces. Whenever desire climbs a tree, internal repercussions trip it up and it falls to its death, the rhizome, on the other hand, acts on desire by external,

productive outgrowths. That is why it is so important to try the other, reverse but nonsymmetrical, operation. Plug the tracings back into the map, connect the roots or trees back up with a rhizome... impasses must always be resituated on the map, thereby opening them up to possible lines of flight. (1987, p. 14)

Desire, as the driver of the flows and connections of matter, is inseparable from assemblages. The flows of desire produce assemblages. As Deleuze and Guattari write about their own writing and thinking,

All we know are assemblages. And the only assemblages are machinic assemblages of desire and collective assemblages of enunciation. No signifiante, no subjectification: writing to the *n*th power (all individuated enunciation remains trapped within the dominant significations, all signifying desire is associated with dominated subjects). (1987, p. 23)

It is not simply that the flows of desire create assemblages. Assemblages themselves also *assemble* desire. Desire is so deeply entangled with assemblages that all desire is assembled, and all assemblages desire; they co-constitute one another (p. 399). Different desires produce different assemblages, and different assemblages mobilize or produce different desires. We can only understand desire and assemblages, therefore, in relation to one another. Deleuze and Guattari illustrate this in their discussion of work and war assemblages:

If it is true that all assemblages are assemblages of desire, the question is whether the assemblages of war and work, considered in themselves, do not fundamentally mobilize passions of different orders. Passions are effectuations of desire that differ according to the assemblage: it is not the same justice or the same cruelty, the same pity, etc. (1987, p. 399)

For Deleuze and Guattari, desire is not simply feeling, although feeling can be one manifestation of desire. Desire can also be affect: motion, active discharge of emotion, relations of speed (p. 399). Desire is the active aspect of affect. What

differentiates particular assemblages is how they allow desiring affect to flow, their relation to its movements and speeds. We can only understand the difference between war and work assemblages, for example, when we compare the flows of desire within them. They are not defined *by* their desires, but with them: pity and cruelty do not take the same forms in each of these two assemblages. Different assemblages instantiate different desires.

Implications of affect and desire for understanding matter

Since, as I demonstrate in the previous paragraphs, assemblages, bodies without organs, and the plane of consistency are co-constitutive with both affect and desire, we must also think materiality as co-constitutive with both affect and desire. Matter in all of its formations is inseparable, not only from active capacities, but also from *passion*. This shows us why it is unthinkable for Deleuze and Guattari that human agents are the only ones intervening in willing or desiring ways into the material formations of the world. Matter's agency and desires play an irreducible role in shaping the world as it is. Although I will not take the time to unpack these examples here, Deleuze and Guattari show matter's agency to be the limiting condition of society and art (including metallurgy and woodworking, two examples commonly understood to be simply about an exercise of imposing form on passive matter) (pp. 388-89, 405-412). They also show that matter plays a crucial and agential role in the construction of the plane of consistency and bodies without organs (which I discuss further below).

It is coherent with the vision of Deleuze and Guattari, then, to ask, "What does matter want?" "What are matter's passions and how are they materialized in the world?" Our role in shaping materiality, even in making ourselves bodies without organs, cannot

be understood apart from the desires of matter. This is a simple point, but one that is deeply neglected in Western medical theory. In practice, all medical interventions in some way reckon with this fact that must proceed with caution, because it is indeed difficult and dangerous to fiddle with the strata of the body. But in theory, the Western mind at work in medicine believes that we ought to be able to rearrange matter at will, one particle at a time. As we saw in the chapter on mechanism in medicine, the mentality that views all matter as theoretically rearrangeable and substitutable fails to understand that matter has its own agency. It thinks about the first sense of affect – how permeable the matter of the body is to externally caused change – but it does not robustly think about the second aspect – the capacities of matter to cause change. Even a simple evidence of this, such as the ability of the body to heal itself from an infinite number of ills and problems, is taken for granted in practice but woefully under-theorized and even disrespected in Western medicine; although the body is ultimately responsible for taking up and integrating any intervention, it is widely understood that the doctor, or rather, the treatment, is responsible for the change.²³³

Schizoanalysis

We can understand the significance of matter's agency for medical theory and practice much more thoroughly by turning to one final Deleuzo-Guattarian term: *schizoanalysis*. Schizoanalysis is a good term to sum up Deleuze and Guattari's entire project. For Deleuze and Guattari, ontology, politics, ethics, and politics are thoroughly inseparable from a practical engagement with material flows. This is why they write that “[The body without organs] is not a concept or a notion, but a practice, a set of practices.

²³³ For a fascinating discussion of this problem, see Rankin (2013).

You never reach the Body without Organs, you can't reach it, you are forever attaining it, it is a limit" (pp. 149-50). Their work is a pragmatics oriented toward helping us identify the kinds of practices that enable us to work toward attaining the body without organs.

²³⁴They call this method of analysis schizoanalysis, and it is all about how human agency and desire interact with material agency and desire.

Deleuze and Guattari's project is most often understood to be a political one, and this is deeply coherent with their ontology. Lines of flight are neither private nor individual, but already part of the politics of reality (p. 204).²³⁵ This is why the pragmatics of schizoanalysis is necessarily political:

Schizoanalysis, as the analysis of desire, is immediately practical and political, whether it is a question of an individual, group, or society. For politics precedes being. Practice does not come after the emplacement of the terms and their relations, but actively participates in the drawing of the lines; it confronts the same dangers and the same variations as the emplacement does. Schizoanalysis is like the art of the new. Or rather, there is no problem of application: the lines it brings out could equally be the lines of a life, a work of literature or art, or a society, depending on which system of coordinates is chosen. (1987, p. 203)²³⁶

Although the plane of immanence must be constructed, it is not constructed by us or for us (p. 157). It is constructed by a multiplicity, a collectivity, of desires and flows. Our interventions in material flows are part of this already political reality, which is why schizoanalysis is also a micropolitics.

²³⁴ There are very significant connections between this mode of analysis and American pragmatism, including James and especially Dewey.

²³⁵ "As for the line of flight, would it not be entirely personal, the way in which an individual escapes on his or her own account, escapes "responsibilities," escapes the world, takes refuge in the desert, or else in art... ? False impression" (p. 204).

²³⁶ Again, these examples of literature and art seem to point in the direction of human agency, but they actually think that these are examples of material tendencies shared by other forms of life (see Deleuze and Guattari (1987) Chapter 11, "Of the Refrain").

Although we are not the only material beings with desires and agency, in Deleuze and Guattari's account, humans do make intentional choices and interventions. This is why schizoanalysis is a form of immanent politicized ethics or ethical politics. The ontological distinctions Deleuze and Guattari draw in their accounts of affect and desire enable them to make qualitative distinctions within material realities. This in turn allows them to explain the conditions for the development of norms guiding judgment and action that do not rely on transcendent principles or realities.

As Chapter 4's discussions of assemblages, bodies without organs, affect, and desire indicate, these norms consist in identifying practices that create full, connected bodies without organs (or deterritorialized bodies), distinguishing them from practices that create empty, suicidal bodies without organs. As Deleuze and Guattari write,

That is why the material problem confronting schizoanalysis is knowing whether we have it within our means to make the selection, to distinguish the BwO from its doubles: empty vitreous bodies, cancerous bodies, totalitarian and fascist. The test of desire: not denouncing false desires, but distinguishing within desire between that which pertains to stratic proliferation, or else too-violent destratification, and that which pertains to the construction of the plane of consistency (keep an eye out for all that is fascist, even inside us, and also for the suicidal and the demented). (1987, pp. 165-6)

This task of identifying norms is a material task of distinguishing between desires, because the materiality of the plane of consistency and bodies without organs exercises and practices desire. As we saw above, we can distinguish among various bodies without organs by evaluating their desires (the desires that produce them and that they produce). This is not just a question of *what* they desire, but also of *how they desire*. Crucially, this is not just a question about how *humans* form judgments about bodies without organs. In Deleuze and Guattari's account, the plane of consistency and bodies without organs *also judge*. They choose, select, and reject. Not every flow, not every composition, is

consistent with the plane of consistency. There are some bodies that cannot be composed on the plane of consistency; there are some desires and some desiring assemblages that do not cohere with the plane of consistency. The norms that govern the ethical task of constructing bodies without organs are internal to the bodies themselves.

Deleuze and Guattari raise the question of what unites all of the bodies that *can* function on the plane of consistency. While this gesture towards a totalizing metaphysical theory may seem strange in the context of their avowedly multiple, rhizomatic thinking, it is of utmost importance because it allows them to delineate how to distinguish full bodies without organs from empty ones. Deleuze and Guattari argue that what defines bodies without organs as a totality is not logical, but material. This is why they say that the goals of the masochist or the drug user may be consistent with the plane of consistency, but the material means that they use to arrive at those goals are not, which is why they ultimately end in abolition and death. It is likely that there are other material means that have more potential for connecting in the plane of consistency, although we cannot know these *a priori* before experimentation. It is even possible, Deleuze and Guattari postulate, that there really are material substances that form “an intensive continuum” of all the bodies without organs, a shared group of material substances that unite them all (p. 165). They continue,

Doubtless, anything is possible. All we are saying is that the identity of effects, the continuity of genera, the totality of all BwO's, can be obtained on the plane of consistency only by means of an abstract machine capable of covering and even creating it, by assemblages capable of plugging into desire, of effectively taking charge of desires, of assuring their continuous connections and transversal tie-ins. Otherwise, the BwO's of the plane will remain separated by genus, marginalized, reduced to means of bordering, while on the "other plane" the emptied or cancerous doubles will triumph. (1987, p. 166)

Ultimately, we can recognize full bodies without organs because they are produced by and connected to a variety of desiring flows. These *full* bodies are thus necessarily collective, while *empty* bodies without organs are those that do not manage to reconnect to these flows.

The efficacy and ethics of our attempts to destratify and deterritorialize are therefore measured by one material standard: how well do we follow, harmonize with, and liberate the flows of desiring matter? This is an immanent ethical criterion: can it function (can it make and sustain connections to other desiring flows), or can't it? Some bodies can fill and connect on the plane of consistency, and some cannot. The positive totality of the bodies without organs on the plane of consistency does not include empty and cancerous bodies because they cannot function there. Our attempts at making ourselves bodies without organs can only "work" (the pragmatics of schizoanalysis) if they successfully connect with a multiplicity of flows of desire.

Schizoanalysis and health

Experimentation with our own embodied ways of living is perhaps the most intimate form of human experimentation with matter. Deleuze and Guattari exhort us to experiment with the materiality of our lives, to dismantle our selves and find out how to make our bodies without organs. This task is related to both ethics and health:

Why not walk on your head, sing with your sinuses, see through your skin, breathe with your belly: the simple Thing, the Entity, the full Body, the stationary Voyage, Anorexia, cutaneous Vision, Yoga, Krishna, Love, Experimentation. Where psychoanalysis says, 'Stop, find your self again,' we should say instead, 'Let's go further still, we haven't found our BwO yet, we haven't sufficiently dismantled our self.' Substitute forgetting for anamnesis, experimentation for interpretation. Find your body without organs. Find out how to make it. It's a question of life and death, youth and old age, sadness and joy. It is where everything is played out. (1987,

p. 151)

If we look only at passages like this one, we might come to the conclusion that experimentation with our own materiality in order to make ourselves a body without organs can be quite a radical, inventive process. It is true that this process is creative and inventive, and that descriptions of it can sound radical. As Deleuze and Guattari write, however,

There are a number of questions. Not only how to make oneself a BwO, and how to produce the corresponding intensities without which it would remain empty (not exactly the same question). But also how to reach the plane of consistency. How to sew up, cool down, and tie together all the BwO's. If this is possible to do, it is only by conjugating the intensities produced on each BwO, by producing a continuum of all intensive continuities. Are not assemblages necessary to fabricate each BwO, is not a great abstract Machine necessary to construct the plane of consistency? (1987, p. 158)

In these lines we read the tension I wish to bring to the fore. We have questions about how to make ourselves bodies without organs and about how to reach the plane of consistency. These tasks, Deleuze and Guattari argue, require “conjugating the intensities produced on each body without organs” and “producing a continuum of all intensive continuities.” This seems to indicate a prioritization of human agency. But Deleuze and Guattari make it clear that “we”, as selves, humans, and organisms, cannot do this, either alone or together, because *assemblages* and a *great abstract machine* are also necessary. In short, we can struggle with our own creative role in reaching the plane of consistency and the body without organs, but we cannot define it in isolation from other forms of material agency. Materiality, reality, is produced through desiring forces and assemblages and all of these dynamic materialities are all necessary to the process; we are only a small

part of them.²³⁷

Both ethics and the pursuit of health, therefore, are only possible when we realize that we are not fully in control of our becoming as it connects to the plane of immanence and consistency. Matter's flows and desires always encompass and exceed us, in the same way that the body without organs always exceeds our personal, individual identities. We do not define our own materiality. Instead, we are constituted by lines that we do not draw and that are not limited to our "persons." They exceed us, they transverse the plane of immanence. The only way to make (for/of) ourselves a body without organs is to work in conjunction with these lines and flows.²³⁸ As Deleuze and Guattari state,

Individual or group, we are traversed by lines, meridians, geodesies, tropics, and zones marching to different beats and differing in nature. We said that we are composed of lines, three kinds of lines. Or rather, of bundles of lines, for each kind is multiple. We may be more interested in a certain line than in the others, and perhaps there is indeed one that is, not determining, but of greater importance . . . if it is there. For some of these lines are imposed on us from outside, at least in part. Others sprout up somewhat by chance, from a trifle, why we will never know. Others can be invented, drawn, without a model and without chance: we must invent our lines of flight, if we are able, and the only way we can invent them is by effectively drawing them, in our lives. . . . It is an affair of cartography. They compose us, as they compose our map. They transform themselves and may even cross over into one another. (1987, p. 202)

We cannot know in advance which lines will successfully become a composition with other lines, because all the lines and all the assemblages we must connect to are not

²³⁷ They affirm, "Something will happen. Something is already happening. But what comes to pass on the BwO is not exactly the same as how you make yourself one" (p. 152). Our role in making ourselves a body without organs is not the same, and is much smaller, than what is happening on the body without organs; this "happening" exceeds us.

²³⁸ This is why Deleuze and Guattari affirm that we cannot think of lines of flight as a way to escape from other kinds of lines and structures (p. 205).

predetermined, linear, mechanistic conglomerations, but material flows of *desire* and *desiring* material flows. In our attempts to define health and in our medical practices that promote it, we need to recognize, respect, and follow these desires of matter.

Conclusion

In Chapter 4 we saw that the structures of matter, strata, assemblages, body without organs and the plane of consistency bring to the fore matter's dynamism, relationality, and underdetermination. In this chapter we have seen that matter's forces, including folding, lines, and deterritorialization, further enhance our understanding of the deeply relational and dynamic nature of matter. While Deleuze and Guattari understand lines of flight and deterritorialization as to be the primary determiners of reality, they also caution that deterritorialization is never absolute and that structure, organization, and lines of segmentation are integral to every successful process of deterritorialization. Matter's affect and desire, which are co-constitutive with both organization and disorganization, with assemblages and bodies without organs, must be taken into account when negotiating transformations of strata, bodies, and assemblages..

Deleuze and Guattari's overall framework suggests two final orientating implications for studying health. The first is the deep connection between knowing and doing at the heart of schizoanalysis. Schizoanalysis is both epistemological and practical because it is an analysis of the material connections and flows that constitute reality. Not only do we need to know what matter desires before we can engage with it in an effective way. Deleuze and Guattari go so far as to insist that knowing the particular coordinates (latitude and longitude, material groupings and affects) of a particular assemblage requires an active, pragmatic method of analysis that is actually a means of *composing*

multiplicities (p. 15). The coordinates of these multiplicities cannot be known in advance, because they are known through experimentation.²³⁹ As Deleuze and Guattari explain,

If it is true that it is of the essence of the map or rhizome to have multiple entryways, then it is plausible that one could even enter them through tracings or the root-tree, assuming the necessary precautions are taken (once again, one must avoid any Manichean dualism)... In other cases, on the contrary, one will bolster oneself directly on a line of flight enabling one to blow apart strata, cut roots, and make new connections. Thus, there are very diverse map-tracing, rhizome-root assemblages, with variable coefficients of deterritorializations. There exist tree or root structures in rhizomes; conversely, a tree branch or root division may begin to burgeon into a rhizome. The coordinates are determined not by theoretical analysis implying universals but by a pragmatics composing multiplicities or aggregates of intensities. (1987, pp. 14-5).

These practices are interactive and mutually constitutive. In other words, there is no other kind of knowledge than the kind that participates in shaping the world.²⁴⁰ Knowledge practices are material. We know by doing, we know by engaging, we know by trying and experimenting. Effective knowledge is therefore responsive and responsible, gathered and built as we engage relationally with the flows and the desires of matter; this is why schizoanalysis is a pragmatics (pp. 15, 227, 250).²⁴¹ In this sense, Deleuze and Guattari's mode of analysis has much in common both with the feminist materialists and with

²³⁹ Epistemologically speaking, there is a unique relationship between a priori and synthetic knowledge in schizoanalysis. The structures and causes of bodies without organs are the object of an *a priori synthetic knowledge*, because they necessarily produce *something* but what will be produced cannot be known in advance. This production, however, might be considered to be *analytic*, since everything that is produced must already belong to the system in some way, because the entire plane is immanent (it has no external sources or causes) (p.152).

²⁴⁰ This closely resembles Barad's *agential realism*, in which the agential cuts that humans make play a causal role in the apparatuses and material formations that come to be. Knowing cannot happen apart from these constitutive cuts (2007).

²⁴¹ This way of thinking has ties to American pragmatism, including to James and to Dewey; it is also very close to the intra-action and interaction of Barad and Tuana that we discussed in Chapter 1.

Aristotle.

Nowhere is this deep coherency between ontology, epistemology, ethics, and politics more relevant than in science. In *A Thousand Plateaus* Deleuze and Guattari articulate a vision for a kind of science that follows the flows of matter. They call this science “nomad science” and contrast it with “royal” or “state” science. While Royal Science is reliant on the hylomorphic model, Deleuze and Guattari describe “nomad” or “eccentric” science as defined by a number of features that indicate a completely different epistemological orientation (pp. 361, 369). This framework constitutes the second final orienting implication whose consequences for medicine I wish to explore. First, nomad science is a hydraulic, or fluid, model; for this science, reality is flux and flow (p. 369). Second, the model is therefore of becoming and heterogeneity, instead of being as sameness or identity. Third, in this model, reality flows, not in layers, but as a vortex, distributed projectively and topologically in open space (this space is non-metric, not counted). Nomad science thus, unlike modern or enlightenment science, makes dynamic materiality the object of its study.

Crucially, nomad science has a fourth methodological component, which is that it requires a different orientation of analysis. Deleuze and Guattari describe nomad science as operating on a model of problems instead of model of theorems (the method of State science). The ‘problem’ model focuses on analyzing *affects*, proceeding from a problem to the material intensities and singularities that condition and resolve it (pp. 361-2). As Deleuze and Guattari write, in nomad science, “One does not represent, one engenders and traverses. This science is characterized less by the absence of equations than by the very different role they play: instead of being good forms absolutely that organize matter,

they are ‘generated’ as ‘forces of thrust’ (*poussées*) by the material, in a qualitative calculus of the optimum” (p. 364). The shift from theorems to problems indicates a shift in orientation from the rational to the material, which as we have seen, is constituted by desire and affect, by transformation and becoming. This places nomad science in a very different position in relation to its object of study. Nomad science cannot separate itself from the flows of matter, but must follow them.²⁴² This means that nomad science cannot take an objective, representational view of reality. In Deleuze and Guattari’s words, “Whereas the theorem belongs to the rational order, the problem is affective and is inseparable from the metamorphoses, generations, and creations within science itself” (p. 363). Nomad science is implicated in these flows, participates in them. This is why, in contrast with State science, which is rigidly bound by the demand to follow the structure of hylomorphic model, nomad science operates “eccentrically” and is thus considered the epistemological aspect of the war machine (the name that Deleuze and Guattari give to the regime of pure affect, speed, and lines of flight) (pp. 361-2, 399).²⁴³

Interesting parallels suggest themselves between Western medicine, by now a thoroughly regimented Royal science, and other forms of medical arts, which are more “eccentric” and more interested in following the body’s material flows. I will discuss this issue in more detail in Chapter 7, but for now suffice it to say that for medicine to do justice to the conception of matter as dynamic put forth by Deleuze and Guattari, an

²⁴² This is why Deleuze and Guattari state that “Metallurgy is minor science in person, “vague” science or the phenomenology of matter” (p. 411).

