

MICROBIAL GEOPOLITICS:
LIVING WITH DANGER AND THE FUTURE OF SECURITY

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ABSTRACT

Taking its departure in a global intensification of infectious diseases, this dissertation tracks the geopolitical effects of microbial conduct to see what a microbial perspective on international relations can teach us about threat and security. Through analyses of biological weapons, microbial bordering, childhood malnutrition, and antibiotic resistance, I conclude that dominant security strategies of risk elimination, and especially the flawed premises of human mastery that these security logics rely on, carry significant dangers of their own. How can international security be informed by an acknowledgement that humans are unable to control their environments? Following my new materialist commitment, I suggest new affirmative security politics of diversity and nurturing that require new relationships to risk and danger, and also find myself forced to reflect on how best to affirm life and death while accepting that microbes will not save us all, and that we have never been sovereign over the mutational character of biology itself.

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INTRODUCTION

A contemporary tone of crisis surrounds the emergence and reemergence of infectious diseases. Antibiotic resistance threatens to push humanity back into the dark ages of medicine, while the medicinal wing of the U.S. biosecurity state and Hollywood-style narratives in books and cinema feed on fears of global pandemics with massive death tolls, just waiting to happen. With the Anthropocene, humanity becomes a geological force just as western enlightenment and the combustion engine come crashing down - our impacts are planetary, and also completely out of our control. Despite the triumphant hopes after the eradication of smallpox in 1980, this single success story has been followed by a series of new emerging and reemerging infectious diseases. HIV/AIDS emerged in the 1980s, dengue fever reemerged in the 1980s, chikungunya and Zika have recently reemerged across the globe, and Southern Europe alone has of late seen the emergence or reemergence of malaria in Greece, West Nile virus infection and chikungunya in Italy and Spain, dengue in Portugal, and schistosomiasis on the French island of Corsica. Measles and polio have returned, Ebola caused thousands of deaths in West-Africa in 2014-15, schistosomiasis continues to increase throughout Africa where it is now a major cofactor in the AIDS epidemic, Southeast Asia has seen the emergence of Nipah virus and drug resistant malaria, and across the globe, drug resistant and extremely drug resistant tuberculosis have also emerged in the last decades, adding to the already massive yearly death-toll of tuberculosis. To this must be added the continued high death tolls of gastroenteritis, malaria and pneumonia. Scientists in epidemiology, geography and entomology agree that this intensification of infectious diseases is co-driven by a large number of ecological factors, most importantly poverty, urbanization, globalized human trade, travel and migration, conflict and political destabilization, deforestation, and climate change. The global threats presented by infectious diseases today suggest that the modes of disease control and prevention championed by the Euro-capitalist-extractionism that brought about the Anthropocene, are failing.

Coming to terms with the Anthropocene requires acknowledging that human and environmental security is dependent on complex and dynamic assemblages that far exceed human control. Attempting to understand and mitigate devastation and suffering on multiple

scales, and honing in on possibilities for thriving, requires attentiveness to these assemblages as wholes, not just their constituent parts.

Pathogens present real threats and dangers that are significant enough to be worth paying attention to in International Relations. But this dissertation departs from mainstream accounts in the responses it suggests to these threats, because security tactics employed from fearful ideas of exotic new diseases are not only ineffective, but also destructive. Most problematic are the security strategies that try to control or eradicate microbial flows based on assumptions that humans are able to control their environments. These kinds of security tactics time and again create more fear, danger and loss than they mitigate. I think it is precisely because mastery and eradication is impossible that security strategies relying on premises of mastery and eradication fail so miserably. But every time they fail, it is viewed as an exception that something, for a short time, was able to penetrate the security bulwarks of 21st century security states. But failure and disorder are the norm. Contagion, predatory relationships and death are the norm. This is the case even in the parts of the world where we for a period of time got to live our lives as if we had in fact mastered our surroundings and as if there were no externalities to our consumption. The Anthropocene is a wake-up call that this was an illusion. In the meantime, we forgot about death and the rituals of mourning, as death became a tabooed last failure, marking the point at which the biopolitical state had nothing more to do and say. We have forgotten how to live and die with risk and danger, we have forgotten how it is to not be sovereign over life and death. But we have never been sovereign, and acting as if we were has created the puffed-up security states and sterile, beeping intensive care units that characterize our lives and deaths today. Fear and avoidance at all cost are the order of the day. Questions of rich life, and even more so questions of a good death, have been relinquished and hidden.

Much is therefore at stake in microbial geopolitics. The ways in which pathogens and microbes challenge puffed-up security states and notions of human exceptionalism has repercussions beyond disease control and prevention, and beyond global health security.

In this dissertation, I explore the geopolitical implications of microbial conduct in contemporary security politics. Human relationships to microbes span the spectrum of killing, predation, dormant hosting, cohabitation, commensal living, and symbiosis, sometimes with overlaps, and this spectrum is mirrored in microbial geopolitics, where the

threats posed by pathogens sit side by side with threats posed by a lack of commensal microbes that have been eliminated. From its forays into microbial conduct in international relations, this dissertation comes to suggest new modes of microbial governance that acknowledge that human control over environments is impossible, and by extension that microbial control is also impossible. Such new modes of security governance require new relationships to living with risk and danger as they abandon security strategies of eradication, separation, striation, and homogenization, in favor of affirmative security politics of diversity, collectivity and nurturing. The conclusions the dissertation arrives at stem not from sentimental ideas about inter-species friendships, but from sincere investigations into the security threats posed by microbial conduct today, and what microbial conduct itself can teach us about possibilities of human and environmental security.

Because the assemblages of microbial geopolitics exceed the boundaries of academic compartmentalization, this dissertation, by following microbes, traverses international relations including global health security, critical security studies, critical border studies, postcolonial theory, and political theory, in addition to environmental politics, geography, microbiology, medicine, epidemiology, entomology, and anthropological theory of indigenous thought. I work from the premise that humans might not be the most capable actor, in fact quite the opposite. As alluded to above, human exceptionalism and ideas of humans as in control of their environments drive drastic changes in climate, an impending post-antibiotic era, deforestation, biodiversity loss, and problems of food and water security. These predicaments necessitate non-anthropocentrism ethically, methodologically, and strategically.

In this pursuit, I get help from speculative realism, which rejects the anthropocentrism that has long been characteristic of Western rationality, and pays serious attention to the fact that human beings, as one animal-species, are cohabitating this planet with myriads of other living organisms and non-sentient beings. In the age of the Anthropocene, this strain of philosophy is urging us to denounce human exceptionalism in favor of acknowledging that humans are deeply interdependent with others and with ecology. In doing to, it rejects the privilege of epistemology practiced in Western philosophy since Descartes and Kant, and instead brings ontology and metaphysics back into philosophy

by insisting that things, animals – and microbes – exist regardless of our knowledge of them (Shaviro, 2014).

I seek to go beyond criticism of existing security practices by formulating new, affirmative security practices, and doing so I heed Jane Bennett (2010, xv), who questions the overarching focus in traditional political theory of critiquing and demystifying, because “a relentless approach toward demystification works against the possibility of positive formulations” that is, positive formulations of alternatives, rather than more critique that doesn’t change, and perhaps has little interest in, changing the status quo.

With the arrival of the Anthropocene, and the type of threats that have entered the stage of International Relations in the last decade, most notably climate change, I think the world itself is compelling IR to pay attention to the world itself, including its non-human beings and components. Climate change matters way beyond and regardless of human meaning making, and this is the case for many of the threats we face today – infectious diseases included. The apocalyptic tone, and the many ways in which the continued survival or at least growth of the human race is put into question by everything from extinctions to a lack of clean water, suggests that there is a need for us to learn to live well in non-human-centric times. We cannot criticize our way into an affirmative acknowledgement of these real predicaments.

I rely on four main empirical sources to track the geopolitics of microbial conduct. These are; 1) scientific articles written by scientists, whom I view as fellow speculative realists that have technology to directly observe and describe microbial conduct; 2) reports and articles by journalists, health practitioners, government apparatuses and non-governmental institutions who describe situations and policies relating to microbial conduct; 3) contemporary political theory that helps me to speculate realistically about microbial conduct, most notably by Gilles Deleuze and Felix Guatarri, Catherine Malabou and Eduardo Viveiros De Castro; and 4) interviews with doctors, microbiologists and epidemiologists who directly work with microbes. During these interviews, I asked philosophical questions about how my respondents think about microbes and microbial conduct, just as I tested my understandings of microbial conduct and my ideas about threat and contagion. My respondents also shared their criticisms of current health security practices and told me about their experiences.

I see a large critical potential in a new materialist orientation towards the world. This doesn't mean that other forms of critical security studies are now obsolete or that new materialism cannot be carried out in tandem with other forms of criticism. Discourses are also part of the new materialist assemblages I try to track, and therefore they also matter, as do histories of postcolonial violence and neoliberalism. I strive to be the kind of new materialist that combines history and institutional analysis with ontologies of becoming, the kind of new materialist who works "to bring enduring structures into conversation with surprising, open-ended potentialities" (Ferguson 2015, 81). As Donna Haraway (2003: 89) writes, "I and my people need to learn to inhabit histories, not disown them." I therefore hope to be in alliance with all critical IR scholarship, even as I hope to make interventions into it.

My priority is to find conditions of possibility for the affirmation or intensification of life, more so than the preservation of life. I want to seek out ways to secure not more lives per se, but more good lives, more healthy, thriving lives. This also entails more good deaths, which I will return to in the epilogue. I am what Eugene Thacker (2015) calls a cosmic pessimist, which means that I do not subscribe to any idea that history sways towards good or redemption. This viewpoint denounces functionalism and also refuses to fall into nihilism. Cosmic pessimism can include optimism towards affirming a fall, in this case the fall of the human race and the planet it has destroyed. It's not necessarily better to extend the human race than trying to have it end well. Redemption is out of the picture. "Saving" the human race or the planet is out of the picture. This doesn't mean that compassion, nurturing, and community are out of the picture. I argue for cohabitation, diversity and contagion firstly because the collectivity and generosity that this requires in and of itself affirms better lives. However, by foregrounding affirmation, I don't give up on utility. I do believe that what I come to suggest in this dissertation will also "work" and save lives, but I also realize that this won't always be the case. Following Donna Haraway (2016), I "stay with the trouble." I refuse to put faith in technofixes such as synthetic biology and geoengineering, or to put faith in narratives of redemption. I also refuse to succumb to a paralyzing despair that amounts to giving up and positing that there is nothing more to do. Staying with the trouble, Haraway writes, is more serious and more lively than succumbing to hope or despair, both amounting to what she labels "a sublime indifference" (Haraway, 2016: 4).

I maintain the difference between mere life and more life. Eduardo Kohn (2013) describes how the Runa of Ecuador's upper Amazon much prefer to hunt and kill their own meat than to buy Styrofoam packaged meat in department stores outside their forest ecology. To them, food is more than sustenance or a means to stay alive. The Runa are more interested in the intensification of the lives they live than the preservation of those lives. In contradiction to such logic, security presumes a western biopolitical utility mode of thinking more life, even if it is mere life: If it can be counted, it counts. On top of this, security always presupposes preemption; something must be secured prior to threat or danger. There is in this sense a fundamental contradiction between the logic of security and rich living as practiced by the Runa. Their notion of the good relies on risk taking, and I adopt that notion in this dissertation. I chose to do this even while invoking the human security paradigm, even though at the end of the day, my stance is in contradiction to a biopolitical attachment to safety. Several times in this dissertation, I bump up against the limits of security when what I wish to say cannot really be said within the existing framework of security. Still, I am not ready to abandon the notion of security yet, especially not the notion of human security, partly because I wish to be in alliance with those who work to ensure human security, and partly because I wish to make scholarly interventions into security studies. I do get the sense that security is so tainted with suffering that it must be replaced with something else. The conclusions of this dissertation make me wonder whether at some point we should start talking about ethics rather than security.

The New Materialist commitment of this dissertation requires discarding some symbolic luggage, most notably some heavy stuff about immunity that does nothing to aid the scholarship pursued here. This discarding happens in chapter 1 about wolves, where a pack of wolves are invoked not as a new metaphor for pathogens, but as an analogy that launches the dissertation's journey towards getting closer to the reality of microbial conduct and rethinking our relationships to risk and danger. The introduced pack of wolves departs from the image of the wolf as an enemy that hitherto has characterized the genealogy of wolves in political theory by introducing an ethos of rewilding, which re-writes the role of the wolf into one that ensures biodiversity through predatory relationships. The ethos of rewilding acknowledges that danger, abundance and what Deleuze and Guattari call "unnatural participations" are co-constituted in ecology. And while the ways the human

body relates to different microbes can be described with the term “immune system” as this term is used by the medical community of the 21st century, it cannot be described by the legal-political notions of immunity championed by theorists such as Roberto Esposito and Jacques Derrida. Abandoning the “immunitary paradigm”, I instead follow Catherine Malabou and her idea that the biological itself provides avenues of resistance that only become visible if we rid our thinking of symbolic cover-ups.

The deadly potentials of biological weapons are the ultimate arena in which microbes are cast as enemies, and fantasies about devastating bioterrorist attacks bring the contemporary crisis talk to a high pitch. However, once again this enmity relies on bellicose understandings of microbial conduct that have little root in reality itself. This becomes clear in chapter 2 about war machines, where I show how microbial conduct resists state-sanctioned weaponization. The chapter extends Deleuze and Guattari’s concept of a war machine to explain the discrepancy between the threat of biological weapons and the ability to leverage that threat geopolitically. Microbes resist control and instrumentality despite the best efforts of synthetic biology and the biosecurity state, and this, the chapter argues, makes them a war machine par excellence. The chapter shows that security strategies that are based on premises of human mastery pose dangers that exceed the threats they are aiming to mitigate, and further nuances the departure from enmity as a good way to describe human-microbial interactions by providing a reconceptualization what it means that microbes wage war.

The futility and danger of human attempts to master their environments are further explored in chapter 3 about borders, which provides a description of how infectious microbes create real borders that are not dependent on human meaning making or identity. By territorializing interfaces between contagion and ecology, infectious agents engage in bordering practices by determining where citizens can move around safely, and thereby challenge bordering practices and biosecurity efforts of sovereign nation states. I link the geopolitics of microbial bordering to biodiversity loss and deforestation, and suggest that microbial bordering should prompt acknowledgement of the role humans play in ecological patterns that far exceed human control and meaning making, and that global health and security efforts should be guided by this ethos. The chapter relies heavily on Amerindian

ontologies, and building on these, lays out how an interest in human security becomes an interest in biodiversity.

The theme of biodiversity continues in chapter 4 about microbiomes, which explores the security dimensions of a lack of commensal microbes as they manifest in childhood malnutrition, which contributes to about three million deaths in children less than five years of age each year. Because the first one thousand days of human life from conception to two years of age are a critical window for the development and maturation of a diverse and abundant microbiome, the chapter introduces a concept of microbial security that rests on logics of nurturing, diversity and abundance as something to be heavily prioritized. Because the microbiome is plastic in quite the same way as the brain, and because malnutrition is characterized by a stunted or altered microbiome, the chapter employs Catherine Malabou's concept of destructive plasticity to explore the security threats of malnutrition and the political opportunities and risks of interventions into plastic biology.

Sometimes reality poses no opportunities for progressive interventions or resisting the necropolitical, and sometimes microbes have no efficacy to be harvested for affirmative strategies of security. By following the assemblages of causes and effects of the amplification of antibiotic resistance in the Syrian war, chapter 5 about limits puts the new realist commitments of the dissertation to the test, leading to a humbling realization that nothing hitherto arrived at in the dissertation is universally true. Syria turns everything on its head and manifests itself as a tragedy where the only thing left to ponder is how to take responsibility for geopolitical horror and suffering, and how to resurrect possibilities for good lives and good deaths from the ruins of biopolitically informed imperialism and humanitarian benevolence.

In the absence of any hope that microbes will save us all, the question of a good death takes center stage. In the epilogue, I end by connecting an acceptance of the sovereignty of death to the possibilities for affirmative security that embraces risk and danger.

CHAPTER 1. WOLVES

Before we embark on the exploration of microbial conduct and its effects on contemporary geopolitics, I have a theoretical bone to pick and some symbolic luggage to discard.

Microbes have their own theories and their own symbolism, and these are what I seek to tap into and learn from, and this cannot be done if engagement with the material keeps wading around in the symbolic realm, as if all progressive politics originate from there. Therefore, both the wolf and the immunity paradigm will be revisited in this chapter, as a starting off point for further explorations into how best to relate to risk and danger.

In a passage where Deleuze and Guattari's scorn for Freud and his psychoanalysis is extra piercing, they ridicule Freud for knowing nothing about wolves, and therefore misunderstanding the Wolf-man. The Wolf-man is tired of his therapist, because he knows that "Freud had a genius for brushing up against the truth and passing it by, and filling the void with associations" (Deleuze and Guattari, 1987, 26). Freud fails to acknowledge molecular multiplicities, and fails to acknowledge that these multiplicities persist regardless of what words are ascribed to them. "Who is ignorant of the fact that wolves travel in packs?" Deleuze and Guattari ask, "Only Freud. Every child knows it. Not Freud" (Deleuze and Guattari, 1987, 28). In the free, reductive associations Freud makes, the multiplicity of the wolves is eliminated as he arrives at One wolf, The wolf. The wolves never had a chance to get away and save their pack before they were captured to serve reductive symbolic ends. "Talk as he might about wolves, howl as he might like a wolf, Freud does not even listen; he glances at his dog and answers, It's daddy" (Deleuze and Guattari, 1987, 216). Freud obviously did not heed the methodology proposed here by Jairus Grove:

[...] all of the things in the world should set the agenda for research rather than our anthropocentric image of the world. If a research agenda is driven by one's presumption of that which is to be studied, then we already find ourselves lost in our imposed telos of the research rather than the object of that research (Grove, 2014).

In this dissertation, I set out to listen to microbes. Microbes certainly communicate, not with words, but with peptides that act as chemical messages. This is called quorum sensing, and such intercellular communication is the norm, not the exception, in the bacterial world. Some peptides mean one thing to one strain of bacteria and another thing to another strain, and a certain peptide has been described as “bacterial Esperanto” because so many different types of bacteria “understand” it (Bassler and Losick, 2006).

As an important nuance to new materialist listening, Tristan Garcia describes ethnologists who worked very hard to get great apes to communicate with them, even talk to them. Some of the apes learned an impressive amount of human signs. However, what these experiments ultimately revealed is that;

[...] great apes have nothing, or almost nothing, to tell us. [...] Chimpanzees, gorillas and orangutans can learn to approach language for us. They can speak in a very restricted sense, but they have nothing to say. But any human child has something to say, in babbling, before even mastering the rudiments of language (Garcia, 2014, 234).

It doesn't follow from a human interest in the biological itself that the biological is interested in the human. The biological perceives the human from its own perspectives, but there is no reason to think it has anything to tell us. Any attempt at listening to the biological is in this sense a humbling one-way endeavor, insofar as this listening has to be reformulated into words on a page. Via quorum sensing, eukaryotic cells already engage in communication with bacteria, which is to say that human cells already perceive and relate directly to microbes.

When taking into account how intensely different humans and microbes are, it seems far-fetched that these two kinds of organisms would share human verbs such as eating, killing, defending and attacking. Microbes have a different ontology than we do. We cannot assume that our language has verbs that get close to describing microbial goings-about. Jamie Lorimer speaks of “non-human charisma” – that some species are easier for humans to relate to:

Most humans are bipedal, between 1.4 and 1.9 metres tall, land dwelling, diurnal, and ocular centric (but in possession of five senses). Human sensory organs make use of only small

portions of the electromagnetic, acoustic, and olfactory spectra. Although many, though not all, of these constraints have been stretched or overcome by the extension of the human body through technologies - such as submersibles, microscopes, and heterodynes - these developments have occurred only relatively recently and are still expensive and unwieldy to use in the field. Understood in this ethological fashion we can see how the physiological and phenomenological configuration of the human body puts in place a range of filtering mechanisms that disproportionately endow certain species with ecological charisma (Lorimer 2007, 916).

With non-charismatic beings such as microbes, Lorimer speaks of “learning to be affected by a target organism or ecology, disciplining one’s body to tune into its forms and dynamics” (Lorimer, 2015, 9). This means that while this listening is radically empiricist, it is also at the same time aesthetic. As Michael J. Shapiro writes, “a critically oriented philosophical ethos encourages an aesthetic mode of apprehension: articulated as the invention of new concepts deployed on a variety of genres of expression, rather than the acceptance of existing conceptualizations of “familiar” problems (Shapiro 2013, 9). This dissertation is informed by a critically and empirically oriented philosophical ethos, and takes the route of empiricism itself to dislodge existing conceptualizations of “familiar” problems. Aesthetic encounters can nudge us to “repartition the global sensible” (Shapiro, 2006), and the method of realism and empiricism pursued here also seeks to repartition the global sensible, as a different angle from which to criticize the “geopolitical cartography that is featured in the mainstream discourses of international studies” (Shapiro 2006, 678). I argue that ecologies are also genres of expression, and also invite aesthetic encounters, or as Rancière calls them, esthetic experiences. I take the biological, rather than the symbolic route, but I do so with many of the same objectives as other critical strains of International Relations scholarship. However, I maintain that the biological route is symbolic in itself, because it holds its own kind of symbolism. I therefore rely in philosophy that helps me to speculate forth this kind of symbolism. To me, the virtue of Deleuze and Guattari and Amerindian cosmologies is that they heed the symbolism of the biological itself in their philosophical formulations.

Honing in on microbiological symbolism first of all entails the acknowledgement that also microbes travel in packs and are always part of multiplicities. Manuel DeLanda defines

Deleuzian multiplicities or assemblages as “wholes characterized by relations of exteriority.” (DeLanda, 2006: 10). In an interview from 1980, Deleuze himself says it like this:

[...] an assemblage is first and foremost what keeps very heterogeneous elements together: e.g. a sound, a gesture, a position, etc., both natural and artificial elements. The problem is one of “consistency” or “coherence,” and it is prior to the problem of behavior. How do things take on consistency? How do they cohere? Even among very different things, an intensive continuity can be found. We have borrowed the word “plateau” from Bateson precisely to designate these zones of intensive continuity (Deleuze, 2006: 179).

Likewise, Daniel Smith and John Protevi (2012) define assemblages as “emergent unities that nonetheless respect the heterogeneity of their components.” In such an assemblage, multiplicity, or zone of intensive continuity, becoming itself achieves its own ontological status (Smith and Protevi, 2012). This is what Donna Haraway (2008: 16) calls “becoming with” as the main characteristic of her concept of companion species. When the relations of the assemblage thereby have an ontological status, the properties of an assemblage cannot be reduced to the sum of the properties of its parts, precisely because the assemblage consists of the actual practice of their capacities (DeLanda, 2006:11). The assemblage is described as a unstable whole, defined in opposition to a totality:

While those favoring the interiority of relations tend to use organisms as their prime example, Deleuze gravitates towards other kinds of biological illustrations, such as the symbiosis of plants and pollinating insects. In this case we have relations of exteriority between self-subsistent components – such as the wasp and the orchid – relations which may become obligatory in the course of coevolution (DeLanda, 2006: 11)

In the example of the wasp and the orchid, these form “a line or block of becoming,” which is a unity, but it is a unity of “shared deterritorialization,” a “coexistence of two asymmetrical movements that combine to form a block, down a line of flight” (Deleuze and Guattari, 1987: 292). Assemblages, contrary to seamless wholes, have linkages that are only “contingently obligatory” rather than “logically necessary” (DeLanda, 2006: 11). Here, we’ve stepped out of Freud’s image of The Wolf as a stand-alone category.