²⁴³ Of course, these two sciences are not completely separate. They operate in the same ontological field, and Royal science both inhibits and appropriates nomad science (pp. 362, 367).

entire paradigm shift is required. This implicates not only the standards we use for determining scientific proof, but also the models we use for engaging with particular problems. How can we come to define health, for example, through processes of experimentation, rather than through logical *a priori* configurations? What might medicine as a science be like if it could start to frame inquiries into health and illness by engaging with relational matter in motion, with matter's affects and desires instead of static relations of form and matter? How might we otherwise understand heart disease, Alzheimer's, or cancer if we think of the matter of the body primarily in terms of its fluidity, layers, and intensities, its capacities to undergo and cause change, its desires? I don't have the answers to these questions, but I believe that this is one of the primary tasks to which Deleuze and Guattari inspire and call us. This reformulation of the epistemological-ontological bases of Western medical science has enormous ethical and political implications, which I will discuss in Chapters 7-8 and the conclusion.

Looking forward: the organism

In this section of the dissertation (Chapters 3-5) I have set forth and analyzed both Aristotle and Deleuze and Guattari's dynamic conceptions of matter. But now it is time to face head-on a difficult problem present in the wings of these two chapters: how do we understand human health in relation to these accounts? Because humans are materially embodied, these accounts of matter's dynamism and agency provide us with important conceptual resources for understanding what health can be for humans. However, up to this point, I have intentionally sidelined the question of where exactly humans fit into this picture of dynamic materiality. How are we defined by this matter? Do we in some way define it as well?

It is impossible to answer these questions without addressing the issue of the role of the organism in organizing matter. As we will see in the next chapter, the organism is central to Aristotle's understanding of health. Deleuze and Guattari, on the other hand, explicitly reject the organism as a unit of measure for health, focusing (as we have seen) on strata and assemblages as the organizers of matter and the body without organs as that which dismantles the organism (pp. 3-4). This is not as easy to interpret as it might seem. On the one hand, I think that this opposition between the organism as the ultimate example of organic stratification and the body without organs as deterritorialization shows that really, for Deleuze and Guattari, humans as organisms have no special status in relation to desire and affect. If anything, their injunctions to try to make our bodies more like bodies without organs are an indication that we ought to work towards being and understanding ourselves as an part of an intensive material continuum with all rest of matter in its single machinic lineage (p. 409). On the other hand, it is clear from their warnings about the need for extreme caution when pursuing lines of flight that it is not really possible to fully do away with the organism as an organizing stratum of our material bodies (see pp. 159-60). Although life always exceeds any particular organism (and even organisms itself), it is also in part defined by its containment in those very organisms (pp. 503, 162-3).²⁴⁴ In fact, Deleuze and Guattari explicitly state that the organism is one of the most important stratum that limits and conditions our possibilities for deterritorialization, although it is by no means the only one. (p. 134).²⁴⁵ Thus the organism is actually central to schizoanalysis, even while this method of analysis focuses

²⁴⁴ See Dema (2007) for an excellent discussion of this notion of *inorganic* life.

²⁴⁵ Many other material strata also intersect with the organism to enable our material possibilities.

on amplifying our ability to connect beyond our organic bodies. In this sense, it seems that their work would lead us to enlarge and transform our conception of the organism, rather than to reject it entirely.²⁴⁶

My main concern in this dissertation is not to answer the question of exactly how we ought to understand the status of the human organism in itself.²⁴⁷ Instead, and in coherence with Deleuze and Guattari's project, I wish to explore how human organisms interact with matter's dynamism, which (at least partially) constitutes them. My concern is to figure out how we can understand and define human health, given the fact that human bodies are made of matter that is dynamic in the ways that Aristotle and Deleuze Guattari show it to be. In the final section of this dissertation (Chapters 6-8), therefore, I explore two of the most important aspects of dynamic materiality that emerge from the analyses of matter I have put forth in the past three chapters: teleology and permeability. Chapter 6 clarifies the nature of Aristotelian teleology in regards to human organisms, and then discusses the implications of teleology for how we understand nutrition. Chapter 7 takes up what I call "permeability", which is a term that gathers the relational,

²⁴⁶ For this reason they state that the body is not reducible to the organism (pp. 158-9). I think this can only be true under a very limited conception of the organism that *de facto* excludes its relational aspects and affects. Deleuze and Guattari's rejection of the organism for thinking bodies and health is in part a political tool that is designed to help us *think* the limits of our body differently (see pp. 275-6). On this basis, their work might equally be used to help us think the organism differently, although this would deprive them of the organism as an image of the norms that guide restrictive, hierarchical biopolitics.

²⁴⁷ Duff (2010, 2014) provides an excellent example of how to take on this task. He uses many of the same concepts we have discussed here to construct a "development ethology" for human beings, which he then uses to analyze several public health cases studies. While his account clearly situates human capacities and affect within dynamic material assemblages, it is less clear what becomes of the organism in his account. Can we shift our focus from the organism to the body, as he does, and still justify the individual human being as the basic unit of public health?

intermediary, underdetermined, and affective conception of matter that we have culled from Deleuze and Guattari's work. In this chapter I analyze the implications of permeability for how we understand the relationship between the environment and human health.

In Chapter 8, I finally bring Deleuze and Guattari and Aristotle into direct dialogue with one another, pitting permeability against teleology. The notion of desire plays an important role in allowing us to see how these two aspects differ in orientation. While for Aristotle, a body's own desiring structure, its teleology, is entirely contained within it, for Deleuze and Guattari, however, this desire supersedes the organism, and is determined in relation to other assemblages, both large and small. These differences are of supreme importance when trying to conceptualize exactly what health is. In this final chapter I thus address the question of how we understand the human organism in relation to dynamic matter's desiring structure. Whose (or what's), desire(s) determine what health can be for a particular body? If these desires constitute the body, how self-contained can we understand it to be? These difficult questions enable us to explore the limits and possibilities of both Aristotle and Deleuze and Guattari's concepts of matter for helping us define health.

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Section 3

Teleology and Permeability

Chapter 6

Teleological Bodies: Aristotle and Nutritional Medicine

Since we see multiple causes in natural generation, for example both that for the sake of which and when the source of motion, one must determine concerning these, which naturally comes first, and which second. But evidently first is that which we call 'for the sake of something'. For this is an account, and the account is the starting point in the same way both in the things composed in accordance with art, and in the natural things. For it is when (either in thought or in perception) the doctor has defined health, or the architect the house, that they retail the accounts and the causes of that which they do, and give the reason why one must do it in this way. But that for the sake of which and the good exist more in nature's works than in the things of art.

- Aristotle, *Parts of Animals* I, 1, 639b11-21

Aristotle's teleological notions

As we saw in Chapter 3, it is impossible to understand Aristotle's conception of matter in natural and living things without recourse to the cause *for the sake of which*. In other words, without *teleology*. Teleology functions for Aristotle as an alternative to mechanism and determinism in explaining matter's motion. Aristotle's position shares some common ground with mechanistic explanations, in that both hold that matter contributes an element of necessity to natural things.²⁴⁸ His analysis, however, shows this

²⁴⁸ See Johnson (2008) pp. 111, 159 and González (2010), esp. pp. xxii-xxvi.

necessity comes not from the matter *per se*, because it is conditioned by the *for the sake of which* of the natural thing or the organism (*Physics* II, 8, 200a33-200b8).²⁴⁹ Matter offers the potencies that allow the thing to pursue its ends but the *for the sake of which* determines how they are picked up and put to use. But what exactly is this *for the sake of which* that conditions the necessity of matter?

This is a crucial question, because misunderstandings about the nature of Aristotle's notion and use of teleology have caused it to be largely rejected from properly scientific explanation, especially in modern science (Johnson, 2008, pp. 3, 16, 290). First, it is important to understand that for Aristotle, to understand the why of a thing, we must understand its causes. He famously enumerates four ways that things can be caused, of which the fourth is the cause *for the sake of which*, the *telos* or end of the thing (*Physics* II, 3, 194b15-195a3). Teleology is therefore a structure of causation that is part of what causes a thing to be what it is. In this sense, Aristotle's use of teleological explanation is directly opposed to that of Kant, for whom, at least as he has been commonly understood, teleological explanations are necessary for understanding natural things, not because of the nature of those things themselves but because of the nature of human cognition.²⁵⁰

²⁴⁹ *Physics* II, 1, 194a27 and *Met.* VIII, 4, 1044a28-29.

²⁵⁰ According to Kant organisms must be understood to have a "natural purpose." both because their parts are reciprocally cause and effect with their form (Kant, §65, p. 251) and because they cannot be fully explained only through mechanistic causation (§70, p. 266), This is remarkably similar to Aristotle's view, but in the Antinomy of Judgment Kant tries to reconcile this purposive view of organisms with the principle of the mechanistic causation of nature. How he thinks he does this is a subject of much debate, but it seems that he attempts to resolve this tension in two ways. First, he subordinates mechanism to teleology, and second, he argues that both mechanism and teleology are regulative rather than constitutive principles. As such they fundamentally reflect the nature of human cognition rather than the objective reality of natural things (§§ 75, 78, 80-1, pp. 281-424). It is the second solution that is most widely understood to be Kant's

For Aristotle, on the contrary, teleology offers an explanation for the thing's being the way that appeals to an order and a causation that are *internal to the thing itself*. As Johnson writes in *Aristotle On Teleology*,

Aristotle's teleological explanations are not just a heuristic for what is actually a mechanical process... On the contrary, they are for Aristotle the starting point for the explanation of living natures, and they necessitate a description of the material and moving aspects of an organism. That is why Aristotle holds that necessity is among the two modes of cause. (2008, p. 188)

Aristotle's thus perspective speaks directly across the millennia to Darwinian science, within whose framework we find purely mechanical processes that are nonetheless described using teleological terminology like "function" and "selection."²⁵¹

What Aristotelian teleology is *not* is conscious intentionality, although many interpreters throughout history have understood it in this way.²⁵² Aristotle divides the category of things that happen for the sake of something into things "in accordance with choice" and things "not in accordance with choice."²⁵³ In other words, some ends are

perspective, although the former presents an interesting framework that is relevant to contemporary philosophy of biology. Philosophers who draw on Kant to explain the relevance of teleology for contemporary biology, and in particular on the subordination of mechanism to teleology include Cohen, 2007; Breitenbach, 2009; Ginsborg, 2014; Quarfood, 2014; McLaughlin, 2000; Walsh, 2006. See Schaffner, 1993 for a more contemporary version of the teleology as heuristic argument.

²⁵¹ See Jonas (2001) pp. 41-53 for a discussion of Darwinian's theory's reduction of teleology to mechanical causation.

²⁵² Johnson (2008) discusses at length various positions taken in relation to this issue.

²⁵³ "Now of things that happen, some happen for the sake of something and some not (*and of the former, some in accordance with choice, some not in accordance with choice, but both are among things for the sake of something*), so that it is clear that even among things apart from what is necessary or for the most part, there are some to which it is possible that being for the sake of something belongs. And for the sake of something are as many things as are brought about from thinking or from nature" (*Physics* II, 5, 196b18-25, Sachs, *emphasis mine*).

consciously chosen and effectuated and some are not. This is why he can claim that both things that are brought about by thinking and by nature happen for the sake of something. Missing this crucial point, many philosophers and commentators have mistakenly believed that teleology is intrinsically anthropocentric, because it is associated only with things that happen through intentional choice.²⁵⁴ When we consider nature to have ends, on this account, we must be assigning it ends that suit our needs and desires. However, Aristotle's vision is fully opposed to this. The cause *for the sake of which* is precisely that which is internal to the thing.²⁵⁵

So what indeed are the ends, the *for the sakes of which*, of natural and living things? This question has been a stumbling block for many interpreters of Aristotle, especially since modernity, when the mechanist account of matter that came to dominate the natural sciences seemed to exclude *a priori* the notion that nature has internal ends (Johnson, 2008, p. 3; Jonas, 2001, p. 34).²⁵⁶ For Aristotle, however, what defines a

²⁵⁴ This is in itself a very limited notion of intentionality, which dismisses the clear fact that animals, at least, make intentional choices. But I do not have the time nor the space to discuss this issue here.

²⁵⁵ This is why he argues that chance is not a cause for the sake of which; it is external to what it causes (*Physics* II, 6, 197b16-23). As Johnson notes, the implication that all living things have a good proper to themselves has important ethical implications (2008, pp. 5, 223, 90).

²⁵⁶ The precise meaning of the relation between teleology and nature continues to be a stumbling block for contemporary interpreters of Aristotle. In Johnson's words, "Persistent interpretative problems" continue to plague Aristotelian and Ancient Greek philosophy scholarship. For example, these questions continue to be unresolved: "Is teleology about causation or explanation? Does teleology exclude or obviate mechanism, determinism, or materialism? Is teleology focused on the good of individual organisms, or is god or man the ultimate end of all processes and entities? Is teleology restricted to living things, or does teleology apply to the cosmos as a whole? Does teleology identify objectively existent causes in the world, or is it merely a heuristic for our understanding of other causal processes?" (2008, p. 2).

natural thing as natural is that all its causes are internal to it, including its ends. Not only this, but the *for the sake of which* cause is in many cases only conceptually distinct from what have come to be called the formal and moving causes. Aristotle therefore simplifies his explanatory account to show that we can think about there only being *two* causes of natural things: 1) the material and 2) the *for the sake of which*, which is also simultaneously the cause of the thing's being what it is and its motion. Aristotle's go-to example to illustrate this phenomenon is human reproduction. "Human being" is at once what it is for the baby to be, what caused and causes it to be put into motion as such (through the parents and through its own internal impetus), and the *end* or goal of its being.²⁵⁷ We can refer to this cause alternately as its form, its source of motion, and its end, and it is this cause in the sense of end that conditions or requires and puts to use the potencies of material causation. As I noted in Chapter 3, Aristotle creates the neologism *entelecheia* ("being-at-work-being-itself," as Sachs translates it), to refer to this multidimensional activity that encompasses the motion and activity of being and staying oneself.²⁵⁸ *Entelecheia* is the cause *for the sake of which* of natural things, and soul is the cause for the sake of which of living things (*Physics* II, 9, 199a31-33, Sachs). In fact, in *On Soul*, Aristotle explicitly assimilates soul to *entelechia* as the *entelechia* of the body

²⁵⁷ "That the causes, then, are these and this many, is clear; and since there are four causes, it belongs to the one who studies nature to know about all of them, and he will supply what is due in the way of natural inquiry by tracing back the why to them all: the material, the form, the mover, and that for the sake of which. But *often three of them turn back into one*, for the what-it-is and that for the sake of which are one, and that whence the motion first is, is the same in form with these; for a human being brings forth a human being, and in general, as many things as, being moved themselves, cause motion, are the same in form with the things moved" (*Physics* II, 7, 198a22-36, Sachs, emphasis mine). See also *Physics* II, 8, 199a31-33.

²⁵⁸ See footnote 35 of Chapter 3.

that has life as its potency (*On Soul* II, 1, 412a27-8).²⁵⁹ The end of a natural thing is internal to its own action of being at work being and staying itself, and the end of a living thing is being at work being and staying itself as living, which implies particular *activities*: always nutrition, and sometimes also perception, motion, and intellection. But in what sense are soul and *entelechia* ends?

According to Aristotle, an *end* is a *limit* that blocks infinite regress in demonstration, motion, and activity (*Met.* II, 2, 994b9-16, *On Soul* II, 4, 416b24-5). The cause *for the sake of which* is an end in this sense because it “provides a limit that makes things both achievable and comprehensible” (Johnson, 2005, p. 83). *Entelecheia* and soul as the ends of natural and living things thus gives them a defined, limited unity, which is why it this word refers to thing being and staying *themselves*. As we as we will see in Chapter 8, this notion of internal, self-defined and maintained unity is precisely why Deleuze and Guattari reject the notion of final ends. *Entelechia* as an end in the sense of limit is intimately related to Aristotle’s notion of *ergon*, or function. Although a thorough discussion of function is beyond the scope of this work, we can summarize Aristotle’s position thus: functions are the activities unique to each kind of thing, the ends that define it as itself, and *entelecheia* is a state of active completion of these functions (*Met.* IX, 8, 1050a21-3, 1055a10-19; *Eudemian Ethics* II, 1, 1219a8-23; *Nichomachean Ethics* IX, 7, 1168a8-9). To take up one of Aristotle’s biological examples, seeing is the *ergon* and *telos* (function and end) of the eye, and *entelecheia* is the completed act of perceiving through sight. All living functions are processes or transitions toward *entelecheia*, in other words, towards their own excellence and completion. This example shows that for

²⁵⁹ In this sense, soul and *entelechia* are overlapping concepts. Soul simply adds another dimension, that of being alive, to the activity of being and staying oneself.

Aristotle, the state of excellence of each function is relative and internal to it, which means that ends in the sense of excellent function are not defined in reference to some external criterion (*Physics* II, 3 195a23-6 and II, 7, 198b4-9).²⁶⁰

Health as an end – a preliminary gesture

For most readers of Aristotle, his use of health as an example of an end is simply an illustration of his concepts. For the purposes of this investigation, however, this identification of health as an end is highly illuminating to our investigation into how to define concepts of health. First, Aristotle makes it explicit that health is an end because it conditions the necessity of all the material processes and interventions that promote it (*Met.* VII, 7, 1032b18-29). Just as the stones that are part of a house only make sense in the context of the house being and staying a house, the material potencies of the living body only make sense in the context of their role in promoting and achieving health. Second, his identification of health as an end also indicates that health is an end in the sense of *limit*. Just as all functions tend toward *entelecheia* in the sense of their own proper, internally derived excellent and complete functioning, so bodily ends, and there are many, tend toward health as their own proper excellent and complete functioning. In this sense, health, like soul and *entelecheia*, provides a limit of being to the body that allows us to explain its motion and activity.²⁶¹ A teleological conception of matter offers a robust alternative to the Cartesian conception of the body as a machine explored in Chapter 2. Similarly, an understanding of health as an end offers a robust alternative both

²⁶⁰ See Johnson (2008) pp. 86–93 for a thorough discussion of the relationship between function, activity, and *entelecheia*.

²⁶¹ In fact, it seems that the notion of the mean central to Aristotle's ethics was modeled on a contemporary understanding of health (c.f. Jaeger, 1957; Lloyd, 1968).

to the objectivist notions and constructivist notions of health discussed in the first few chapters of this dissertation. In the conclusion to this chapter I will further develop the implications of considering health to be an end.²⁶²

But in order to truly understand all of what is implied clinically in the conception of health as an end, it is important to first clarify another aspect of ends, which is that ends must also be considered in terms of whom is their beneficiary. Aristotle states that *for the sake of which* is said in two ways, distinguishing between the ‘of which,’ or the aim of the activity, and the ‘for whom’, or the beneficiary of the activity (*On Soul* II, 4, 415b2-3, *Eudemian Ethics* VII, 15, 1249b15). Certain kinds of ends or aims cannot be the beneficiaries of those activities of which they are the cause. In these cases, there is a dual *for the sake of which* structure, because the *for the sake of which* also has a beneficiary *for whose sake* it is (Johnson, 2005, p. 79).²⁶³ Health is an example of an end whose beneficiary is not itself; while health is the end of the living organism, it is this organism, and not health, that is the beneficiary of all activities that are pursued *for the sake of* health.²⁶⁴ ²⁶⁵ The organism therefore acts (in intentional and unintentional ways) *for the sake of* health, but health is also *for the sake of* the organism, in that the organism is its

²⁶² For another analysis of health grounded in Aristotelian teleology, see Kass, 2008. The basic direction of his account in Chapter 6 is very similar to that of my analysis here, but he does not engage with precisely how teleology can impact the *content* of our conceptions of either nutrition or health.

²⁶³ This is why, as we saw in Chapter 3, soul is the *for the sake of the body* “in a twofold sense” (*On Soul* II, 4, 415b8-415b31).

²⁶⁴ This is why Johnson argues that we must reject the notion that the form (or, expressed anachronistically, species) of an animal somehow benefits from its reproduction, since the form needs nothing and is only an aim to be achieved. In other cases, however, the aim might also be the beneficiary (2008, pp. 69, 79).

beneficiary. This *for the sake of which structure* of health is parallel to the structure of both *entelecheia* and soul. In the case of *entelecheia*, the end of a natural thing is to be at work staying itself. But the main, intrinsic beneficiary of this activity is the thing itself, because in virtue of its activities for the sake of *entelecheia* it is and stays itself. The only time it the natural thing can cease to have this end is when it goes out of existence. Soul also has this same structure: it is cause in the sense of the *for the sake of which* of living organisms and when they stop having this end is when they stop being *alive*. But individual organisms, not soul itself, are the beneficiaries of all activities that they undertake *for the sake of* soul (*On Soul* II, 4, 415b8-415b31; Johnson 2005, p. 93).²⁶⁶

Nutrition as teleological

Nutrition is one of Aristotle's most important examples of how teleology conditions living material and its processes. Nutrition is the most fundamental activity of soul, and soul is its cause in the three senses mentioned above, including the cause *for the sake of which*. In Chapter 3 we saw that Aristotle's explanation of how the *for the sake of which* structure helps us understand the nature of *food*, since what defines the being of matter as food is necessarily conditioned by its relation to soul, for the sake of which the activity of nutrition occurs. However, nutrition is not reducible to soul, because in nutrition soul teams up with material processes and material ends, which are an additional and irreducible cause. Three material elements must be taken into account in explaining nutrition: the body fed, the processes through which it is fed, and the material that feeds it (food).