There would be no humans, and no wolves, without microbes (See for example Falkowski, 2015). Eukaryotic cells, of which animals consist, evolved from two major events of what Donna Haraway calls microbial indigestion, firstly when an archaean cell engulfed a possibly photosynthetic bacterium that would later evolve to be a mitochondrion, and secondly when a cell containing a protomitochondrion engulfed a cyanobacterium that evolved into a chloroplast (Falkowski, 2015: 119). Bottom line: Plants and animals evolved from endosymbiosis and horizontal gene transfer in microbes.¹ Humans, then, are a microbial evolutionary extrapolation, a multiplicity, and this is, as we shall see, also the case with the commensal microbes that are paramount to any human body staying alive.

To Deleuze and Guattari (1987, 239), every animal is a becoming – “the wolf is not fundamentally a characteristic or a certain number of characteristics; it is a wolfing.” Deleuze and Guattari reject heredity, filiation, ancestry, genetics and structural distinctions between clearly classified entities as a good description of how nature operates. These terms rather describe how the state codes nature vis-à-vis the family as a state institution. Instead, they argue, nature operates against itself, by heterogenous becomings by contagion, alliance, mutation, epidemic, symbiosis, battlefields and catastrophes. This view puts interspecies propagation at the forefront of becoming: “animals are packs, and [...] packs form, develop, and are transformed by contagion” (Deleuze and Guattari 1987, 242), which is not to say that certain animals live in packs, but that animals “have pack modes, rather than characteristics” (Deleuze and Guattari 1987, 239). The becoming of a truffle involves a tree, a fly and a pig. Nature operates by “unnatural participations” (Deleuze and Guattari 1987, 242).

Deleuze and Guattari are far from alone in taking up the wolf as a figure in their political philosophy. The wolf has a long history in political theory, from Machiavelli, to Hobbes, Rousseau, Schmitt, and Derrida. In these theorizations, the wolf is always the enemy. It represents the dangerous, the evil, the disorderly and the un-human, and it is often what threatens the sovereignty of a human. The fascination with the animal is understandable, as it has distinct non-human charisma (Lorimer, 2007). Historically, wolves have been a threat to human lives, and especially the lives of farmed animals. In the extremely rare contemporary cases when wolves kill human beings, the wolves are subsequently hunted down and shot by biologists, similarly to how sharks have been

¹ Endosymbiosis is the same as what Lynn Margulis famously calls symbiogenesis.

eradicated simply for being above humans in the food chain (Goldberg-Hiller and Silva, 2011). However, as the Anthropocene is teaching us, humans are not sovereign. The Amerindian philosophers I engage with in chapter 3 know this very well, as they occupy a space in which they are prey to jaguars, without this making them want to eradicate all jaguars in the name of security.

This chapter therefore posits a new wolf. It's of course a new pack of wolves. Contrary to a traditional wolf-in-philosophy, the disorder that these wolves bring about is welcome. To a proponent of *rewilding*, the landscape of for example the Welsh Cambrian Mountains – named “The Wilderness of Wales” - is desolate and barren (Monbiot, 2014). In an effort to hold the landscape still as a certain version of ‘wilderness’ - which has been defined as what the landscape looked like between deforestation and industrialized farming - the rolling, grassy hills are “conserved” by grazing sheep that keep the hills from bursting into forest. A few key species of birds and butterflies thrive in this landscape, but on the whole, the mountains are characterized by an astounding absence of life. An ethos of rewilding would suggest releasing a pack of wolves into these hills, because this would likely result in a complete re-rendering of the ecosystem. Contrary to a belief that ecosystems can best be replenished by starting from the bottom of the food-chain, ‘trophic cascades’ occur when apex-predators are introduced into an ecosystem and transform it - all the way down the food-chain, and all the way down to the flowing of rivers and the chemical composition of soil. This is precisely what happened after the introduction of wolves into Yellowstone National Park in 1995. Here, red deer were dominating the landscape by grazing and nibbling on trees along rivers and lakes. When the wolves arrived, they sharply reduced the number of deer, and changed the behavior of their prey such that the deer avoided places where they could be caught most easily (Monbiot, 2014: 84). Because nibbling deer no longer continuously suppressed trees along lakes and rivers, the trees quintupled in height in six years, thus shading and cooling the water below them. Their roots stretched out and halted erosion. This created more pools and riffles in the river. Valleys began reverting to forest. All this resulted in more fish and other river species arriving, the number of songbirds increasing, beaver colonies being built in the riverbank forest, which again created niches for otters, frogs, and reptiles. All this indirectly - as another example - allowed bison populations to expand (Monbiot, 2014: 84). Here, the scariest story is

precisely not the one about the big bad wolf, but the one about the sixth anthropogenic extinction event. A lot of landscapes – both above and below sea level – which we think of as “wild,” are in fact not so much so. In a recent report from the WWF, it is estimated that the number of wild animals on Earth has halved in the past 40 years (Carrington, 2014). It is scarier yet to think that the numbers might also have halved in the 40 years before that, and again in the 40 years before that. What passes as “wilderness” has a shifting baseline (Monbiot, 2014: 69).

In the Anthropocene (Eurocene (Grove, 2016a)) many kinds of landscapes are kept in a perpetual mode of depletion. With soap, hand sanitizer, pest eradication crews for hire, cleansers, sterilized institutions, filters, and, perhaps most prominent of all, antibiotics; this is increasingly also the case for microbial landscapes inside human bodies. With titles such as *An epidemic of absence* (Velasquez-Manoff, 2012) and *Missing microbes* (Bassler, 2014) authors are echoing the outpouring of scientific evidence for the detrimental effects of depleted microbiomes. The human cells in our bodies are outnumbered by communities of microbial cells that fulfill life-important functions relating to our uptake of nutrients and our immune system. While sanitation of the wild seems to eliminate many dangers, the eradication of predators from inner as well as outer ecosystems comes at a price: The lack of diversity that characterizes barren landscapes comes with its own set of existential dangers. The depredation of our outer ecosystems means that we might ultimately take our own species down with the sinking ecological ship, while the one on the inside has so far been causally linked to a load of so-called chronic or “lifestyle” diseases, for example Alzheimer’s, anxiety, cancer, Chron’s disease, diabetes, asthma, allergies and autism.

Wolves released into depleted ecosystems can introduce trophic cascades that rewild their surroundings. In this role, the wolf is no longer an enemy that takes away life by eradicating it, but a predatory facilitator of life assemblages. The wolf remains a threat, a danger and a killer. However, this kind of wolf is not an enemy, and its relationships to its surroundings are not characterized by enmity, and perhaps most importantly of all, there is no war declared that requires retaliation and defense. Risk, danger and threat are all parts of rich and diverse ecosystems, and destruction is a prerequisite for creative novelty.

Immunity revisited

Traditionally, the immune system is posited as an elaborate set of protective or defensive tactics that a body deploys in order to keep “foreign” objects from attacking and invading it. As Haraway asserts, “the immune system is a map drawn to guide recognition and misrecognition of self and other in the dialectics of western biopolitics” (Haraway, 1989: 204). In this rendering, the task of the immune system is to actively distinguish between self and other. As mentioned earlier, Deleuze and Guattari reject structural distinctions between clearly classified entities as a good description of how nature operates, which means that such an idea of an immune system is precisely the opposite of what Deleuze and Guattari describe as unnatural participation, multiplicities and blocks of becoming.

The way the immune system actually functions mirrors the descriptions of Deleuze and Guattari as well as the lesson learned from rewilding. Biologically, the immune system is a system of diplomacy more so than one of defense. It manages cohabitation and in that sense it manages becoming. The human body would perish quickly without any “others” inside of it. Most of these others are commensal microbes, but they are others nonetheless. And often, the boundary between predator and symbiont is remarkably blurry. Take *H. Pylori*, for example, a bacteria that was long targeted for causing ulcers and that therefore had to “be eradicated.” It now seems that this bacteria is essential for avoiding asthma and allergy in children. Wiping it out from our ecosystems might mean that fewer adults get ulcers, but another consequence seems to be that more children get asthma and allergies (Finlay and Arrieta, 2016). Human microbiomes work closely together with human immune systems in a constant diplomatic mission of hospitality, give-and-take, balances, equilibriums, thresholds and intensities, which amounts to a constant diplomatic mission of cohabitation involving risks and danger. For the microbiome and the immune system, there is no other way. This is how it was done, also long before humans constructed an immunity paradigm and squeezed these processes into it. The human body is a disjunctive synthesis, an assemblage that would perish if it were not made up of heterogeneous elements. Nature operates through contagion and unnatural participation, and the messiness that characterizes these assemblages is the precondition for any life at all.

When a bacteria - pathogenic or not - enters a human body, it enters a cellular and microbial assemblage of which it then - in one way or another - becomes a part. Most of the

time it finds a way to cohabitate. Other times it is deemed a threat and is deactivated by a produced antibody, and eliminated by being engulfed by for example a phagocyte. This is elimination and defense, but has nothing inherently to do with war. The current explosion in science relating to the microbiome is forcing us to reassess how the immune system actually operates. This has come a long way.

As Ed Cohen (2009) thoroughly shows, before Metchnikoff's recasting to a notion of immunity-as-defense in 1883, immunity in relation to disease was a description of an "escape" from a "reigning disease." Immunity did not at first refer to any active engagement of the human body, but rather just denoted the failure to be affected by something that people in the same circumstances were affected by. Immunity just referred to negative susceptibility.

During a series of international sanitary conferences in the mid-1800s, the European nations were trying to come up with ways to defend themselves against the "reign" of diseases - especially the "reign" of cholera - that swept through Europe. France and other continental nations argued for quarantine, a solution Britain was staunchly against because it limited trade. The British rather argued for sanitary measures taken inside the nation itself. In an effort to solve this disagreement peacefully, Cohen describes how the committee eventually used the trope of immunity as a way to formulate a solution everyone could agree to. Based on an idea of disease as similar to a seed that needs certain environmental factors in order to grow, this is how the committee at the conference speaks of immunity in 1866:

Does this fact, and many other analogous ones, prove that cholera is not transmissible? Not at all. It only proves that there are certain localities, like individuals, who enjoy a certain immunity against the transmission, immunity which, for the localities, can be complete or partial, permanent or temporary. We say temporary because there are some examples which show a locality which resisted at a certain time and had been invaded at another and vice versa (Cohen, 2009: 232).

Immunity is here cast as something mostly connected to an environment or area outside of human bodies. Cohen argues that the trope of immunity here functions as a negotiator that can support at once efforts of quarantine and sanitation as valid against cholera. The committee casts sanitary measures as necessary complements to quarantine measures, and

“by artfully equivocating between these options, the committee associates immunity with national safety, but not by insisting that national borders define geopolitical thresholds” (Cohen, 2009: 233) and in the ambiguous words and conclusions of the committee, immunity justifies almost any intervention a nation wishes to take or not to take. In other words, immunity does not here arise as a well-defined medical concept, but rather as a term that denotes a diplomatic compromise.

It was later than this that disease came to be understood as taking place within the body. This happened with Pasteur’s germ theory (disease is a matter of microorganisms competing against their host for its living property), Claude Bernard’s *milieu interieur* (the idea that the body is constantly working to keep an internal equilibrium), and Koch’s idea that bacteria are parasites that eat off of their hosts. Tellingly, Pasteur did not cast the inoculations he initiated in a framework of immunity, to him inoculation was a matter of inducing a “nonrecidivistic character” (Cohen, 2009: 249). This non-recidivism still represented immunity as a non-event rather than as an active response in a body. According to Cohen, it is with Koch that what happened inside was cast in a bellicose light. He saw disease as an invader, and the measures taken against disease became a war:

Koch translates the tropes of invasion and enemy, which had characterized the International Sanitary Conference’s discussions of cholera twenty-five years earlier, from the geopolitical domain into the individual body. If bacteria stand as an invasive disease’s cause, Koch avers, then by metonymy the bacteria must invade; however, such diseases no longer invade nations but individuals, or rather they invade nations by invading individuals (Cohen, 2009: 253).

With Koch, disease becomes a war between different species. It was Metchnikoff who discovered and named the phagocyte. He even described how it engulfs and reabsorbs other cells as well as their genes. However, Metchnikoff understood this not as symbiogenesis and horizontal gene transfer, but as an intracellular struggle for survival, and the phagocytes were cast as violent defenders of the human organism.

Thanks to Metchnikoff’s innovation, bioscience now imagines the host organism as a materially localized entity, inscribed within a recognizable frontier, whose immunity appears

within the furthest limit of its ability to defend against a marauding parasite's invasive forces (Cohen, 2009: 257).

It is with Metchnikoff that healing is recast from a process of (re)harmonizing a balance to a matter of fighting, destroying, attacking, and battle. According to Cohen, the notion of sovereignty got mixed up in an understanding of disease even before immunity got mixed up in an understanding of defense:

Before Metchnikoff's revision, then, when immunity appears in medical texts, it explicitly borrows against its juridico-political inheritance – especially in reference to epidemics. According to immunity's metaphoric tenor, nature acts precisely as a political sovereign does, affirming its jurisdiction by defining those whom it exempts from its laws. Indeed, if we remember that Foucault characterizes the political sovereign as the one who bears the “right to *take* life or *let* live,” then immunity in both its political and medical valences evinces such a sovereign power (Cohen, 2009: 207).

The conflation of immunity-as-defense with the legal framework of immunity persists. The confusion laid onto an understanding of being exempt from disease is double. Not getting sick while others get sick is firstly confused with immunity granted by a sovereign nature. Secondly, this immunity is confused into signaling an active action of defense against an enemy. These layers of theoretical legal-political-belligose constructions continue in the “immunitary paradigm.”²

² Georges Canguilhem (1989) also analyzed the ways health and disease were defined in the early 1800s, and showed that the categories of the normal and the pathological that came out of biology and medicine during this time were not “objective” scientific concepts, but were intertwined with political, economic, and technological ideas. Like Esposito, Canguilhem doesn't step out of this analysis of different (inadequate) symbolic renderings to say anything about what a more precise or correct way to describe the normal and the pathological would be. I side with the speculative realist wager that even though humans don't have unlimited access to reality “out there” (or to our own biological reality, as Malabou makes clear), this doesn't mean we shouldn't try to get as close as we can. I think that some renderings are more correct than others, and I think its worth trying to find those to see what they can teach us. Canguilhem gestures towards this kind of thinking in his lectures “The living and its milieu” (2001), where he suggests a view of a multiplicity of milieus within a single space. Again, Canguilhem's aim is more deconstruction than to suggest a new, more precise way to theorize space, but he still questions a certain anthropocentrism of the space as it is described by physics.

Roberto Esposito has laid out an immunity logic of keeping foreign objects out by inviting small bits of them in:

To escape from the extreme risk of annihilation, life must take inside itself a fragment of the nothingness that threatens it from outside. It must partially and preventively incorporate what negates it (Esposito 2011: 56).

But microbes do not negate or threaten the human body, they comprise it. Esposito, like Freud, overlooks the multiplicity. And microbes are certainly not nothing, as this dissertation manifests. Simply put, the biological resists the metaphorical, renders it incorrect. To Esposito, there is a dialectical relationship between immunity and community, because being granted immunity from something always means that the collective was exposed to what you were exempted from. Immunity is therefore always stepping out of the community (Esposito, 2011). This is true within law, but what is called immunity in the body factually operates differently. The “immunity” of the immune system occurs when an incoming antigen triggers the production of a specific antibody to deactivate it, and the body then continues to host this antibody, such that if the same antigen presents itself again, the body will appear “immune” to it, because the antibody is readily available. The antibody itself is not a “negating fragment from the outside” that is incorporated but something created by the immune cells in the body, and immunity is granted from prior exposure, which means that earlier, the immune body was exposed to what the community is exposed to. The idea of a dialectical relationship between immunity and community doesn’t hold up against biological fact-checks. Another example is herd immunity, where certain members of a community who are too weak to be vaccinated still de-facto acquire immunity from a disease precisely because everyone else in the community is vaccinated, which means the disease can’t spread into the community in the first place. Here, the entire community is exempted, precisely because they are a community. Further, adaptive immunity - the part where B and T cells memorize and recognize specific pathogens and distinguishes one microbe from another - is only one part of the human immune system. Physical barriers (skin, acidic stomach, etc.) and innate immunity are different immune aspects whose defense mechanisms don’t operate according to a logic of protection arising because of incorporating something into the body. In the innate immune response, pathogens are recognized by a fixed repertoire of cell-

surface receptors and molecules that have evolved over hundreds of millions of years and are passed between generations via genes, which recognize structures shared by many pathogens (Parham, 2009). Importantly, and as I will get into in more detail in chapter 4 about the human microbiota, the innate as well as the adaptive part of the immune system is dependent on commensal microbes entering the body in order to develop properly. A human body hosts plenty of pathogens at any time. Being sick is not a matter of pathogens, but a matter of a complex range of other factors. Therefore, avoiding disease is never a question of avoiding all bacteria and microbes that could cause disease. Our boundaries are never fixed; we are bordered and constituted by cellular and microbial encounters. The immune system is all about diplomatic communities and cohabitation. Another example is the fact that about one third of the world's human population lives with dormant tuberculosis bacteria in their bodies, without the bacteria causing any harm. The immune system tolerates a dormant pathogen.

In essence, the immune system does not distinguish between the host and what is foreign to it, but between what can be commensally or symbiotically part of the disjunctive synthesis of the host, and what cannot. Immunity, therefore, is dependent on community, not dialectically opposed to it.

Esposito's immunity-community dialectic is interesting with regards to politics and law, but will not serve me in my theorizations of microbes. Esposito is correct to question why legal-political understandings of immunity have infused the medical community, and how the functioning of the human immune system "has been the object of an excess of meaning that threatens to erase, or at least confuse, its distinctive traits" (Esposito, 2011: 17). Still, Esposito's own explorations never exit the metaphorical, which means that they are useless to someone who is interested in the distinctive traits of the immune system, which I am.

To Esposito, the immunitary paradigm explains the "hypertrophy" of security apparatuses of the contemporary era, who "instead of adapting the protection to the actual level of risk [tend] to adapt the perception of risk to the growing need for protection – making protection itself one of the major risks (Esposito, 2011: 16). This is similar to Derrida's notion of autoimmunity, which describes defense or self-preservation acts that in fact leads to internal destruction. These kinds of formulations brush up against the main

critiques provided in this dissertation. I agree that contemporary security apparatuses are militarized to an absurd level, and that contemporary security logics and tactics are faulty and dangerous in themselves. Because I am interested in the distinct traits of the immune system itself, how microbes relate to it, and how security apparatuses relate to microbes, I will not utilize sloppy immunity metaphors to get my criticisms of security apparatuses across. The immunitary paradigm is a sloppy metaphor not only for the human immune system, but also for security apparatuses, because the “immunitary logics” used to describe these security systems presume that we can speak of security assemblages with (a sloppy metaphor of the) human body as a useful metaphor. I want to get at a different kind of assemblage, where something (in this case pathogenic microbes) that is exterior to the human body, as well as to human government and so on, has efficacy. What Brian Massumi describes as “mimicking the accident” as something integral to preemptive security policies that aim at finding a threat and curbing it before it becomes unmanageable, in which an “anti-accident becomes its own enemy,” describes the ironies of contemporary security without getting stuck in metaphors that don’t correspond to reality (Massumi, 2015). We will see an example of these kinds of policies in chapter two when I describe the U.S. biosecurity state. Unlike Esposito, I don’t think there is much potential in staying within the metaphorical and providing critique and suggestions for progressive politics from that vantage point. Relying on incorrect and imprecise biological understandings to criticize how those understandings inform medicine and security is to me ineffective. Instead, I agree with Catherine Malabou (and Deleuze and Guattari) that the answer is to get closer to the biological reality itself.

To Malabou, the problem for Esposito and others is that they conflate the symbolic with the biological (Malabou, 2016). Because of this, these thinkers overlook resistance potentials within the biological itself; that the structure of the living itself holds potential for resisting thanatopolitics and, as will be pursued in this dissertation, violent security logics of eradication and the calamities of the Anthropocene. Malabou writes that with there being two lives – biological life and symbolic life – “symbolic life appears as the resource or the potentiality of resistance” (Malabou, 2015: 38). However, when a critique of or resistance to biopolitics maintains this separation, sovereignty gets stuck in the body, such that “the critique or deconstruction of sovereignty is structured as the very entity it tries to critique or

deconstruct” (Malabou, 2015: 39). As an example, Malabou mentions how Agamben’s notion of ‘bare life,’ roots the resistance to biopolitics in something other than the bare life, i.e. somewhere else than the biological body itself. In other words, Agamben reaffirms the theory of sovereignty as a split between the symbolic and the biological. Malabou:

It is as if we still need to affirm the existence of a beyond or an outside of the real to confer meaning to reality, as if prior structure, necessarily nonmaterial, was requested to give sense to materiality itself (Malabou, 2015: 40).

Roberto Esposito proceeds theoretically in a similar way as Agamben. For him, the “immunization paradigm” is a category that makes it possible to have a negative causal relationship between the thanatopolitical and the life-giving parts of the biopolitical, “one affirmative and productive, the other negative and lethal” (Esposito, 2006: 24) For him, immunization is a negative form of the protection of life:

Just as in the medical practice of vaccinating the individual body, so the immunization of the political body functions similarly; introducing within it a fragment of the same pathogen that it wants to protect itself from, by blocking and contradicting natural development (Esposito, 2006: 24).

As I read it, a biopolitical state’s thanatopolitical tendency towards violence and death is here rendered analogous to the doctor being protectively violent to her patients by inserting pathogenic bacteria into them. This analogy is a glorious theoretical mess. It is neither clear what exactly is analogous to what, who (the doctor or the bacteria?) is violent and when, or what is nation and what is body. Also, the immune system, as mentioned above, is much more than a logic of vaccination. If Esposito cared to look carefully at microbial conduct, he would see that microbes correct him. But he just wades around in the symbolic, and only “brushes up against the truth and passes it by, filling the void with associations.” Esposito’s embrace of the immunity paradigm ends up reinforcing the immunity paradigm because he stays within the symbolic to formulate his criticism. Further, Esposito never exits an entirely humanist framework for his political theoretical interventions. I think this is a mistake. It is also a good example of what Malabou wants to move past. She criticizes how, in western

philosophy, biology continues to be rendered dependent on the symbolic and always derived from the symbolic. The biological remains understood as predetermined and genetically programmed, deprived of meaning. Also in Esposito's case is biology merely an ally of the symbolic, "it never serves the cause of the symbolic, but always tries to hide it" (Malabou, 2015: 42).

Theoretical notions of resistance to biopolitics that rely on this political move makes not for resistance but rather for another political move. This is precisely what Malabou wants to move past. The immunity paradigm is an example of a theoretical move that relies on a separation between the biologic and the symbolic. Even though it puts itself out there as if the biological and the symbolic are conflated, it is rather the case that the biologic is taken hostage in hiding that the symbolic is in fact symbolic. The immunity paradigm does not help us to heed Malabou's insight that the biological *is* the symbolic. Malabou, through her concept of plasticity, shows that biological life "creates or produces its own symbolization" (Malabou, 2015: 43). This is the case not only with the brain, which is Malabou's favorite example, which however also keeps her within the biology of the human, but is also the case with microbes, and myriads of other non-human beings who, as we shall see in chapter 3, engage in bio-semiotics, interpretations, and predictions to mention but a few of their symbolic endeavors. Furthermore, not only the brain is characterized by plasticity, but also the gut microbiome, which I will discuss as plastic materiality in chapter 4. Malabou asks:

And how might the return of these possibilities offer a power of resistance? The resistance of biology to biopolitics? It would take the development of a new materialism to answer these questions, a new materialism asserting the coincidence of the symbolic and the biological.

There is but one life, one life only (Malabou, 2016: 7).

The next four chapters of this dissertation is an attempt at developing that kind of new materialism. If we care to listen, the wolves tell their own stories; stories about diversity and abundance, hunting, and competing. Attempts at getting close to these stories ought to be the next part of their genealogy in political theory. We need to rewild our landscapes, we need to rewild ourselves by acknowledging and nurturing our commensals, and exposing ourselves to risks and microbial abundance, and we need to rewild our thought in an effort to get closer to the wild itself. Finally, rewilding cannot be reconciled within an immunization paradigm.

As such, it doesn't matter to me what things are called. Immunity or not. What matters to me is how we choose to cohabitate and govern based on our understandings of how we relate to the world. This dissertation therefore does not propose a set of new metaphors as a progressive politics. It seeks to move past metaphors and suggest amendments and new ways of thinking and relating that are based as much as possible on reality itself. Rewilding is an ethos of diversity, letting go of control and harnessing the efficacies of the biological itself. It is an ethos of abundance, dangers included. It is also a strategy for mitigating the catastrophes of the Anthropocene.

CHAPTER 2. WAR MACHINES

In every respect, the war machine is of another species, another nature, another origin than the State apparatus. (Deleuze and Guattari 1987, 352)

In theory, anthrax is a terrifying and highly effective weapon. While most bacteria require nutrients in a moist environment at certain temperatures to remain alive and infective, anthrax can be dormant in invisible spores that prevail in harsh environments over long periods of time, only to spring back into bacterial life once conditions are met. If left untreated, *Bacillus anthracis* kills up to 90% of humans who inhale it (as listed on CDC's website; WHO 2008). Because the spores can be sprayed in an aerosol over victims, it is speculated that an attack with anthrax can decimate a large city, infecting millions (see for example O'Toole 2007).

Despite this magnificent weaponry potential, merely two incidents with deaths from weaponized anthrax exist. The first occurred in 1976, when anthrax spores were accidentally released from a Soviet bio-weapons laboratory in Sverdlovsk and caused 68 confirmed deaths. Keeping the causes and effects secret even from its victims, Soviet officials blamed the outbreak on contaminated meat at the local market (Alibek 1999). Although producing and stockpiling hundreds of tons of weaponized anthrax spores, the Soviet never utilized them in war (Alibek 1999). The second incident occurred in late September 2001, when letters containing anthrax were mailed to two members of the U.S. congress and three U.S. news media outlets. Some 30,000 federal employees were advised to take prophylactic antibiotics, 23 people were infected with anthrax, and five died (Masco 2014, 147). The CIA later concluded that the letters were mailed by a U.S. army biodefense expert specialized in anthrax (As listed on CDC's website, see also Shane 2010; Masco 2014). In both of these cases, those who died were victims of anthrax produced by state employees in their own country, which means that the overall success rate of weaponized anthrax as a state security enhancer is crushingly negative. The reality is similar but even less dramatic for weaponized plague, tularemia, smallpox, botulism, and the rest of the infectious agents that are

considered potential weapons by offensive and defensive bioweapons programs. Very few have been used at all in war.

Despite this, biological weapons continue to be of priority to security states that spend vast resources on developing and stockpiling countermeasures against bioterrorist attacks in a worry that “rogue states” and non-state actors (terrorists) will succeed where so many others have failed. Why has a weapon of such great potential been used so little?

This chapter begins by briefly covering the history of biological warfare and how deaths from biological weapons have overwhelmingly occurred when developers and attackers had no control over the weapons, for example during testing, colonialist expansion, and laboratory accidents. This history emphasizes the discrepancy between threat and utilization that characterizes bioweapons, and also underlines that the discrepancy stems from a lack of control, not a lack of threat. After placing itself within existing literatures on biological weapons, global health security, and the biosecurity state, the chapter clarifies why explanations for the threat-use discrepancy that disregard microbial efficacy are insufficient. This leads to a theoretical exploration of microbial war machines that explicates how microbes cannot be weaponized according to state requirements. Furthermore, the conceptualization of pathogens as war machines proposes that the wars pathogens wage are not on human bodies, but arise when their goal of proliferation clashes with state objectives. In conclusion, the analysis highlights the futility of continuous efforts of environmental and biological control, and critically questions how war and public health have been conflated in matters of policy and discourse alike.

In enlarging the theoretical conceptualizations of Deleuze and Guattari to make an instrumental and practical argument about biological weapons, the chapter utilizes political theory to make policy-relevant arguments. This combination, and what the exploration of microbial efficacy in questions of bioweapons does to it, leads the chapter to first and foremost suggest amendments to security politics of biological weapons, and secondarily also to suggest amendments to the framework of Deleuze and Guattari.

Biological weapons historically: a strategic mistake

As Carus (2015) and Koblentz (2014) make clear, the history of the use of biological weapons is sketchy and everything but glorious. Overwhelmingly, the pursuit of biological

weapons has been futile and a waste of recourses for state and non-state actors alike. Because infectious disease has historically accounted for a large number of war casualties, it is mostly impossible to determine with certainty that deaths were due to an intentional attack. While there is consensus that the invading Tartar army catapulted dead bodies of plague victims into the city of Kaffa in 1346 and that British troops gave Delaware Indians blankets used by people with smallpox, there is no consensus on whether these attacks in fact intensified the already occurring deaths from the diseases. During World War I, Germany launched an unsuccessful sabotage campaign by trying to infect ally horses and mules with anthrax and glanders. By WWII, Britain, France, Japan, The Soviet Union, and the United States all had offensive bioweapons programs. During World War II, Japan's bioweapons program conducted horrific experiments on thousands of prisoners and used biological weapons against Chinese soldiers and civilians by unleashing plague-infected fleas and contaminating food and water sources. Due to accidental Japanese casualties and the general unpredictability of the weapons, this elaborate endeavor never gave the Japanese any advantage in the conflict. It is speculated that Israel used biological weapons in the 1948 Arab-Israeli war, which might have caused an outbreak of typhoid fever in British troops. In the 1970s and 1980s, Rhodesia used biological weapons against nationalist African insurgents, but ultimately lost their claim to what is now Zimbabwe (Cross 2017). The South-African state had an expensive but unsuccessful bioweapons program during the apartheid period. Iraq launched a bioweapons program during the Iran-Iraq war, but destroyed stocks in anticipation of a UN visit in 1991, and an Iraqi bioweapons production facility was destroyed by the UN special commission in 1996. Despite U.S. claims in 2003 that Iraq possessed vast stocks of biological (and chemical) weapons, the intelligence supporting this finding turned out to be false. In addition to these state-run efforts of producing biological weapons, the Japanese cult Aum Shinrikyo unsuccessfully attempted to produce biological weapons before turning to chemical weapons in 1995 (see Danzig 2011), and Al Qaeda has also had an unsuccessful bioweapons program (Carus 2015; Koblentz 2014). This brings us to the 2001 anthrax letters, which is the largest bioweapons attack in U.S. history. Essentially, this history conveys a series of failed attempts of microbial control. In fact, most deaths from bioweapons have occurred precisely when developers and attackers had no control over pathogens.

Arguably, the biggest bio-attack in history in fact happened when Europeans arrived in the Americas and entered into a strategically important, lethal alliance with the pathogenic microbes they brought with them. What resulted was an attack that largely left the Europeans untouched while it decimated the indigenous populations of the Americas. To the Europeans and their colonized alike, this selective destruction made it appear that Europeans were in fact a people chosen by God, when what actually accounted for the differential effects of the microbes was immunity acquired by Europeans from their habit of sleeping next to animals (McNeill 1976). Importantly, the attack was neither planned nor controlled. Similar accounts of indigenous populations being wiped out by pathogens traveling with settlers exist for Brazil and Australia (Carus 2015) as well as Hawai'i (Goo, 2015).

Testing biological weapons to learn about their potential effectiveness has claimed thousands of lives. Many of these were monkeys that died in Soviet Union biological weapons tests (Alibek 1999, 27). I have already mentioned the testing carried out by the Japanese unit 731 during WWII, and as another example, one person died and ten fell ill when the U.S. army in 1950 diffused two bacterial agents thought to be harmless into the fog over San Francisco (Loria 2015).

Lab workers also experience the lethality of infectious agents first-hand. Alibek describes how in 1983, managing a Soviet lab, he was called to an emergency in the middle of the night, and when entering the lab found himself standing in a milky brown pool with enough tularemia to infect the entire Soviet Union. He got out of the room by spraying hydrogen peroxide on his boots as he took small steps backwards out of the lab, being careful not to drag any disease with him into the corridor. Despite wearing an astronaut-type lab-suit, he brushed his face while taking off his mask and hood, and fell ill. He survived thanks to massive shock doses of tetracycline acquired illegally (Alibek 1999, 64-69). Infectious pathogens are lethal, and they pose a threat to human lives, but overwhelmingly, the lives that have been lost to biological weapons are of lab-workers, test-animals, test-humans, and civilians killed by pathogens from programs that were supposed to protect them. The laboratory is deadly in itself, and the weapon never makes it to the battlefield.

Biological weapons in the literature

Along with making sense of the history of the use of biological weapons (Koblentz 2014; Carus 2015), literature on biological weapons has focused on the Soviet biological weapons program (Alibek 1999), efforts of disarmament after the 1925 Geneva Protocol banning the use of chemical and biological weapons and the 1972 Biological Weapons Convention (Chevrier 1995; Koblentz and Chevrier 2011; Revill et al. 2016; Edwards and Revill 2016), aspects of dual-use issues and the security governance of science (Koblentz 2015; Rychnovská 2016), attempts to predict the actual risk of biological weapons (Koblentz 2010; Koblentz 2011), and biodefense efforts of state security apparatuses after 9/11, specifically the United States.

Historically, biological warfare between states was viewed as the only biological threat to international security (Koblentz 2014: 118). At the beginning of the 21st century, the threat of biological weapons, now re-labeled as a threat of “bioterrorism,” became an established part of what to be afraid of in the post-9/11, post anthrax letters landscape, in which the threats to prepare for had moved into the realm of the “unknown unknowns.” In this landscape, it had become legitimate, in fact required, to preemptively prepare for highly unlikely events (see Cooper 2006; Lakoff 2008; Duffield 2011; Koblentz 2014; Elbe, Roemer-Mahler and Long 2014; Massumi 2015; Lundborg 2016). Since 2001, the United States has spent over \$60 billion on defense against biological weapons (Koblentz 2011, 514). Part of this money funds a stockpile under “Project BioShield”, in which an anthrax vaccine, two anthrax antitoxins, a botulin antitoxin, and a smallpox vaccine have been procured. In 2013, as one example, GlaxoSmithKline was funded \$198 million to *replenish* a stockpile of anthrax antitoxins, to deliver 60,000 treatment courses of their medicine “Raxibacumab” in order to “maintain current preparedness to 2017 and procurement of cell bank” (HHS 2014, see also Gottron 2011). The military-industrial complex has a pharmaceutical wing that is funded not by a “free market” but by a fearful biosecurity state.

There is dark irony in the practices of the U.S. biodefense state. For example, “characteristics, challenges and medical countermeasures” to the speculated bioterror-agent Staphylococcal enterotoxin B are well-known due to “a series of laboratory accidents in the 1940s–1960s in the United States [that] led to intensive research of the toxin which yielded a vast amount of pertinent information” (Berger et al. 2016). The toxin has never been used in

an attack against the United States. Similarly, a report from the Commission on the Prevention of WMD Proliferation and Terrorism states: “The United States should be less concerned that terrorists will become biologists and far more concerned that biologists will become terrorists” (Graham et al. 2008, 11, see also Koblentz 2015). As discussed in the previous chapter, I do not find it helpful to include what I here describe as ironies into an immunitary paradigm. What we see here is precisely what Brian Massumi describes as “mimicking the accident.” In order to intervene in a territory that generates unpredictable, singular threats at any time, and in order to engage a hugely asymmetrical enemy, it is necessary to partly become whatever preemption is aimed at. An anti-accidental exercise of power must move as the accident moves, catching it before it actually emerges (Massumi, 2015). In addition to the worry that preemptive measures of becoming the accident will lead to emergence of the accident itself, and the worry that non-state actors would have recourse to biological weapons, as of 2012, the U.S. was concerned that China, Iran, North Korea, Russia, and Syria were developing biological weapons (Koblentz 2014). Presently, advances in biotechnology pose a new arena of perceived threat. In November 2016, the U.S. President’s council of advisors on science and technology publicized a report in which they expressed that the adequacy of the billion-dollar U.S. biodefense efforts “is increasingly challenged by advances in biotechnology” (PCAST 2016, 2). The council describes that biotechnologists are increasingly adopting an “engineering mindset” in which working biological units can be assembled to carry out desired behaviors, and warns that while this holds great promise for medicine and agriculture, it also harbors the potential for misuse, because pathogens could potentially be genetically modified to “overcome existing immunity or to be resistant to available drugs” (PCAST 2016, 3), and “a pathogen might be deliberately modified to affect its spread or to be resistant to current preparedness and response capabilities” (PCAST 2016, 4). The council continues:

In view of the rapid advances in biotechnologies, a biodefense strategy must prepare not only for *known* biological agents, but also for a much wider array of novel and ever-changing biological threats that may be impossible to fully anticipate; moreover, even attacks involving known pathogens may not follow scenarios devised during the Cold War (e.g., an aerosol dispersion of anthrax spores) because biotechnologies may lead to new paths for dissemination. (PCAST 2016, 4)

The council recommends a dual-use approach also to defend against these “unknown unknowns” because defense against a deliberate attack in many ways resemble defense against a naturally occurring outbreak of a new emerging infectious disease for which vaccines or treatment has not yet been developed (for example Zika). Secondly, protecting against new and emerging infectious diseases provides “a critical testing ground for approaches to detect and respond to potential deliberate biothreats” (PCAST 2016, 5). Therefore, “PCAST favors maximal coordination between biodefense efforts directed at deliberate and naturally-occurring threats” (PCAST 2016, 5). Practically, the council advises that there is an urgent need for massive investments in public health infrastructure, a public health emergency response fund, an agency charged with an overall U.S. biodefense strategy, massive funding for the development of medical countermeasures, expanded efforts in developing new broad-spectrum antibiotics, the development of platform technologies for rapid production of therapeutics and preventative medicines, and research with the goal of developing new types of countermeasures (PCAST 2016).

These contemporary biodefense efforts have been widely criticized from different angles. Some authors have claimed that biodefense channels funds away from public health threats with vastly higher death-tolls (CAE 2006; Garrett 2013), a critique that has been echoed by public health practitioners themselves (Dr. Richard Brostrom, personal communication, 2016). Others argue that the threats from dual-use risks such as theft by terrorists and laboratory accidents, especially after the massive increase in biodefense laboratories after 9/11, exceed the threats from actual bio-attacks (Klotz and Sylvester 2009), and others again argue that the threat of bioterrorism is created by the very practices meant to secure against it (Kittelsen 2009), and that the biodefense system itself produces vastly more weapons of mass destruction, terror, and insecurity than it protects from (Masco 2014). Much in tune with this chapter, a 2001 editorial titled “Why Biodefense won’t work” in *Nature Biotechnology* (19, 993, 2001) written in response to the 2001 anthrax letters, stated that “The simple fact is that biological defenses will nearly always be defeated by biology,” and that “No country, no matter how powerful and technically advanced, can defend against evolution.” In the words of Neel Ahuja, this characterizes “investment in the security state as if the uncertainty inherent to life was itself the enemy” (Ahuja 2016, 139). This chapter adds

to this critical arsenal in providing a theoretical explanation for the futility and danger of attempting to control biological life.

Biosecurity goes viral

As mentioned, security apparatuses ceased to distinguish between the threat of an intentionally released and naturally occurring disease outbreak in the aftermath of 9/11 (see Elbe 2010; Massumi 2015; PCAST 2016), and this amplified the conflation of public health and security that had begun a couple of years earlier when the UN Security Council in 2000 declared HIV/AIDS as a threat to international peace and security (Ingram 2005; Elbe 2010; McInnes and Rushton 2012).

Since then, the subfield of global health security has described a securitization of health (McInnes and Rushton 2012; Rushton and Youde 2014) and even a medicalization of security (Elbe 2010). Scholars in global health security are discussing whether the security threats posed by infectious diseases should be labeled as a threat to national security, global (public) health security, human security, or biosecurity, as appealing to each dispositif brings about different discursive and practical potentials in terms of attention and funding as well as disadvantages in terms of a militarization of the problems, and a lopsided focus on emerging threats and bioweapons rather than on the diseases that claim most lives globally (Fidler 2007; Elbe 2010). Because the impact of biological weapons is overwhelmingly felt in the programs created to preempt them, biological weapons are not at the forefront of investigations that focus on infectious diseases with high death tolls. When actors such as the U.S National Institute of Allergy and Infectious Diseases (see the page “Biodefense and Related Programs” on their website) and the U.S. President’s council of advisors on science and technology (PCAST 2016) embrace biodefense, one could therefore speculate that this is for strategic rather than ideological reasons following the motto “if you can’t beat them, join them.” It is a mistake to assume that if funds were taken away from biodefense, they would automatically be given to public health efforts. Epidemiologist Alan Katz (personal communication, 2016) described to me how public health practitioners and epidemiologists in Hawai‘i were thrilled with the bioterror preparedness funding they received after 9/11, because subsequent investments in disease surveillance and infrastructure were useful for

health issues currently unfolding. In any case, the collapse of public health and security is a fraught relationship in academia and beyond.

Alternative explanations for the threat/use discrepancy in bioweapons

Existing literature on biological weapons does emphasize the rare use of the weapons, stating for example that “the use of biological agents as weapons is fraught with uncertainties for the attacker“ (Koblentz 2014, 120), or that a developer of bioweapons faces “formidable technical hurdles” (Koblentz 2011, 503). These uncertainties and technical difficulties, it is proposed, stem from the fact that biological agents are “fragile creatures” that are affected by environmental factors such as temperature, humidity, wind, and sunlight, which makes it difficult to keep them alive during production, storage, delivery and attack (Koblentz 2010; 2014, 120).

In addition to technical difficulties, deterrence and successful diplomatic missions of disarmament are stated in bioweapons literature as explanations for the threat/use discrepancy in biological weapons. While knowledge that the U.S. has vast medicinal stockpiles against every conceivable (and unconceivable) biological weapon might be discouraging, this alone doesn’t explain the rare use of biological weapons. The threat of retaliation isn’t sharp enough, and pathogens are not destructive on the same scale as nuclear weapons. In relation to disarmament, the Soviet Union signed the treaty banning biological and chemical weapons in 1972, and then simply continued their offensive bioweapons program, and the whole *raison d’être* of terrorists is to ignore the laws of war. One author does highlight that “intangible factors” beyond factors of knowledge transfer and laboratory access play a role in the possibilities of state or terrorist groups developing biological weapons, however the listed “intangible factors” are work organization, program management, structural organization, and social environment (Ouagrham-Gormley 2012).

Such anthropocentric accounts fail to address microbes themselves as a factor. Microbes are not fragile creatures to be perceived as innate objects in the hands of more or less technically capable and resourceful humans, but agents with political efficacy that warrants far more recognition and consideration than the literature on biological weapons has thus far afforded them. It is, I argue, this political efficacy that more than anything explains the discrepancy between threat and use in biological weapons.

By lending efficacy to microbes themselves in analyses of biological weapons, this chapter hopes to disrupt the circular analytic that takes place between the military and biomedical fields in which the biomedical field borrows its metaphors from the military, viewing disease as war inside a body and medicine as a matter of defense against an enemy, while the military, as mentioned earlier, casts the outbreak of an infectious disease such as the avian flu as a military threat that is strategically undistinguishable from a bio-attack. To break out of this false entanglement of public health and war, this chapter re-conceptualizes the relationship between infectious microbes and the state, and redefines which kind of war pathogens wage and more specifically what they actually wage it against. As we shall see, a view of microbes as objects, and of humans as in control of their environments, misses the point.

Infectious agents as war machines

Deleuze and Guattari's war machine characterizes a force that is radically exterior to the state apparatus. The state constitutes an interiority from which we habitually address security concerns, and in relation to this, the war machine must be regarded as a "pure form of exteriority" (Deleuze and Guattari 1987, 354). Because the war machine arises outside the state apparatus, and is entirely distinctive from state sovereignty and law (Deleuze and Guattari 1987, 352), the concept offers a valuable alternative to a view of microbes as objects in the hands of the state (for other examples of the application of the war machine in IR, see Reid 2003; Hoffman 2011; George 2016).

Microbial exteriority in relation to the state crystallizes in how microbes continuously slip between the fingers of the state apparatus. Microbes don't respond to ideologies, they are very difficult to keep under surveillance, they are indifferent to any psychological threat, and they are impossible to incarcerate. When the state attempts to control them with for example antibiotics, they mutate into resistant strains – "the war machine's form of exteriority is such that it exists only in its own metamorphosis" (Deleuze and Guattari 1987, 360). Pathogens resist fitting into the category of distinguishable species, which makes the state unable to count and document them, leaving only the disease and death they cause available for statisticians. Microbes are hard to code according to a binary of pathogenic/non pathogenic, as many microbes, such as *H. Pylori* and *E. coli*, can make us sick while we also

symbiotically depend on them. Microbes are in a constant flux of mutations, and they are everywhere; in the soil, in the ocean, in caves with no oxygen, and colonizing every human being. Microbes were here before the state and they will be here after the state. From a microbial perspective, which is radically exterior to the state perspective, the state itself exists, but it exists differently to microbes than it does to humans.

Deleuze and Guattari explicate the war machine's exteriority to the state by distinguishing between smooth and striated space. War machines move in smooth space - the desert, the steppe, the ocean, and the air; spaces that are out of reach to the coding and striation efforts of the state apparatus. In smooth space, movement isn't from one point to another, but is about holding space beginning from any point: "One occupies it with a vector of deterritorialization in perpetual motion" (Deleuze and Guattari 1987, 387). The war machine is the "constitutive element of this space, the occupation of this space, displacement within this space" (Deleuze and Guattari 1987, 417). In contrast, striated space has been delineated, counted and controlled by the state. According to Deleuze, the state apparatus functions by overcoding binary segments such as legal-illegal, black-white, man-woman, healthy-sick and so on. This coding means that as one moves around striated space, identities are ascribed – from parent, to teacher, to consumer, to prisoner, etc. Striation is the State's response to everyone who attempts to escape its coding operations (Shapiro 1999, 162). In this way, the state always regulates speed and movement. Biopolitical actions of controlling, augmenting, and regulating are matters of striation, and through biomedicine, the State apparatus indirectly attempts to striate microbes as it attempts to striate our bodies and our environments: clean-dirty, sterile-non-sterile, safe-un-safe; the state seeks to territorialize, code and appropriate, it constantly counters flows in an effort to make everything part of its interiority (Deleuze and Guattari 1987, 386).

While microbes are exterior to the state apparatus, they are precisely not exterior to human bodies, and the way microbial life is interspersed in human life makes it impossible to recognize or uphold any boundaries between the smooth and the striated, which presents a challenge to the state. Deleuze and Guattari focus on flows that have to do with unruly human bodies, commodities and capital. This chapter adds that also non-human organisms constitute flows that the state attempts to striate. Further, microbial lines of contagion suggest that smooth space figures in much smaller patches than a desert or an ocean, even

within individual bodies, as areas of smooth space constantly fragment space that has been striated by the state. Infectious agents such as anthrax, chickenpox, influenza, measles, smallpox, and tuberculosis move in droplets (or spores), floating through air, and Ebola virus persists in fluids on surfaces and materials such as bedding and clothing, spreads via bodily fluids such as blood and secretions, and enters human bodies via broken skin or mucus membranes, and the corpse of an Ebola victim can be contagious for up to seven days (Prescott et al. 2015). Other diseases spread via various surfaces, and others again move with vector species, taking advantage of and resonating with the movement and appetite of insects and rodents. In relation to biological weapons and infectious agents, Alibek (1999, 20) writes; “the most effective way of contaminating humans is through the air we breathe, but this has always been difficult to achieve,” which is to say that the weaponization of infectious microbes requires to some extent controlling smooth space. It is difficult to striate an ocean (see Heller-Roazen 2009), but it is also difficult to striate smooth space that is scattered through striated space in a continuous fragmentation of state efforts to control flows, and more so when the boundaries between smooth and striated space are always changing.