²⁶⁶ This is an interesting counterpoint to Darwinian theories, in which really the activities of life in each organism happen only for the sake of "survival", or in other words, for the continued life of the species (or at the limit, for the sake of life itself).

What is crucial about the teleological explanation is that it shows that the specificity of material nutritional needs is conditioned by the *for the sake of which* structure of living bodies. This structure, as we saw, indicates both a beneficiary and an aim in the sense of limit. In the case of nutrition, the living body is the beneficiary, because nutrition enables the body to maintain itself, grow, and reproduce. The limit of nutrition is the body itself, in its active state of being and staying itself. The body needs access to particular nutrients and combinations of nutrients in order to be able actively live and be itself. Nutrition thus meets the needs created by the body's various activities. Although nutrition is the "lowest" activity of soul, since it is common to all living things, its *for the sake of which* structure is actually quite complex. In beings with higher potencies, nutrition benefits the living organism by providing it with the resources to be and stay itself. Depending on the particularities of the living being, sometimes this includes undertaking and sustaining other living activities like perception, motion, intellection. Nutrition thus operates for the sake of all of these other activities of soul, which in turn benefit the organism.²⁶⁷ Not only this, but as I noted in Chapter 3, in living beings nutrition also serves the end of allowing the living organism to reproduce by making another like itself (*On Soul* II, 4, 415a23-415b10).²⁶⁸

²⁶⁷ To push Johnson's argument about beneficiaries cited in footnote 12 to the limit, can we say that reproduction benefits the living organism? It would seem to the contrary that the beneficiary of reproduction is either life or the newly born new organism. Following Darwin we might think that life is actually not unchanging and thus can indeed benefit from reproduction. Aristotle, however, seems to think that all living organisms long to participate in the eternal, and that reproduction serves this end (*On Soul* II, 4 415a30-b1). In any case, what is clear is that nutrition has at least two beneficiaries, but at every point the living organism is one of them.

²⁶⁸ *C.f.* Chapter 3, footnote 54. Aristotle's notion that nutrition serves the goal of reproduction is held up by contemporary science. Healthy reproduction requires that very

Putting aside for a moment the somewhat complicated notion of the relation between nutrition and reproduction, we can define nutrition as a set of complex, material, end-driven processes that benefit the living organism. From this seemingly straightforward notion, we can gain four main insights into the nature of human nutrition, each of which have dramatic and transformative consequences for how we understand living bodies. First, Aristotle's teleological explanation of nutrition indicates that nutrition seeks to meet very particular and material conditions that enable the body to accomplish its living activities. Food serves the needs of the body's many activities. Disease and illness, as disruptions of so-called "normal" functioning, are instantiations of the body failing in its activities of being and staying itself. Therefore, we can reasonably conclude that nutritional processes, which have the promotion of "normal" being and functioning as their goal, may also be failing.

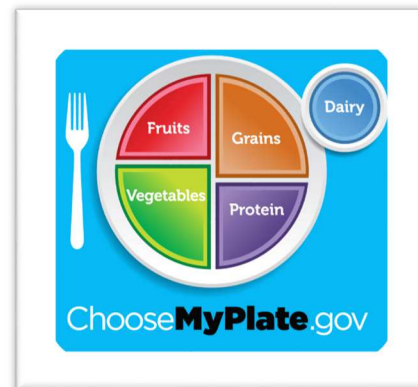
Aristotle's teleological conception of nutrition implies a normative framework for food choices as well as a crucial role for nutrition in the prevention, treatment, and cure of diseases. Some food choices and options may fail to provide for all of the bodies needs, causing illness; on the other hand, when the body is ill some foods might be able to give the body precisely what it has lacked that caused the disease, and thus contribute to making the body well again. In other words, food can be both poison and medicine.

particular nutrient and micronutrient needs are met in both the male and female. The connection between female nutrition and reproduction has been explored much more extensively than the connection between male nutrition and reproduction, but there is nonetheless some information available on this topic. (C.f. Asprey, 2013; Chiu et al., 2014; ESHRE Capri Workshop Group, 2006; Maizes & Weil, 2013; Morell & Cowan, 2013; Shanahan, 2008; Tamura & Picciano, 2006). One of the most interesting discussions of reproduction and nutrition is in the book *Deep Nutrition*, which argues that nutrition activates epigenetic changes through reproduction that take into account environmental availability of nutrients; in this sense, it is likely that evolutionary change is responsive rather than random (Shanahan, 2008).

Therefore, when we attempt to understand, treat, and prevent these illnesses we ought to look to nutrition. It seems likely from an Aristotelian perspective that chronic diseases, including all of those that we have been discussing such as cancer, heart disease, autoimmune disorders, and digestive difficulties, are likely to be caused by a failure to properly meet the body's nutritional needs.

These notions seem reasonable in light of Aristotle's teleological notion of nutrition, but they go directly against many common Western understandings of food, especially the "combustion" conception of metabolism that sees food as mere calories to be counted, consumed, and expended.²⁶⁹ When we really understand food to be conditioned by the for the sake of which structure of bodies, we open up the likelihood that food must fill an enormous variety of material needs, only one of which is to provide energy. In the current U.S. FDA MyPlate nutritional guidance platform we can visualize the notion that we need a variety of macronutrients (carbohydrates, proteins, fiber, and fats) in a particular proportion:

Image 1:
(taken from "USDA MyPlate Food Groups," 2014).



²⁶⁹ In this conception, as I noted in Chapter 3, "a calorie is a calorie," no matter whether it is obtained through a milkshake, a steak, or a carrot stick. This approach reductively mathematizes nutrition to only view food in terms of its pure countable caloric energy. See Jonas, 2001, p.76 for a robust philosophical critique of this conception.

However, this is a very minimally specified answer to the material needs of the body, precisely because it groups highly varied foods into only four groups with little regard for the variations in nutritional resources provided by the different foods in each group.²⁷⁰ The body's needs are deeply and materially specific, and generic categories like this cover over this specificity.

Clinical nutrition, on the other hand, has recognized the vital role that particular nutrients play in health and functioning. The identification of diseases like rickets, beriberi, pellagra, and scurvy to be caused by nutrient deficiencies (vitamins D, B1 (thiamine), B3 (niacin), and C, respectively) has made it clear that at the very least, beyond calories and fiber, the body has particular vitamin and mineral needs. On the basis of this kind of identifiable pattern in diseases corresponding to nutrient deficiencies, entities like the World Health Organization and the U.S. FDA have created minimal and maximum vitamin and mineral intake guidelines. These reflect current knowledge about the limits over and above which deficiencies will cause these diseases. But these intake requirements do not and cannot address the question of what optimal intake for health and disease prevention might be, in large part because there is very little research to support recommendations about optimum health (Balch, 2010, p. 25; Shannon, 2009, p.

²⁷⁰ The only specific nutrients intake that are recognized as a part of a healthy diet are essential fatty acids, but the role of these in health is not explained. Vegetables, fruits, and whole grains are apparently recommended because of their fiber content. Cooking is mentioned only in relation to food safety, and the notion of nutrient bioavailability does not appear at all (“USDA MyPlate Food Groups,” 2014, “Weight Management and Calories,” 2014).

39; World Health Organization and Food and Agriculture Organization of the United Nations, 2004, pp. 1, 10).

Although nutrition is not widely recognized in biomedicine to play a role in the development of chronic disease, I believe that Aristotle's teleological explanation of nutrition shows us that it ought to be. The reality about nutrient deficiencies causing disease also implies the reverse truth: that *health* is caused by nutrient sufficiency. Nutritional research from the last century or so shows has proven that to form structures, metabolize energy, and to undertake every human activity, including and moving, our bodies make use not only of macronutrients but also micronutrients. These include vitamins only soluble in water or only in fat, particular essential amino acids and fatty acids, particular minerals and trace minerals, and all in very specific combinations and ratios. Without these substances in the right combinations, all of our activities become impossible, from the smallest enzymatic reactions that make digestion possible to the seemingly most significant activities such as thinking, moving in space, and maintaining a balanced perspective on life.

To illustrate, let's briefly discuss two basic examples: amino acids and fatty acids. Amino acids are an essential part of the human body. Of the twenty amino acids immanent to the human body, nine must be obtained through food (the "essential" amino acids), and are available in various food sources, including legumes, grains, and meat products.²⁷¹ The body uses these to make the other eleven amino acids, although some of these are also more efficiently obtained through food than through bodily production (Fallon, 1999, p. 5). The body uses these twenty amino acids in various combinations to

²⁷¹ Only animal products contain all nine, which is why they are called "complete proteins"(Fallon, 1999, p. 5).

produce its proteins. It also uses amino acids for the metabolism of other nutrients and to produce neurotransmitters (Balch, 2010, pp. 96–7). Deficiency in certain amino acids can therefore cause deficiencies in other nutrients as well as depression and other neurological conditions. Similarly, certain long chain fatty acids, commonly known as Omega-3's and Omega-6's, are essential and must be obtained through food, such as fish, flax, and fatty fruits like coconut and avocado. The body uses these to make saturated and monosaturated fatty acids, although as with amino acids, the capacity to generate these secondary fats, including DHA and EPA, varies considerably according to sex and other genetic factors, so they are also considered essential nutrients. These fatty acids are fundamental components of cell membranes in the brain and eyes, provide a medium for chemical signaling that is crucial for immune function, and play a key role in modulating gene expression. Deficiencies in fatty acids therefore can cause learning and memory difficulties and vision problems ("Essential Fatty Acids", Linus Pauling Institute, 2014).

Although it might seem that we can sufficiently explain nutrition through simple biochemical reactions, what we actually have in nutrition are interlocking and embedded teleological chains of activities *for the sake of which* that imply and condition very particular and complex material needs. As this discussion of amino acids and fatty acids shows, our ability to take up and in some cases produce these nutrients depends on the health and functioning of our tissues and organ systems (for example, colon issues that make nutrient assimilation difficult). In addition, our ability to assimilate nutrients also depends on how they interact with other nutrients in our systems. For example, phytic acid (phytates) in legumes and grains inhibits zinc absorption, while vitamin C is an important actor that promotes iron absorption (World Health Organization and Food and

Agriculture Organization of the United Nations, 2004, pp. 233–7, 251–5). Nutritionists label this teleological aspect of food *bioavailability*. It is one of the most crucial factors in nutrition and is very hard to statisticize, since it is inherently contextual. Furthermore, we cannot take for granted that the levels of nutrients in food is static, since the soil conditions and processing, transport, and cooking of foods drastically impacts their nutritional content, both decreasing and increasing the bioavailability of nutrients. The adequacy of food for human health is dictated by the body's needs, and certain forms of growing, transporting, and cooking can undermine the ability of a food to meet those needs.

Unfortunately, although clinical nutrition has generated a lot of specific knowledge about the nutritional needs of the body, this needs-based perspective is lacking in the approach to nutrition that dominates the way most of us think about eating. In popular culture and the media, nutrition is seen as a generic process whose positive import is taken for granted. The relation between health and food is mostly construed in terms of the dangers that all the things we *want to eat* – hamburgers, candy, bread - might pose to our health. Unfortunately, we think much more about what we shouldn't eat than what we should eat. This is especially the case because our only framework for understanding the relationship between food and the body is in terms of *size* or *weight*, with excess size attributed to excess macronutrients or energy. Nutritional advice gleaned from popular media sources like magazines and websites is almost always geared toward

solving the problem of unwanted weight, and is nearly without exception framed in terms of what to *avoid*, such as calories, red meat, sugar, fat, grains, carbohydrates, etc.²⁷²

In contrast, an Aristotelian teleological notion of nutrition shows that we must conceive of eating in terms of how it enables our bodies to properly do all that they need and want to do. In other words, we should focus much more on eating as a process that meets our bodies' needs. The idea that food can contribute something positive to our bodies is not completely foreign in popular cultural notions of nutrition. Sometimes particular foods rise to stardom because researchers have found evidence that they play a role in preventing obesity or healing particular diseases. Following the release of studies establishing nutritional benefits of one food or another, new "superfood" trends are born; recent examples include chia seeds, coconut oil, and dragon fruit ("Superfood Fruits - Healthy Exotic Fruits," 2011, "Why are chia seeds the next big superfood?," 2014; Xanthe Clay, 2013; Zelman, 2014). However, the superfood approach fails to do justice to all of what is involved in nutrition, and especially of the varied and complex the needs of the body.²⁷³

Just as Aristotle's predecessors sometimes attributed the source of bodily growth to the ingested substance, in both the cases of health benefits and health harms, the common understanding in our time is that it is the food in itself that is solely responsible for the good or harm that it causes. Thus some foods are just *bad for you* or *good for you*,

²⁷² This includes the New Dietary Guidelines for Americans from 2011. Although official recommendations include increasing fruit and vegetable intake and eating whole grains, health related guidance is oriented toward weight management through calorie-counting ("USDA MyPlate Food Groups," 2014).

²⁷³ I think that the sheer number of foods that end up being designated superfoods shows that many foods are "miraculously" nutritious, when we take the time to research them.

no matter the context. This conception not only creates a psychosocial context of guilt and taboos about eating certain foods, but it prevents us from considering how these foods interact with other nutrients in bodily processes that are bound by concrete needs. Popular diet plans promote this mentality by creating lists of foods to avoid and to eat. According to teleological approach, on the other hand, it is not so much that some foods are bad or good, but rather that to be *food*, a substance must meet our nutritional needs.²⁷⁴ The teleological conception of nutrition focuses on the way that food meets the active needs of the body, and on the way that the material resources of the food are taken up by the body in dynamic nutritive processes.

Not only is the process of nutrition materially specified to the teleological needs and processes of the body, but these needs are also specific to each body. On the basis of genetics, environmental and food exposures, living habits, etc., each body has a unique set of needs that must be met for it to effectively undertake its own activities. This individualized approach to nutrition is implied by Aristotelian teleology, since the primary beneficiary of nutrition is the individual living organism that is nourished. However, this individualized approach is completely lost to view in the dietary recommendations made in most diet plans. This is especially the case with the public health-oriented federal and international recommended daily intake guidelines. By definition, these guidelines aggregate nutritional needs and sufficiencies into a statistically derived universal norm valid for all bodies, or at least bodies of a certain type, such as a young, pregnant, or aging body. Research determines an average daily

²⁷⁴ In this sense, as I noted in Chapter 3, Michael Pollan's rule number one from his *Food Rules: An Eater's Manual* - "Eat food" - coheres perfectly with Aristotle's teleological conception of food (2009).

requirement that meets the needs of 50% of a given population, and then this is mathematically enlarged by adding two standard derivations, which results in a number that is statistically assumed to be sufficient for 97% of that population (World Health Organization and Food and Agriculture Organization of the United Nations, 2004, pp. 1–6, 13, 335). Although the World Health Organization recognizes individualized nutrition as one of the foremost challenges of nutritional science, current recommendations worldwide are therefore based on a method that is diametrically opposed to the individualization of nutritional needs. Unless the science for determining nutritional needs is radically transformed, it will be impossible to do justice to the fact that the nutritional needs of each body are specific to that particular body.²⁷⁵

Popular conceptions of the role of food and health often fail to take into account a final and crucial teleological aspect of nutrition, which is its temporal nature. The nutrients taken in by the body are bound up in a relation of futurity with its activities. Today's food will serve tomorrow's needs. Not only is the very structure of the relationship between nutrition and activity oriented toward the future, but the particularities of nutritional processes further complicate the picture.²⁷⁶ The effects of sub-optimal and optimal nutrition build up gradually and often appear over long periods of time. The body accumulates many of its most vital nutritional resources; it stores, uses, and produces them in complicated temporal processes. For example, iron is used by the

²⁷⁵ As the World Health Organization acknowledges, in order to be accurate, this equation requires a population that is symmetrically organized around the mean, which is often not the case. This is true, both in the case of intakes, which vary widely according to economic and physical access to food, but also in bodies, which do not necessarily cohere with statistical patterns (World Health Organization and Food and Agriculture Organization of the United Nations, 2004, pp. 5–6).

²⁷⁶ See Jonas (2001) p. 85 for a phenomenological account of the futurity of organisms.

body to recognize and carry oxygen in the blood, as well as for growth and healing (Linus Pauling Institute, 2014b). The body uses the protein ferritin to store and release iron. Depending on the body's intake and need, and whether these stores are increasing or decreasing, the intestines also correspondingly increase or decrease their absorption of iron (World Health Organization and Food and Agriculture Organization of the United Nations, 2004, p. 257).

The body also has mechanisms that allow it to expend some of its own resources to compensate for inadequate nutritional intake, at least for limited periods of time. For example, enzymes, complex proteins that act as catalysts for nearly every bodily process, can be consumed in food or produced by the pancreas and other digestive organs. When there is sufficient enzyme intake through food, such as in fermented foods and raw fruits and vegetables, the body secretes few of its own enzymes. But a diet poor in enzymes causes the body's enzyme output to rise (Fallon, 1999, pp. 45–7). Although the body can compensate temporarily for this and many other nutritional deficiencies, these take a toll on the body. Stores and production diminish over time if nutritional resources continue to be inadequate. The process of rebuilding the body's nutritional reserves is also cumulative, as the body slowly uses the resources it gains through food to rebuild its systematic and structural elements.

For this reason, it is very difficult to correlate changes in diet with changes in health. In an age when we define scientific viability in terms of visible correlational causality, the fact that nutritional changes require months and even years to result in visible transformations in the body and its functioning has made nutritional medicine a tough sell both to physicians and to patients. Not only are few doctors trained to identify

the nutritional roots of health issues, but even when they are able to provide nutritional recommendations, in the absence of visible evidence of positive change, patients often lose the patience needed to transform and maintain their diets (Levy, Loy, & Zatz, 2014). We notice when we get food poisoning, because we get sick immediately and we can trace its effects. But if we develop coronary blockages from eating too many saturated fats, or as a result of cellular inflammation caused by consuming too much sugar (as two competing theories go), the damage happens so slowly during many other simultaneous processes that it is almost impossible to perceive the cause-effect relationship (Liponis & Hyman, 2005; "Eat for a Healthy Heart", 2011). Reversing these processes through better eating habits thus requires an enormous amount of faith in the process, since they require much time to show any benefit.

Epistemological Difficulties

This is not just a problem for lay people. The teleological aspects of nutrition also make nutritional processes very difficult objects of scientific study. First, that it is goal oriented, rather than mechanical in nature means that it must be understood within the framework of the body's activities that it serves, and thus it is not easily isolable for study. In order to 'scientifically' demonstrate causality, nutritional studies must rely on isolating one food, and for proper precision, one micronutrient, often in synthetic form, and testing it in tightly controlled randomized trials, sometimes involving *in vitro* tests that are of limited validity since they cannot simulate the complex activities of a living being. Accepted methods for establishing valid nutritional knowledge are undermined by numerous aspects of this teleological aspect of nutrition, including the fact that living human beings eat food, rather than micronutrients. Given this tendency, it is unsurprising

that the body appears to benefit much more from foods than from isolated nutrients, but the complexity implied by this fact makes it all the more difficult to ‘scientifically’ study the relationship of nutrition with health and disease.²⁷⁷ Furthermore, we consume many foods over the course of our lifetime, raising the possibility that it might be dietary combinations and patterns, rather than specific micronutrient intakes, that most promote health or illness. Unfortunately, this only further confounds isolation of variables. These issues are well known. Nutritional epidemiology is attempting to address these issues through dietary pattern analysis, but it faces additional methodological complications, including the fact that self-reporting about eating tends to be unreliable, and it is difficult to rigorously otherwise observe long term dietary patterns (Boeing, 2013; Boeing et al., 2011). Despite the complexities and complications involved, however, nutritionists argue that dietary pattern analysis provides a needed complement to traditional nutrient-based analyses as a way to try to evaluate the effects of overall diet on populations (Pollan, 2009).