Microbes at war

The outbreak and spread of an infectious disease is a line of flight – a rupture through the order of a society or community. The infectious microbes cause a rift through striated space, leaving behind them a wake of expanding deterritorialization of collapsing health clinics, impromptu graveyards, sick people, dead bodies, and the bereaved. The war machine has the objective of drawing a creative line of flight that composes smooth space and movement within that space, and for the war machine, this line of flight becomes one of destruction of others and itself (Deleuze and Guattari 1987, 386; Deleuze 2006, 107). A movement of decoding or deterritorialization therefore runs through the war machine (Deleuze and Guattari 1987, 386). In response, the state scrambles to reterritorialize the space, to striate it once again, to regain order. Counting the infected and the dead, and separating (as a form of striation) the infected from the not infected and the dead from the alive are the ways in which the state reterritorializes the space by coding it. Eventually, the war machine destroys

itself or is coded by the state to the point where it vanishes. And that is the end of that line of flight.

War, or the elimination of the adversary, is not the *raison d'être* of the war machine, but war necessarily accompanies or completes it (Deleuze and Guattari 1987, 417). War results when the war machine comes from outside the state and collides with forces of striation. According to Deleuze and Guattari, it is upon this collision that the war machine becomes war and adopts the objects of annihilating the forces and forms of the state. It either works against a state arising in the first place, or to destroy an already existing state (Deleuze and Guattari 1987, 359). There is therefore a tension between the State and its obligation for self-preservation, and the war machine in its objectives of destruction – destruction of the state and its subjects, as well as destruction of itself along the line of flight (Deleuze 2006, 106-107). The war that results when pathogens collide with state striation is a war in which the object of infectious agents, namely to proliferate and multiply, collides with state objects of health and order. Competition, destruction and killing on the cellular level turns into war once it disrupts critical state infrastructure. It is precisely this line of flight of the disease outbreak that the state attempts to appropriate as a bioweapon. As mentioned earlier, the war machine always disperses - it either vanishes with its line of flight or becomes appropriated into doing service for the state. And then at some point, another war machine arises.

The bioweapons laboratory

Weaponizing microbes is a question of appropriating them into the state apparatus such that they can serve state desires. To do so requires appropriating the pathogenic line of flight and making war on behalf of the state, not proliferation, the direct object of the microbial war machine (Deleuze and Guattari 1987, 420). In essence, the laboratory is an effort to train microbes by disciplining them. However, discipline does not define a war machine but is the characteristic required of armies after the State has appropriated them (Deleuze and Guattari 1987, 358). It therefore becomes very clear in the bioweapons laboratory, that the state never has a war machine of its own. An army or military institution is not the war machine in itself, but rather the form under which it is appropriated by the state (Deleuze and Guattari 1987, 418). When the state appropriates the war machine, the war machine becomes territorialized and changes in nature and function, because it is then directed against what is

against the state, or is expressing relations between states (Deleuze and Guattari 1987, 418). To Deleuze and Guattari, the state making a military is always a compromise, because the military is also a line of flight, it is in itself a deterritorialization that runs against what the state stands for. Accordingly, a military is an excessively disciplined and striated destructive force. Appropriating the war machine into the state in the form of an army is dangerous, and “one of the most formidable problems which States will have” (Deleuze 2006, 106).

Bioengineering – genetically modifying pathogens to become more sturdy or resistant to enemy countermeasures – is an extreme form of striation, in which apparatuses of state capture operate not just on the molecular, but on the genetic level.

Laboratories are striated spaces that are continuously deterritorialized by the pathogens they are attempting to appropriate. Small ruptures happen every day as microbial husbandry is carried out in tiny petri-dish sized smooth spaces. To avoid these becoming catastrophic, the laboratory itself, like an army, is extra striated. As Alibek (1999, 62) describes, the lab is “structured according to the box-within-a-box principle, to keep the deadliest organisms out of the surrounding countryside.” The inner boxes host the most dangerous organisms:

Zone One is restricted to the preparation of nutrient media. Zones Two and Three are both “hot zones,” sealed off from the outside world with special filtration systems. Zone Three at Omutninsk throbbed with the constant hum of steel dryers and centrifuges. In this zone, we had to wear bubble helmets, large gloves, and thick rubber outfits which we called “space suits.” They gave us the slow, tentative stride of astronauts walking on the moon. Zone two had its own protective gear – not quite so cumbersome as the space suit, but still requiring an elaborate rite of passage from the outside world. (Alibek 1999, 54)

Alibek further describes how air pressure was kept slightly lower inside the “hot zones” to avoid contaminated air seeping into the outer zones, and how hydrogen peroxide was sprayed into the laboratory air from outlets in the ceiling. Leading into the inner lab was a corridor called a “sanitary passageway,” that consisted of a series of linked sterile rooms separated by doors. Any sign of bleeding from a cut in one’s skin meant no entry. On top of these efforts came ample vaccinations with yearly boosters (Alibek 1999, 62-63).

As mentioned earlier, laboratory personnel repeatedly fall sick despite these efforts. We ought not read such events as accidents, but rather as struggles between the state and the war machine, in which the microbes are behaving exactly as microbes do. Lab incidents do not display the control of microbes as an on/off switch. Microbes are always ready to do what they do, and as such they resist objectification. Once things are mastered they can become objects, but microbes can't be turned off, any mastery is always incomplete, ripe for catastrophe. One can have 100 days of perfect striation, but then one slippage that is disastrous: "It was a world of invisible perils. One false step, a fumble, an unthinking gesture, could unleash a nightmare" (Alibek 1999, 63). There is never total control or instrumentality when it comes to microbes and the wars they enter into.

Becoming weapon

Animals can be trained and disciplined, and this requires to some extent striating or territorializing their war-machinic elements. Such disciplining has been successfully done with animals in war. Deleuze and Guattari describe the war machine as having an aspect of "becoming animal," and they provide the example of the horse and rider, charging towards the enemy, as the first example of this. The war machine is self-propelling speed, the release of a "speed vector that becomes a free or independent variable" (Deleuze and Guattari 1987, 396). The movement and speed of the war machine relates to breeding rather than hunting animals. A hunter's aim is to stop the movement of a wild animal by killing it, whereas the animal breeder seeks to conserve both the life, speed and movement of the animal in ways where the rider can join, steer and accelerate the movement as desired (Deleuze and Guattari 1987, 396). A disease outbreak, as well as releasing pathogens, is precisely self-propelling, and because microbes travel in smooth space, their speed vector is multidirectional. The movement and speed of the war machine consists in being distributed by turbulence, again across a smooth space. This movement holds space and affects all of its points simultaneously, as opposed to a form of movement from one point to another (Deleuze and Guattari 1987, 363). Through the acronym of CBRN, biological weapons tend to be lumped together with chemical, radiological and nuclear weapons, but this umbrella runs counter to the premise of this chapter, namely that there is a fundamental difference between weaponizing living and nonliving matter. As such, the weaponization of microbes fits better

into considerations of animals in war. For example, Hediger (2012, 1), much in line with the argumentation here, writes that the presence of animals in war “indicates human limitations and human reliance upon other species” more than human dominance over nature and other animals.

However, animals are not as characteristic a war machine as microbes. Erika Cudworth and Steve Hobden (2015) divide activities of non-human animals in war into the categories of transportation, sensory work, morale boosting, weapon carrying or being weapons. These activities vary greatly in terms of how much striation or disciplining of the animal they require, and how much they seek to conserve the wild aspects of the speed and movement of the animal. Animals tend to be used in war in their ultra-disciplined roles, and very rarely are they utilized as weapons. Deleuze and Guattari note that the horse can be used for transportation in war, but underline that this has nothing to do with the war machine *per se*, but rather with the war machine after it has been appropriated by the state to be a state army. A dolphin or sea lion that can detect mines is also a war machine whose function has been changed in its appropriation by the state.

To Deleuze and Guattari (1987, 239), every animal is a becoming – “the wolf is not fundamentally a characteristic or a certain number of characteristics; it is a wolfing.” Deleuze and Guattari reject heredity, filiation, ancestry, genetics and structural distinctions between clearly classified entities as a good description of how nature operates. These terms rather describe how the state codes nature vis-à-vis the family as a state institution. Instead, they argue, nature operates against itself, by heterogenous becomings by contagion, mutation, epidemic, battlefields and catastrophes. This view puts interspecies propagation at the forefront of becoming: “animals are packs, and [...] packs form, develop, and are transformed by contagion” (Deleuze and Guattari 1987, 242), which is not to say that certain animals live in packs, but that animals “have pack modes, rather than characteristics” (Deleuze and Guattari 1987, 239). The becoming of a truffle involves a tree, a fly and a pig. Nature operates by “unnatural participations” (Deleuze and Guattari 1987, 242). Such unnatural participations are central to how microbes interact with and effect human, environmental and planetary history. As mentioned earlier, Europeans populated the Americas highly aided by contagion, and interspecies propagation by contagion can of course also involve symbiosis. The point is that nature isn’t in itself striated, in fact exactly

the opposite. As Deleuze and Guattari (1987, 248) write, “States have always appropriated the war machine in the form of national armies that strictly limit the becomings of the warrior.” Appropriating the war machine means limiting the elements of “becoming animal” that is inherent to it. Any animal, to varying degrees, is a pack, a becoming, a multiplicity, and any animal, to varying degrees, can be appropriated by the state (Deleuze and Guattari 1987, 241). The latter is not the case for microbes. Microbes cannot be trained to answer to discipline. They cannot be used as spies, or for their sensory capabilities, as experimental objects, for morale, for surveillance or to transport anything. They exist only in the form of the pack, the becoming-microbe, only in unnatural participations of contagion and mutation. As such, microbial war machines exceed the conceptual landscape described by Deleuze and Guattari.

Conclusion

Ultimately, the discrepancy between the lethal threat of infectious microbes and the inability to deploy this threat effectively in war rests in a clash of spaces. As soon as the space in which the microbes travel is striated, they cease to create any destruction, and as long as the space they travel in is smooth, the state doesn't hold sufficient control over them. Microbes cannot be turned into an army, because turning them into an army implies changing how they move, which also means changing the part of them that can potentially be weaponized. As Deleuze and Guattari (1987, 371) write, smooth space can be explored only by legwork. Microbes explore by legwork as contagion. They are a line of flight, they are a war machine, and in fact they are so much a war machine that even a state that is abandoning its striation in its interest of going to war, still cannot adequately appropriate them. Microbial exteriority to the state manifests in indifferent refusal to act in the interest of the state in the form of biological weapons. This makes pathogenic microbes a war machine par excellence.

Foregrounding microbial conduct as the main explanation for why biological weapons are used so rarely disrupts the narrative that human advances in technical capabilities (even within biotechnology) will change the overall historical tendency that the threat of biological weapons is extremely unlikely. This ought to provide an important amendment to explanatory arsenals composing the background for risk assessments, priorities and preemptive measures against biological threats.

The bottom line is that with microbes, total control is impossible. It is impossible to control microbes enough to turn them into a systematized weapon, and it is impossible to control microbes enough to create a fail-safe defensive barrier against them. In the case of biological weapons, we see an example of the biological itself resisting the biopolitical state and its militarized biosecurity wing. Conflating security and public health has infused policy efforts with an unwise goal of environmental control at the expense of views that rightly recognize aspects of co-evolution, contagions and becoming. Traditional efforts in public health readily accept that public health is an ongoing effort that will never be finished and that will never bring about any absolute victories or defeats on either the microbial or human side. The dangers of biodefense programs in the form of accidents and dual-use issues are in essence dangers that arise out of a futile desire for biological control that is informed by a false idea that pathogens are enemies that wage war against human immune systems. This idea collapses war and public health in much the same way that the U.S. anti-terror and biodefense state has done since 9/11. But microbes don't wage war against human immune systems. They travel in smooth spaces and have a goal of microbial proliferation that only becomes war when they clash with state forces of striation. Getting closer to the biological itself, we see that death from infectious disease is not war, but killing, destruction, or cohabitation gone wrong. The biodefense state turns this into war, exacerbates this war – *asks for this war*, in the way it has conflated war, security and public health. Bringing nuance to the relationship between war and public health opens up for new, perhaps more fruitful, integrations of public health and security, and suggests that microbes cannot be weaponized in reality, and that they therefore shouldn't be weaponized discursively or symbolically, and that this is in fact a good thing that we can embrace. The quest for control is dangerous and results in wars that we will not win. This ought to be a lesson not just for biodefense, but for security efforts as a whole.

CHAPTER 3. BORDERS

The Centers for Disease Control and Prevention issued an unprecedented travel warning Monday, advising pregnant women and their partners not to travel to a small community just north of downtown Miami, where Zika is actively circulating. This is the first time the CDC has warned people not to travel to an American neighborhood for fear of catching an infectious disease (LaMotte, 2016).

This chapter conceptualizes how infectious microbes make real borders that are not dependent on human meaning making or identity, while also not being detached from these. Pathogens engage in bordering practices that matter to human beings, and thereby relate to human communities such that microbial bordering challenges sovereign nation states and their bordering practices. By challenging a nation state's ability to regulate where its citizens can move around safely, infectious agents challenge state sovereignty by territorializing interfaces between contagion and ecology.³ Microbial border making is another example of the biological itself resisting state apparatuses and violent security logics of eradication.

There is good reason for looking into microbial bordering. Across the globe, a complex assemblage of socio-economic, environmental and ecological factors, including anthropogenic activities of continued resource extraction, environmental depletion, and globalized movement of goods and people, is driving an intensification of emerging and re-emerging infectious diseases. A significant part of the re-emerging diseases are drug-resistant strains, as sterile hospitals and antibiotic overuse in humans and animals have put selective pressures on pathogens to harbor resistance to human tools of killing them (Jones et al., 2008). These trends suggest that western modes of disease control and prevention are

³ I draw on Deleuze and Guattari when I use the term territorialization, which in their vocabulary refers to bio-semiotics, identity and art, more than merely to power and control, when an area is marked as one's territory, for example with birdsong or smell. To Deleuze and Guattari, deterritorialization is to leave the territory, which is always imbued with risk. Microbial territorializations are in this sense a deterritorialization of the state's control. As such, microbial territorialization forces the state to abandon part of its striation efforts, which precisely results in risk.

failing. A new strategy is needed, and a view of microbes as objects, and of humans as in control of their environments, misses the point.

This chapter argues that responding to the threats of infectious diseases requires attention to how microbes territorialize spaces. Such microbial cartography is based on ecological factors for which separations between nature and culture do not make sense. Acknowledging non-human beings such as pathogenic microbes as having real political leverage helps to establish a new, more realistic playing field for security politics. It is important to note that microbes are distinct political actors precisely because they are in relation with everything else.

The chapter begins with a definition of a microbial border, before it briefly positions itself within the IR subfields it taps into. Following this is a series of empirical examples that support a conceptualization of non-human bordering, namely descriptions of bordering by tuberculosis bacteria in London, Papua New Guinea and Arkansas, and by Zika virus in Florida. Finally, the chapter turns to a discussion of how best to govern such microbial bordering. To get at this, evidence from epidemiology and geography is brought into conversation with anthropological theory of Amazonian ontologies, in order to understand causalities of microbial bordering in its own terms, and respond to how pathogens territorialize spaces by taking advantage of ecological factors favoring their proliferation.

Global health, borders, and new materialism

The concepts of global health and security are wedded in a rocky but intimate relationship and have been so since the UN Security Council in 2000 declared HIV/AIDS a threat to international peace and security (Elbe, 2010; Ingram, 2005; McInnes and Rushton, 2011; Patterson, 2015; Youde and Rushton, 2015). Whether the security threats posed by infectious diseases should be labeled as a threat to national security, global (public) health security, human security, or biosecurity is contested, as appealing to each dispositive brings about different discursive and practical potentials in terms of attention and funding as well as disadvantages in terms of a militarization of the problems, and a lopsided focus on emerging threats and bioweapons rather than on the diseases that claim most lives globally (Elbe, 2010; Fidler, 2007; McInnes, 2015).

Stefan Elbe (2010) reverses the notion of a securitization of health into a “medicalization of security” in order to describe how, in an era of “deep microbial unease”, security practices in international relations are being subtly transformed by a rise of health security (Elbe, 2010: 24). This means that in their efforts to insure national security, states now employ a growing number of medical professionals in the analysis and formulation of security policies, and also spend vast resources on stockpiling medical countermeasures such as vaccines and antibiotics in preparedness for unforeseen epidemics, which has resulted in a shift towards security increasingly taking place within the body and on the molecular level (Elbe, 2010: 65; Elbe, Roemer-Mahler and Long, 2014; Elbe and Voeklner, 2015). This chapter takes the molecular focus further by insisting that the molecular itself has political leverage beyond human conceptualizations of it.

Because “pathogens do not respect national borders” (Youde and Rushton, 2015: 1), it is posited within global public health that infectious diseases require international collaboration across nation state borders (Fidler, 2003; Heymann and West, 2015; Weir, 2015), and such calls invariably raise questions of global justice (Weir, 2015), and the political economies that sustain unequal distribution of risk and health care (see for example DeLaet, 2015; Ingram, 2005; Nunes, 2015). How postcolonial legacies of violence persist in the name of keeping “foreign” pathogens out of the motherland forms another important wing of literature in global health (Ahuja, 2016; Bashford, 2014; Cooper, 2008), which has covered the schism between a globalized “era of universal contagion” and strengthened medico-legal border control (Bashford, 2007). For example, a study of different screening practices for tuberculosis in different countries prompted a question of where the border actually is (Convery et al., 2007). This chapter asks similar questions, but includes pathogens themselves as bordering agents, thereby also highlighting how pathogens take advantage of anthropogenic structural violence.

Questioning the location of a border is highly relevant for literature in Critical Border Studies, which has severely dislocated what borders do, who does the bordering, and precisely where it is done (Johnson et al., 2011; see also Paasi, 2012). With the concept of “disjunctive cartography,” Shapiro captures that global space is “ambiguous, contested, and temporarily unstable,” and that the aim of critical geographical scholarship is to render “mobile, fragile, and contestable what traditional political discourses naturalize, pacify, and

dehistoricize” (Shapiro 1996, 138; see also Shapiro 2015, 26). In their paper *Lines in the Sand? Towards an Agenda for Critical Border Studies*, Noel Parker, Nick Vaughan-Williams, and fifteen other authors (2009) call for border studies that are capable of the following: illuminating the changing reality of borders; highlighting epistemologies that are founded on uncertainty and that sidestep the charms of a fixed border; coming up with alternative topologies that disassociate the study of borders from the idea of territory; and keeping a focus on practices, i.e. on how divisions between entities are produced and sustained.

The relation between borders and territory is becoming ever more complex. Borders are not only found at territorially identifiable sites such as ports, airports, and other traditional ‘border crossings’. Instead, they are increasingly ephemeral and/or impalpable: electronic, non-visible, and located in zones that defy a straightforwardly territorial logic. (Parker, Vaughan-Williams et al., 2009)

The argument presented in this chapter is inspired by and epistemologically in tune with critical border studies, but suggests an ontological expansion of this field to also include non-human bordering practices, and how these dislodge state-centric cartographies.

Chris Rumford (2012) calls for a multiperspectival theory of borders, in which the border should be treated as an object of study in its own right, rather than subsumed to national sovereignty or state security. Such a theory is based on the premises that borders are not always lines of securitized defense, are not always the property of the state, and do not always follow the outer edges of the state. While the conceptualization presented in this chapter is indebted to Rumford’s theory of multiple *human* perspectives, this chapter builds on Eduardo Viveiros De Castro’s engagement with Amerindian perspectivism, which, as we shall see, takes this kind of thinking much further by including non-human perspectives. Importantly, Rumford continues, the presence of a border does not imply consensus; the existence of a border is only visible to those whose mobility it affects. Hence, we should focus on the constitutive nature of borders for social and political life, and how the capacity to make or unmake borders is a major source of political capital not necessarily only held by the state. To Rumford, a border is a place of selective control that strengthens some people while disempowering others.

Following these trends, Mark Salter (2012) puts further emphasis on the process, “world-making characters,” and “performativity” of a border, and posits that rather than expressing a division, a border is a condition of possibility for sovereignty itself. Applying this framework outside a purely anthropogenic lens, this chapter highlights the world-making characters, and hence the challenges to nation state sovereignty enacted by pathogens with political capital.

Studies within Critical Border Studies have focused on non-human effects on border making practices, for example by describing how dirt is added or moved to a borderland (Nyers, 2012), how materiality such as border posts, the landscape and biometric entry–exit systems are actants that partake in the making of borders (Frowd, 2014), how border-lines are located in cyberspace in which algorithms, data and border security software make decisions on in versus out (Amoore, 2006; Johnson et al., 2011), how the efficacy of pathogens themselves gets overlooked in a focus on governmentality and management of bodies in a “migrant-health-assemblage” (Voelkner, 2014), how a desert landscape and its plants and animals disrupt the daily practices of border enforcement (Sundberg, 2011), and how bordering practices are related to items left behind by migrants (Squire, 2014). Irrespective of significant non-human and material efficacy, the borders analyzed and conceptualized in this literature are either borders between nation states or alternatively are made by citizens of the state. This chapter makes a departure by conceptualizing borders that are enacted by non-humans.

As alluded to above, with a conceptualization of non-human border making, this chapter has taken the “non-human turn” (Grusin, 2015) and is adding to literature in New Materialism, which insists that the world itself, not just human representations of it, has political consequences. This literature is increasingly contributing important new approaches to the field of International Relations, with growing focus on non-human life forms, a decentering of the anthropos in IR, and a ecological or relational view of causality (see Aradau, 2010; Burke et al., 2016; Fagan, 2016; Grove, 2014, 2016; Mitchel, 2014, 2016; Salter 2015a, 2015b). This chapter is indebted to the overall position in New Materialism that the non-human has political effects, and that these political effects matter for IR and security. Some of the theoretical underpinnings of New Materialism (see for example Alaimo and Hekman, 2008; Barad, 2007; Bennett, 2010; Coole and Frost, 2010), and by

extension some applications of New Materialism in IR, attribute agency to the material. This chapter does not attribute agency to microbes. Following Eduardo Viveiros De Castro, I see a danger in attributing agency or consciousness to everything, because it can hide the relational character of causality that this strand of literature makes a big effort to highlight (De Castro, 2014: 171). This chapter maintains that microbes are living beings (viruses included, see Nasir and Caetano-Anollés, 2015) that actively maintain the differences between themselves and their environments (Garcia, 2014: 196), and that they are selves because they as living beings interpret their environments by learning from the past and making predictions about the future (Kohn, 2013: 76). This means that microbes engage in decision-making and have experiences (Shaviro, 2016). With for example bacterial quorum sensing and biofilms (Bassler and Losick, 2006), and recently discovered viral ways of communication (Erez et al., 2017), microbes engage in social behavior that amounts to collective cognitive capability. Trees (Wohlleben, 2016) and slime mold (Shaviro, 2016; see also Shaviro, 2014) are other examples of life forms without brains that nonetheless lead social lives. However - and this is where this chapter positions itself philosophically vis-a-vis New Materialism - there can be thoughts, sentience, cognitive capabilities, and selves, without there being agency, brains, subjective experience, a unity of experience, consciousness, self-awareness or intention (see Shaviro, 2016). In other words, single-celled organisms or trees can be rich in experience, without knowing or understanding this experience (Shaviro, 2016). The crucial point for the purposes of this chapter is that these selves, irrespective of possessing agency or not, can have significant efficacy. International politics are affected and even contested by the activities of microbes without microbes being aware of it. Because decision-making can vary, and be irrational and faulty, the microbial efficacy theorized here is positioned between randomness and determinism, again without this amounting to agency (Shaviro, 2016). The causality related to microbial borders rests on microbial actions, relational causality, and microbial indifference.