Second, the concrete specificity and singularity of bodily needs in some sense require an individualized approach, not only to see which nutritional needs arise from the body’s many activities, but also to understand how the needs of each body are conditioned by its proper, unique activities and realities, including history, environment, and genetic inheritance. Unfortunately, as the World Health Organization recognizes, individualized nutritional needs are both conceptually and empirically difficult to

²⁷⁷ One example of this is that excess intake of nutrients through food is rarely a problem, since the body has mechanisms for regulating and excreting these unneeded nutrients. However, excess supplementation of certain synthetic nutrients, like Vitamin A, can cause adverse effects (World Health Organization and Food and Agriculture Organization of the United Nations, 2004, pp. 4, 36–7, 139, 174).

ascertain. For this reason, from a public health perspective it is much more practical to focus on aggregates and statistical norms, which will always mean that there is a mismatch between official nutritional recommendations and the actual needs of each body for disease prevention and optimum health. Even the “individualized” daily eating plan offered as part of the new MyPlate guidelines unrolled by the U.S.D.A. in 2011 bases its recommendations for individualized eating plans on average “healthy” weights aggregated by sex, height, and age (“Weight Management and Calories,” 2014)

Third, the generally imperceptibility of the time-bounded nature of teleological causation involved in nutrition has huge implications for obtaining and proving nutritional knowledge. Because food interacts with our bodies so slowly, we eaters are quite dependent on the observations of others to tell us what is likely to work or not. In our society this means we look toward the scientists, but there are strong limitations on the kinds of information they can give us. The results of research about the impact of food on health are so dependent on study design and interpretation that nutritional science itself often supports opposing conclusions, such as that antioxidants both prevent and promote cancer, or that drinking coffee is harmful or beneficial to your health (“Antioxidants and Cancer Prevention,” 2014, “Antioxidants Speed Up Lung Cancer,” 2014, “Is Coffee Bad or Good For Your Health? Two Experts Debate,” 2012). This also explains how there can be so many proposed diets with passionate adherents that in the end propose opposing principles for eating.²⁷⁸ This is a fascinating state of reality, but it

²⁷⁸ To cite a few contemporary examples: raw food diets vs. Chinese medicine which discourages raw foods in all but a few cases; Paleo and Atkins diets, which are very heavy on meat products vs. vegan diets which contain no animal products at all; gluten free or even grain and legume free (*i.e.* Paleo) diets vs. “nourishing” diets that encourage soaking grains and legumes; diets that encourage eating fermented foods for their

also leaves us in a difficult place when we consider how to choose what to eat – as Aristotle himself shows us, an essential activity for life.²⁷⁹

A few teleological dietary approaches

It is clear that the teleological nature of food presents an enormous conceptual challenge for researchers. I believe that until a teleological understanding of bodies begins to shape the way that science interacts with them, robust methods for studying the impacts of food on health will continue to be very difficult to formulate. However, a few interesting alternatives have arisen that challenge the nutrient- and statistics- based models currently dominating clinical nutrition. Evolutionary medicine has recently come to the table with the proposal that we ought to eat more like our Paleolithic ancestors. This is based on the notion that the human body evolved many thousands of years ago to be best suited to a hunter-gatherer lifestyle (Gluckman, Beedle, & Hanson, 2009; Koella, 2008; Trevathan, 2010). The popular Paleo diet, which eschews any foods that are a product of agricultural invention, is an example of this kind of approach to eating (“The Paleo Diet Premise,” 2014). A less radical historically based approach also gaining significant following in popular culture is a turn back to “traditional” or “nourishing” diets”. Best exemplified in the diet promoted by the Weston A. Price foundation, this approach argue that humans throughout history, including during the agricultural era, have been building up collective wisdom about what benefits our bodies and what

microbiota vs. diets like that promoted by the Bulletproof Executive that prohibit them for the same reason (“The Bulletproof Diet,” 2014, “The New Atkins Diet,” 2014, “The Paleo Diet Premise,” 2014, “Weston A. Price Foundation Principles of Healthy Diets,” 2013, “Why Go Veg?,” 2014; The Mayo Clinic, 2014).

²⁷⁹ For an accessible lay discussion of this issue and why it means that culture is an important aspect of eating, see Pollan's *The Omnivore's Dilemma* (2007).

doesn't, including processes for preparing (pre-cooking and cooking) and eating food (at specific times of day or in particular combinations). They point to traditional practices for food preparation and consumption, including the culturing of dairy products, the lacto-fermentation of vegetables, and extended soaking and cooking of grains and legumes, as ways that we through culture have learned to increase the bioavailability of nutrients (Fallon, 1999; "Weston A. Price Foundation Principles of Healthy Diets," 2013). These approaches have much in common with dietary pattern analysis, but are based on identification of similarities between the traditional diets of small but healthy populations around the world.

These historical/evolutionary approaches share with conventional clinical nutrition the basic assumption that humans overall have basically the same nutrient needs, with exceptions made for differing activities such as pregnancy, birth, and lactation, childhood and adolescent growth, and differing levels of physical activity. The notion presented above that each body has somewhat unique nutritional needs presents a huge empirical and conceptual challenge. A few diet approaches attempt to identify body subtypes that have different nutritional needs. One example is the Eat Right For Your Type diet, which specifies kinds of food appropriate for each blood type on the assumption that certain foods are chemically harmonious with each blood type (D'Adamo & Whitney, 1997). I cannot comment on the science behind these claims but it is at least an attempt to recognize that the same foods might not be equally beneficial or detrimental to all bodies. Ayurveda, an ancient Indian medical art, also assumes that there are three main tendencies at play in bodies, and each body is a particular mixture of one

or two dominant tendencies. This allows for multiple (seven) kinds of bodies, each of which is best suited to certain kinds of diets (Svoboda, 1998; The Chopra Center, 2014).

Health as End - Conclusion

I believe that we need to radically renew a teleological understanding of living bodies. Teleology currently plays a very limited role in medicine and in biology generally speaking. Although not usually explicitly linked to the term teleology, any notions of human growth that are developmental in nature, including the idea that fetuses, infants, and children have particular needs that must be met in order to develop ‘normally’ make recourse to teleological explanations in the sense that they presuppose that the living bodies in question have purposive direction or aims that guide their development. Darwinian science also has a very limited teleological sphere of explanation, since organisms and especially species always have the goal of surviving (through successful adaptation and reproduction).

However, far beyond these minimal common conceptions, a teleological conception of nutrition can have radically transformative consequences for how we understand living bodies and health. Near the beginning of this discussion I floated the idea that we can consider health to be end, in the same way that *entelechia* and soul are ends. Health is an end in the sense of a limit, both of activity and explanation, and health benefits the living organism. I think that it is reasonable to think that health is a word that designates the *entelecheia* (the complete, excellent functioning) of the living body, being and staying itself. This entails, in the case of humans, activities including motion and intellection, as well as nutrition, all of which are seeking their own excellent functioning and the overall excellent functioning of the organism as a whole.

This is certainly the case with nutrition, as we have seen in this chapter. Just as food is defined by its relation to nutrition through a for the sake of which causality, so nutrition is for the sake of health. Nutrition is deeply, integrally, and causally implicated in health, because nutritional processes are oriented toward enabling the excellent functioning of the body. This means that exploring the nutritional causes of chronic disease ought to be foremost on our medical research agendas. Since the individual body is the beneficiary of nutrition, we need to reconfigure our understanding of food and nutrition to focus on meeting the particular needs of each individual body in its development, environmental, and other kinds of contexts. This focus on meeting needs also orients our eating toward enabling bodily thriving, rather than toward trying to maintain a particular weight, or in Darwinian terms, to just survive. Furthermore, although material bodies are finite, it is coherent with the teleological conception of bodies to think that chronic degeneration is not a necessary feature of aging or products of genetic determinism. Instead, the time-bound nature of nutrition and bodily end-oriented function enables us to think about the chronic diseases of aging bodies as a product of habits, and in this case nutritional habits, that over time have failed to meet the body's needs. Finally, the time-bound nature of nutrition and function also challenge our scientific methods, showing us that we need more dynamic and holistic approaches to studying the causation of both health and disease.

A teleological conception of bodies and health also applies more broadly to how we think about bodies and health. First, it shows us that all of life is teleological. Living things, as they function or activate their potencies, seek to enact them in excellent ways. The teleological nature of living organisms shows us that all bodies, and not only

children's bodies, have a directionality. Every living body is oriented towards its own optimum functioning. Development and purpose do not stop at the achievement or completion of reproductive age, but continue throughout life. This has huge implications for how we understand the processes of aging, since it signifies that the biological "point" of the organism is not over even when reproductive age has passed.

As a *telos*, health is an activity that encompasses the whole organism. It both is the goal of and requires the resources of nutrition, motion, and intellection. This is why, not only optimum nutrition, but also optimum activity is implied by a teleological notion of health (although I do not have time to discuss that here). Furthermore, it is crucial to see that healthy intellection is also part of the picture of a healthy human body.²⁸⁰ This teleological notion of health as optimum functioning that includes nutrition, motion, and intellection explains, I think, the conception that health is something that arises from within the body, rather than being given to it from without (*i.e.* from a pill). The imbrication of cognition in bodily health suggests that our own beliefs and intentions are fundamental to our health. This can help to explain the phenomena of the placebo, which is well recognized but totally undertheorized in Western medicine (Lipton, 2007). Furthermore, it shows why our habit of giving over responsibility for our health to physicians and other medical practitioners is one of the most malicious features of Western medicine. Our own minds have an access to our bodies that no one else has, and our willingness to cognitively know and engage with our bodies is a prerequisite to good

²⁸⁰ Something like this holistic picture of human functioning is the basis of psychologists Ryff and Singer's multi-faceted definition of health as an individual life that is characterized by aspects such as self-realization or purposeful activity, quality connection to others, and positive self-regard and mastery. This is an interesting attempt to formulate health in terms of the goods of human life as a whole, although it does not pay a lot of attention to the role of the body to health in this broader sense (1998).

health. This is why nearly every alternative to Western medicine begins with the premise that there is an inherent connection between self-care, self-responsibility, self-knowledge, and health (Fallon, 1999; Kaptchuk, 2000; Rankin, 2013; Trivieri, 2001; Weed, 2003).²⁸¹

Finally, the notion of health as a *telos* shows us that health is the horizon and tendency of all life. Health as the *telos* of human bodies is an activity, an excellent completion of functioning. This is the opposite of a state that we can take as a given, as dominant models that construe health as “the absence of disease” do. It is imperative that we positively theorize health, and not just disease. Healing as the manifestation of the body’s desire for health has much to teach us, although currently Western medicine overlooks and takes this phenomenon for granted, focusing instead on disease and illness. Health as a *telos* is also never a fixed or accomplished state. This means that bodies are never as healthy as they can be, but rather are always desiring to move towards health, toward excellent/optimum functioning. Furthermore, health is relative to the materiality of each body. Bodily realities and changes determine each body’s possibilities for health. My body’s structure and material potencies changed, for example, when I had corrective back surgery for scoliosis. Although this surgery permanently reduced the range of motion I have in my spine, the result is not that my health is permanently impaired, but that health as the active excellence of my body’s functioning has taken on a different form. Health is thus never permanently achieved or lost; rather, each body’s contingent, historical, material realities condition what health can be for it. We can therefore conclude by defining a teleological notion of health as *an objective horizon of active*

²⁸¹ This connection is also related to Illich’s notion of health as responsibility to self and others (1982, pp. 105–7).

being and functioning that is relative to and dependent on the dynamic material processes and potencies specific to each body.

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Chapter 7

Permeable Bodies: Deleuze and Guattari and Environmental Medicine

When we recognize that human bodies are directly affected by their environments, we are forced to acknowledge that humans are not simply agents of environmental change but also objects of that change. Conversely, the environment is more than an object upon which change is enacted; it is also an agent of sorts that acts upon the bodies inhabiting it. As landscapes can be investigated to uncover the effects of certain human actions, human bodies- their symptoms and diseases – become sites for investigating the quality and effects of certain landscapes.

- Linda Nash, *Inescapable Ecologies*, p. 8

Deleuze and Guattari's Permeable Bodies

Chapter 7 concludes with a teleological definition of health as *an objective horizon of active being and functioning that is relative to and dependent on the dynamic material processes and potencies specific to each body*. This definition, however, grounded as it is in Aristotelian conceptions of biological causation in living things, does not yet take into account the insights we gained from Deleuze and Guattari's conception of matter. In this chapter I develop the implications of one particular aspect of Deleuze and Guattari's account of dynamic matter for thinking about health: permeability. As we saw in Chapters 4 and 5, for Deleuze and Guattari, all matter is constituted by its relations with other matter through assemblages and flows. Through stratification, matter always

exists in a web of relation with other matter, each strata being influenced by and influencing its internal and external (epi- and para-) strata (1987, pp. 50, 72–3). All bodies, including human bodies, are assemblages that instantiate and create relations between and organization of various strata, both internal and external. As such, they communicate between and organize strata as well as mediate between them and the disorganizing force of the body without organs that is always at work in matter (1987, p. 71). Assemblages fundamentally exist in relation to other assemblages, which means that living bodies are also taken up by and relate to other assemblages.

From the perspective of Deleuze and Guattari, therefore, matter's relationality is so constitutive of bodies that they are literally unthinkable apart from the strata and other assemblages that they organize, relate to, and of which they form a part. They certainly cannot be understood in isolation or as self-enclosed entities, as modern Western thought has attempted to think them. Two simple examples serve to show that the concepts of epi- and para- strata are easily applicable to human bodies.²⁸² For example, human bodies serve as “parastrata” to the host of living organisms that exist within our guts, which as we are learning now, are crucial to our good health, not only digestive but also physical

²⁸² This is unsurprising, since this conception of the symmetry between the body and its internal and external environments is already present in the work of Georges Canguilhem, one of the most important influences on Deleuze's thought. As Canguilhem writes, “From the biological point of view, one must understand that the relationship between the organism and the environment is the same as that between the parts and the whole of an organism. The individuality of the living does not stop at its ectodermic borders any more than it begins at the cell. The biological relationship between the being and its milieu is a functional relationship, and thereby a mobile one; its terms successively exchange roles. The cell is a milieu for intracellular elements; it itself lives in an interior milieu, which is sometimes on the scale of the organ and sometimes of the organism; the organism itself lives in a milieu that, in a certain fashion, is to the organism what the organism is to its components” (2008, p. 111).

and mental health.²⁸³ Similarly, the earth and our natural environment, including soil, plants, water, and many other organisms, form the “epistrata” of our bodies, without which our existence as *living* bodies would be impossible. The constitutive relationality of human bodies with their environment is evidenced by every life-giving breath we take. The dynamic interactions that create these relations are also evidence of the affect and underdetermination of bodies; they show how all bodily becoming and capacities are influenced by interactions with other strata and assemblages. These dynamic, relational, constitutive interactions I gather together under the umbrella term *permeability*. Unlike the modern Western body, which is bounded by its skin, *permeable* bodies are characterized, shaped, and defined by necessary, constant interactions with their environments. In this chapter I explore some ways that contemporary research and thinking about health engages with bodies’ permeability, and discuss the implications of permeability for medical epistemology and theory.

Health and place

One preliminary way that we can see this permeability at work in living bodies is in their significant, mutually constitutive relationship with place. Because bodies are constituted by their relations with their environments, they cannot be separated from the place(s) in which they exist. As Ed Casey puts it, “We are bound by the body to be in place” (2009, p. 104). Because of living matter’s permeability, those places are also constantly exerting an influence on our bodies.²⁸⁴ Our matter forms assemblages and

²⁸³ See *De Cruz et al., 2014; Farmer, Randall, & Aziz, 2014; Ferguson, Shelling, Browning, Huebner, & Petermann, 2007.*

²⁸⁴ This is why, as Illich argues, the environment is the primary determinant of general human health (1982, p. 6)

flows with the earth, the air, water, and other living creatures. As we saw in Chapter 6's discussion of affect, each assemblage's affects, or capacities to change and be change, of each assemblage, including body assemblages, are also determined in intensive relations of proximity or location. This means that the material capacities and agency of each body must be understood in relationship with their environments. In other words, health is inseparable from the relationship between bodies and place.

In contemporary society we can see a resurgence in consideration for the relationship between place and health.²⁸⁵ Contemporary medical geography and health geography seek to explore locally- determined aspects of medicine, including both justice-related questions of access and care and the role of place and environment in

²⁸⁵ I say resurgence because this perspective is not unique to our historical moment. As Linda Nash chronicles in *Inescapable Ecologies*, until the nineteenth century, Western medicine recognized this relationship as constitutive of what health is for bodies. She contrasts the 'modern' conception of the body, with the understanding of the body that preceded it, which was thoroughly situated within and a part of in its environment. As she demonstrates, the 'modern' notion of the body as somehow self-contained and separate from the world is actually a historical aberration contemporary. Configurations of environmental health movements and environmental medicine have much in common with those older views of the body. Throughout the nineteenth century in the United States and around the colonized world, even as the biomedical model of the body was gaining prominence, theories of miasma and climatotherapy conceived of the body as embedded in and vulnerable to its environment. In conjunction with these views, public health experts and sanitary engineers also acknowledged the imbrication of human health with the natural environment, working to create land that was conducive to human health, for example, in the efforts to control and eradicate diseases like malaria, cholera, and typhoid. With the arrival of germ theory and laboratory medicine, Western biomedicine during the twentieth century sought to theoretically detach the human body from its surroundings, but these connections remain salient, especially in the domain of public health.

human health (Brown, McLafferty, & Moon, 2009; Kearns, 1993).²⁸⁶ These approaches recognize that bodies and places exist in mutually constitutive relationships. Our influence on the places in which we live is undeniable, and much of the environmental movement is oriented toward defining and evaluating the effects our lifestyles and choices and modes of production are having on the places we live, work, and play.

These myriad interactions between human health and landscapes are at the heart of an international movement to promote urban health (“American Planning Association: Healthy Communities Through Collaboration,” 2013, “Design for Health,” 2013; WHO Europe, 2014). This movement focuses on “urban sustainability”, a term which emphasizes the relationship between the health of the land and human health, both as individuals and as communities (“Center for Urban Health,” 2011). It also engages with the “built environment,” a term that highlights the role humans play in shaping the places in which we live.²⁸⁷ The Urban Land Institute, for example, promotes principles of urban planning that make the health of the community the goal and create designs that ensure that people have just access to health care, green spaces, fresh, healthy food, and physical activity (Eitler, McMachon, & Thoenig, 2013). The impact of access to green spaces on human health in urban cities has also become an issue of significant scholarly import. For example, many studies suggests that access to green space may be beneficial for mental health, most likely because of the opportunities for physical activity that these spaces provide (Astell-Burt, Feng, & Kolt, 2013; Astell-Burt, Mitchell, & Hartig, 2014; Lee & Maheswaran, 2011; see also

²⁸⁶ The interdisciplinary journal *Health and Place* displays a wide array of work on this subject: <http://urbanhealth.jhu.edu/>

²⁸⁷ See “Built Environment and Public Health Curriculum,” 2014; Jackson, Richard J., 2013; National Center for Environmental Health, 2011; Toronto Public Health, 2013.

Nutsford, Pearson, & Kingham, 2013; Richardson, Pearce, Mitchell, & Kingham, 2013). Green spaces have also been associated with positive birth outcomes such as higher preterm birth weights and decreased likelihood of small gestational age (Hystad et al., 2014). This same permeability of our bodies that makes them able to be sustained by healthful aspects of the natural environment like green spaces, however, also makes bodies deeply vulnerable to malicious influence from the environment. In fact, studies of the relationship between place and human health largely focus on the negative impacts of the built environment on human health. One important and still poorly understood influence that cities have on human health occurs through air pollution. Air pollution can contribute to a wide variety of negative health outcomes, including heart and lung disease and asthma. Lack of access to fresh food and an overly sedentary lifestyle induced by communities built around cars, rather than human bodies, are also believed to be environmental causes of obesity, heart disease, and diabetes, both in urban and rural areas (Goodman, Brand, & Ogilvie, 2012; Mobley et al., 2006; Pasala, Rao, & Sridhar, 2010; Stewart et al., 2011; Tamosiunas et al., 2014). It is becomingly increasingly clear that these problems transcend the allopathic/biomedical approach that confines the disease to the individual body and require a public health/communitarian intervention (Booth, Pinkston, & Poston, 2005; Raun, Ensor, & Persse, 2014).

Rural environments also present serious health threats to the human bodies that work in and inhabit them. Soil, air, groundwater, and other nearby bodies of water of land used for farming are often heavily contaminated by the pesticides used to promote crop growth or impair pests, and natural gas drilling done in rural areas puts drinking water and air quality at risk (Holzman, 2011; Kröger, Moore, & Brandt, 2012; McKenzie,

Witter, Newman, & Adgate, 2012; Otieno, Lalah, Virani, Jondiko, & Schramm, 2010). Chemicals used in production leach through soils and waterways into the ocean, where they build up in the bodies of the sea animals we eat and make their way back into our bodies as well.²⁸⁸ The oceans are filled with the residue of our industrial agricultural production techniques, as well as trash and plastic residues from our consumer lifestyle (Barnes & Milner, 2005; Michael H. Fulton et al., 1999). While the mechanistic conception of our bodies inclines us to think that these environmental changes do not have an impact on our bodily health, permeability reminds us that this is false. We influence our environments, through our choices, practices, and habits, and these environmental changes also exert an influence on our bodies and our health.

Environmental Medicine

Several contemporary medical frameworks take into account and address the permeability of bodies as a component of health and illness. For example, environmental medicine, an under-recognized and controversial branch of allopathic medicine, studies the relationship between our environments and disease. The human body is permeable, not only to what we inhale, ingest, and absorb through our skin, but also to many kinds of energetic influences, including changes in temperatures, and electromagnetic fields.²⁸⁹

²⁸⁸ Methylmercury contamination in seafood, for example, is a major health concern (Chen, 2012; Karimi, Fitzgerald, & Fisher, 2012; Oken et al., 2005; Sagiv, Thurston, Bellinger, Amarasiriwardena, & Korrick, 2012). Experts estimate that up to two thirds of the mercury in the oceans comes from “human” sources like coal combustion (“Mercury in Seafood Overview,” 2014; Safina, 2014).