Microbial borders, a definition

In 2003, the WHO warned against “all but essential” travel into Toronto due to a local threat of severe acute respiratory syndrome (SARS). Forty-four people in Canada died from SARS, approximately 400 became ill, and 25,000 Toronto residents were placed in quarantine.

Subsequently, the Mayor of Toronto posited that it wasn't the disease itself, but the perception of SARS, that did damage to Toronto's tourism industry as a result of the quarantine (Naylor, 2003; Strange, 2007), and a report from the Canadian National Advisory Committee on SARS made an effort to conclude that "viruses are without borders" (Naylor, 2003: 197). These contentions overlook the real border-making practices of infectious microbes, and the extent to which pathogens have political efficacy that disrupts states and territories and differentially affects the mobility of different people.

As a possible way of conceptualizing a border, Parker, Vaughan-Williams et al. (2009) suggest defining what transgressing the border entails, and how this transgression produces the very border itself. Transgressing a microbial border is entering into an area in which the state no longer can or will protect people from the risks or threats of an infectious disease, and as such, microbial borders, albeit differentially, disempower all humans within an area by exposing them to risk (which is different from Rumford's (2012) idea that a border strengthens some people while disempowering others). When the state sanctioned Centers for Disease Control and Prevention issues a travel warning for a neighborhood in Miami in which Zika is actively circulating, they are in essence saying that they are longer able to keep citizens safe from the threat of Zika within that area. An area enclosed by microbial borders is an area in which the state has, willingly or unwillingly, renounced part of its control. It is in the renunciation of power or control that the microbial border comes into existence, not for necessarily for microbes, but for humans.

Microbes make borders based on the ecological factors that enable them to pursue their goal of proliferation. This is a very different border-making practice than the human one of drawing lines on a map that are defended by sometimes-violent national security apparatuses. This ecological foundation of microbial borders, which I will return to in full later, means that the concept of a microbial border is characterized by the porousness, complexity and flexibility with which mobility is hindered and augmented. The point at which a disease becomes a problem in an area is not a matter of there being one case, but rather a matter of there being a certain number of cases. The question of when a microbial border is crossed is a matter of thresholds of intensity, and as such, microbial borders express a "topology of thresholds" as called for by Parker and Vaughan Williams (Parker et

al., 2009). Cartographies that depend on ecological factors are not static, which means that microbial territorializations are in constant flow.

Sometimes, microbial borders overlap with state borders. For example, the international border between the United States and Mexico separates an area in which Dengue fever is endemic from one in which the disease is extremely rare (Reiter et al., 2003). A study investigated a 1999 dengue outbreak that affected Nuevo Laredo, Mexico, and Laredo, Texas, which are connecting cities that span the border. The incidence of dengue cases was significantly higher on the Mexican side although the vector, *Aedes aegypti*, was more abundant on the U.S. side. The authors conclude that the ultimate determinant of dengue prevalence in this setting is socioeconomic rather than environmental, because Americans have access to air-conditioning and spend most of their time behind closed windows, whereas Mexicans have no air-conditioning and leave their windows open for airflow, which also puts them into contact with mosquitoes that carry dengue (Reiter et al., 2003). The microbial border in this case corresponds to the state border in how it crystalizes an ecology of political economy that is partly a result of the US. security apparatus of the border. While this territorialization is convenient for the United States, the virus and the mosquitoes are not governed by the US-Mexico border itself, but merely proliferate according to the ecological factors that best favor them. Everything, including air-conditioners and closed windows, is ecology to pathogens as they opportunistically proliferate where the habitat most favors them. That this proliferation sometimes happens by mirroring human patterns of activity and structural violence does not mean that humans have created the microbial borders, but it does highlight how microbes are distinct political actors precisely because of their relations to human communities.⁴

⁴ Vicky Squire notes that in order to avoid placing too much emphasis on human meaning making or non-human efficacy, analyses of boundary-production should focus on the mutual enactment of subjects, objects, and environments (Squire, 2015). This chapter agrees, but asserts that mutual enactment does not entail that every thing or being that plays into the production of a boundary or border has equal efficacy. This chapter describes boundaries that are primarily enacted by microbes, in co-constitution with many ecological factors, human conduct and discursive activity being part of these.

Bordering by tuberculosis

Despite what might be commonly assumed, tuberculosis is well established within the borders of Europe, and this to such an extent that the territorializing effects of the bacteria fractalize borders of European countries. WHO's annual tuberculosis report includes a map in which the average tuberculosis rate within each country is marked with a darker color the higher it is (WHO, 2015: 18). Looking at such a map, one easily gets the sense that the disease is knocking on the eastern doors of Europe, waiting to rush in if the borders aren't kept tightly secured. However, a similar map of tuberculosis rates in different postal codes of London shatters the world map that renders the United Kingdom a 'low incidence country,' as certain areas within London have the same rates of tuberculosis as countries such as China, Russia, Rwanda and Iraq (de Vries et al., 2014: 6). In fact, London is the 'tuberculosis capital of the West,' with other European cities such as Birmingham, Brussels and Barcelona not far behind in rates of the disease. These territorializations express a 'tuberculosis epidemiology transition' in which national rates of tuberculosis continue to fall in European countries while rates are increasing in their large metropolitan areas. The politics of this transition are characterized by vulnerable and socially excluded migrants, former felons, drug and alcohol users, and homeless people concentrating in urban centers (de Vries et al., 2014; Public Health England, 2014). Their susceptibility is augmented by living in poor/crowded housing, having co-infections with for example HIV and Hepatitis, and having restricted access to health care (WHO Europe, 2007). Almost three quarters of TB cases reported in the UK in 2014 occurred in people born outside the UK, and most of these occurred in people born in India and Pakistan (Public Health England, 2014). Here, tuberculosis takes advantage of the inequality that persists in Britain's postcolonial state. The microbial border takes effect as the United Kingdom has surrendered parts of its urban centers to tuberculosis such that the area over which the British state is totally sovereign has been fractalized. This emphasizes the state's inability (or unwillingness) to keep all its citizens safe, and highlights how certain populations are sacrificed when the state collaborates with pathogens in creating zones of exclusion.

The Australian state is competing with tuberculosis bacteria about the bordering of such a zone. The island of Daru just north of Australia, which is part of Papua New Guinea, is infected with multi-drug resistant tuberculosis. Dr. Richard Brostrom, Federal CDC field

medical officer assigned to the Hawaii state Tuberculosis control program, who worked for two years to control a 2008-09 outbreak of multi-drug resistant tuberculosis on Chuuk Island in Micronesia:

Socially, geopolitically, it feels like we have chased TB into the far corners of the planet. And the question is, are we willing to go there and finish the job? And for that, it seems like a battle that we are not always getting gold stars for. There's a horrible situation with TB going on right now in Daru, Papua New Guinea. Difficult place to be, difficult place to work. Money going missing with government officials, violent at times. Tough housing for consultants to go into, with mosquitoes and other diseases and run-down, poverty, and it's probably not very much fun to be there. But it's a brutal outbreak going on right now, MDR [multi-drug resistant tuberculosis]. We see a little bit of reticence for folks to jump in with both feet and really tackle the problem (Richard Brostrom, 2016, personal communication).

With a conservative estimate of 1000 new cases of multi-drug resistant tuberculosis every year, and with only about 200 of these diagnosed and treated, and with hospital nurses getting infected and subsequently going on strike and thereby shutting down the local hospital (Furin and Cox 2016; Salmang, 2015), the border that tuberculosis has created isn't around Papua New Guinea as a whole, but around the impoverished Western Province of Daru Island, with approximately 15,000 out of Papua New Guinea's 7 million inhabitants. In this instance, what Dr. Brostrom calls "the far corners of the planet" are not so far away. Daru is immediately north of Australia, and over the last 10 years, some 250 people with drug-resistant tuberculosis have flown down to Cairns, Australia on tourist visas to seek treatment, prompting an Australian parliament magazine to cover how "debate continues over where our first line of defense should be" (Doudy, 2013). This however is not merely a debate between different political actors within the Australian system; the tuberculosis bacteria are bio-semiotic players in this debate, which we could call a competition between the bordering of the state and the bordering of microbes.

By closing down two tuberculosis clinics in the far north of Australia and putting money into a treatment facility on Daru island itself, the Australian state is effectively attempting to push the border north, into Papua New Guinea itself. This solution is problematic not only because the Papua New Guinean health system has staggeringly few

resources compared to the Australian one, but also because people from Papua New Guinea are allowed to sail in dinghies or canoes to do “traditional activities” on many islands in the Torres Strait between Australia and Papua New Guinea, even though these islands are effectively Australian territory. According to the “Torres Strait Treaty,” only the Torres Strait islands farthest south towards Australia are deemed a “quarantine zone” in which visitors have to undergo “biosecurity checks” (Australian Government). It is speculated that there are unreported cases of drug-resistant tuberculosis on the islands in the Torres Strait, and as efforts to make treatment effective in Daru itself continue, sick Papua New Guineans continue to travel to Australia for treatment (Douady, 2013).

To describe this situation under the framework of a nation state border, however porous, deludes not only the bordering efficacy of the infectious microbes themselves, but also the actual competition between the microbes and the state about who gets to set the border. Like the microbial borders within London, this border is also built upon present colonial legacies. The epidemic is still not posing a threat to the general Australian population. Insofar as tuberculosis bacteria, through their predatory relationships to vulnerable people, are pushing the Australian border south, they indifferently play a part in efforts of decolonization. Powerful post-colonial states do not get to set their borders unhindered.

The illusion that borders can be secured from pathogens threatening the population in the motherland is uniquely pursued by powerful states. Such an idea is bolstered by massive injustices in access to healthcare, and is based on racialized and xenophobic views that all ailments a priori originate ‘outside.’ After 9/11, the US embarked on a program to feed this illusion once again, as “quarantine stations” were set up at 20 ports of entry and land-border crossings where international travelers arrive into the United States. A captain of a ship, plane or train is federally mandated to report if someone on board seems ill, based on certain criteria. Victoria Rayle, CDC project officer who previously worked at the quarantine station in Honolulu, Hawaii, says that such a station is “kind of a misnomer,” and that it should not imply a barrier or being able to stop anything. Here, she describes the protocol for her work once an ill person had been reported onboard an incoming airplane:

No one comes off the plane, no luggage, and then the quarantine staff comes on the plane. To do what? You are wearing your uniform, but you are not wearing any mask, you might have gloves, you have a thermometer with you, and a few other accouterments in your bag, probably just to make you feel better that you are carrying something. And then you find who the passenger of question is. And then you do a quick “oh my gosh they look like they have...”, you are judging if it looks like they have something right out of the textbook that says “disease, disease!” which is virtually impossible, but it’s an opportunity then to say okay, you and your traveling party are coming off the plane with us, and you get out into the gate area, not very sanitary or far off to the side, sometimes right where everyone is walking, and then at that point somebody like an EMT will be there to do a much more extensive evaluation. You come on to see it, and the passengers have been on for hours with it. It kind of doesn’t make that much sense. To have people looking for H1N1 at the port of entry made no sense once it had already made it pretty fully into the community (Victoria Rayle, 2016, personal communication).

For example, a passenger with dormant tuberculosis will not be noticed by this system, and as of March 2017, more than 5000 cases of Zika had made it into the United States.

An outbreak of tuberculosis in north-west Arkansas is another blind spot to the US state. tuberculosis is endemic to the Marshall Islands, and as one fifth of the population of the Marshall islands have moved to north-east Arkansas, many to live with family members and work in the Tyson chicken factory, the bacteria migrate with them and take advantage of diaspora patterns of family reunions, which has resulted in an outbreak with over 100 cases of tuberculosis, that has not spread beyond the Marshallese diaspora. Again, the US borders are not the boundaries of this outbreak. Another postcolonial situation, Marshallese can live and work freely in the United States without a visa, and are not screened for TB upon entering the country. Dr. Richard Brostrom points out that this situation will likely be exacerbated in the future, as the current migration trend will resonate with climate change:

We have to think about global warming, and what the effect when the Marshall islands go under, those people are all going to come here, they come here freely, they don’t need a visa, they can come to the United States and with them will come the TB and the leprosy, these conditions that have a great latency and are hard to eliminate. Of course the diabetes and

everything will come, but these infectious diseases will come with them (Richard Brostrom, 2016, personal communication).

Microbial borders not only indicate that something dangerous that was supposed to be kept external to the state has made it in, which is in itself a failure of sovereignty, but also that the geography of the state is fractalized without the state being able to control this. While pathogens are predators, they cannot be faulted for the racism and exclusion that results from this.

Bordering by Zika

Unlike tuberculosis, which spreads directly from person to person, Zika and other infectious diseases rely on vectors, and are therefore only able to proliferate where their vectors thrive. *Aedes aegypti*, the mosquito that carries dengue, yellow fever, chikungunya and Zika, thrives particularly well in ecologies characterized by human activity, prospering on environmental degradation as a parasite on Anthropocene human life forms. The *Aedes* is already endemic to large parts of the southern United States and with increased temperatures prompted by global climate change, its habitats are likely to move north (Patz et al., 2003). In combination with globalized flows of people, an area that already has *Aedes Aegypti* is a potential new habitat for vector-borne diseases.

In July of 2016, the first locally spread cases of Zika in the United States were reported in Miami. After having discovered 15 locally transmitted cases of Zika, the United States Centers for Disease Control and Prevention on August 1st, 2016, issued a travel warning advising pregnant women and their partners to stay out of a 1-square mile area in “trendy” Wynwood, a densely urbanized community immediately north of downtown Miami. On August 18th, the Florida Department of Health announced that Zika was also spreading locally in Miami Beach, just across Biscayne Bay from Wynwood, which prompted the CDC to issue another travel warning for a 1.5-square mile section of Miami Beach, a section which was expanded to a 4.5-square-mile area on September 17. On September 19th, the CDC modified recommendations for the Wynwood area, merely advising pregnant women to postpone nonessential travel into the area. On October 13th, a new 1-square-mile area of Miami was found to have active local transmissions of Zika. On

October 19th, the CDC issued a travel warning for all of Miami-Dade County, which distinguishes between red areas with active Zika transmission, where pregnant women should not travel, and yellow areas where pregnant women should consider postponing travel (CDC, 2016a). On December 14, 2016, CDC issued guidance related to Zika for people living in or traveling to Brownsville Texas, after detecting locally spread cases, again advising pregnant women to postpone travel to the area (CDC, 2016c). These areas are now enclosed by borders enacted by the Zika virus. The shifting characteristics of microbial territorializations are highlighted in the state's struggles to provide a cartography that is able to keep up.

As of February 21, 2017, there were 1534 reported "pregnant women with any laboratory evidence of possible Zika Virus infection" in the United States, a number arrived at by screening all pregnant women in the United States during their prenatal visits (CDC 2016b). Needless to say, U.S. borders fail to keep the threat of Zika out.

The idea that a superpower can make pathogens "respect" its borders relies on a premise that humans are capable of controlling their environments and that threats can be managed with strategies of elimination. Microbial borders and, as we shall see next, evidence from the natural sciences, suggest that these premises are false.

Deforestation, biodiversity loss and pathogenic proliferation

As mentioned in the introduction, the last decades have brought intensifications of emerging and re-emerging infectious diseases globally (Jones et al., 2008; Whitmee et al., 2015). HIV/AIDS emerged in the 1980s, dengue fever reemerged in the 1980s, chikungunya and Zika have recently reemerged across the globe, and Southern Europe alone has of late seen the emergence or reemergence of malaria in Greece, West Nile virus infection and chikungunya in Italy and Spain, dengue in Portugal, and schistosomiasis on the French island of Corsica (Hotez et al., 2016). Measles and polio have returned, Ebola caused thousands of deaths in West-Africa in 2014-15, schistosomiasis continues to increase throughout Africa where it is now a major cofactor in the AIDS epidemic, Southeast Asia has seen the emergence of Nipah virus and drug resistant malaria (Hotez et al., 2016), and across the globe, drug resistant and extremely drug resistant tuberculosis have also emerged in the last decades (Shah et al., 2007), adding to the already massive yearly death-toll of

tuberculosis. To this must be added the continued high death tolls of infectious diseases such as gastroenteritis, malaria and pneumonia. Scientists agree that this intensification of infectious diseases is co-driven by a large number of ecological factors, most importantly poverty, urbanization, globalized human trade, travel and migration, conflict and political destabilization, deforestation, and climate change (Hotez et al., 2016; Jones et al., 2008; Kilpatrick and Randolph, 2012; Whitmee et al., 2015).

I cite these facts firstly to point out that these amplifications of infectious diseases demonstrate that humans have impacts on their environments that greatly exceed human understanding and mastery. This ought to inject a modicum of humility into dominant accounts of human exceptionalism, just as it should inform efforts of microbial border governance. In what follows, feedback loops between deforestation and pathogenic proliferation, as well as between biodiversity loss and pathogenic proliferation, will be explicated in an effort to show that governance of microbial borders counter-intuitively ought to be based on the propagation of an abundance of all sorts of life, rather than on eradication of life forms that pose a threat.

Deforestation is coming into focus as one of the most potent factors at work in relation to emerging and re-emerging infectious diseases (Patz et al., 2004; Yasuoka and Levins, 2007). Rates of deforestation continue to grow, with almost 2% of forests lost globally each year (Patz et al., 2004).

When native forest is cut down to make space for palm-oil plantations or the like, existing ecosystems are reshaped, which leads to an “edge effect” that promotes interactions amongst pathogens, vectors and hosts (Patz et al., 2004). Deforestation means less available habitat for wildlife species, and it modifies the structure of environments by fragmenting habitats into smaller patches separated by agriculture or human settlement. For example, primates who are reservoirs for malaria group closer together in the remaining forest, spreading the malaria parasite amongst themselves, and the humans that work in the palm oil plantations along the edges of the forest get bitten by the same mosquitoes as the primates. The low-lying vegetation characteristic of agriculture provides a very suitable environment for mosquito breeding, with increased water and air temperatures and many pools of water for egg laying, which compels mosquitoes to breed more often, which makes them more hungry for blood. Deforestation with subsequent changes in land use and human settlement

has been shown to coincide with an upsurge of malaria in Africa, Asia and Latin America (Patz et al., 2004; Whitmee et al., 2015). A study from the Peruvian Amazon found that the same species of mosquito bit 278 times more frequently in deforested areas than in intact forest. The scientists found very little breeding and biting by adult mosquitoes in the forest (Vittor et al., 2006). Another study from Brazil found that cutting five percent of a forest was associated with a 48% increase in human malaria cases (Olson et al., 2010).

Lymes disease is a similar case. Reported cases of the disease have roughly tripled since 1990 in the USA, and this presents another example of disease proliferation due to deforestation and the “edge effect” (Kilpatrick and Randolph, 2012). The disease-causing bacteria have mice as their main reservoir, and are spread to humans via deer by ticks. In rich forest ecologies, mice compete with foxes, coyotes, rabbits and squirrels, none of which are reservoirs. Species diversity therefore means smaller mice and tick populations, and fewer infected ticks. A study found that forest patches that were smaller than three acres had an average of three times as many ticks as did larger fragments, and seven times more infected ticks. As many as 80 percent of the ticks in the smallest patches were infected (LoGiudice et al., 2003). More forest therefore means less incidences of the disease.

This conclusion resonates with the conclusion, which has become clear within the last decade, that loss of biodiversity results in more infectious disease (Keesing et al., 2010; Pongsiri et al., 2009). An eerie part of this conclusion is the finding that those species who are best at surviving loss of biodiversity and environmental degradation are also, for some reason, the species that are most apt at carrying and spreading pathogens. For example, mosquitoes that thrive and become dominant in human-made habitats almost always transmit malaria better than the species that had been most abundant in the intact forests (Chivian and Bernstein, 2010; Keesing et al., 2010). We are therefore facing a situation in which resonances between changes in climate, land-use and biodiversity will intensify emerging infectious disease, a feedback loop that will be further amplified because the kinds of species most capable of withstanding global environmental change are those who are most likely to promote new diseases (Whitmee et al., 2015). It is therefore suggested that the conservation of areas rich in wildlife diversity might have high value in reducing the likelihood of future zoonotic disease emergence (Jones et al., 2008). This is also to say that:

Managing potential emergence hotspots by attempting to eliminate them is likely to backfire because the species most resilient to habitat destruction and degradation may be those that amplify pathogen transmission (Keesing et al., 2010).

As mentioned, the idea that more different life-forms, more wildlife, and more wilderness should correspond to less infectious disease, is counter-intuitive to a western rationality, in which life-forms that present a threat to human lives have historically been eradicated (bears, wolves and sharks present good examples), just as wildernesses have been “tamed” in an continuous effort of human mastery and safety. I therefore now turn to Anthropological theory of Amerindian indigenous thought, to which these findings come as no surprise.

Ethnographic Encounters with Amazonian Ontologies

[T]o take other ontologies seriously is precisely to draw the political implications of how things could be for “us,” given how things are for those “others” who take these other ontologies seriously as a matter of fact (Holbraad, Pedersen and De Castro, 2014).

This chapter engages encounters between Deleuzian ontological anthropological theory and Amerindian philosophy. To do so, this chapter is indebted to the anthropologists Eduardo Viveiros De Castro and Eduardo Kohn. De Castro frames the encounter through these questions: “how can we restore the analogies traced by Amazonian peoples within the terms of our own analogies? What happens to our comparisons when we compare them with indigenous comparisons?” (De Castro, 2015: 57).

Kohn and De Castro’s ethnographic engagements describe how indigenous people in the upper Amazon live their lives in and off the forest, hunt for their sustenance, and also occupy a space in which they are prey to large predators such as jaguars. The cosmologies of these communities radically decenter the human perspective in a way that opens up for new approaches to living with (rather than promptly killing) dangerous beings. Again, I am not in a position to directly engage these cosmologies; I am engaging De Castro and Kohn’s ethnographic encounters with them.

These engagements answer to several issues that have been raised within the field of IR lately. Encounters with Amazonian ontologies amplify indigenous thought and minor

traditions within Western thought, which has specifically been called for within post-humanist or New Materialist thought (Sundberg, 2014; Todd, 2016), just as they answer to the call for bringing perspectives from the global south into focus (Tickner, 2013: 642). Heeding the idea that methods are acts that can be critical and political in themselves, and that enact certain worlds by their focus (Aradau and Huysmans, 2014), an engagement with anthropological theory of Amazonian ontologies posits a powerful alternative to dominant western modes of thought that (wrongly) inform our security efforts. Encounters with Amazonian ontologies also help traversing notions of security that merely reinvent the nature-culture binary in Anthropocene times, towards notions of vulnerability and cohabitation. The way these ontologies, as described by De Castro and Kohn, insist in the embeddedness of humans in ecology, thus provides an answer to a schism that has been excellently laid out by Madeleine Fagan (2016). Finally, engagement with Amazonian ontologies resonates with the decentering of the human perspective championed by New Materialism, but does so without invoking non-human agency, and instead adds a focus on a lived experience of embodiment: The Amazonian peoples in Kohn's ethnography would rather be eaten by a jaguar than exit the forest and thereby their relationship to it, and this embodiment emphasizes the virtues of cohabitation characterized by risk and vulnerability. According to Kohn and De Castro, Amazonian ontologies rest on a pervasive idea of biosemiotics, and begin with the premise that all beings have selves, which means that the world is not only interpreted and made meaningful by humans. A self, a "someone" who is alive, interprets their environment, by being capable of learning by experience, and by making predictions about the future. Learning from the past can be a matter of how the course of evolution makes an anteater's snout more adapted to the ant-tunnel that it is made to fit into. At the same time, the anteater's snout implies a prediction of the future, namely that there will be ant-tunnels in which to put it (Kohn, 2013: 74). Taking this ontology seriously entails accepting that pathogenic microbes also in these ways interpret their environment and make predictions about the future – they are selves that interpret and give meaning to their environments based on their unique points of view.⁵

⁵ As noted earlier, this view of microbes does not entail agency, and does not differ significantly from recent scientific conclusions, even for viruses, which, even if they are merely quasi-alive, I will

Amerindian perspectivism, as presented by De Castro, does not merely decenter the human perspective by positing that the world itself is ontologically the same, but perceived epistemologically different by different beings. The decentering of the human perspective is much more radical in that all species see themselves as human, meaning all species presume that their view is central.⁶ De Castro defines this reversal with the concept of multinaturalism, which he describes like this:

The term “multinaturalism” could be used to designate one of the most distinctive traits of Amerindian thought, which emerges upon its juxtaposition with modern, multiculturalist cosmologies: where the latter rest on the mutual implication between the unicity of nature and the multiplicity of cultures – the first guaranteed by the objective universality of bodies and substance, and the second engendered by the subjective particularity of minds and signifiers [...] – the Amerindian conception presupposes, on the contrary, a unity of mind and a diversity of bodies. “Culture” or subject as the form of the universal, and “nature” or object as the particular (De Castro, 2014: 56).

Amerindian thought thinks a forest as full of selves or subjects, who see themselves as persons, and who therefore are persons. “What these persons see and thus are as persons, however, constitutes the very philosophical problem posed by and for indigenous thought” (De Castro, 2014: 56).

Every being perceives in the same way as us, but what they see is different, because their bodies are different than ours (De Castro, 2014: 72). Therefore, the world *is* different to for example a microbe. To a jaguar, blood is beer. To a parakeet, a scarecrow is a hawk:

still assert for our purposes here, are selves, in that they are able to move from body to body, and that they are able to respond to their environment for instance by developing resistance to antiviral drugs.

⁶ That all beings see themselves as human is not a slide into anthropocentrism. As Jane Bennett (2010, 120) writes, anthropomorphism works *against* anthropocentrism by establishing a connection between human and non-human, and is therefore a productive tactic for staging encounters with non-human perspectives. There is an element of anthropocentrism in the charge of anthropomorphism, given that humans are neither the sole possessors nor the inventors of seemingly ‘human’ capabilities. Humans, like octopuses, trees, birds, mammals and microbes, all evolved from the same single-celled organisms, some to have complex and comprehensive nervous systems and brains, others not so (Godfrey-Smith, 2016). Consciousness, or agency, is therefore a question of degree, not kind. If we acknowledge this lineage, humans are extrapolating rather than appropriating a non-human perspective.

Perspectivism presumes an epistemology that remains constant, and variable ontologies. The same “representations,” but different objects. One meaning, multiple referents. (De Castro, 2014: 72).

This means that we as humans do not come from the outside with an objective view of what is inside, because we are always already inside ecology. It also shows us that the threats and risks that we experience are not threats and risks to others. To mosquitoes, the body of a mammal is a source of food. To bacteria or viruses, the body of a mammal is a place to live and propagate. Amerindian thought thereby opens up for a perspective that puts cohabitation front and center, albeit cohabitation that involves predation, parasitism as well as symbiosis. If blood is beer to a jaguar, a relationship between a predator and its prey does not have to involve enmity, does not have to be a war, and does not have to be governed by logics of containment and control. This is an important lesson for our relationships with microbes. For example, one third of the world’s human population lives with dormant tuberculosis bacteria inside their bodies. It still is not clear to humans what triggers the bacteria to begin replicating, unleashing the full-blown disease. The body being weakened by diabetes is one link that has recently been discovered (Richard Brostrom, 2016, personal communication), which means that a western diet high in processed foods can disrupt cohabitation equilibriums. When migrants move to the West and adopt the local diet of highly processed foodstuffs available to underprivileged people, their dormant tuberculosis guests awaken. This should give pause for thought in terms of what or who ought to be excluded in the name of excluding infectious diseases.

Sometimes, cohabitation goes wrong. The tuberculosis bacterium is evolutionarily well adapted to its human host. This is not the case for other microbes. Thinking from the perspective of microbes, Dr. Richard Brostrom understands humans as an “accidental host” for the Ebola virus. Viruses seek to live, replicate and spread from within their host, and it is therefore not in the interest of a virus to kill its host as quickly as Ebola kills a human host. Fruit bats for example, survive with the virus in them. Ebola, it is thought, is introduced into the human population through close contact with “the blood, secretions, organs or other bodily fluids of infected animals such as chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines found ill or dead or in the rainforest” (WHO 2016). As an example

of faulty decision-making without agency, the virus mistook a human for a bat. To an Ebola virus, both are warm mammals. It should come as no surprise at this point that deforestation also played a significant role in the 2014-15 Ebola outbreak. Again, forests were cut down for timber logging, mining and agriculture (often palm oil plantations), which brought human and animals populations into proximity (Wallace et al. 2014; Wilcox and Ellis, 2006).

The slogan in global health that “diseases don’t respect borders” (Rushton and Youde, 2015: 1) presumes that microbes interpret the world like we do. Amerindian thought shows us that microbes are not disrespectful of, but differently invested in our borders than we are, or to put it differently, our borders exist differently for microbes. We have to deal with how their bordering territorializations exist to us. Microbes are opportunists who are indifferent to our concept of race, but take predatory advantage of the political economies that keep large human populations in poverty and without access to health care. Such populations are safe areas for infectious microbes, whereas areas in which people live with ample air-conditioned space around them and access to top-notch health care, are for microbes wastelands where it is hard to make a life. Needless to say, the concept of “biosecurity” is anthropocentric.

Destroying equilibriums

Cutting down a forest is not just destroying trees. It’s destroying intricate patterns and equilibriums that, without humans noticing, had kept creatures in mutual check. Again, this comes as no surprise to Amerindian thought as interpreted by Kohn, where an ecology full of selves is not in itself devoid of pattern or regularity, and is not just sitting there, waiting for human minds to impose that on it (Kohn, 2013: 158). In his book *How Forests Think* (2013) Kohn describes *forms* that arise from particular configurations of constraint on possibility. Water for example, is constrained by always flowing downstream. This constraint creates patterns of mountain streams and valley rivers that empty into the ocean. Whirlpools in the rivers arise from constraints on how the water can move downstream. These ephemeral forms are not the result of human cognitive schema or cultural categories, but something real that arises in and of itself, and importantly, not for humans (Kohn, 2013: 158). According to Kohn (2013: 186) form moves through us, as “complex multispecies

associations cultivate form in ways that also think their way through us when we become immersed in their ‘fleshliness’”. Importantly to Kohn, being inside such forms is effortless. Form propagates effortlessly, “it is not imposed from above, it falls out.” (Kohn, 2013: 176). Form, then, has “effortless efficacy.” This causal logic easily remains invisible and under-theorized by humans who might be enmeshed in the form themselves:

Humans do not just impose form on the tropical forest; the forest proliferates it. One can think of coevolution as a reciprocal proliferation of regularities or habits among interacting species. The tropical forest amplifies form in myriad directions thanks to the ways in which its many kinds of selves interrelate (Kohn, 2013: 182).

Hunting for example, is not about hunting animals, but about harnessing form. When the Runa people of the upper Amazon hunt, they

don’t hunt animals directly. Rather, they seek to discover and harness the ephemeral form created by the particular spatial distribution or configuration of those tree species that are fruiting at any given point in time because this is what attracts animals (Kohn 2013: 163).

In environmental destruction, these forms are destructed, and as a result, the efficacy of them is destructed too. This presents a different view of what is destructed in environmental destruction. Humans might see an edge around a forest, and think that if the forest becomes smaller, this does not affect the edge around it. However, the edge of a cut-down forest is not a microbial border separating between a “wild” inside and a “tamed” outside, it is a frayed edge of destructed ecological forms and equilibriums, which is an ecology in which vector species for diseases thrive extraordinarily well. Once out of the forest, intensified as a disease-carrying vector, and warmed up to a breeding frenzy, mosquitoes, increasing in numbers, spread viruses from humans to humans, hopscotching along patterns of human migration, environmental degradation, climate change, and poverty. Such an ecological view of infectious diseases highlights that more and more of us, particularly in privileged countries, directly contribute to the insecurity of our planet.

Governing microbial borders

The WHO and several scientists in epidemiology and related fields are calling for viewing infectious diseases within ecological frameworks (Patz et al., 2003; Whitmee et al., 2015). These calls have so far gone unnoticed at the scale of the political, perhaps partly because science does not translate neatly into modes of governance. Surveillance, modeling, origin analysis and emergency responses are insufficient as modes of governance. If these actions are taken as best-practice governing, we rely on methods such as border-checks, quarantines, and declaring a state of emergency once an epidemic is underway, which are modes of governance that create situations for violent panic and public policies based on fear.

Taking the example of the rising prevalence of Lyme's disease in the United States, suggestions resting on dominant security logics would be to cut down forests, limit human activity in forests, or shooting deer in the forest, which has been proven somewhat effective (Kilpatrick et al., 2012) and has been suggested by several hunting communities. Similarly, when mosquitoes are killed in attempts of "vector control," the messenger is killed while the ecological situation favoring the messenger is overlooked.

Public health professionals know that total elimination of threats from infectious diseases is impossible. Disease control efforts will never be finished, which is why the management of relationships of parasitism between humans and infectious microbes have to be steadily funded:

We had problems with dengue, they gutted the vector control program in Hawai'i, no one was doing mosquito studies, why do we need all these people out there, nothing has happened, and then all of a sudden, "there's an emergency, we need more people!" Yeah, like we've been asking for more money for a long time and you guys ignore it? It needs constant funding, constant work (Alan Katz, 2016, personal communication).

In addition to continuous management and attention, communities have to be empowered to face this reality of human life. Infectious diseases will not be eliminated, and thinking that infectious diseases suddenly emerge out of nowhere, and that the only way to govern them is to strike down hard with emergency politics whenever a crisis sets off, feeds into a faulty view of risks and threats:

Explain, there is a sophistication to this, we don't want to just spray the hell out the big Island because that has health consequences, and it hasn't shown that much impact, but to give people some wherewithall. [...] *Aedes aegypti*, that's the main guy, lets figure out his patterns and behaviors. Let's not be hospitable to these mosquitoes in our homes and our yards. Something that empowers communities to take control and be a part of it, rather than just declare [an emergency] and then sit and wait and wonder (Victoria Rayle, 2016, personal communication)

Ultimately, humans have to know how to actively live with and knowingly manage the risks that infectious diseases will invariably pose to human communities. If public health policy and environmental policies more broadly were informed by ecological thinking and microbial cartography, it would be clear that microbial borders cannot be governed with human borders between sovereign nation states, or by tactics of eradication. They can be governed by realizing one's own role in the ecology of selves, which is a type of governance that accepts the limits of human mastery.

As I hope to have convincingly suggested here, humans might not be the most capable actors in an ecosystem, and because beings such as microbes are as capable as they are, how microbes view and navigate their worlds is of crucial importance to us. I am arguing for cohabitation out of an interest in human health and security, not out of a sentimental idea about interspecies friendships. Because human flourishing depends on the flourishing of myriads of other beings, an interest in human security becomes an interest in biodiversity: Thriving is not a zero-sum game between different species, in fact quite the opposite. The best way to mitigate infectious diseases is therefore to engage in rewilding that acknowledges the roles of predators and prey in safeguarding diversity. Current modes of governing infectious diseases overlook this, and as a result are proving futile.

When infectious pathogens create borders that challenge nation state borders and by extension the sovereignty of powerful nation states, this ought not be perceived as an enemy attack that requires counter-attack and attempts of total risk eradication. Instead, microbial borders should prompt acknowledgement of the role humans play in ecological patterns that far exceed human control and meaning making, and subsequent public health efforts should be guided by this ethos. International Relations include our relations with non-humans, and how we choose to cohabit with them has large implications for human security.

CHAPTER 4. MICROBIOMES

Childhood malnutrition contributes to close to half of all deaths in children less than five years of age. This is 3,1 million dead children each year. A lot of these deaths are from diarrhea and pneumonia that become deadly in small, weakened bodies (Black et al., 2013). And the ramifications of undernourishment in childhood are even larger than this. Acute undernutrition, defined by very low weight for height, affects 50 million children worldwide, and chronic undernutrition, also called stunting, defined by low height for age, affects 160 million children (Blanton et al., 2016). Stunted growth is irreversible and associated with impaired cognitive ability, continued vulnerability to infectious and non-communicable disease, higher risks of birth complications, and reduced school and work performance later in life (Prentice et al., 2013; Black et al., 2013; Blanton et al., 2016; Martorrel, 2017).

Childhood undernutrition presents a major global health security challenge, and this chapter will engage with how this particular issue forces forward the acknowledgement that diversity, abundance and nurturing must be included in strategies to ensure more life, not just mere life, in childhood as well as later in life. Because nutritional security is in essence microbial security, as this chapter will argue, mitigation of childhood malnutrition again makes the conclusions from the previous chapter clear, namely that thriving is not a zero-sum game between different species, and that an interest in human security is congruent with an interest in biodiversity. The complexities of childhood malnutrition however don't serve up these conclusions in a straightforward way, but inserts a question of eradication tactics back into the equation, forcing the dissertation to qualify its problematizations of strategies of eradication. It turns out that Catherine Malabou's concept of destructive plasticity offers a way of achieving this.

It has long frustrated and puzzled aid workers that undernourished children often don't recover even when being fed an adequate diet. This tragic conundrum has lately been explained by pointing to the microbiota - the ecosystem of tens of trillions of commensal microbes that live in the human gut. Because it is impossible to culture these microbes outside the gut, they have remained mysterious until recently, when microbial genome-

sequencing enabled assessment of microbiota composition and functions, leading to an explosion of research dubbed the ‘microbiome revolution’, which has linked the human microbiome to autism, anxiety, asthma, cirrhosis, diabetes, dementia, and a wide range of other chronic, mental and infectious diseases (Blaser, 2014; Ianiro et al., 2016; Finlay and Arrieta, 2016).

Two major findings from this revolution are of importance to the links between microbiomes and child malnutrition. Firstly, research is pointing to a certain trajectory for the maturation of a healthy microbiome, which develops similarly across geographies and life styles in healthy children between birth and 2 years of age, while malnourished children have immature biomes compared to their age (Yatsunenکو et al., 2012). Secondly, research outcomes suggest that malnutrition is the effect, not the cause of an immature or stunted microbiome (Blanton et al., 2016; Smith et al., 2014). The so-called “1000-day critical window for nutrition” from conception to 2 years of age is therefore, it seems, first and foremost a critical window for microbiome development. Establishing a healthy microbiome in the first two years of life is paramount not only for nutrition, but also for cognitive development, bone growth, and development of immune cells. As an example that highlights how vital microbial colonization is early in life, oligosaccharides in human milk don’t provide nutrition to the baby who swallows them, but act as prebiotics that promote colonization of the infant gut with bifidobacterial strains that provide a range of benefits, including stronger immune adjustments from vaccinations, stronger mucosal gut-barrier function and protection from pathogenic infections in the intestine (Blanton et al., 2016). The bacteria that populate the infant gut teach the immature immune cells lining the gut to tolerate certain bacteria and not tolerate others. Infant immune cells are literally taught how to fend off infections by certain bacteria in the gut, making the maturation of a healthy microbiome a kind of school in which a lifelong symbiosis between human host and microbial ecosystem is set up (Finlay and Arrieta, 2016). When the microbiota doesn’t mature, neither does the immune system itself, which remains more vulnerable to incoming pathogens (Finlay and Arrieta, 2016). Needless to say, a philosopher would be hard pressed to fit this co-development between the microbiota and the gut mucosal immune system into legal-politically informed immunitary logic.

To this picture must be added that the global burden of malnutrition is now double – with underweight and overweight coexisting, often within the same households or institutions (Shrimpton and Rokz, 2012). Sedentary lifestyles and low-quality, highly processed foods are the two main factors in this double burden of malnutrition (El-Kassas and Ziade, 2017), but again the microbes play a part. Not only stunting and wasting, but also obesity has been connected to a stunted or altered microbiome. Both burdens of malnutrition are therefore to some extent microbial burdens. For example, a study from Mexico showed that “intestinal dysbiosis” and lower diversity characterized the microbiomes of both underweight/stunted and obese Mexican children compared to children with normal weight (Palacios-González et al., 2016).

Highlighting that the burden of malnutrition is now double, what was previously known as merely food security is now being labeled as nutritional security, in acknowledgement of the importance of quality and nutritional value of the food fed to children, and focus is especially on the first one thousand days of life, from conception to two years of age, which are seen as a critical window. However, nutritional security is highly microbial. Nutritious foods, infections, antibiotics, whether or not children are breastfed – all these things play heavily into the development of a strong microbiome. We must therefore, I argue, speak of microbial security as the main priority for the first one thousand days of life. This is a security logic of nurturing diversity, which flies in the face of dominant logics of security relying on mastery and eradication. Again, the ethos of rewilding comes close to what must be aspired to: Provide nutritious food, step back, and let the ecosystem populate itself. Rather than a tactic of eradication, microbial security is an affirmative security logic of abundance and nurturing.

The current debate on whether antibiotics should be part of the treatment of severe acute malnutrition however complicates microbial security efforts, again inserting the question of whether eradication is an effective strategy for ensuring security. Severe acute malnutrition affects approximately 13 million malnourished children a year, and contributes to 1 million deaths, and is therefore only a subset of the larger issue of childhood malnutrition (WHO, 2007).

Treatment of severely malnourished children used to be consist of fortified milk formula, but presently the international recommendations call for ready-to-use therapeutic

food (RUTF) — usually a fortified spread consisting of peanut paste, milk powder, oil, sugar, and a micronutrient supplement (Trehan et al., 2013). Already in 2007, a joint statement from WHO, UNICEF, WFP, and the UN System Standing Committee on Nutrition titled “Community-based management of severe acute malnutrition” (WHO, 2007) advocated for treating severely acutely malnourished children with RUTF at home and giving them broad-spectrum antibiotics as well. In 2007, no evidence supported the recommendation for antibiotic treatment. At this point, WHO still recommends, and traditional clinical practice advocates, prescribing a course of antibiotic therapy in children with severe acute malnutrition even without confirmation of the presence of bacterial infection. An often-cited study published in 2013 provided RUTF therapy to 2,767 Malawian children with severe acute malnutrition, along with either a placebo or a 7-day course of the antibiotic amoxicillin, which is a very commonly prescribed third generation penicillin, or the more rarely prescribed antibiotic cefdinir, which is an advanced generation cephalosporin. Over 80% of the children enrolled showed signs of infection, with a fever, cough and/or diarrhea in the weeks prior to the study, and 20% of those tested were positive for HIV. In the amoxicillin, cefdinir, and placebo groups, 88.7%, 90.9%, and 85.1% of the children recovered respectively, supporting the use of antibiotics in treatments of severe acute malnourishment (Trehan et al., 2013). Then a different study published in 2016 questioned the effects of antibiotics, after it enrolled a total of 2,399 children in Niger with acute severe malnutrition, who received either amoxicillin or placebo with their RUTF. 65.9% of children in the amoxicillin group, and 62.7% in the placebo group recovered, amounting to no significant difference in the likelihood of nutritional recovery. However, the children who received amoxicillin were 14% less likely to end up in the hospital during the treatment (Isanaka et al., 2016). Another recent study in Kenya found no lower mortality after providing prophylactic antibiotics to hospitalized children with severe acute malnutrition (Berkley et al., 2016). Since, the Niger study has been accused of being full of “biases [which] led to erroneous conclusions that threaten at least 500,000 children with nutritional failure” (Million et al., 2016). Now the debate is on, numbers are crunched, statistics bended, factors considered, and the answer is that nobody knows.

Insofar as a stunted microbiome is the cause of malnutrition rather than the effect, treating acute severe malnutrition with antibiotics should make the malnutrition worse.

Eradicating even more bacteria, thereby stunting the biome further, shouldn't be an effective treatment. As microbiologist Brett Finlay described to me, the theory is that pathogens and the unbalanced, stunted biome needs to be taken out before a new, healthy one can start to grow (Brett Finlay, personal communication). However, the practice of prescribing antibiotics is now increasingly being labeled as harmful and controversial. Authors who are critical of antibiotic use cite the dangers of long-term effects on child health and mortality, as well as the problem of antibiotic resistance, which has already been noticed. Relapse is common for children who have been fed for 12 weeks or however long a study is, with nutritious food and have been given antibiotic treatment. Providing antibiotics is a risky strategy that comes with no guarantees of what the microbiome will be repopulated with, as "every course of antibiotics may represent another roll of the dice, potentially allowing displacement of a mutualist with a strain that may or may not provide the same benefit" (Dethlefsen and Relman, 2011). On the other hand, some studies have shown "eubiotic" effects of antibiotics, when certain antibiotics given for certain ailments promote the growth of commensal strains of bacteria in the gut (Ponziani et al., 2016). Antibiotics or not, the provision of a nutrient-dense diet often corrects both dysfunctional microbiomes and the symptoms of severe acute malnutrition, but this recovery is only partial and temporary (Dethlefsen and Relman, 2011; Prentice et al., 2013). Right now there is a race to come up with pre- or probiotic treatments that can correct a stunted microbiome for the long term, by "deliberately shaping human development through manipulating the assembly of microbial communities" (Sheridan et al., 2014; Blanton et al., 2016; Brett Finlay, personal communication). The question remains whether a tactic of antibiotic eradication must persist as part of the toolbox, especially in severe acute malnutrition.

Forms of life

While a healthy biome of an infant harbors few but paramountly important bacterial strains across geographies and lifestyle, adult microbiomes are characterized by high diversity and are very dependent on environmental factors. There is scientific consensus that already from the age of 3 and onwards, a healthy microbiome is one characterized by diversity. Highly sanitized forms of life in the industrialized west is now being linked to a large amount of chronic, so-called "lifestyle diseases," that are associated with lower diversity and altered

conditions in the microbiota. As a result of this, there is much interest in the microbiomes of people who have not adopted a western lifestyle and a diet rich in highly processed foods, and who do not suffer from these chronic diseases.

Scientists who ventured into the Yanomami territory in the Amazonian rainforest to sample the microbiomes of previously uncontacted Amerindians found that the Amerindian ecology of selves is characterized by abundance and diversity also on the microbial level, as the scientists sequenced the highest level of microbial diversity ever reported in a human microbiome (Clemente et al., 2015). In the guts and on the skin of Amerindian hunter-gatherers were vastly higher numbers of different kinds of microbes than in the comparison group of Americans living in the United States. Microbial communities in Amerindian intestines are very alike among the Yanomami themselves, likely due to their close cohabitation, but highly distinct from those in the comparison group of Americans with western diets and lifestyles. In the microbial communities on the skin of the Yanomami lived microbes that had previously been labeled soil microbes. Amerindian cosmologies embrace living with risk and danger and invite diversity. Amerindians don't need to rewild, because they, just as their cosmologies, were never unwild in the first place.