²⁸⁹ This approach to medicine is also sometimes called clinical ecology or ecological medicine, names that emphasize the systemic and interconnected nature of bodies as inclining medical practice and institutions toward viewing health holistically (“British Society for Ecological Medicine,” 2014; Oberg, 2010; Raffensperger, & Schettler, 2002).

Environmental medicine studies how these interactions with environmental influences shape the becoming of the body. In contrast with the modern, self-enclosed body we discussed in Chapter 3, the body acknowledged by the American Academy of Environmental Medicine is dynamic, changing, and in constant interaction with its environment. As Gary Oberg writes in the AAEM official “Overview of Environmental Medicine”,

The model of Environmental Medicine is based on the growing appreciation that the human body is constantly coping with its dynamic environment by means of a number of inherited, built-in, complexly interacting, and usually reversible biologic mechanisms and systems. These systems are designed to maintain overall homeodynamic (not homeostatic) functioning among all biological mechanisms. Their ongoing adjustments are unique to the individual and change continually over time. According to this model, substances in the diet or environment are appreciated as being potential stressors, capable of contributing to destabilization of homeodynamic functions, therefore causing disease. (2010, p. 1)²⁹⁰

An illustrative example of the difference between these two approaches can be seen in the case of allergies. Because allopathic medicine does not offer a robust explanation for the causation of allergies, it generally defaults to merely treating the symptoms through pharmaceutical histamine inhibitors. Since the middle of the twentieth century, on the other hand, physicians like Theron C. Randolph have been arguing for a more holistic, interactive notion of causation in allergic response. This approach insists that we can understand why the body reacts allergically and help it to retrain it to respond otherwise. According to Randolph, allergies are the result of an interaction between the

²⁹⁰ The clinical and theoretical origins of this conception of illness are varied. According to this official AAEM overview, “This model has its roots in the ancient traditions of both western and eastern medicine. In more recent times it has been influenced by research on the physiologic effects of prolonged exposure to cumulative stresses (Selye, 1946) (Randolph, 1962), by systems analysis (Bertalanffy, 1950), and chaos theory (Capra, 1996)” (2010, p.1).

body's natural protective functions and its environment. Under conditions of physiological and emotional stress, or in the case of high or repetitive exposures, the body can develop patterns of overreaction reactions to substances. Since allergies, according to this model, are both responsive and dynamic, they can also be both prevented and healed. According to these approaches, treating and curing allergic responses involves minimizing and sometimes eliminating exposures, as well as retraining the body's responses (Fourman, 2013; Randolph, 1990).

Research oriented toward investigating the connections between health and illness and the environment is proliferating. The impact of environmentally-present chemicals on human health are of particular concern. These substances are now ubiquitous in our environment, our food and its packaging, our air, the fabric of our clothes, bedding, and carpeting, and the cosmetics and other products we put on our skin. The dogma of Western medical understanding is that with few exceptions, each of these substances has a threshold of "safe" exposure, below which it causes no harm to living human bodies. Chemical and heavy metal exposures *over* EPA "safe" limits are widely recognized to cause a wide range of illnesses, including neurological disorders like Parkinson's, blindness, cancer, birth defects, etc. ("Breast Cancer and the Environment," 2011; Clapp, Jacobs, & Loechler, 2009; Dick et al., 2007; Rosin, 2009; Seneff, Davidson, & Liu, 2012; von Ehrenstein, Aralis, Cockburn, & Ritz, 2014). Beneath this level, however, the assumption is that the human body either does not react to the presence of the substance or can effectively defend itself from the dangers the substance would pose if present in

greater quantities.²⁹¹ This model inhabits a curious gray zone between mechanistic and environmental conceptions of the body. Clearly, the body is permeable, but only when its defenses are overwhelmed, so to speak, by a certain, significant quantity of the substance.²⁹²

How are these safe levels determined? Methodology is crucial here and methods for deciding on safe levels of exposure are historical artifacts that are subject to review and revision. Currently, and around the world, safe limits are calculated using a method called the Benchmark Dose Method (BMD). Through statistical analysis of experimental data, the lowest limit of exposure, at which a particular low level “benchmark” response can be expected, is determined (also called the BMDL). The experimental data analyzed are most often studies done on animals, usually mice or rats, undertaken in a lab under tightly controlled conditions. BMD calculations therefore include attempts to mathematically reckon with variables of *uncertainty*, compensating (usually by factors of 10) for aspects like the effect of moving from animals to humans, the variable of individuality or differences between bodies, and the change from a one time or “subchronic” exposure to a chronic exposure (Hayes, 2001). There are various

²⁹¹ The No Observed Adverse Effect Level (NOAEL) method of testing in toxicology considers that some substances are carcinogenic or genotoxic in a linear way, which means that there are no truly safe exposures. The BDM has nearly universally replaced NOAEL, because it is less dependent on study design and has statistical mechanisms for coping the uncertainty factors, discussed below (Barlow et al., 2009).

²⁹² It is my belief that most people think that their bodies are not permeable to the chemicals in their environment. The notion that a paraben, a chemical ingredient of most body care products, is likely to end up stored in the fatty tissues of our bodies is foreign to most of us. This ignorance inclines us to not question how chemical safety is determined, whereas for researchers in toxicology this is an issue of pressing epistemological, ethical, and political importance. I discuss these latter aspects of the issue in more detail in the conclusion to the dissertation.

mathematical models that are used to determine the BMD, chosen based on their efficacy for predicting responses and the biological plausibility of what they predict. They all rest, however, on a common assumption and method. The assumption is that there is one limit under which the substance in question provokes no adverse response and over which it provokes a predictable adverse response, and the method is to isolate substances to test them.²⁹³

Environmental health researchers challenge both the premise and the method that undergird the BMD. First, with regard to the premise, they argue that there are in fact several different thresholds at which the body reacts to chemicals. In particular, research suggests that both very minute quantities and very large quantities pose significant risks to the body. This means that bodies do not respond in linear ways to dose quantities. In the absence of a linear pattern of response, the benchmark dose as a method for determining safety is unreliable (Vandenberg et al., 2012). Second, in respect to the method, researchers argue that exposures do not function mechanistically, but synergistically; in other words, the organism might tolerate a particular level of one chemical alone, but exposure to other chemicals might make the organism more sensitive or vulnerable as a whole. Rather than testing levels of exposure for each chemical individually, therefore, we need to consider the total load of exposure, or chemically-created stress, on the body (Alexeeff et al., 2012; Daughton & Ternes, 1999; Meehan, August, Faust, Cushing, Zeise, & Alexeeff, 2012; Montague 2014; Wason, Smith, Perry, & Levy, 2012). Proponents of alternative threshold and cumulative load theories argue

²⁹³ Furthermore, as obvious from this discussion, these methods compensate for lack of empirical data with mathematical calculations, a strategy I critique as well in Chapter 6 as not able to do justice to the concrete realities of human bodies.

that chemical exposures under the currently derived safe limits contribute to a wide range of health issues not commonly recognized as caused by chemical exposure, including chronic fatigue, Parkinson's and Alzheimer's, autism, and depression (Allen et al., 2014; Bell, Baldwin, & Schwartz, 1998; Casida et al., 2014; DeKosky ST & Gandy S, 2014; Fleming, Mann, Bean, Briggie, & Sanchez-Ramos, 1994; Fleming et al., 1994; Fonken et al., 2011; Gorell, Johnson, Rybicki, Peterson, & Richardson, 1998; Kang, Natelson, Mahan, Lee, & Murphy, 2003; Pall, 2007; Priyadarshi, Khuder, Schaub, & Shrivastava, 2000). Their argument implies that we overlook the chemical causes of these conditions because our approaches fundamentally misconstrue the nature of the permeability of the body to environmental influences, which is much more essential and much more dynamic than we have understood it to be.

One of the most important areas of research into the impact of environmentally-caused illness involves a particular class of chemicals called endocrine-disruptors. Currently, over 900 endocrine disruptors have been identified. They are present in almost everything we interact with on a daily basis, including pesticides, flame retardants, sunscreen, solvents, plastics, cleaning supplies, food additives and packaging, and cosmetics (Braun et al., 2014; Heindel et al., 2013; Soto, 2013). These substances permeate the body through the skin, lungs, and digestive organs, and very often they remain in the body, accumulating especially in fatty tissues. Bisphenol A (BPA) is an example of an endocrine disruptor that has gained a lot of attention in the popular press. It is present in many plastics and in the packaging of canned food.²⁹⁴ According to some estimates, over 90% of people in industrial societies have BPA in their blood and/or

²⁹⁴ The media hype over the presence of BPA in so many bodies is why we now see a trend to sell bottles made with other chemicals, now labeled as "BPA-free."

urine. While some argue that the presence of BPA and other endocrine disruptors in the body does not mean that they are causing harm, research in environmental medicine demonstrates that these substances interfere with the production and processing of hormones in the body, both augmenting or diminishing their presence and/or reception. These disruptions or interferences have a wide range of effects on the body, impacting fertility, mood, metabolism and weight, cardiovascular, immune, and cognitive function, and fetal and sexual development (Beydoun, Khanal, Zonderman, & Beydoun, 2014; Bhandari, Xiao, & Shankar, 2013; Braun et al., 2014; Doherty, Bromer, Zhou, Aldad, & Taylor, 2010; Eugen Dhimolea et al., 2014; Hengstler et al., 2011; Chevrier et al., 2012; Ko et al., 2014; Li et al., 2011; N'Tumba-Byn et al., 2012; Nerin et al., 2014; Thayer, Heindel, Bucher, & Gallo, 2012; Vandenberg et al., 2012; vom Saal, Nagel, Coe, Angle, & Taylor, 2012). The effects of endocrine disruptors vary in each individual body, and they also have particular life-stage specific effects. There is even evidence that these effects occur epigenetically, or transgenerationally (Anway, Cupp, Uzumcu, & Skinner, 2005; Bernal & Jirtle, 2010; Crews, 2008; Dhimolea, et al., 2014; Doherty et al., 2010; Heindel et al., 2013; Hochberg et al., 2011; Wolstenholme, Rissman, & Connelly, 2011).

Endocrine disruptors are particularly challenging to the models of the body that have dominated Western medicine and toxicology. Because of the complex ways they interact with hormone function and all the hormones do in the body, they are a primary example of how the effects of chemical exposures on bodies follow non-linear patterns. As discussed above, this means that we need to take into account the impact of various kinds of doses, including the possibility that a small dose exposure might have a stronger impact than a large one, and the reality that chemical influence on hormone function

often creates synergistic feedback loops that also undermine linear models. Endocrine disruptors also challenge us to think in more dynamic ways about the developmental timing of the body, since endocrine disruptors interact differently with the body at different developmental moments. Research into endocrine disruptors thus shows why we need to integrate concepts like “timing of exposure,” “organizational versus activational effects of contaminants,” “additive and synergistic effects,” and “nonmonotonic dose response curves” into both toxicological and overall medical understandings of environmentally caused illness (Krimksy, 2001, pp. 132–3). The complexity of causality implicit in these concepts shows that we need a much more dynamic, interactive notion of the living body and its interactions with environmental influences. This research also suggests that we do not have enough protections and safeguards established to ensure that human health is not being adversely affected by these substances.²⁹⁵

Another highly controversial area of research investigates the impact of the environment on human health of electromagnetic fields (EMF) and the radiofrequency radiation (RFR) they emit. Researchers are especially concerned about the effects of the frequencies put out by the multitudes of electric devices that fill our contemporary environment: cell phones, laptops, cell towers, smart meters, Wi-Fi routers, etc. It has long been widely recognized that large amounts of radiation from radon, nuclear

²⁹⁵ Because of the health risks posed to humans, animals and the environment by widespread exposure to endocrine disruptors, mounting evidence for significant disruption of hormone systems, especially rises in mammalian (including human) reproductive disorders and birth defects, and the complexity of the mechanisms of interaction between endocrine disruptors and bodies, in 2013 the European Union called for new, comprehensive standards for protection, testing, and labeling of these substances (Westlund, 2013).

exposures, and devices like x-ray machines can damage the body.²⁹⁶ Experts in environmental medicine, however, are also concerned about the health effects of the smaller exposures, such as to the electric frequencies emitted by commonly used technological devices, on human bodies. These devices are generally assumed to be safe, because institutions like the Federal Communications Commission officially declare them to be so.²⁹⁷ Recent research, however, seriously challenges the idea that they truly have no negative influence on human bodies.

For example, even though there are a number of well-publicized studies that find no evidence for a causal link between cell phone use and brain cancer, there is also a large body of research that shows there is indeed a significant relationship, especially between long term cell phone use and brain tumors (Aydin et al., 2011; Dobes et al., 2011; Han, Kano, Davis, Niranjana, & Lunsford, 2009; Hardell, Carlberg, Soderqvist, & Mild, 2007; Kheifets, Swanson, Kandel, & Malloy, 2010; Kundi, Mild, Hardell, & Mattsson, 2004; Lönn, Ahlbom, Hall, & Feychting, 2005; Rhexhadevi, Sailaja, Mahboob, Rahman, & Grover, 2009; Schoemaker et al., 2005; Söderqvist, Carlberg, Mild, & Hardell, 2011). For this reason, the International Agency for Research on Cancer (IARC) recently qualified cell phones as a potential carcinogen ("Electromagnetic fields and public health," 2011). FCC safety guidelines actually require "safe distance" of at least 5/8 of an inch between the body and the cell phone. For this reason, all cell phones must

²⁹⁶ This is the principle at work in radiation treatments for cancer, which damage both the cancer and many other aspects of body structure and function. The assumption is that if the cancer is damaged enough, the body may be able to heal itself from the collateral damage it incurs.

²⁹⁷ Exposure rates are determined by the amount of energy the body absorbs when exposed to radiation (the Standard Absorption Rate) ("Specific Absorption Rate (SAR) For Cell Phones," 2011; Wargo et al., 2012).

come with a safety manual that explicitly tells the user to keep the cell phone at least this distance from the body, especially when in use or in Wi-Fi mode. However, many users, and especially men, disregard this warning and carry their phones in their pockets, making the impact of RFR on testicles and sperm a matter of special concern (Avendaño, Mata, Sanchez Sarmiento, & Doncel, 2012; Roychoudhury et al., 2009; Scherer, 2010; Xu et al., 2012). Other sources of RFR such as electrical wiring, cell towers, and laptops have been shown to be detrimental to health, demonstrably causally implicated not only in cancer, including breast cancer and childhood cancer, but also in infertility (particularly male infertility), low birth weight, neurobehavioral complications like fatigue and depression, and immune effects (Avendaño, Mata, Sanchez, Sarmiento, & Doncel, 2012; Bioinitiative Working Group, 2012; Carpenter, 2013; de Vocht, Hannam, Baker, & Agius, 2014; Heinrich, Thomas, Heumann, Kries, & Radon, 2010; Roychoudhury et al., 2009; Wertheimer & Leeper, 1979; Xu et al., 2012).²⁹⁸

So why are these devices officially deemed safe? Environmental health researchers raise a number of important epistemological issues about the way that studies and institutions determine whether exposures to EMF/RFR have negative health implications.²⁹⁹ For one, official safety regulations currently assume that harm is done to the body only through the *thermal* effects of radiation. However, heat is not the only way that that radiation effectuates change living bodies. Many studies have demonstrated that

²⁹⁸ Some research indicates that excessive exposure to RFR can be a contributing cause to autism and ADHD, and physicians have successfully treated these conditions by reducing exposure levels (Singer, 2014).

²⁹⁹ There is a complex interplay between politics, economics, and epistemology in all of the safety issues mentioned in this chapter, which I will address in the conclusion of the dissertation.

low-intensity, non-thermal radiation also affect human tissues, modulating signals, immune function, gene expression, and even rendering more permeable the blood-brain barrier (Bioinitiative Working Group, 2012; Volkow et al., 2011). Because the nervous system and the brain function through electric signaling, the potential for even non-thermal radiation to disrupt the functioning of the body and especially these systems is enormous. For this reason researchers are also investigating the possibility that EMF can cause changes in cognitive and neurological function, especially in children whose neurological systems are much more plastic and still developing, and many have found evidence that it does (Gandhi et al., 2012; Maaroufi et al., 2014; Maier, Greter, & Maier, 2004; Sakhnini, Ali, Qassab, Arab, & Kamal, 2012; Schneider & Stangassinger, 2014). Second, FCC determinations of safe levels of frequency were determined several decades ago through a testing of the (thermal) impact of cell phones on adult male human bodies. Although they cautioned that the same frequencies could have different result on other bodies, especially smaller bodies, like children's, little is known about the differing effects of radiation on younger and smaller bodies, or on women's bodies and on fetuses exposed in utero (Wargo et al., 2012, p. 56). One reason for this is that researchers often study homogenous groups, which may mask existing effects on specific populations or bodies (Regel & Achermann, 2011). FCC levels of safe exposure were also determined by testing exposures that occurred over short periods of time, and thus cannot account for the effect of repeated exposures over the course of many years, especially for babies and children who will be truly exposed throughout their entire lifetimes (Bioinitiative Working Group, 2012). But the strongest evidence for the link between cell phone use and cancer involves long term use, and especially consistent use over ten years or more.

Researchers also theorize that many other effects of EMF exposures do not show up in studies because they are delayed in time and thus not recognized as causally related (Kundi et al., 2004; Regel & Achermann, 2011; Schoemaker et al., 2005). Current SAR rates also do not account for multiple exposures from various devices or for the amplification of EMF that might occur in specific contexts through the medium of the physical environment, including proximity to the body and especially to particularly vulnerable parts of the body (Bioinitiative Working Group, 2012; Luria, Eliyahu, Hareuveny, Margalio, & Meiran, 2009). Finally, some researchers even speculate that it is the intermittent pulses of frequency, rather than the length of exposures, that might be the cause of the biological disruptions demonstrated to occur in the body as a result of exposure to RFR. As Cindy Sage writes,

It may be that we, as a species, are more susceptible than we thought to intermittent, very low-intensity pulsed RFR signals that can interact with critical activities in living tissues. It is a mistake to conclude that the effect does not exist because we cannot explain HOW it is happening or it upsets our mental construct of how things should work. This highlights the serious limitation of not taking the nature of the pulsed RFR signal (high intensity but intermittent, microsecond pulses of RFR) into account in the safety standards. This kind of signal is biologically active. Even if it is essentially mathematically invisible when the individual RFR pulses are time averaged, it is apparently NOT invisible to the human body and its proper biological functioning. (2014, p. 17)

In sum, the human body's permeability to EMF/RFR is only beginning to be understood, and current standards of safe exposures do not do sufficient justice to the many ways that bodies can be influenced by these forces.³⁰⁰

³⁰⁰ This is certainly the case because Western medicine has not thought the body *either* as permeable *or* as energetic, although a proper discussion of this latter is beyond the scope of this dissertation.

The discussion of chemicals and EMF/RFR up to this point may give the impression that the environment largely has a negative influence on human bodies. But this is manifestly not the case. Just because bodies are permeable does not mean that all environmental influences are harmful. On the contrary, even in the case of RFR, a number of experts are exploring possible therapeutic use of non-thermal radiation. Positive effects of RFR have been demonstrated, for example, in treating cancer (Bioinitiative Working Group, 2012; Johnson, Waite, & Nindl, 2004; Pilla, 2013; Saliev, Tachibana, Bulanin, Mikhalovsky, & Whitby, 2014).³⁰¹ Another direction of research about the positive health impacts of environmental factors involves the way that bodies interact with sunlight to produce vitamin D. Because people in industrial societies spend a great deal of time indoors and protect their skin with sunscreen when they go outdoors, vitamin D deficiency is widespread in many populations, even despite widespread supplementation of synthetic vitamin D through foods like milk and processed grain products (Ginde, Liu, & Camargo, 2009). Researchers demonstrate that lack of sufficient vitamin D in the body is likely to be a contributing cause, not only to skeletal health problems, as is widely recognized, but also to such conditions as severe preeclampsia, cancer, Alzheimer's, autism, diabetes, and autoimmune conditions (Baeke, Takiishi, Korf, Gysemans, & Mathieu, 2010; Bodnar et al., 2014; Daga et al., 2012; Devaraj, Yun, Duncan-Staley, & Jialal, 2011; Franchi et al., 2014; Gong et al., 2014; Keeney et al., 2013; Mitri, Muraru, & Pittas, 2011; Mostafa & AL-Ayadhi, 2012). This research indicates that the most basic of environmental exposures, exposure to sunlight, is necessary, not only for the growth of plants and the continuation of the water cycle, but

³⁰¹ This is closely related to the concept of hormesis, which I discuss below.

also as a direct component of bodily health (Mead, 2008). Finally, the concept of hormesis is another promising path for thinking in a more complex way both the positive and negative impacts that chemicals and naturally occurring substances might have on the body in particular amounts. Hormesis refers to a phenomenon in which a substance that would be harmful in a large dose proves to be a beneficial to the organism in smaller doses. The beneficial response provoked by this particular, low-level exposure, called an “adaptive stress response”, is an accepted biomedical phenomenon. Unlike the linear BMD, it calls for a much more subtle, attuned, and precise knowledge of how the body’s permeability conditions its possibilities for health. It also creates new possibilities for understanding alternative methods of treatment. Most notably, the notion of hormesis offers a promising path for understanding the mechanisms by which the controversial homeopathic approach to medicine might function (Bellavite, Chirumbolo, & Marzotto, 2010; Calabrese & Jonas, 2010; Oberbaum, Singer, & Samuels, 2010).