The story is similar for the Hadza hunter-gatherers roaming the Savannah in Tanzania, whose microbiota are also very distinct, and harbor much higher diversity than an Italian comparison group (Schnorr et al., 2014). The Hadza biome includes microbes that are generally seen to be opportunistic, meaning they can act as pathogens in certain circumstances, such as when the host immune system is suppressed. Most notably, the microbiomes of the Hadza, as well as other African groups living in rural areas, include the *Treponema* group of bacteria, which are the ones that can cause syphilis and yaws. It is speculated that these bacteria are immunoregulated in these rural African biomes, and aid in the digestion of plant fibers from tubers and the like. Again, an immunitary paradigm fails to comprehend such an unnatural participation. And while the adult Hadza have *treponema* bacteria as part of their symbionts, they don't have *bifidobacteria*, which are prevalent in mammalian milk, and are among the first to heavily populate a human infant. Vegan and Korean adults also tend to be missing *bifido*, without this leading to adverse health issues.

The sampling of different microbiomes across the globe has led to a view of the microbiome as a diverse and responsive ecosystem that adapts continuously as a commensal

component of the host organism (Candela et al., 2012). A foraging lifestyle makes for one microbiome; a western lifestyle makes for another. The microbiome can adjust compositionally and functionally in 1-3 days in response to changes in diet. Some bacterial groups are affected by short-term dietary changes, while others are only changed by long-term dietary habits. As such the biome is reconfigured in response to different environmental factors, which allows the host to adjust metabolic and immunologic performance. These changes in the composition of the biome can happen in response not only to changes in diet, but also to changes in for example geographic origins, climate change, antibiotic use and levels of sanitation (Candela et al., 2012). The finding that microbiomes of Japanese people recently acquired a gene via lateral gene transfer from a sea bacterium living on seaweed, which now allows Japanese people to extract energy from a red marine algae, suggests that the adaptability of the microbiome improves the metabolic capacity of the human organism to extract energy from its diet (Hehemann et al., 2010).

In contrast to these adaptations, which are all variations on a healthy microbiome, some environmental circumstances can disturb the microbiome beyond the limits of its adaptability, at which point it can take on a “disease-associated profile.” This is not only a characteristic of the stunted microbiome in malnourished children, but also of for example Crohn’s disease, asthma, allergies, and autism, which have all been linked to dysbiosis between host organism and biome. A stunted microbiome is one with an altered state, where diversity is low, inflammatory and pathogenic bacteria dominate, which affects the gut mucosa layer. The so-called “vicious circle of malnutrition,” where inadequate nutritional status makes the body vulnerable to infections, which makes the malnutrition even worse, for example from diarrhea or appetite loss, is all about the microbiome: A stunted microbiome is susceptible to infection, and doesn’t assist its host body in the uptake of nutrients (Kane et al., 2014). The characteristics all make the microbiome is a prime example of plastic materiality.

Enter plasticity

To Catherine Malabou (2009), plasticity is a concept that helps us grasp the *form* of materiality as neither rigid and fixed, nor in total flux. Plasticity describes the capacity to receive form, as in the plasticity of clay, and the capacity to give form, as in sculpting.

Plasticity differs from elasticity, because the latter denotes a returning to the original form after change occurs. Plasticity is also distinct from being flexibility, which only captures the capacity to be formed, not the aspect of also giving form. To the capacities of giving and receiving form, Malabou adds destructive plasticity, which is the annihilation of form, in which the nature of being changes, not just the form: Destructive plasticity denotes an ontological annihilation.

Malabou uses the brain as her main example of something that is plastic, because the brain is the creator and receiver of form, and it can also be ontologically annihilated, with Alzheimers, for example, when the change is so radical that a person ceases to remember who they once were. To Malabou, plasticity is a constitutive historicity, meaning that each person's brain has the capacity to receive and give form based on that person's history and experiences. The brain of a piano player is different from the brain of someone who reads many books about political theory. The brain is neither a centralized computer that dictates everything, nor is it merely a program playing out as a result of genetic determination. Plasticity therefore opens a space for agential interventions, albeit restricted and limited interventions: What can we do with this plasticity that makes us? The material space for political intervention is therefore one that acknowledges the possibilities as well as constraints of the material.

The microbiome is plastic in much the same way as a brain. As an organ in itself, or as a commensal component of the host organism, the microbiome shows remarkable plasticity (Candela et al., 2012). It is constituted by its history, but changes much faster than a brain. Just like the plasticity of the brain, the plasticity of the human intestinal microbiota is both phylogenetic and functional, meaning it is sculpted by its phylogenetic history of microbial encounters and gene-swaps as well as its history of environmental influences. Working together as an organ, the microbiome is formed by our ways of life, and at the same time, it gives form to itself. It is not merely the biome as a static entity that is important for human health, but its very characteristic of plasticity. It is also this plasticity that has made the microbiome a prime focus of microbiology, because as one review says, there are great potentials in research on the microbiome because of “precision tools that now allow us to *sculpt* microbiome interventions with diet, prebiotics, probiotics, and targeted antibiotics to

prevent and treat disease” (Duffy et al., 2015, my italization). What will be sculpted here are not merely the interventions, but the microbiomes themselves.

Destructive plasticity most pungently marks the constraints that characterize the material. To Malabou, the accident has its own ontology, and one that must be reckoned with philosophically. To her, “the accident is the experiential dimension of ontology” (Malabou, 2012: 59). In the microbiome, destructive plasticity occurs at the moment when the microbiome ceases to be adaptable, and is ontologically transformed into the disease-associated profile no longer able to help its human host uptake nutrients from the food it is presented with. To Malabou “destructive plasticity [...] sculpts by annihilating precisely at the point where the repertory of viable forms has reached exhaustion, and has nothing else to propose” (Malabou, 2012: 54). The microbiome reaches a point where it can no longer adapt to the environmental circumstances it is presented with, and it instead breaks down. One course of antibiotics, and the microbiome reestablishes itself anew, with sculpting plasticity of resurgence. Too many courses of antibiotics, and the microbiome explodes in annihilation, is taken over by opportunist pathogens, equilibriums cannot be reestablished, and the microbiome is split from what it was before.

As mentioned, the two most common consequences of undernutrition are wasting (low weight for a given height) and stunting (a relative failure in height growth that also has long-term effects of impaired cognitive, immune system and skeletal development). Severe acute malnutrition is more uncommon. This end of the malnutrition spectrum covers marasmus, in which there is virtually no body fat, and protein is lost from muscle, and kwashiorkor, which is characterized by swelling, fat congregating in the liver, skin and hair lesions, and low appetite. Marasmus is considered an appropriate adaptive biological response in which muscle protein is mobilized to protect essential organs and plasma proteins required for ensuring survival. Kwashiorkor on the other hand is understood as a maladaptive response, in which the liver shuts down plasma protein synthesis before other less crucial proteins have been mobilized, and this liver failure results in swelling and liquid buildup in the body, and a breakdown of the gut mucosal lining (Prentice et al., 2013). Thus far, kwashiorkor has been causally linked to a stunted or altered microbiome (Smith et al., 2013), but the specific differences in how the biome is stunted in these different forms of

malnutrition is not yet known. One could speculate that with Kwashiorkor, the microbiome has been pushed beyond a certain threshold of adaptability.

To Malabou, the possibility of an ontological change brought on by destruction, an “annihilating metamorphosis” (Malabou, 2012: 30), resides virtually as an ontological fate within the biological, ready to self-actualize at any moment (Malabou, 2012: 6). To Malabou, destructive plasticity marks an ontological change. An entirely new form takes over where another form once was, with “a real and total deviation of being” (Malabou, 2012: 7). The new essence is imposed “without mediation or transition or glue or accountability” (Malabou, 2012: 6). It is “a plasticity that does not repair, a plasticity without recompense or scar, one that cuts the thread of life in two or more segments that no longer meet” (Malabou, 2012: 6). To Malabou, destructive plasticity is the explosion, annihilation of equilibrium; it is the destruction of the capacity to repair (Malabou, 2012: 6).

The biology of the microbiome prompts us to make some amendments to Malabou’s concept of destructive plasticity. Firstly, Malabou describes the ontology of the accident as a law that is logical and biological, but does not allow us to anticipate its instances (Malabou, 2012: 30). While we may not be able to say with precision which day the microbiome breaks down, and while it will vary from person to person for reasons unknown to human perspectives, we can nonetheless anticipate the accident if someone has been fed an inadequate diet for a long time, or has received antibiotics repeatedly. With gene sequencing and other new techniques that have revolutionized microbiology in the last decade, human consciousness is coming closer to the microbial logics of the law of destructive plasticity in microbiomes. If the ontology of the accident is governed by a law that is logical, are its instances merely unknown to us because we don’t know the causality? To put it differently, will human science and consciousness get to a place where also brain lesions can be anticipated, at least somewhat?

Prompting a second amendment, Malabou stresses that there is no redemption or healing or repair possible once destructive plasticity has set in. Her prime examples are again brain lesions. With a microbiome that has succumbed to destructive plasticity, there is the possibility of repair and healing, although this will be with a new microbiome that is ontologically distinct from the one that existed prior to its annihilating metamorphosis. Just

like the trees that grow after a forest fire are different trees than those in the forest prior. As one review of gut microbiota writes:

The existence of sudden regime shifts in ecosystems, sometimes triggered by perturbations, is a familiar ecological phenomenon, and the return of external conditions to their former state may not reverse such changes in community composition. (Dethlefsen and Relman, 2011).

Is there something anthropocentric in how Malabou connects ontological annihilation to a change in identity? A new microbiome or a new forest is ontologically different, but retains the function/identity/empiricism of microbiome/forest. As Eduardo Viveiros De Castro describes, Amerindian perspectivism presumes the ontological as the particular, and the epistemological as the universal. This seems more useful for describing the destructive plasticity of microbiomes: The epistemology of a microbiome is universal, while its ontology is particular. A microbiome remains a microbiome even as it undergoes an ontological annihilating metamorphosis. A human with a brain lesion is still a human, albeit a different human. Pushed by the microbiology of microbiome, the concept of destructive plasticity must be expanded to also include an ontological annihilation that gives rise to something new that, without identity change, takes the place of what was there. If what was there was unhealthy, then destructive plasticity becomes one tool for diversity and abundance. A productive destruction.

As Malabou writes, destructive plasticity is a condition of positive plasticity. Antibiotics as part of the treatment of malnutrition in children begs the question whether eradication must be one tool in the toolbox of microbial security, even for alleviating a problem that stems from a lack of microbial diversity. Can the negative effects of destructive plasticity be mitigated by a strategy of destructive plasticity? And what does this say about security tactics of eradication?

First of all, there is a difference between security strategies of eradication and security strategies of *risk* eradication. The former may very well acknowledge that risks can never be eradicated and that a security strategy of eradication is a particularly risky one. Strategies that seek to eradicate risk itself are what I have labeled as ineffective and dangerous, precisely because they rely on faulty premises of possibilities for human mastery

and control. Microbial security brings a new kind of security logic to the table, one that is affirmative, aimed at producing and favoring something positive built on abundance, diversity and nurturing. It is also a security logic that acknowledges the complexity and interconnectedness of the issues at hand, and acknowledges that seeking mastery is a dead end, and that there is no other way than to embrace living with risk and danger. Again, treatment of malnutrition by boosting the microbiome is in essence the ethos of rewilding: Nurture and relinquish full control, harness the diversity-affirming powers of the biological itself, and accept that sometimes everything blows up no matter what you do. Here, the antibiotic comes closer to the role of the wolf in rewilding: Eradication, or limiting the populations of some species in order to clear way for other species as a means to abundance, not as a means for mastery.

In conclusion, this plasticity-informed affirmative microbial security, in conjunction with the temporality of the plasticity of the microbiome, opens up for other avenues of biologically inspired affirmative politics than merely the treatment of malnourished children. The microbiome can disrupt traditional notions of identity and difference, because while each of us can be identified based on the microbes we harbor, biomes still change more frequently than lives do. For example, racial identifications change much slower than biomes do, so nurturing biomes and adaptive diversity can be a political act of political equality. Professor and activist Richa Nagar:

Saathis in Sitapur often remark on the well-intentioned members of the middle classes who visit their villages to support them and who condemn caste untouchability but who cannot operate without their own segregated bottles of purified water. Why is this practice not deemed untouchability, they ask. I feel that sangtins have a sophisticated gauge by which they determine whether or not someone can stand with them, to what extent, and in what ways; and the ability to eat and drink the same food and water that they are eating is a very important component of this gauge. I try to do well on the test but almost always lose my voice due to air and water pollution, and sometimes get violently ill with gastroenteritis, at which point I am generously excused by my comrades for my body's refusal to comply with their standards. All of this keeps me perpetually journeying through the question of what it means to enact solidarity when, like a virus, the germs of my physical, material, and socioeconomic location have made a *pukka* house inside my body and made it unable to

accept the same conditions of living embraced by those I want to stand, dream, and learn with? Is the body betraying the mind, or is it telling a harsh truth that the mind is refusing to accept? Maybe some of each? But how do we theorize this contradiction, and work with it in our beings and in the spaces available to us, despite, and beyond our institutions? (Nagar, 2014: 43)

Microbiomes enact differences between us, and those differences become separations, and vulnerability can suddenly be distributed in different ways than we normally think of, when we from the more sanitized parts of the world become vulnerable. Were I, with my western biome, invited to live with an Amerindian tribe, I would likely get very sick very quickly and would be the first to become prey to the jaguars. The way microbes distinguish is radically un-essentialist. Mutations and flow, changes, thresholds, intensities, these are the seams of distinguishing. Our microbiome is not based on what we are, but how we live. Being indifferent, but not unresponsive, to human culture, pettiness, unfairness and violence, microbes silently highlight these by habituating accordingly. But microbiomes just are what they are. They are not inherently good or bad. The body is not betraying or telling a harsh truth to the mind, it's just cohabitating with its symbionts as best it can. Any politics of caste, any gesture towards solidarity or "standing with" is added to a politically malleable space of plasticity. Again, I think one should be cautious not to get trapped in the symbolical when the biological is right there, presenting progressive solutions. According to contemporary microbiology, the situation described by Nagar could be surpassed if well-intentioned members of the middle classes stayed in the villages long enough for their microbiomes to adapt. Again with danger and risk included, because the process could be painful, and could also go very wrong. The act of staying would hover in the space between adaptive and destructive plasticity, and would be a biologically grounded political and ethical response to the differences between rural Indian and urban Indian or American biomes.

CHAPTER 5. LIMITS

This dissertation has described how microbes provide biological corrections to the violence and clumsiness of an immunity paradigm, how infectious agents resist being weaponized systematically according to state desires, how pathogens engage in bordering practices that challenge nation state borders and sovereignty, and how microbes compel us to embrace (risky) security tactics of nurturing, abundance and diversity. Microbial geopolitics dislodge a human-centered perspective of the geopolitical, and also throws a wrench into logics and premises behind dominant strategies and objectives of security.

Looking for the geopolitical effects of microbes has led to the conclusion that killing, predation, loss, death, and horror cannot be escaped, and this conclusion guides the main argument of the dissertation, namely that we have to learn how to live better with risk and danger, rather than living in ways that deny or seek to eradicate risk and danger.

In its insistent loyalty to the empirical, this argument falls way short of offering any kind of redemption. The commitment to a new materialism pursued throughout this dissertation nonetheless acknowledges microbial efficacy as a fact to be reckoned with. Dislodging dominant modes of thought and security strategies that rely on false premises of human mastery holds potentials for significant political change, but it is important not to replace faulty narratives of mastery and redemption with other faulty narratives of mastery and redemption. Loss and horror are part of biological change. Empiricist ventures into the mutational character of life, even to look for roots of new affirmative security politics, are no less fraught with chaos and cruelty than human-centered geopolitics.

To put all this into relief, the dissertation ends with the exploration of a tragedy in which the political efficacy of microbes drowns in the horror of geopolitics in ways that resist the arguments this dissertation has arrived at so far.

Microbes are all over the Syrian war. Pathogens reemerge and spread easily when health care systems, vaccination programs, sewage systems and food and water supplies are destroyed and populations are displaced. In Syria and among displaced Syrian refugees, polio (suspected to have been introduced to Syria by Pakistani jihadist fighters), measles, tuberculosis, meningitis, scabies, and hepatitis A have reemerged, and a “catastrophic”

outbreak of cutaneous leishmaniasis is affecting hundreds of thousands living in refugee camps or conflict zones (Sharara and Kanj, 2014; Du et. al, 2016). Following Syrian refugees, incidences of leishmaniasis have intensified in Turkey (Inci, 2015), Iraq saw one case of polio, and the measles outbreak has spread into the Jordanian and especially the Lebanese population (Sharara and Kanj, 2014). Crowded living conditions, inadequate sanitation and poverty make refugee camps vulnerable to the spread of infectious diseases. The move from war zone to refugee camp is often a move from one set of threats to another (Du et al., 2016).

In addition to these pathogens taking advantage of the situation for their benefit, an increasing amount of Syrians are dying from war injuries that are infected with pathogens resistant to all known antibiotics. The patients who survive such infections have their infected limbs amputated, and spend months quarantined in hospitals, being a threat to others. MSF Doctors at a hospital for reconstructive surgery in Amman speculate that the Syrian war right now spearheads the slowly amplifying crisis of antibiotic resistance globally, and that antibiotic resistance could become a source of death in the Syrian war comparable to ISIS and Assad's air forces (Schwartzstein, 2016). Multi-resistant bacterial strains migrating with refugees from the Syrian civil war have now been reported in hospitals in Lebanon (Rafei et al., 2014), Turkey (Heydari et al, 2015; Doganay et al., 2016), Israel (Peretz, 2014; Lerner et al, 2016), Italy (Angaletti et al, 2016) and Germany (Reinheimer et al., 2016; Tenenbaum et al., 2016; Heudorf, 2016), and alarms are being sounded that these strains could spread into and take hold in European populations, amplifying the incidences of antibiotic resistance on a global scale (Maltezou, 2016).

When the Syrian state itself has become a self-destructing state-war machine mutant, microbial war machines come to assist in misanthropic destruction. Paradoxically, microbial war machines were amplified by state forces of striation, when negligent pre-war use of antibiotics resulted in a latent reservoir of multi-drug resistant bacterial strains that were unleashed by a breakdown of striated space often perpetrated by the faltering state itself. And while the Syrian state/war machine holds control over its explosive and chemical weapons, it doesn't hold control over the death and destruction caused by self-propelling biological weapons released by the war.

Engaging Syria from a microbial perspective is a humbling endeavor, especially with the rest of this dissertation as the backdrop for the engagement. Microbes have very little political efficacy in Syria, as their deadly potentials have been swept up into and merely slightly amplify much larger deadly potentials. In Syria, microbes don't resist state apparatuses but come to aid them in their self-destruction. Embracing risk and danger is a futile tactic in Syria, where a double movement of weaponization and targeting of everything from medical aid to food shopping has saturated everything as being dangerous, not least the prospect of fleeing. Risk and danger cannot be embraced in a tragedy that has saturated everything with risk and danger. Rewilding is also rendered meaningless in the Syrian context. Syria is overflowing with predators who facilitate death, not life. Finally, appealing to diversity of different life forms, including the microbial, is not a pathway to human security in Syria. Syria already hosts an abundance of diverse destructive forces and an abundance of multi-drug resistant pathogens. In Syria, the question of more life versus mere life is out of the picture, because survival itself is so difficult.

Such are the conditions of a new realist commitment. There is no new Kantian imperative of diversity or rewilding or embracing risk and danger that will universally work to create better lives and better worlds everywhere. Being loyal to the empirical means falling short of being able to write a new life into any tragedy. I think the aim of scholarship is to find conditions of possibility for better lives and better worlds, and this must be pursued knowing there are Syrias too. We have to look to strive where we can, but there is no new universalism where that kind of striving will work everywhere on everything. Sometimes, things really just are horrible. Pretending things are something else, or avoiding what things are by remaining in the symbolic, are not the objectives of the scholarship pursued in this dissertation. Instead it accepts the condition that nothing will save us all, and asks how we might best live with that.

The geopolitics that have been traced throughout this dissertation, by allowing the efficacy of microbes – in life and in death – to lead the conversation, denounce a view of geopolitics as something that can be adequately understood within state-centric frameworks, in which territoriality and sovereignty is only claimed by human apparatuses. In Syria, geopolitics are neither human nor microbial, but characterized by disordered assemblages over whom nobody can claim sovereignty. Causes and effects of Syrian catastrophes and

interventions are planetary and reverberate chaotically in ways where it is impossible to distinguish between an inside or outside to the consequences of warfare, medical aid, military intervention and refugee policy. Following the empirical route of microbial conduct into Syria highlights all of the above, and also raises a question of responsibility, and how to live up to that responsibility. Some tragedies render all affirmative and progressive arsenals of action powerless, and because such tragedies reverberate far and wide, they call for taking responsibility. Tragedies do not take place within bubbles, but are results of resonating ways of life and relating to the world.

Without much hope, the chapter will now follow the route of microbial conduct that traverses the tragic space of Syrian geopolitics. This route arrives at exposure to contagion and risk as a way to take responsibility, but not necessarily as a way to fix anything.

The weaponization of health care

How did Syria get there, microbially? How did antibiotic resistance become the hallmark of Syrian micro-bio-geopolitics? Firstly, the breakdown of health care in Syria has been extraordinary and unprecedented, because health care facilities and providers have been deliberately targeted in the war, especially by Syrian air forces and their allies. A strategy of using people's need for health care as a weapon against them by violently depriving them of it, has effectively "weaponized health care" (Fouad et al., 2017). As an MSF operations advisor puts it:

Using health care denial as a weapon of oppression, the government has de facto transformed health care provision into a weapon of resistance (Weissman, 2013).

This direct targeting of medical facilities and medical workers, along with the obliteration of medical neutrality and besieging of medicine, has been carried out alongside other actions deemed "strategies of war crimes" (Roth, 2015), namely deliberately bombing civilian homes, utilizing sarin gas, and attacking infrastructure vital to civilian life such as schools, bakeries, and markets (Fouad et al., 2017). As a result, public hospitals are deserted, and temporary hidden field hospitals are set up in individual houses, abandoned public facilities, or buried underground. In 2013, an MSF operations advisor reported that a growing number

of the wounded in the war were people injured by ammunition fragments during aerial and artillery bombing, with extensive soft tissue and bone damage due to shrapnel (Weissman, 2013). These are precisely the types of wounds that lead to bone infections, especially when it takes a wounded patient a long time to get to a medical facility. A bone infection (osteomyelitis) is severe in itself, but when the infection is resistant to front-line antibiotics, it becomes life threatening to a different degree. Doctors report how emergency room sanitation has been set back decades in some areas, and doctors die or leave out of fear for their lives. In addition to the weaponization of health care carried out by the Syrian government and its allies, ISIS in 2015 abducted 13 MSF employees and held them captive for up to five months, which has made MSF draw away from serving areas under ISIS control (MSF, 2015). As a consequence, most Syrian medical professionals have gone into exile, leaving dentists and pharmacists to provide emergency medical care:

Their skills are improving but they are rarely trained in war surgery, which presents specific complications such as bone infections, and in triaging victims during mass influx of wounded (Weissman, 2013).

A 2017 *Lancet* article reports that at least 247 doctors, 176 nurses, 146 medics, 74 pharmacists, 38 medical students, 24 ambulance workers, 20 veterinarians, and 19 dentists have been killed in the Syria conflict between 2011 and 2016, the vast majority of these from shelling or bombing by the Syrian Government or its allied forces. Since the collection of these numbers, an additional 32 health workers have been killed, bringing the total number to 814 (Fouad et al., 2017). This weaponization of health care has escalated throughout the war with 2016 marking the worst year of the conflict to date in terms of attacks on medical facilities (Fouad et al., 2017). The repeated bombing of impromptu health care facilities until they are forced to shut down reveals a pattern of recurrent targeting with the intention of depriving access to health care, for example when “an underground fortified hospital in eastern Aleppo was attacked 19 times in 3 years, including 13 times between July and October, 2016, shutting it down with the last attack in October” (Fouad et al., 2017). With no access to medical care, people die because they don’t get medication to treat their chronic illnesses, or they die from blood-loss or organ devastation. Infections are only one aspect of the sources of death. When targeting and weaponization become a perverse and self-

amplifying double movement, everything, from infrastructure, to medicine, people, movement, microbes, community, and borders, is saturated with risk and danger.