Permeable Bodies: A Challenge to Western Medicine and Science

Despite the enormous public health implications of the aspects of environmental medicine discussed above, environmental medicine occupies a very questionable space in Western medicine. As Nash shows in *Inescapable Ecologies*, both public and occupational health have historically acknowledged and worked with environmentally caused illness. Since its modernization in the twentieth century, however, allopathic medicine has systematically under-theorized and under-investigated the connections between bodies and their environments (2007). Because of its theoretical construal of the

body as a self-enclosed entity, it tends to marginalize and even deny environmental causes of disease and illness. Medical schools do not teach their students about environmentally caused illness, and environmentally caused illnesses have a questionable status in the allopathic medical community.³⁰² For example, multiple chemical sensitivity (MCS), a controversial condition in which exposures to different environmental irritants cause a variety of psychological and somatic symptoms, is not recognized as a legitimate diagnosis by many major U.S. allopathic medical organizations, including the American Medical Association (AMA), the Center for Disease Control (CDC), the American College of Physicians (ACP) and even the American College for Occupational and Environmental Medicine (ACOEM).³⁰³ Similar controversies plague environmental diagnoses of candidiasis, sick-building syndrome, and chronic fatigue syndrome (Council on Scientific Affairs, American Medical Association, 1992; Hampton, 2006; Pall, 2007).

³⁰² A recent study showed that although obstetricians in the U.S. recognize the significance of potential environmental risks during pregnancy, less than 20% of them have been formally trained on the subject. They thus feel unable to provide adequate guidance to their patients and tend to avoid bringing up issues like chemical or mercury exposures (Stotland et al., 2014).

³⁰³ I interviewed Dr. Lisa Nagy, who worked in allopathic emergency medicine for several decades before she became severely ill with an environmentally-caused adrenal fatigue. She told me that her training as an M.D. did not teach her to recognize the ways that environmental exposures can cause illness, for example, the exposures that might come through topical application of substances to the skin, or the ways that food allergies cause sinusitis or fatigue. It wasn't until she was forced by her own condition to seek help from the Environmental Health Center of Dallas that she learned to recognize the impact that exposures to mold, chemicals, and electrical fields can have on health. She also told me that in her experience many allopathically trained doctors are actively hostile towards environmental conceptions of illness. I conjecture that there is a mechanistic ontology of the body implicit in allopathic medical school training that predisposes doctors against giving environmental causes of illness due consideration, but this question is beyond the scope of this dissertation (2012).

Why is the status of environmental causation so controversial in allopathic medicine? This has everything to do with State versus nomad science. Doctors and researchers frequently question studies of environmental illness on the basis of their investigative *methods*. One of the most challenging aspects for environmental approaches to medicine is that the permeability of bodies defies accepted standards for testing and proof in science. As the American College of Physicians' statement paper on clinical ecology explains,

Proof of cause-effect relations between environmental factors and symptoms of "environmental illness" is particularly difficult because clinical ecologists implicate such a broad range of agents, including chemicals, foods, hormones, and microorganisms. Most patients are believed to react to multiple environmental substances by any route of exposure, and some are said to be intolerant to the entire environment, the so-called "total allergy syndrome. (1989, n.p.)

In order to verify something as scientifically "proven" or even "provable", researchers (human agents) must be able to be replicate the phenomenon using tightly controlled and isolated variables.³⁰⁴

This is *most possible* in laboratory conditions and very difficult in real life, especially when a variety of variables are present and mechanisms of causality are unknown.³⁰⁵ Widely embraced Evidence-Based Medicine (EBM) standards require

³⁰⁴ In a fascinating display of State vs. nomadic science, the Texas State Board of Medicine has labeled Dr. Rhea, the founder of Environmental Medicine, a hazard to public health because he refuses to submit his methods to the "gold-standard" of double blind randomized trials (Moran, Foster, & Nightline, 2008).

³⁰⁵ This is one reason why toxicology testing often uses lab tests involving rats or other small mammals, although *in vitro* testing of cultured cells is gaining popularity. Both have serious methodological limitations for proving causality of environmental illness,

testing by double-blind randomized clinical trials that use matched patient-control groups and account for the placebo. These tests (RCT's) are the standard for proving causality in EBM, although recently advocates of EBM have attempted to open up a limited role for evidence gathered from observational studies and physiological rationale, expert opinion, and anecdotal evidence (Worrall, 2010). The dominance of these standards as the only accepted method for scientifically proving causality explain why the FCC, the FDA, and the World Health Organization can currently conclude that there is no scientific evidence that cell phone use causes cancer. Much of the evidence cited above has been gathered through observational studies or through control trials with animals. Because causation through environmental influence is difficult to replicate in RCT's, because observational studies produce inconsistent results, and because there is no consensus about what constitutes acceptable design for either of these kinds of studies, these institutions judge that there is *inadequate evidence* to prove a causal relationship between exposure and disease (see WHO, 2010).

Yet as I hope the previous discussion of empirical research in environmental medicine has shown, this lack of officially sanctioned evidence does not mean that there is no causal relationship between these exposures and environmentally caused conditions. Unfortunately for biomedical science, the permeability of bodies is directly opposed to the principles of randomization, tight control and isolation of variables, and repeatability that form the bedrock of current definitions of scientific proof. Living bodies are not only various, but singular, and exist in constant interaction with their environments. In other words, they are influenced by an infinite number of variables that all interact at once, and

since neither can replicate the conditions of living human organisms in a complex environment.

whose influences on the body are multiple and systemic. RCT's attempt to standardize these various bodies through randomized, double blind trials with supposedly matched control and test groups, while the BDM whisks away their multiple and chronic exposures as statistical "uncertainty factors."³⁰⁶ Yet these elements are precisely what are in question in the causal mechanisms of environmental illness. How do chronic exposures, in concert with other substances, affect human bodies, and especially all different kinds and sizes of bodies? Until we can construe the meaning of scientific proof and evidence in a way that allows us to take the actual and vibrant permeability of life into account, it will be very difficult to prove the claims of environmental medicine in a way that satisfies dominant scientific criteria.³⁰⁷ For this reason, it will also be impossible to have a rigorous science of the ways that the environment influences human health. In this way, environmental medicine, as a nomad science, works to reveal and undermine the Statist pretensions of biomedicine, whose claims to objectivity are predicated on a misapprehension of bodies as mechanistic in nature.³⁰⁸

³⁰⁶ For a rigorous philosophical critique of the epistemological "special powers" supposedly guaranteed by trials involving randomized, matched groups, see Worall 2010.

³⁰⁷ This means that the best evidence we can rigorously gather for environmental causation is precisely through observational studies of living bodies, which is why the Bioinitiative report on RFR/EMF calls for *biologically-based* exposure standards (Bioinitiative Working Group, 2012).

³⁰⁸ An incendiary blog entitled "Science Based Medicine," run by two doctors, is symptomatic of these Statist pretensions. In the name of "objective science," each entry discredits a different alternative approach to medicine. The authors dismiss a wide variety of medical practices, from Reiki, Traditional Chinese Medicine, Chiropractic, and Naturopathy to "integrative oncology" and medical marijuana use, supposedly because each fails to meet the standards of scientific proof. They present their approach as being rigorously scientific, while other approaches are naïve and "fail to ask the hard questions." (Novella & Gorski, 2013).

The unfortunate fact is that modern Western science, in thinking human organisms as somehow separate from nature, has created deep epistemological barriers to knowing and understanding the reality of human bodies. The public health implications of this misconstrual are enormous. Because our matter is deeply permeable (meaning: dynamically relational, interactive, and underdetermined), biomedicine cannot properly understand or promote health if it continues to conceive of the body as a self-contained unit that ends at the skin. Bodies are constituted by their relationships with their environments, utterly dependent on and thus vulnerable to environmental influences. This implies an entire ecology of medicine that requires a complete reorientation in how we theorize, prevent, and treat disease, including how we understand immunity.³⁰⁹

Permeability also posits human health as inseparable from the health of the water, soil, plants, animals, and even other people with which and with whom human bodies interact. This indicates that ecologies of the environment are inseparable from medicine, an implication whose political and ethical import I discuss in the conclusion to the dissertation.³¹⁰ Until we learn to see human bodies as embedded in and vulnerable to the

³⁰⁹ According to Ed Cohen, dominant twentieth century models of immunity are based on modern political concepts like autonomy, defense, and sovereignty. However, an environmental and ecological conception of the body requires that we think of immunity as something other than defense and war (2009, p. 8). He cites Polly Matzinger's "Danger Model", which rests on metaphors of harmony, habitats, and communal life, as one of the few existing alternative frameworks for thinking immunity (p. 29, see Matzinger, 2001).

³¹⁰ The permeability of matter also extends to its relationship with mind and psyche. The dynamic relationality that characterizes the mind-body connection is extraordinarily complex, and a full discussion of it is beyond the scope of this dissertation. However, it is worth noting here that recognition of this aspect of matter's permeability opens the door to more robust and integrated understandings of phenomena like the placebo effect, self-healing, and psychosomatic illness. We have already seen in Chapter 2 how a willingness to rethink the relationship between mind and body enables Elizabeth Wilson to open up

world, we will never fully understand health. In this sense, we can amplify the discussion of health developed in Chapter 7 to be defined as *an objective horizon of active being and functioning that is relative to and dependent on the dynamic material processes and potencies specific to each body as it exists in vulnerable and dynamic interaction with its environment.*

new and revolutionary possibilities for understanding and treating condition like depression and anorexia. This kind of revolution in healing possibilities, and many others, awaits Western medicine when it learns to think the body as permeable.

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Chapter 8

Teleology + Permeability: Putting It All Together

It is a regrettable characteristic of the Western mind to relate expressions and actions to exterior or transcendent ends, instead of evaluating them on a plane of consistency on the basis of their intrinsic value. For example, a book composed of chapters has culmination and termination points. What takes place in a book composed instead of plateaus that communicate with one another across microfissures, as in a brain? We call a 'plateau' any multiplicity connected to other multiplicities by superficial underground stems in such a way as to form or extend a rhizome.

- Deleuze and Guattari, 1987, pp. 21–2

Introduction

This final chapter brings Aristotle and Deleuze and Guattari into conversation at last. In the previous five chapters we have seen that for both, matter is thoroughly and irreducibly dynamic. In both cases, their views of dynamic materiality lay crucial groundwork for rethinking both the materiality of the living body and how we define what health means for these bodies. From this perspective we can envision them to be partners in a common project. As we saw in Chapters 4, 5, and 7, Deleuze and Guattari's account of matter shows it to be thoroughly permeable, existing in varying relations of

mutual influence. The advantage of this account is that it both enables matter to be characterized first and foremost for its flows, and shows how these flows take on definite, concrete forms of organization that have both recognizable patterns and stability through time. An understanding of matter as permeable thus allows its relationship with environmental influences to come to the fore. Aristotle, on the other hand, focuses on teleological causation as an explanation for recognizable, time-bound patterns. As we saw in Chapter 7, this teleological notion, even in its most basic form as an explanation for the causal processes of nutrition, has much to teach us about the nature of nutrition and health.

In light of the evidence presented in the previous two chapters, it would be common sense to try to understand living bodies as both teleological and permeable. Indeed, this is what I have done in presenting, in the conclusion to the last chapter, a definition of health that is conditioned by a body both teleological and permeable: *an objective horizon of active being and functioning that is relative to and dependent on the dynamic material processes and potencies specific to each body as it exists in vulnerable and dynamic interaction with its environment*. But although I am convinced that we must take both of these conceptual poles into account in order to formulate robust definitions of health, things are, theoretically speaking, not so simple. There are important philosophical reasons why Aristotle prioritizes *internal* causation (teleology) and Deleuze and Guattari prioritize *interaction* (permeability), and these reasons seem to put these conceptions at odds with one another. The permeability of bodies indicates that bodies are neither self-enclosed nor self-defined, while teleology precisely posits bodily causation that is self-regulated and self-defined.

In order to preserve the dynamism and interactivity of matter in its various transformations, Deleuze and Guattari reject organismic and teleological explanations, opting instead to explain matter's motion solely in terms of patterns and sedimentation of interaction. The significant shared conceptual space that exists between Deleuze and Guattari's and Aristotle's dynamic conceptions of matter, however, can be easily overlooked. This chapter explores both the differences and the overlap between their conceptual frameworks. Since these notions are not simply hermeneutical, but ontological, to claim that bodies are both permeable and teleological puts us at the intersection of these two competing ontological tendencies. The question of whether the locus of determination of bodily change lies is internal or external to the living body is a fascinating and crucial one for defining health. Are bodies determined primarily by the network of relations in which they participate, or by something within themselves? This disjunction of relational *or* internal causation is not particularly helpful for finding a solution to what Deleuze might call the problem of health, but it does help us frame the range of conceptual possibilities encapsulated between these options. In the end, I argue that we must find a way to understand both tendencies as playing a constitutive role in the body. This conjunction of teleology *and* permeability helps us to frame an important middle ground in how we approach living bodies and health. I conclude by pointing to a few provocative, alternative conceptions of health and medicine that manage to account for both of these tendencies.

Shared conceptual space

Let's begin by highlighting the significant agreement that arises between Aristotle and Deleuze and Guattari about the nature of matter, in light of their views discussed in

Chapters 4-6. Both Aristotle and Deleuze and Guattari agree that matter is always matter in motion and seek to analyze and explain the sources of matter's changes. For Aristotle, matter is dynamic because it is in itself a source of change and motion. Deleuze and Guattari characterize matter's motion in terms of nomadism and transformation. The potencies of matter, and particularly its ability to affect changes and be affected, also play a pivotal role in their philosophy. For Aristotle, as we have seen, matter provides the potencies that natural and living things enact in their activity and ends (*entelecheia* and *telos*).³¹¹ Similarly, although the word potency does not occur in *A Thousand Plateaus*, the notion of capacity is also central to Deleuze and Guattari's conception of matter. Throughout *A Thousand Plateaus*, Deleuze and Guattari use *puissance*, one of several French words rendered into English as *power*, to refer to the range of dynamic capacities of a material body.³¹² As Brian Massumi notes in his translator's introduction to *A Thousand Plateaus*, *puissance* references a particular range of affective *potencies* or capacities immanent to matter.³¹³ The term *puissance* is used in *A Thousand Plateaus* to designate material capacities for variation, becoming, escape, deterritorialization, vectors

³¹¹ See Chapter 3 footnotes 19 and 32 for a discussion of Aristotle's notion of *dunamis* (potency).

³¹² They describe metal's capacity for transformation, for example, as the immanent *puissance* of corporality within all matter: "The relation between metallurgy and alchemy reposes not, as Jung believed, on the symbolic value of metal and its correspondence with an organic soul but on the immanent power [*puissance*] of corporeality in all matter, and on the esprit de corps accompanying it" (1987, p. 411). Also see 1980, p. 512.

³¹³ "It [*puissance*] has been defined by Deleuze as 'capacity for existence', a capacity to affect or be affected,' a capacity to multiply connections that may be realized by a given 'body' to varying degrees in different situations. It may be thought of as a scale of intensity or fullness of existence (or a degree on such a scale), analogous to the capacity of a number to be raised to a higher 'power.' It is used in the French translation of Nietzsche's 'will to power'" (p. xvii).

of flight, as well as matter's capacity to create and sustain connections, to change and be changed (pp. 101, 106, 109-10, 134, 152). Deleuze and Guattari also directly correlate *puissance* with affect.³¹⁴ Affects constitute an assemblage as what it is by acting on and changing its capacities to affect change.³¹⁵ It is not a stretch, therefore, to understand affect as the capacity to undergo and effectuate change. This definition is nearly identical to the understanding of potency (*dunamis*) employed by Aristotle to account for matter's dynamism (*Met.* IX, 1, 1046a4-1046a11 and IX, 8, 1049b3-1050a14). Affect is therefore intimately related to potency and provides a central point of connection between Deleuze and Guattari and Aristotle.

We could say that Deleuze and Guattari go one step beyond Aristotle by situating potency or affect in a localized network of relations (1987, pp. 256–60). Affects are relational. Their relationality is what makes Deleuze and Guattari's matter so permeable. It influences but is also open to influence; the same affects that cause change are also susceptible to being changed. The correspondence of affect to localized relations of elements also means that affects are always in a particular place. We cannot think of capacities for undergoing and causing change apart from their particular location. This embeddedness in permeable relations in particular locations means that affect is immanent, not just to individual assemblages, but to the dynamic flows of matter between and with assemblages. For this reason, as we saw in Chapter 8, Deleuze and Guattari's

³¹⁴ Remember that Deleuze and Guattari also refer to affect as latitude. They write, "Latitude is made up of intensive parts falling under a capacity (*puissance*), and longitude of extensive parts falling under a relation" (pp. 256-7, emphasis mine).

³¹⁵ "To the relations composing, decomposing, or modifying an individual there correspond intensities that affect it, augmenting or diminishing its power to act" (1987, p. 256).

understanding of matter's dynamism sets the stage for a rigorously environmental or ecological understanding of health and living bodies.

Yet as we saw in Chapters 4 and 7, according to Aristotle, matter provides potencies for natural and living things. Although he does not explicitly theorize the permeability of natural things to various material influences, matter's permeability is not inconsistent with his view of natural causation. For example, his account of the relationship between matter and necessity in biology indicates that he realizes that both external and internal material contingencies are capable of intervening in and changing the natural teleological course of biological development (González, 2010; Gotthelf, 1985). Rather than focusing on the influence external causes, like Deleuze and Guattari, however, Aristotle narrows in on the internal causes of living bodies. Aristotle is not content to rely only on material *potencies* to explain reality. On the contrary, he argues that in explanation, activity is more important than potency. Living potencies, the potencies for life, cannot be understood apart from their activities, which are in turn determined by their ends. Without an understanding of the ends, neither activities nor potencies can be fully understood. Explanatory priority is thus accorded to these ends.³¹⁶ For Aristotle, *dunamis* cannot be understood apart from *telos*.

Divergences that converge

It is highly significant that Deleuze and Guattari focus on permeability, or the openness of entities to influence from both within and without, while Aristotle focuses on teleology, or causation from within. Deleuze and Guattari believe that their account of relational material causation is premised precisely on a rejection of teleological reasoning

³¹⁶ *De Anima* II, 4, 415a15-18.

and explanation (1987, pp. 21-2). But I think that by looking at the role *desire* plays in their account of matter's becoming, we can see that their account is not as opposed to Aristotle's as it might seem. Just as for Aristotle, *dunamis* cannot be understood without *telos*, so for Deleuze and Guattari, *affect* cannot be understood without *desire*. As we saw in Chapter 5, for Deleuze and Guattari, all of matter's flows and structures are driven by desire, because the entire plane of matter's intensive connections, the plane of consistency, is a plane of desire (p. 165). Depending on how they understand desire, the importance of *desire* to all becoming might mean that Deleuze and Guattari's notion of materiality might not be as devoid of teleological notions as they believe it to be.

Let's briefly review the role of desire in material assemblages. Although desire exceeds subjects and persons, is depersonalized and inorganic, and is fundamentally rhizomatic, always in the middle, it is also localized in assemblages (1987, pp. 156, 14). Desire produces assemblages, and assemblages assemble desire. What an assemblage does and how it changes are inseparable from the flows of desire that it assembles. Each assemblage has particular, distinguishable desires. Assemblages can thus be evaluated on the basis of the desires they assemble. As we saw in Chapter 5, we can distinguish a war machine from a work machine on the basis of the desires or passions they mobilize (p. 399). On the basis of this summary we can conclude that it is not out of line with Deleuze and Guattari's thinking to say that bodies, as assemblages, have their own "proper" desires. In fact, a Deleuzo-Guattarian way to think of this combination of desire and bodies is that bodies constitute desires and desires constitute bodies. This vision already indicates a kind of coherency between Deleuze and Guattari's desiring bodies and Aristotle's teleological living things. In both cases, the body has (or in Deleuze and

Guattari's language, assembles) desires that constitute, determine, and define its activities and potencies (affects).

Yet Deleuze and Guattari reject teleological explanations (1987, pp. 21–2). So we need to find a way to explain exactly how their account of desiring bodies differs from Aristotle's conception of the teleology of living things. Certainly, there is a significant difference in the sense that Deleuze and Guattari posit a *multiplicity* of desires, while Aristotelian teleology presents us with a conception of internally derived ends that are very minimal in number. As we saw in Chapter 6, living beings have essentially two ends: to be and maintain themselves as themselves, and to reproduce. Furthermore, in some sense we can see these two as being one, in the sense that reproduction allows the living thing to participate in the eternal (*De Anima* II, 4, 415b1-32). In place of this end/ends, on the other hand, Deleuze and Guattari posit an infinite multiplicity of desires.

³¹⁷ As Guattari states in *Chaosology*, "What defines desiring-machines is precisely their

³¹⁷ Despite the important role that chaos plays in their thought, this infinity of desire does not mean that desire functions chaotically. In no sense do Deleuze and Guattari privilege chaos over organization. Although they describe chaos as the milieu of territorialization, of the formation of assemblages and refrains, matter itself and the plane of consistency are not chaotic. The plane of consistency is made of zones and continuums of intensities, which are neither chaotic nor undifferentiated. In fact, chaos is equated with the absolute lack of stratification and relation, which signifies the failure of lines of flight to achieve their goals. Neither is the body without organs total chaos, organs without a body. It is not splintered and fragmented, lacking coherency. This is why the important task of schizoanalysis is to distinguish between various desires to determine which constitute empty, cancerous, and fascist bodies, and which constitute the full body without organs (1987, pp. 56, 70–1, 164, 312–3, 503).

capacity for an unlimited number of connections, in every sense and in all directions” (2008, p. 96).

But Aristotle’s identification of the end of a living thing as its own complete functioning as living (soul) is deceptively simple. In fact, this is a formal concept that, because it is minimally specified, can be applied to all kinds of material processes and activities. A bean plant seeks its own complete living functioning in a much different way than a mouse or a human being. The particular processes that contribute to these various functioning are in themselves also end-guided processes that we might visualize as an assemblage of various desires assembled by the living organism to serve its purpose of living. I don’t think Aristotle would quarrel with the idea that bodies have many desires; instead he simply seeks to show that an organism’s desires are organized by an internal *for the sake of which* structure.

This brings us to another significant difference. For Deleuze and Guattari, desire flows through matter and between assemblages, rather than being encapsulated within one living entity. While for Aristotle, *telos* is situated within individual living organisms, in Deleuze and Guattari’s account, it is assemblages (rather than organisms) that are constituted by desire.³¹⁸ This is why Deleuze and Guattari’s engagement with the notion of the organism is so important to their work. As we saw in the previous chapter, the true “enemy” of the body without organs is not organs, which such a body may indeed have, but the organism (1987, pp. 3, 157–60). The main problem with the organism, according

³¹⁸ Deleuze and Guattari state that there is nothing natural or spontaneous about assembled desire (1987, p. 399). It is unclear, however, exactly how material desires can be understood to be non-natural and non-spontaneous. At any rate, for them what is clearly at stake is whether desire is determined or free, a question to which they give a complex answer that I have tried to elucidate in Chapter 6.

to Deleuze and Guattari, is that life is misunderstood to be contained within organisms, while in fact organisms are simply “diversions” of life:

If everything is alive, it is not because everything is organic or organized, but, on the contrary, because the organism is a diversion of life. In short, the life in question is inorganic, germinal, and intensive, a powerful life without organs, a Body that is all the more alive for having no organs, everything that passes between organisms. (p. 499)

Life surpasses the particular organism, which is why the body without organs is continually dismantling the organism (p. 3). This is also why, to make yourself a body without organs also requires dismantling the organism, or, in other words, opening the organism up to a field of connections, to all the flows that constitute assemblages.³¹⁹

For this reason assemblages, rather than organisms, take the center stage in Deleuze and Guattari’s thought. This difference is important, because it appears to decenter desire. Rather than being simply an *internal* source of direction, as *telos* is for Aristotle, for Deleuze and Guattari the desire of a body is defined by the assemblages in which it participates. This is in part why the desires of the body are multiple: any living body is defined by its participation in other desiring assemblages: water and oxygen production assemblages, work assemblages, war assemblages, love assemblages. Deleuze and Guattari seek to show that the assembled desires within a body are part of a larger field of flows and connections of desires on the plane of consistency, in other words, part

³¹⁹ “What does it mean to disarticulate, to cease to be an organism? How can we convey how easy it is, and the extent to which we do it every day? And how necessary caution is, the art of dosages, since overdose is a danger. You don't do it with a sledgehammer, you use a very fine file. You invent self-destructions that have nothing to do with the death drive. Dismantling the organism has never meant killing yourself, but rather opening the body to connections that presuppose an entire assemblage, circuits, conjunctions, levels and thresholds, passages and distributions of intensity, and territories and deterritorializations measured with the craft of a surveyor” (Deleuze & Guattari, 1987, p. 159).

of *a/inorganic* life. They are far less interested in the living body as self-contained than they are in the living body as connected with and participating in its milieu. This is why their work is so helpful for framing the relationality and permeability of living matter.

Their notion of inorganic life might seem significantly different from Aristotle's conception of living things, in the sense that inorganic life makes desire a pulsating force in all matter. However, I don't think that Aristotle would agree that his conception of teleology encapsulates life within the organism. As we saw in Chapter 6, for Aristotle, while it is in one sense true the *telos* of living things is internal to living beings (the activity of soul is to maintain them as themselves), it also exceeds them (the activity of soul also seeks reproduction, for the living thing to produce another like itself). The role of reproduction in the *telos* of the organism thus achieves for Aristotle what Deleuze and Guattari seek: to tie the living organism into a chain of life that exceeds it from within and without. Furthermore, for Aristotle, all natural things, which is to say all material things, including all living things, have *telos*. It is true that only living things have the *telos* from non-living things of life and reproduction, but because all material things have *telos*, it is coherent for us to see both *telos* and desire as being similarly distributed throughout all material reality.

We are approaching the unorthodox conclusion that Deleuze and Guattari's and Aristotle's views have a lot in common. Up to this point, the main difference is that Aristotle posits one guiding desire for bodies, that of being at work staying themselves, while by showing bodies to be assemblages, Deleuze and Guattari posit that each body assembles or participates in a multiplicity of desires with no governing desire. This is certainly part of Deleuze and Guattari's project: to open up the field of signification,

meaning, and even health to a multiplicity of directions and desires. But it is clear that Deleuze and Guattari see their project as qualitatively, and not just quantitatively different. If there is any qualitative difference between these two visions of matter, it is in the precise nature of desire and *telos*. It remains to be seen, then, whether we can assimilate *telos* and desire.

The crucial question is whether desire, for Deleuze and Guattari, includes a notion of end or goals, or precisely excludes such a notion. As I mentioned above, Deleuze and Guattari reject transcendent and final ends. We saw in Chapter 6 that for Aristotle, *telos* can be understood to be an end in the sense of limit. Deleuze and Guattari identify this notion of end as the kind of end that they reject, distinguishing between ends as limits and ends as thresholds:

We can now posit a conceptual difference between the "limit" and the "threshold": the limit designates the penultimate marking a necessary rebeginning, and the threshold the ultimate marking an inevitable change...This is an economics of everyday life. For example, what does an alcoholic call the last glass? The alcoholic makes a subjective evaluation of how much he or she can tolerate. What can be tolerated is precisely the limit at which, as the alcoholic sees it, he or she will be able to start over again (after a rest, a pause,...). But beyond that limit there lies a threshold that would cause the alcoholic to change assemblage: it would change either the nature of the drinks or the customary places and hours of the drinking. Or worse yet, the alcoholic would enter a suicidal assemblage, or a medical, hospital assemblage, etc. (p. 438)

This passage makes it clear that assemblages are indeed defined by ends, but not by ends as limits, because these are the limits of toleration of the repetition of the same. Instead, assemblages are defined by their thresholds, the points beyond these limits at which they change in nature. In other words, assemblages do not have ends in the sense of a final state, but instead they have points at which they undergo a change in state or transformation.

A war machine can become a work machine if its defining desire changes, since it is these desires that distinguish it. The activities of the machine are conditioned by and dependent on its desire (just as the potencies of a living being are conditioned by and dependent on its *telos*) (p. 406).³²⁰ The threshold of change in an assemblage is thus a threshold in which its desire changes, which then changes the affects and material groupings of the assemblage. Since these features of assemblages are co-constitutive, the causal process could also go the other way: the material groupings could change, which change the affects, which change the desire. But the important point is that the qualitative shift that occurs at the threshold only happens when there is a change in constitutive desire. Desire defines assemblages just as *telos* defines living things.

Certainly Deleuze and Guattari think that in positing the ends of assemblages as thresholds, they have rid themselves of the specter of teleological ends. But I question whether Aristotle's teleology, and in particular his conception of *telos* as limit, really aligns with Deleuze and Guattari's distinction between end as finality or limit and end as threshold of transformation. Their distinction does not apply for two reasons. First, the distinction itself is not as clear as they believe it to be. In fact, their understanding of the constitutive role that desire plays in assemblages discussed in the previous two paragraphs actually belies the distinction they are trying to draw. The assemblage has a particular desiring production that defines it as itself. But when its desire changes, the assemblage itself changes into another kind of assemblage. The assemblage as itself no longer exists. So the threshold of transformation is also the threshold of finality for that

³²⁰ "Each phylum has its own singularities and operations, its own qualities and traits, which determine the relation of desire to the technical element (the affects the saber "has" are not the same as those of the sword" (p. 406).

particular assemblage. We can certainly see this as being the case with living beings. As long as a living being is alive, it is defined by certain participation in desiring productions, which maintain it as itself. But death is the threshold at which the active matter of that living being ceases to have those desire. After death the materiality of that living body begins to have other ends, other desires. The matter is taken up into different assemblages with different ends: it becomes part of a soil-creating assemblage, and then a plant-growing assemblage, which is part of an oxygen producing assemblage, which is part of a water producing assemblage. We might say that the living body was also part of those assemblages all along, but its matter is now organized according to a different desire; rather than consuming the oxygen, it is now part of the process that produces it. At any rate, there was at least one crucial desire that made the living body itself as alive, that is no longer part of the assemblage, which allows other desires to take over and the nature of the assemblage to change.

Second, I don't believe that Aristotle would recognize his notion of *telos* in Deleuze and Guattari's description of ends as limits as final or transcendent ends. As we saw in Chapter 7, even when they are limits, teleological ends are never transcendent for Aristotle. Instead, they are immanent and relative to the capacities of the individual natural or living thing (*Physics* II, 3 195a23-6 and II, 7, 198b4-9). Furthermore, ends are not limits in the sense of a final location or ending point *per se*. An end as a *telos* is a limit in the sense of purposive direction; when this purpose and direction are accomplished, the end coincides with the final destination. However, in many cases, for

Aristotle ends are not the kind of thing that can be completed or achievable.³²¹ This is certainly the case with ends like *entelecheia*, soul, and health, which are each best understood as the active complete/excellent functioning of a being or capacity. Another way to describe this active functioning of a capacity or capacities might actually be *threshold*, as it indicates a particular state of active functioning that marks a kind of limit of qualitative transformation. This understanding of Aristotelian teleology shows there to be deep resonance between Aristotle and Deleuze and Guattari's views.

We have at arrived at a point where we must wonder whether the choice to define the change of desire of an assemblage as a threshold or a final end is merely a matter of emphasis. Certainly, framing the issue this way allows Deleuze and Guattari to show that all matter is interconnected and part of a great flow that supersedes any particular organism or organisms. This is a very useful point, and it serves their project of flatten hierarchical modes of living and being, opening them up to new possibilities and freedoms. For our purposes, however, it is clear that even the robustly permeable account of matter they offer is not free of purposive, end-driven activity. On the contrary, matter's affects, transformations, and movements cannot be understood apart from matter's *desires*. The one clear point of difference that remains between the two accounts is that Deleuze and Guattari show that assemblages have multiple desires, while Aristotle focuses on the singular desire that organizes the organism. This is appropriate, since his entire line of inquiry revolves around trying to find methods of explanation *for natural things and living organisms*. Deleuze and Guattari's project, in contrast, aims at political

³²¹ As Johnson notes, "This is the chief problem with the locution 'the final cause' – because, as often as not, the end for the sake of which is not the end in the sense of finality" (Johnson, 2008, p. 83)

and social liberation by freeing desire from oppressive and hierarchical structures, and they believe the singular *telos* that organizes the organism is one of them. However, this means that like contemporary biologists, they also ignore the question of which desire(s) enable an organism to be an organism.³²² In this sense, as long as we consider human bodies to be organisms, Aristotle's account of organismic, teleological causation will offer unique conceptual resources for understanding our own biological functioning.³²³ On the other hand, Deleuze and Guattari's concept of "a" life could help us orient the horizons of health beyond the organism. If both life and material processes in general undermine the unity and coherency of subjects and persons, how can we understand health? Can health still be in some sense a state, property, or activity of persons or individual human bodies? Or would it we want to attribute health to larger assemblages or tendencies, like "a life", an ecosystem, and age, or a culture? Is there a way to understand both as operative, or does the impersonality of materiality flows undermine the possibility of definitions of health for particular organisms in themselves? These are fascinating questions and they suggest interesting avenues for further research.

Implications for Health and Medicine

Ultimately, despite this final divergence, the significant conceptual convergence between Deleuze and Guattari and Aristotle's accounts holds enormously important implications for how we understand medicine and health. First, Aristotle and Deleuze and

³²² Current models of biological explanation focus much more on mechanistic and chemical material interactions, meaning that post-teleological science has still not found a way to account for the holistic organization of organisms. Cf. Talbott (2011) and Goldstein (2000) for examples of contemporary biological accounts that embrace holism.

³²³ This is why permeability adds a constitutive condition to the teleological definition of health I put forward in Chapter 6, but does not add any further specification.

Guattari together offer us a picture of matter as having its own proper desires, desires that drive its movements and transformations. Both definitions of health and medical theory and practice need to accept this fact as their fundamental premise. We cannot continue to interact with matter as if it were lifeless and inert. In this sense, Deleuze and Guattari and Aristotle are very much thinking along the same lines as Nancy Tuana, who as we saw in Chapter 2, proposes that we ought to see Nature as a conversation partner. From this perspective, the first rule of medicine ought to be: find out what the body wants. This makes the body a conversation partner. It makes listening, rather than seeing, the primary sensory skill of the medical practitioner. It entails respect for the body's material tendencies, desires, and constraints, rather than the attitude disposed toward the domination of bodies through knowledge and technology that has guided medical practice and theory (not to mention civilization and society) in the West since the modern era.³²⁴ This change alone would completely revolutionize medicine and health in the

³²⁴ It bears noting that a notion of what the body wants *as a whole* is required for this approach to function. When we assume, as Aristotle does, that the organism as a whole seeks its own *entelecheia*, or as I argued in Chapter 6, its own health, this desire and tendency becomes a source of guidance and wisdom for both patient and practitioners. Deleuze and Guattari's notion of the multiple desires of matter and assemblage, on the other hand, makes interpreting the body's desires a much more difficult task. Although Deleuze and Guattari eschew the organism as a causal and explanatory device for matter, they nonetheless seek to distinguish between cancerous bodies and full bodies (as I mention in footnote 9 above). On the basis of this distinction I think we could argue that they must be willing to grant some kind of holistic unities to living bodies (even if they prefer to call them assemblages, rather than organisms, in order to emphasize their embedded and permeable nature) that would allow us to recognize that the destructive desire of the cancerous matter of the body does not serve the overall desire of the body-assemblage to *live* as itself. In fact, without a recognition of the desire that organizes and constitutes a body as an organism, it seems impossible to characterize, as they do, a cancerous body as a body of death (see pp. 162-3). This discussion demonstrates the need for an analysis and critique of the medical value of the Deleuzo-Guattarian view of the limits of organismic thinking, but this is unfortunately beyond the scope of this dissertation.

West. Respect for an attention to the needs and expressions of the body are the cornerstone of many other “alternative” medical arts and practices, including herbalism, Chinese medicine, and osteopathy, which regard the material desires of the body as constitutive of health rather than obstacles to be overcome or tendencies to be taken for granted. These approaches understand medical symptoms to be a way that the body expresses its needs and desires, and encourage both patients and practitioners to listen to what the body has to say. Allopathic medicine has much to learn from these practices. Since *telos* is intrinsic to individual bodies and desire is constitutive of each particular assemblage, a universal science of bodies is impossible, and each body becomes the expert source of information on itself. From this perspective Aristotelian teleology supports Deleuze and Guattari’s ethical injunction to *experiment*, as the only way to really discern what your body needs and what health is for you. However, in light of the resonances discussed in this chapter, it is more important to engage with *what your body wants* rather than *what your body can do*, since this latter implicitly affords cognitive, rather than bodily, willing the most influential role in deciding what should be done with and for the body.

Second, the conceptual overlap between Deleuze and Guattari’s and Aristotle’s frameworks indicates that we can and should think of permeability and teleology as two conceptual poles or tendencies that are always simultaneously at work in living bodies. They are not mutually exclusive; rather, they are mutually determinative. The desire of bodies gives them direction, and the permeability of bodies can influence and change this direction. Although for the sake of conceptual clarity I did not highlight this mutual determination of permeability and teleology, it is clear from the discussions in Chapters 7

and 8 that in both nutrition and environmental medicine we see both permeability and teleology at work. Environmentally caused illnesses are only possible because external substances can enter the body and influence or change its function and development. Indeed, the way that endocrine disruptors interact with the body, as characterized by concepts like timing of exposure, show us that we must think of environmental exposures as interacting with teleological bodily processes and a teleological body.³²⁵ Nutrition, although we discussed it in the context of teleological explanations, is one of the most substantial and formative phenomena of interaction between the living organism and the environment that we can find. By definition, nutrition relies utterly on the body's permeability and exhibits the body's vulnerability to environmental influence, since all growth and maintenance is made possible by taking in substances from the environment. Not only this, but the nutritional content of food itself is a product of environmental influences, including the soil it was grown in and the mode used to transport it. The concept of bioavailability also indicates that nutrient absorption, a teleological process, is also highly permeable.

This picture of bodies as both permeable and teleological paves the way for an incredibly dynamic view of human bodies. Taken and theorized together, teleology and permeability open up possibilities for thinking health as being open to influence by human actors and desire, but also determined by material factors and desire. This health

³²⁵ If teleology were as deterministic as Deleuze and Guattari seemed to think it would be, this interaction, characterized in biological terms as *epigenetics*, would not be possible. However, epigenetic research is showing that our genetic expression is highly permeable to our environment, including to chemicals, nutrition, and even stress (i.e. Hochberg et al., 2011; Kabasenche & Skinner, 2014; Vickers, 2014; Yao et al., 2014). Underdetermination is a crucial aspect of permeability; the dynamic, relational processes of interaction that form strata and assemblages mean that our bodies are open to determination from external and internal influences.

also has both genetic and environmental components, situating the causation of disease in the complex interactions between the two. This construal might seem very straightforward, but it marks a definitive reorientation for Western medicine, which unfortunately is still mired in a deterministic, geneticist vision of bodies, particularly in the study and treatment of chronic diseases.

A construal of health as determined by material desires and not just subjective human desire also provides a position from which to critique “mind over matter” approaches that insist on the ability of the mind to heal and determine the body, or indeed of the human will to define health. As we saw in Chapter 7, health as the complete excellent functioning of the whole organism implies an irreducible role for intellection, including belief and intention, in health. But the fact that matter also has desires means that we need to take into account, rather than dismiss, its agency in health and disease.

In all of my research into theories about the ontology of the body, I have come across only a few forms of medical practice that robustly theorize both of these tendencies of living bodies. One is a psyche-body approach developed by Mark Fourman. This approach focuses on the way unprocessed emotions get trapped in bodily tissues, where they disrupt normal function and diseases. He teaches patients how to use mental awareness of the body, or body consciousness, to help release these trapped emotions and allow the body to return to its normal desired state (Fourman, 2013). Although it does not pay much attention to the role of specific material processes and activities like nutrition or exercise, this approach is remarkable because it theorizes the internal connection of mind and matter while still recognizing the material tendencies at work in matter (including the directionality of bodies toward their natural health) as something causally

constitutive, not just something we can just will away, as some other mind-body approaches tend to do (*i.e.* Rankin, 2013).

Another approach that coheres remarkably with the philosophical framework I have developed here is Functional Medicine, an offshoot of allopathic medicine. Physicians specializing in functional medicine conceive of the body as a whole. In this view disease thus constitutes a breakdown, not of one particular part, but of the relational functioning of many parts together. Functional medicine seeks to recognize symptoms as evidence of a breakdown in holistic functioning as influenced by diet, stress, exercise or lack thereof, and other environmental factors. Once it identifies the immediate problem, it seeks for the *cause* of that problem, rather than just trying to alleviate that immediate problem or the symptoms themselves. Interestingly enough, functional medicine always begins with *gut health*, which in the framework I have proposed we can identify as the center of both permeability and teleology in the body. Functional medicine also recognizes the crucial role of sleep in bodily healing and repair, and integrates a concern for the role of toxic emotions and thoughts in patterns of disease and health. Identification of developmental and long term patterns of tissue inflammation and toxic build up in the body also play a crucial role in functional medicine's capacity to catch diseases early and reverse their course (Ashe, 2014; Liponis & Hyman, 2005).