With health infrastructure crumbled, doctors fleeing, and areas of Syria that doctors can't reach, antibiotic resistance is provided optimal circumstances for intensification, as under-trained and under-equipped medical staff is inadvertently spreading the resistant strains amongst the many casualties as they and doctors are forced to perform complex operations in poorly lit basements with recycled equipment:

These facilities function as well as they can, given the shortage of medical supplies. "I saw one emergency ward where they had no sterilization tools," says MSF doctor Natalie Roberts, who recently returned from Aleppo. "They had to do sutures with materials that had already been used" (MSF, 2015).

Patients with bacterial infections that are resistant to all available antibiotics who manage to survive until they get to a health clinic that has the resources to inspect the bacteriology of their injuries, have their infected limbs amputated, and if the infection is situated centrally in the body, no hospital can do anything, and the patient dies (Schwartzstein, 2016, see also Teicher et al. 2014; MSF, 2017). It isn't clear if impromptu hospitals are the only site of spread:

Analysts still aren't sure whether this resistance is spread in the streets or strictly at battlefield clinics. There are insufficient micro-laboratories in the relevant areas, which are needed to scrutinize bone cultures for signs of deep infection, and Syrians, it seems, are being killed too quickly for analysts to keep up. It's possible, doctors say, that explosions—from car bombs to airstrikes—are spreading resistant bacteria through body parts and flesh that flies through the air after a blast (Schwartzstein, 2016).

The only scientific documents to rely on at this point are reports of multi-drug resistant bacteria found in Syrian patients. A recent article, which documents antimicrobial resistance in Syrian children who were wounded or severely ill, and were secretly transported across the Syrian border for treatment in Israel, found that 83% of the 128 children admitted during the study period of 2013-15 carried multi-drug resistant pathogens, and that the average

amount of multi-drug resistant strains increased significantly among incoming children between 2013-14 and 2015 (Kassem et al., 2017). Seven of the children carried strains with the dreaded NDM-1 (New Delhi Metallo-beta-lactamase-1) gene that confers resistance to almost all known antibiotics, and which can spread from one strain of bacteria to another via horizontal gene transfer. Multi-drug resistant infections occurred in 90% of the wounded children, and only 10% of the ill children, again suggesting that there is a high carriage rate of multi-drug resistant pathogens in healthy children in Syria, a latent threat unleashed by the war (Kassem et al., 2017). As the Israeli authors state, “The rate of MDR [multi-drug-resistant] carriage among wounded and ill Syrian children who were treated in Israel is extremely high” (Kassem et al., 2017).

What underlies this latent threat of antibiotic resistance that was unleashed and amplified by the war? As mentioned earlier, a lax attitude towards and negligent use of antibiotics characterized Syrian health care before and during the beginning of the war, when antibiotics were available without prescription, given and self-prescribed to treat ailments that had nothing to do with infectious bacteria, and were assumed to be a medication that was at worst neutral, with no side effects to patient or community (MSF, 2014; Al-Faham et al. 2011; Plackett, 2014). This consumption of antibiotics put selective pressures on microbial communities in Syria prior to the war, leading the so-called resistome - the collection of antibiotic resistance genes harbored by a certain microbial community (Wright, 2007) - of the Syrian population to include a high number of resistance genes. Such genes cause few troubles in bodies that aren't infected. Once infection occurs, pathogens harboring these resistance genes manifest. Postcolonial political economies of medicine, infrastructure and vulnerability have created a situation where places such as India, the Balkans, and the Middle East are “hot spots” for antibiotic resistance. But antibiotic resistance is everywhere, and human consumption of antibiotics has amplified this resistance everywhere. This is also to say that if war broke out and health care collapsed in America or Europe, this would likely also unleash a latent potential of multi-drug resistant infections.

The problem of antibiotic resistance is so entangled in human activity and resource extraction globally that it constitutes yet another issue of the Anthropocene epoch. Importantly, humans did not invent antibiotics, but discovered them. Humans came across microbial technology, borrowed it, and copied it, and these borrowed and copied

technologies are what we know as antibiotics today. In microbial communities, antibiotics as well as resistance genes are tools or technologies that are scattered around in resistomes (Choffnes et al., 2010). Some scientists think that antibiotics are competitive tools used to secure advantages in microbial communities, while other scientists think that they are tools of communication. Deep in underground caves, microbes that have never been in contact with modern medicine or humans harbor resistance to front-line antibiotics (Choffnes et al., 2010). When scientists gene-sequenced the microbiota of the previously uncontacted Amerindian tribe the Yanomami in the Amazon rainforest of Venezuela, they “identified 28 functional antibiotic resistance genes in the microbiota of these people naïve to anthropogenic antibiotics, including genes resistant to semisynthetic and synthetic antibiotics, to which the villagers and their surroundings are highly unlikely to have ever been exposed” (Clemente et al., 2015). Bacteria in the Yanomami harbored genes that coded for resistance to five later-generation antibiotics, including a fourth generation cephalosporin and a synthetic monobactam, and penicillin-binding proteins resistant to the third-generation cephalosporin ceftazidime (Clemente et al., 2015). Still, all *E. coli* isolates sampled were sensitive to all the 23 antibiotics tested, which suggests that these 28 resistance genes are currently silenced. These genes are nonetheless part of the Yanomami resistome, which is quite similar to the resistome in the project’s control population of westernized Americans. As soon as selective pressure is put onto these resistomes, as happened in Syria, the resistance genes would be activated. In the Amerindian microbiome mentioned above, antibiotic resistance genes, regardless of their origin, have been maintained in the absence of antibiotic selection pressure. Carrying such a pool of mobilizable resistance genes to next-generation antibiotics in microbiota that have not been subjected to selective pressure by antibiotic use points to how rapidly clinical resistance has occurred to each new antibiotic class after its introduction. Although the resistant genes are apparently silenced in the Yanomami resistome, selection could readily occur with the introduction of antibiotic selective pressure (Clemente et al., 2015).

This means that resistance is everywhere, and that the efficacy of any antibiotic is limited. What is labeled a global crisis of antibiotic resistance is therefore not a crisis of resistance per se, but a crisis of human interference into microbial webs of life, which has massively amplified resistance by placing enormous selective pressure on microbial life

cycle after microbial life cycle. Human activity in especially medicine and agriculture has pushed this kind of selective pressure to the extreme, not only in Syria (Choffnes et al., 2010). In run-off from farms, laboratories, hospitals, agriculture and waste-water treatment plants, antibiotics and resistant strains have flooded into ecosystems all over the planet. The selective pressure prompted by human consumption of antibiotics therefore happens not just in human and animal bodies, but also in streams, lakes, oceans and soil. The resulting changes in ecosystems are what make antibiotic resistance yet another aspect of the Anthropocene era (Kahn, 2016). Because resistance genes are tools that are available (sometimes readily, sometimes on standby), there is nothing novel in selective pressures resulting in a cycle in which resistance is developed to antibiotics. Resistance can also go away again if it's no longer needed, the tools can be dropped or silenced, as they are energy consuming to carry around (Choffnes et al., 2010). This is the checks and balances of a healthy ecosystem, a part of the web of microbial life.

In the massive amplification of the antibiotic resistance cycle, humans have quickly blazed through the natural reservoir of technologies from microbial communities. And while humans have managed to harvest and utilize these microbial technologies, this has happened without understanding how these technologies work. No human understands how borrowed antibiotic technologies get through the cell walls of pathogenic bacteria, especially how they get through the two membranes surrounding a gram-negative bacteria, or how bacteria are able to push antibiotics back out as soon as they enter a cell (Walsh and Wencewicz, 2016).

Antibiotics have provided a human-centered epoch of bracketed non-disaster. Like fossil fuels, they have allowed humans, for a brief geological period, to pretend there were no externalities to human consumption, mobility and health. The ways in which the Syrian war has unleashed latent potentialities of multi-drug resistant infections is intricately enmeshed in the global catastrophe of antibiotic resistance. The Syrian war and antibiotic resistance are two catastrophes that resonate, or, to be more precise, the Syrian war is an amplification of the amplification of antibiotic resistance.

A doctor from the MSF reconstructive surgery hospital in Amman says the following about the problem of antibiotic resistance and the war in Syria:

The problem is not the mentality of the doctors; it's the conflict. We have to treat the conflict to stop antibiotic resistance (Schwarzstein, 2016).

This quote gestures at just how tightly enmeshed and far-reaching the causal feedback loops behind the tragic Syrian geopolitics are. Both the conflict and antibiotic resistance are results of a failed global system that relied on ideas of human mastery, extractionism, and isomorphic states with orderly borders competing in an anarchic environment. Reading the Syrian conflict and the way it resonates with antibiotic resistance from a microbial perspective points to assemblages with distributed efficacy. The way the war has spilled into parts of the world whose consumption and life styles originally aided in creating it, is another correction to a compartmentalized view of the Syrian war as a singular threat, existing in a box that has nothing to do with the rest of us (see also Betts, 2015). Security issues find their causes and effects scattered across the globe.

And the war is reverberating far and wide. The Syrian war is currently the world's single-largest driver of human displacement. The UN Refugee Agency and Security Council have reported that 7.6 million Syrians are internally displaced, more than 5 million Syrians have been registered as refugees, and at least 250,000 Syrians have died, including well over 10,000 children (UNHCR 2015, 2017; UN 2015). With few exceptions, the dominant international response has been to erect fences, travel bans and border-control posts, and to implement policy after policy designed to discourage refugees from seeking a new future in countries safe from war (see for example Meko and Sharma, 2016 and Bilefsky, 2017). As a result, refugees are trapped in camps, and the international response hovers between authoritarian isolationism and benevolent humanitarianism, both of which cast Syrians as people "over there", who should ideally stay "over there."

At this point, nobody knows how wide-reaching the problem of antibiotic resistance is in Syria, and what will happen as it spreads (Whitman, 2014). One author states that perhaps the resonances between these two catastrophes – the Syrian war and antibiotic resistance – will finally push the global crisis of antibiotic resistance into the realm of a post-antibiotic era (Schwarzstein, 2016). In a so-called "post-antibiotic era", nobody would be able to depend on antibiotics to treat infections that those of us who are most privileged consider relatively minor today, such as urinary tract infections and pneumonia. Because

medical treatments like chemotherapy, organ transplants and hip replacements rely on antibiotics, these would also become too risky to perform. It is estimated that currently 50.000 people die every year due to drug resistance in the U.S. and Europe, and 700.000 people globally. A recent report commissioned by the British health ministry estimates that the death toll could be 10 million annually by 2050, if nothing is done about antibiotic resistance (O'Neill, 2014). War seems to be a strong force in the amplification of antibiotic resistance worldwide.

The fantasy of a “post-antibiotic era” is a peculiar one. I wonder whether pushing antibiotic resistance to the point where we could finally say that it’s over and there is nothing more to do becomes almost attractive because it seems to come with a kind of order to hit rock bottom. I however doubt that the geopolitical chaos of Syria will provide any kind of order. If this dissertation has taught me anything, it is that the human condition is to hover somewhere in the thick of it, where closure is not an available option. If the embrace of risk and danger becomes defeatist, then succumbing to, rather than seeking to live with, risk and danger is just a backwards way of wanting to eradicate it. Both seek to get rid of the ongoing struggle of uncertainty and cohabitating in entropy. The ontological position of living with risk and danger is about existing in disorder, uncomfortable as this seems to forms of life that actively deny that such is life. Against this, the apocalypse becomes a relief, because it seems to hold its own kind of certainty, order, or closure. Of course it doesn’t. There is no rock bottom. It’s rock bottoms all the way down.

Now, alarms are being sounded about the links between the global crisis of antibiotic resistance and the so-called European refugee crisis. Antibiotic resistance mechanisms “could be transferred from their country of origin along the immigration route to a host country and disseminate within healthcare facilities, in case of hospitalization” (Malteizou, 2016), and such findings constitute “an emerging public health risk” because “movement across borders has played a key role in the dissemination of new antimicrobial resistance mechanisms globally”, and “the potential of importation of a novel antimicrobial resistant mechanism in a country [...] is an alarming event.” Finally, it is “expected that the current migration crisis will eventually have an impact on antimicrobial resistance globally” (Malteizou, 2016). Likewise, an article of two cases of infections with pathogens harboring the NDM-1-gene in Italy warns that “Italy is a first-line European checkpoint with respect to

African countries and plays a pivotal role in limiting the dissemination of high-risk clones, especially considering the latest strong migration flows” (Principe et al, 2017). These scientific reports are ripe for racialized and xenophobic securitizations of contagion.

I don’t think an embrace of the complexity of assemblages will erase any foundation for informed political intervention or human judgment. Firstly, ignoring the complexity of assemblages and continuing to rely on policies informed by state-centric assumptions seems to bring about cruelty, loss, and violence such as what we are witnessing in Syria and the response to Syria. Secondly, when efficacy is radically dispersed, opportunities for intervention are amplified. This doesn’t mean that responsibility is reduced, but highlights that responsibility is dispersed beyond any state-centric borders. Following the microbial tracks, we end up with a call for stepping up when the consequences of the geopolitical upheaval hits home.

I wonder how much of the obsessive optimism that there is a solution to horror in Syria comes from a sense of compassion, and how much of the insistence to do something comes from an irresponsibility or refusal to take responsibility for what imperial geopolitics and neoliberalism have created? If there is no fix to microbial resistance and the Syrian war, then Euro-American state-craft and the populations that benefit from it may have to accept they will not be saved by a technical solution or any geopolitical cutting to the chase. Going beyond solutions or redemption calls for a new kind of ethical commitment that urges us to take more seriously that we should risk infection, risk contamination in all sorts of ways, from the cultural, religious, political to the microbial, if we are to accept full responsibility.

A recent study of Syrian refugees in a camp in Italy found high levels of resistant pathogens in healthy Syrians with no history of prior hospitalization or consumption of antibiotics, which, again “indicates circulation of MDR strains in Syrian communities and dissemination under poor sanitary conditions” (Maltezou, 2016). There are no reports of any of these resistant strains making it into or infecting anyone in the local Italian population. And while there has been much crisis-wording relating to NDM-1 in the academic and popular media alike, pathogens with the gene have only entered the West in patients contracting infections in “The Indian subcontinent, the Balkan region, and the Middle East” (Principe et al., 2017), and have to date never spread outside Western hospitals, just as the spread within hospitals has been very limited at this point. Similarly, in the study of children

treated in Israel; all infections remained isolated in each of these 128 children, and another center in Israel that cares for patients from Syria documented nothing more than the spread of one pathogen, again only within the hospital (Kassem et al., 2017). So while resistant strains of bacteria in Syrian bodies have been detected in hospitals across the Middle East and Europe, there is still no evidence of these resistant strains spreading into and infecting non-refugee populations in those countries. The presence of multi-drug resistant bacterial strains is alarming, and the dangers they pose when war breaks out and health care breaks down, is alarming. However, their spread in intact health care systems and healthy bodies is not alarming.

Notably, in Europe, many resistant strains are detected upon screening, not because Syrians are hospitalized with infections due to those strains. This means that as long as migrant bodies are safe from bullets, car bombs and camps, multi-resistant bacterial strains do not pose a threat to the Syrian refugees themselves, but cohabit peacefully, under check in the microbiome of which they are a part. Such strains can become a threat to a body out of balance and under stress by for example an open wound.

Will these resistant strains pose threats to European bodies, as Syrian bodies resettle in the midst of them? One hypothesis states that resistant strains pose a threat to the local populations, because they can spread from Syrians and from there take hold. Another hypothesis states that the microbiome of the local population will “crowd out” these resistant strains (Abigail Carlson, personal communication). Whether resistant strains from refugee bodies will be added to local European resistomes, or whether local European resistomes will crowd out and thereby exclude or genetically downgrade resistant strains in Syrian immigrants, no one knows (Abigail Carlson, personal communication). The meeting between different microbiomes and different resistomes upon resettlement are encounters with risks as well as potentials. One potential of such encounters is that refugees can adopt a new geographic microbiome and resistome that has not been under stress and excessive selective pressure due to war, and is therefore a more stable equilibrium than the one the refugees fled from. Rather than diversity leading to human security, Syrian microbial politics once again turns everything arrived at in this dissertation on its head, because here a certain homogenization seems to be needed. Such resistome homogenization will not happen if refugees remain excluded migrants even in their new settings - cohabitation is the key to

microbiome interactions. The ethos of nurturing returns here, because a crowding out of resistance genes happens in healthy bodies with no stress or selection pressure. The point of this cohabitation isn't to save anyone. The point is that there is no guarantee.

Exclusion, eradication, isolation and separation are all actions that are condonable from a perspective of national security that supports isolationist compartmentalized views of threats that do nothing to mitigate or take responsibility for the causes of them, instead focusing on changing their effects in only certain selected enclaves.

Relationships of parasitism and symbiosis between humans and infectious microbes are risky. I argue that we ought to take the route of embracing these risks, not only to harvest their potentials, but also because it allows us to escape the alternatives of securitization and militarization of humanitarian issues, and racialized, xenophobic and isolationist immigration and refugee policies. Perhaps risking contagion won't work, and antibiotic resistance will burst onto the European scene in an unprecedented manner no matter what. To me, the point of the generosity and community of exposing oneself to risk in an acknowledgement of the causal relationships that lead to the status quo, is a goal worth pursuing in itself. Of course I want more people to have better lives as a result, but I know this isn't always possible. It is a worthwhile endeavor to go for solidarity itself.

The geopolitical implications of microbial conduct do not reveal an order and sovereignty that was never there in the first place. There is no solution to our current predicament, no new language or logic of governance or economy to introduce. However, disappointment is a bad reason to hold on to bad concepts.

EPILOGUE

Perhaps triumphs are not even the point. Perhaps struggle is all we have because the God of history is an atheist, and nothing about his world is meant to be. So you must wake up every morning knowing that no promise is unbreakable, least of all the promise of waking up at all. This is not despair. These are the preferences of the universe itself: verbs over nouns, actions over states, struggle over hope (Coates, 2015: 90).

Death is not personal, but it is real, and it compels us to accept that we are not sovereign to life and death. Living with risk and danger entails accepting that death will come. I think the security apparatuses of the contemporary era, and their futile quests for human mastery, their strategies of threat elimination, and the separation, homogenization and fear they rely on, resonate with how medicinal apparatuses of the contemporary era create great suffering and violence in a delicate attempt to avoid death itself. People with incurable diseases die in ICU's with tubes in their chests instead of at home with their families. The feat to eradicate risk and danger is ultimately a feat to eradicate death, which because it is impossible becomes a feat of postponing death for as long as possible. As described by Atul Gawande (2014), American doctors are afraid to tell patients when there is nothing more to do, and instead offer treatments and surgeries with horrific side effects that have miniscule chances of elongating the life, while resulting in a drop in the quality of life and the quality of death for the person who is sick. People who opt out of these kinds of treatments and decide on "amor fati" as Nietzsche would label it, or palliative care, as hospice medicine labels it, often end up with longer lives than those who opt for medicine to never give up the battle. But a longer life is not the point. The point is that people in hospice or palliative care suffer less, are more physically capable, and are better able to interact with others for a longer period of time, compared to those who opt for resuscitations and intensive care units and who often don't discuss their impending deaths with neither their doctors nor their families. On top of

this, family members of people dying in hospice have markedly lower rates of depression during their grieving period (Gawande, 2014: 177).

As I have argued in this dissertation, mere life is not a goal in itself. Life has to be intensified; it has to be a good life. A life with abundance, community, diversity, thriving, and risks. A rich life. Such lives must end with good deaths. A good death is neither rooted in nihilism nor functionalism. As Ta-Nehisi Coates writes to his son, pragmatism, cosmic pessimism, or as I would like to call it, affirmative realism, is not despair. A good death requires compassion, community, and rituals. A good death is about maintaining an ethics of care. Palliative care isn't nihilism, and to be invested in something other than the prolonging of mere life is not a form of defeatism. I want to enliven a space between declaring that nothing matters and frantically holding onto everything. A good death is followed by what Derrida calls the work of mourning. It is hard work that needs to be done. Grieving is a collective activity, and we need to make space in our societies for it to be just that.

Letting go of human attempts of mastery will not save us all, but still holds potential for better worlds. Letting go comes with its own beauty. Accepting our fate, and working to affirm that fate is in my opinion a much better way of living than not accepting our fate, and spending our lives trying to fight it. I would much rather cry and die together than cocoon myself in a dispositif of denial.

Pessimism is affirmed by listening to the biological itself, heeding its realities and the lessons it provides. Pessimism steps up when biopolitics and necropolitics fall short of leaving any room for good deaths. Both view death as a failure, a sharp end that cannot be nuanced in itself. Death is the moment when biopolitics let go and have nothing more to do. For necropolitics, putting to death itself, actively pushing for a failure of life, is the goal. And both biopolitics and necropolitics forget that questions of letting die and making live and making die are not solely determined by human governmentalities. Thom Van Dooren (2014) writes that extinction is a dull edge. This is the case for death too – it is a slow process. Death is a space in which there is room for intervention, and intervention into the space of death is important and holds potentials for affirmative pessimist politics. There can be thriving and loss, even in death. Death is of course not a failure. It's the natural order of things:

The simple view is that medicine exists to fight death and disease, and that is, of course, its most basic task. Death is the enemy. But the enemy has superior forces. Eventually, it wins. And in a war that you cannot win, you don't want a general who fights to the point of total annihilation. [...] You want someone who knows how to fight for territory that can be won and how to surrender it when it can't, someone who understands that the damage is greatest if all you do is battle to the bitter end (Gawande, 2014: 187).

Those pesky bellicose metaphors sneak in again here. Medicine has a tendency to embrace its own field as a war against this that and the other. So while surgeon Atul Gawande is correct in his overall statement above, why does death have to be a war? It's not a war. Medicine turns it into a war, like the state turns disease outbreaks into war as described in chapter two. There is no war between life and death, death is not an enemy, just like pathogens or wolves are not enemies, even though they entail loss of life.

I think the question of death is paramount in order to get towards affirmative security logics of diversity and nurturing that embrace risk and danger. As long as death is a taboo to be avoided at all costs, and as long as the notion of a meaningful life remains trapped in biopolitical notions of what counts, we cannot abandon the security logics of eradication, separation, homogenization, and fear. Accepting death still entails being afraid of death, and respecting the work of collective mourning that needs to take place after death. To return to Amerindian cosmology one last time, Déborah Danowski, and Eduardo Viveiros de Castro (2016) describe how the goal of an Amerindian tribe is to keep the number of tribe members constant, in order to ensure that there will continue to be enough resources in the surrounding forest to sustain everyone. This radical alternative to western obsessions with growth invariably welcomes death in a different way. Climate change, pollution, a lack of clean water and nutritious food, deforestation, coal and oil extraction, resource wars, and new emerging infectious diseases bring death. Either we learn to *live* with it, or we don't.

APPENDIX: LIST OF INTERVIEWEES

Richard Brostrom. MD, Director of the Tuberculosis Control Program, Hawaii State Department of Health.

Abigail Carlson. MD, Infectious disease specialist, Veterans Affairs Health Care System, St. Louis.

Brett Finlay. Peter Wall Distinguished Professor in Microbiology and Immunology at the University of British Columbia.

Alan Katz. MD, Professor in Epidemiology at the University of Hawaii at Manoa, Member of the Hawai'i State Board of Health, Staff physician and medical consultant at the Hawai'i State Department of Health's Diamond Head STD Clinic.

Victoria Rayle. Project Officer, Centers for Disease Control and Prevention, Honolulu Hawaii.

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