Chinese Medicine, as explained in books like *Between Heaven and Earth*, *Dragon Rises*, *Red Bird Flies*, *The Web That Has No Weaver*, and *Healing with Whole Foods: Asian Traditions and Modern Nutrition* also provides an excellent example of a medical system that successfully integrates and addresses both the permeability and teleology of living bodies (Beinfeld & Korngold, 1992; Hammer, 2005; Kaptchuk, 2000; Pitchford,

2002). According to traditional Chinese Medicine (by which I do not mean TCM, the modern systematization and formulation ancient practices, but rather the accumulation of medical knowledge in the Chinese medical system), all bodies have particular tendencies (toward excess or deficiency of heat, dryness, etc.) that are partly a product of genetic inheritance and partly a product of environmental, nutritional, lifestyle, emotional, and other factors. But each body also has an ideal balanced state, and disease reflects a divergence from this balance. Appropriate treatments for various imbalances or symptoms must take into account the dynamic material tendencies of the particular body in question as well as its innate desire to move toward balance (Beinfeld & Korngold, 1992). Chinese medicine has developed extensive knowledge about how to make use of the interactions between the material tendencies of various foods and various bodily tendencies to promote health and healing (Pitchford, 2002). It also has a particularly complex theoretical framework to explain how human intention and material tendencies interact in health. As Leon Hammer writes in *Dragon Rises, Red Bird Flies*

The Chinese see all phenomena as manifestations of one unifying principle of energy, the life force, or Dao (Tao). All form and substance in the universe is the materialization of energy ($E=MC^2$). The Chinese observed and recorded in intricate detail the rhythmic movement of this energy in the most cosmic and most minute structures of the universe within their sphere of scrutiny. Out of this study and observation came the Laws of Nature. Only man, among all the manifestations of energy in the universe, collectively and consistently has the choice to follow or defy these laws. All other manifestations of this energy, from rocks to apes, follow their inner rhythms and biological clocks. Whatever the rationalizations, disease will follow significant deviations from the laws governing values, eating habits, work, and exercise patterns. The patient is responsible for his illness. With knowledge and awareness he can also prevent it. (2005, p. 12)

This approach manages to pull all of the factors that I have discussed about the permeability and teleology of bodies in this dissertation into one clinical art: accounting

for how human intention, material desire, norms of idea function, environmental and nutritional influences, and time-bound habits and processes interact.

There exist many alternatives to Western medicine, and many of them, including acupuncture and Chinese herbs, have been demonstrated to have consistent clinical success, even when the exact mechanisms for treatment are difficult to ascertain and replicate using Western scientific standards (Kaptchuk, 2000, pp. 356–60; “New WHO guidelines to promote proper use of alternative medicines,” 2004). These approaches ought to be carefully studied, not only for their proven efficacy in treating illness, but for their theoretical import, their bodily ontologies, which provide alternatives to the mechanistic ontology of the body that dominates Western medicine. In this respect Chinese Medicine is exemplary. It is hard to imagine an approach more diametrically opposed to that of Western medicine, and indeed, the ontology of the body in Chinese medicine is so different that very few of the same conceptual categories apply to both. However, because it successfully incorporates the permeability and teleology of the body into its ontology, I believe that Chinese Medicine deserves significant attention as a theoretical alternative to the mechanistic Western ontology of the body.

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Conclusion

“The community-in the fullest sense - a place and all its creatures - is the smallest unit of health, and to speak of the health of an isolated individual is a contradiction in terms.”

- Wendell Berry, “Health is Membership”

In this dissertation I have shown why the concept of matter that guides Western medicine needs to be radically revised, and explored a wide variety of resources for doing so, from feminist materialisms to Aristotle and Deleuze and Guattari’s dynamic conceptions of matter. In the spaces and connections between all of these ideas a new way of understanding the ontology of living materiality begins to emerge. The resources I have brought to bear on the question of the nature of living matter show us that this is not an abstract or merely theoretical question. This combination of theoretical resources orients our investigation toward a robust analysis of health that sits at the intersections of practice and theory, of being, knowing, and doing, of ethics and politics. Feminist materialists show us why we need to rethink matter as dynamic, and how we need to understand ontology as being irreducibly related to epistemology, ethics, and politics. Aristotle shows us that health is at once ontological and epistemological, caused in part by both material processes and human agents. Deleuze and Guattari explicitly tie their ontology of immanence to politics and ethics.

This situating of theoretical inquiry into the ontology of living matter within a broader context is crucial. Without this, it would be impossible to justify my attempt to remedy the ills and failures of Western medicine through a theoretical investigation into the nature of matter. A number of friends and colleagues have asked me why I think the problem of modern biomedicine is its theoretical conception of the body, when it is clear that so many of today's problems stem from the interactions between Western medicine and the insurance and pharmaceutical industries. From this perspective, the main systematic problems related to health in our society are economic and political, rather than ontological. Perhaps doctors know that living bodies are complex, teleological, and permeable, but the insurance industry requires them to give simple diagnoses for which there are known, usually technologically efficient, treatments. Similarly, doctors and policy makers know the weaknesses and dangers of pharmaceutical treatments, but the pharmaceutical lobby is just too powerful; it overwhelms the political and medical systems with its push for drug treatments for every condition.

I do not wish to deny the enormous political and economic challenges presented by the current Western medical landscape. However, I believe that at the heart of all of these systems is an outdated and overly mechanistic conception of how our bodies work. Our entire medical culture is implicitly guided and shaped by this conception. It is so normalized as to be invisible, yet is at work every day throughout our entire medical system, creating particular possibilities for research, prevention, and treatment, while excluding others. If lay people and patients did not believe that medical problems could be solved with a pill, and if doctors were educated to understand the dynamic, permeable, and teleological nature of the living bodies they treat, the problematic logic of the

insurance and pharmaceutical industries would be unmasked and we would search collectively for more coherent alternatives.

For this reason, and by way of conclusion, I want to briefly explore some concrete ethical and political implications of the framework I have proposed in this dissertation for understanding the materiality of living human bodies. I will begin by reviewing the clinical implications discussed in the past chapters and then I will offer a few broad stroke ideas about how to extend this framework into the ethical and political spheres.

Clinical Implications of This Framework

First, a more dynamic understanding of living matter leads us to recognize the individuality of each particular body. It means that statistical norms do not tell us what is healthy for each body and that medical knowledge needs to be appropriate to each body's implicit desire for and capability for health. As Aristotle says, "For the doctor does not cure a human being, except incidentally, but Callias or Socrates or any of the others called by such a name, who happens to be a human being. So if someone without experience has the reasoned account and is familiar with the universal, but is ignorant of what is particular within it, he will often go astray in his treatment, since what is treated is particular" (*Met.* I, 1,981a20-24). In this case, although throughout this work I have used the term "the body", there is really no universal human body, and instead we have many *bodies*. As members of a species they share certain features, which makes medicine as a science possible, but the individual differences created by dynamic materiality are an irreducible aspect of bodies that changes both how we know and how we treat them.

Second, as we saw in Chapter 8, because of the unity of all kinds of soul in bodily teleology, we also need to consider each individual human being as having crucial

expertise about and responsibility for her or his health. This undermines the perception, pandemic in our society, that doctors and other health professionals are both the experts and the ones responsible for curing us when something goes wrong with our bodies. This view, as Ivan Illich notes in *Medical Nemesis: The Expropriation of Health*, disempowers patients and leads them to become passive objects of medical technologies. Illich argues that this “social iatrogenesis” is in effect the main product of the contemporary medical system (1982, p. 14). In opposition to this, the teleological causation of living matter explored in this dissertation shows that because the teleology of each bodies primarily benefits itself and incorporates all available activities of soul, including not only nutrition but also motion and intellection, each individual has an internal access to his or her own matter and the reality of what health is for it, which no doctor can replace. This also means that each individual has a special relation of responsibility and care for his or her body and its possibilities. True health cannot be expropriated.

Third, in Chapter 8 we also saw from a careful analysis of Aristotle and Deleuze and Guattari that living bodily matter has its own desires. These desires are the foundation and the force of health. The medical art and each individual can only foster health by listening to and responding to these desires. These desires include bodily needs, such as the nutritional needs we discussed in Chapter 6, but they also include desires related to permeability, such as for connection to other assemblages and strata. These desires are not universal and cannot be known *a priori* or in advance. They make of the body an important conversation partner. This indicates that clinical practice should make *listening*, rather than seeing or doing statistical analysis, the basis of understanding and promoting health.

Finally, the dynamic conception of matter proposed in this dissertation, which incorporates aspects of permeability and teleology, indicates that we need to look more widely, both in space and time, for the causes of chronic disease. In this sense, both environmental and nutritional medicine are very promising fields. If we are serious about understanding and preventing chronic disease, mainstream research and treatment of these conditions needs to focus much more on nutritional and environmental causes. In Chapters 6 and 7 we saw that the complex teleological and permeable nature of living bodily matter is so far poorly understood. This indicates that we actually need a lot more empirical research oriented toward ontology, toward the *nature* of the interactions between the body and its environment and the *nature* of the body's internal directionality, especially its time-bound element. In this sense, research into endocrine disruptors is bringing up some important questions for both toxicology and medicine in general, and hopefully it will play an important role in fomenting a transformation in the concepts of bodily matter that guide research and clinical practice.

Ethical and political implications of this framework

Now I would like to offer a few suggestions about the impact that these clinical implications ought to have on our economic, political, and ethical engagement with medicine. The first involves the relationship between state and nomad science in medicine. Deleuze and Guattari's framework gives us important tools for understanding the relationship between conventional allopathic medicine and so-called "alternative medicine", especially in terms of their epistemologies. The statist monopoly that allopathic medicine holds over "science" and "proof" creates a system that by definition excludes other ways of understanding and interacting with the body. In our social

imaginary, these other ways of understanding and caring for bodies will always occupy a questionable space. This has enormous practical and ethical import. Many people are unwilling to try any option not validated by Western science, even when those options have proven track records for effectively treating and preventing many conditions that stump allopathic medicine. In other words, there are gentle, affordable, and effective options for treating and preventing chronic illness that many people refuse to consider because they are not sanctioned by “State” medical science. This is a shame, because in many cases, these alternative systems have the capacity to recognize potential tendencies, disharmonies, and developing problems much earlier than Western medicine, creating much greater windows for prevention and healing.

The cost of this epistemological standoff in terms of bodily suffering is far too high. This shows how deeply entangled epistemology and ethics are in medicine. In my experience, when diagnosed with a serious condition, very few people are willing to experiment with unorthodox approaches. Alternative practitioners confirm this reality. I have interviewed doctors and practitioners from a wide variety of “alternative” approaches, including osteopathy, acupuncture, naturopathy, environmental medicine, functional medicine, and energetic medicine. In every case their greatest problem is that despite the efficacy of the healing they can offer for many different conditions, there is a deep ideological bias against approach that is not Western medicine that makes it difficult for their methods to gain recognition. Normally, their patients only turn to them after exhausting every conventional option, being told by allopathic doctors that they cannot be cured or even that there is nothing “real” wrong with them. In other words, for most people, these are desperate (rather than intrinsically viable) options.

Yet the heartbreaking fact is that most people don't grasp how narrow and monolithic allopathic medicine's understanding of the body is, the understanding the conditions and enables all Western medical practice as well as people's understandings of their own bodies. While Western biomedicine recognizes that there is much we do not yet know or understand about the body, it also fails to open the door to any other way to understand the basic nature of the body. As I have indicated in this dissertation, many "alternative" medical systems provide truly alternative ways of thinking the ontology of the living body, visions that in many cases do much greater justice to the dynamic, permeable, and teleological aspects discussed here.³²⁶ I believe that if we collectively revise our concepts of the nature of living bodies, many "alternative" medical systems will show themselves to be theoretically, and not just practically, valid and viable. This would certainly have transformative material consequences on how we allocate research money, design our investigations, and pursue and prescribe treatment. The ethical implications of this shift are enormous. Chinese medicine and functional medicine, for example, are able to recognize and reverse disease patterns much sooner than traditional allopathic medicine.

³²⁶ For example, osteopaths are trained in dynamic intersubjective techniques that use touch to observe rhythms of the body and perceive where those rhythms are being disrupted. Similarly, in Chinese Medicine practitioners are trained to read the pulses of the body and to diagnose tendencies toward excess and deficiency on the basis of the pulses and other bodily signs. This intersubjective ability to listen to the body has been all but lost in Western medicine, which relies on statistical and technological measures for determining health and illness. A whole critique of the humanity and intersubjectivity of bodily is implied here. Functional medicine is an example of Statist science that has been transformed by nomadic thinking. Another example is functional medicine, a branch of allopathic medicine that focuses on deep causes of illness, such as toxic build up or chronic inflammation in the body. Its concept of the body is deeply teleological because it views the body as having a holistic unity and a natural direction that can be disturbed, mostly through problematic lifestyle habits and poor eating. Functional medicine has had a lot of success reversing a wide variety of chronic conditions, including heart disease and autoimmune conditions (Ashe, 2014; Liponis & Hyman, 2005).

So much suffering could be prevented, and so much money now spent on expensive and often deeply iatrogenic pharmaceutical treatments could be saved if these approaches were broadly explored. If treatment and prevention were not costly, more people could access them, making healthcare more just and equitable. In this sense, the only ones who benefit from *not* revising the basic ontology of the body at work in medicine are the pharmaceutical companies. I truly believe that if we wish to promote human health and flourishing, a deep transformation in our understanding of the basic nature of the living, material human body is imperative.

The second implication of this framework for politics and ethics involves food. I believe an entire food revolution is implied by the dynamic conception of living matter I have constructed here. Since living matter is permeable and teleological, food cannot be raised in just any which way if it is to serve as *food* for human bodies. On this basis alone we must radically rethink industrial food production, whose only goal is to make money by producing things that *look like food* and that people are willing to eat. This system creates food products rather than food. When we understand the permeable and teleological nature of living matter, we can easily see why feeding cows corn and bits of other cows might not produce either a healthy cow or meat that is actually nourishing as a food for humans. Similarly, chemical-saturated plants in nutrient-poor soil do not make for healthful food. Industrial agricultural production that dowses the soil with chemicals and isolates plants from their ecosystems by monoculture farming does not promote health, either for the plant or for the human being that consumes it, since all that is done

to the plant in the end directly impacts the human body that tries to take it up as food.³²⁷ Not only this, but industrial agriculture operates on such a large scale that it requires produce that can survive long transport routes and still manage to look pretty sitting for days on the supermarket shelf. Industrial food production perhaps finds its most holistic expression therefore in highly processed, packaged foods, which add value to for the producer but which are packed with chemicals and preservatives and whose only nutrient content for the consumer comes through the addition of synthetic vitamins. In sum, on the model I have proposed, we might even come to conceive industrial agriculture as a root cause of chronic disease, since it gives to modern eaters products that look like food but fail to meet their nutritional needs, and in many cases actually permeate the body with harmful chemicals.

Recognizing the teleological and permeable nature of our bodies means that we need to evaluate every input and process that goes into our food in terms of how it meets our nutritional needs. This includes how the food is engineered, including genetic modification and breeding, as well as how it is grown, shipped, processed, cooked, and served.³²⁸ As Michael Pollan points out, the human challenge with regard to eating is that we require so much knowledge to eat well. We need knowledge about how to breed,

³²⁷ See Pollan's *The Omnivore's Dilemma*, especially Part II, for a great discussion of animal and plant teleology in relation to human food production (2007).

³²⁸ I have yet to see a discussion of genetically modified organisms (GMO's) that evaluates it in terms of its suitability for *promoting human health*. This would be a helpful turn in our thinking, which up to this point has been most concerned about evaluating the *risks* of GMO use. This thinking is quite backward from the way we ought to be thinking about GMO's potential for human *nutrition* understood in a teleological sense. In addition, GMO's need to be evaluated not as an isolated food substance, but as part of an entire network of technological and ecological systems that are involved in growing them.

grow, process, transport, cook, serve, and eat our food: what kinds, in what quantities and combinations, and how. This is an epistemological challenge that implies a revolution in food education.

Nutritional education needs to include information about food production. Without a personal connection to how food is grown and prepared, this multifaceted knowledge about food is nearly impossible to obtain. In this sense, movements to teach children how to garden and cook as part of their primary education seem to me a wonderful development (see Organic Garden Project: Schools, 2010). All eaters need to live in the context of a much more robust connection to the food chain than most of us have. This implies in turn a very different food chain. But for all citizens to be able to have a personal connection to how their food is grown and produced, we need a radical revision of the *scale* of agricultural and food production. The current system makes it impossible for consumers to really know what is in their food in terms of its permeability. We need a much smaller, intimate system. This also implies a more just system, where nutritious food is available to all people, regardless of their socioeconomic standing or the place that that live.³²⁹

We also need nutritional training in how to prepare food in ways that promote its bioavailability. For this, traditional cuisines offer a lot of resources. Unfortunately, as society has industrialized, cooking became a hassle rather than an art. We need to recover traditional knowledge about how to make nutritious and pleasurable food, as well as to create new knowledge and new forms of passing it on. The Slow Food movement is

³²⁹ This also implies a rigorous critique of food sovereignty, which is normally oriented toward having enough food, rather than having the right access to food, including to information about food.

exemplary in this respect (“Slow Food,” 2014). We also need to reorient our thinking about nutrition to understand it as a process that is fundamentally about meeting our bodies needs. Too many Americans are focused on a restrictive relationship between eating and weight, and most often only in terms of caloric intake and expenditure. True health requires that we learn to eat *for the sake of* giving our bodies all that they need to do all that they want to do on an every day basis. These needs are incredibly complex, and we need to make sure our diets address all of them. I am convinced on the basis of the research that I have done for this dissertation that learning to eat properly requires a lot of knowledge. A simple inspirational image of a well-balanced plate and an exhortation to eat more fruits and vegetables is not sufficient. Eating is even further complexified by the singular nature of each body’s needs and tendencies. This means that we all need to learn how to combine cognitive, research based knowledge about what bodies need to thrive must be combined with intrapersonal knowledge of how our own bodies respond to various foods. Nutrition training needs to involve training in how to listen to your body as it reacts to various foods. If these two aspects of nutritional training were given serious consideration and made part of our basic health education, many eating and health problems could be avoided.

A third major sociopolitical implication of this framework has to do with the ways that chemical production and use are regulated. The deeply permeable nature of living bodies means that if we truly wish to promote public health, we need a much more robust testing process to determine chemical safety. In the United States, since the Toxic Substances Control Act (TCSA) was passed in 1976, over 80,000 chemicals have been produced and used. Most of the chemicals in use (64,000) were grandfathered in under

the law and have never been tested. Of the remaining 16,000, only 200 have been tested for safety by the EPA (Brody, 2013; US EPA, 2012). This shows a clear preference for protecting industry interests over human health. Public health requires a more consistent use of the precautionary principle when approving chemicals for use in homes, workplaces, and agriculture.

Fortunately, numerous databases exist for finding information about the known toxicity of chemicals as well as for helping employers and manufacturers to move towards safer alternatives (“About Pharos,” 2014, “About Plum,” 2010, “BizNGO,” 2014, “BlueGreen Alliance,” n.d., “CDC - NIOSH Pocket Guide to Chemical Hazards (NPG),” 2014, “Chemical Hazard and Alternatives Toolbox,” 2014, “EWG’s Consumer Guides,” 2014, “Good Guide,” 2014, “Risctox: 100,000 Substances,” 2014, “Tox Town,” 2014). These reflect a move to democratize and privatize efforts to replace hazardous chemicals with safer ones. However, this belies the fact that hazardous chemicals are already widely present and in use in our environments. This situation is especially problematic because not all people bear the burden of these chemical exposures equally. Those who produce the chemicals and use them every day in their jobs are disproportionately at risk for exposure-related diseases, as the NIH’s Haz-Map website clearly demonstrates (Brody, 2013; “Haz-Map,” 2014). In general, it is lower paying jobs, such as manufacturing, agriculture, and cleaning, that have the highest exposures levels. Until we regulate both production and use, the bodies of these workers and their families will continue to suffer disproportionately the effects of our contaminated environment.³³⁰

Final thoughts

Certainly, this short discussion does not exhaust the clinical, ethical, or political implications of a dynamic understanding of the matter of living bodies. I hope that this work will encourage other philosophers, theorists, and medical practitioners to invest in developing even further, and in new directions, our understanding of the material dynamism of bodies. This is important, because as this dissertation as shown, ultimately, ontology, epistemology, ethics, and politics are all connected. The framework put forth in this dissertation shows how our understanding of the nature of living matter is deeply imbricated in the possibilities we are able to inhabit within medical knowledge and practice. This knowledge and these practices in turn have ineluctable ethical and political consequences. This means that theoretical investigations into the ontology of living bodies, like this one, are crucial for helping us decide what the good is and how to pursue it; in other words, they contribute to creating a more just common world.

³³⁰ For an excellent discussion of this point within the context of the natural-cultural disaster of Katrina, see Tuana (2008). It is crucial to say again here that permeability shows us that we cannot think of human health as separate from the health of the environment. This does not only mean that the environment affects our health, but also that we affect the health of the environment (although the latter is not the focus of this dissertation).

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