

# More-Than-Human Eating. Reconfiguring Environment|Body|Mind Relations in the Anthropocene

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**ABSTRACT:** *This paper is concerned with emergent more-than-human eating practices and how they might challenge received understandings of bio- and geopolitics. After a brief review of the anthropology of food and eating and how its concerns may have to be expanded in the Anthropocene, we briefly analyse three empirical cases of anticipatory more-than-human eating practices: a set of artistic anticipations of future eating; microbiome research and related biohacking practices; and research on future food security in the context of planetary boundaries. We discuss how all three cases make the boundaries between body|mind|environment porous. The ›I‹ of the embodied human subject emerges as multiple—colonised and accompanied by a panoply of microorganisms. How might such a collective be subject to governance and 'self'-technologies? We close by pleading for an experimental para-sitic anthropology that critically addresses emergent forms of bio/geopolitics in the Anthropocene.*

**KEYWORDS:** *More-than-Human, Eating Body, Microbiome, Anticipation, Food Security*

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## Introduction: More-Than-Human Anticipations of Food and Eating

Our planet has now entered the Anthropocene—a geological epoch in which the historical and practical contingency of the reified Western modern dichotomy of nature and culture is re-emerging. Natureculture conjures up deep ambiguities and uncertainties in many different fields and across vastly different scales (Haraway 2008). In this paper, we focus on the field of food and eating. We draw on the notion of anticipation as a defining quality of our times in which the possibility of the ›future‹ is pervasive in our ways of knowing, evoking a variety of practices of speculation, prediction, and a kind of affective state of preparedness for an uncertain future (Adams et al. 2009). With this lens, we discuss three different cases of anticipatory practices: future food design, developments in microbiome science and application, and the knowledge politics directed at future food security in Germany. These three cases of eating configurations reveal how boundaries between body and mind, human and non-human, and environment and body are becoming blurred. We explore how human and non-human actors are mobilised in specific forms of more-than-human eating. And we discuss how in each case established forms of biopolitics are called upon

to govern these emerging configurations. Our line of argument unfolds in three steps: We begin by giving a brief overview of how anthropology has addressed the topic of food and eating with a particular focus on how the body and its inner and outer boundaries and divisions have been discussed. We then present our three case studies.

The first case on speculative body|mind reconfigurations in the field of future food design is based on literature and discourse analysis. The second case on reconfigurations of human|non-human relations in practice is based on ethnographic research in the field of microbiome science and application. The third case on future food security demanding a reconfiguration of environment|body relations in knowledge politics analyses the logic of a major research project aimed at generating new technological approaches to the future of food and eating in Germany. In a final step, we discuss how body boundaries begin to dissolve in these different cases as food comes to be understood not as a bundle of material ingredients but as a scripted technology. This more-than-human eating as a relational practice questions received notions of subject and object and leads us to ask whether interesting normative claims emerge from making new relations through eating. We conclude by wondering what a more-than-human biopolitics may look like and how anthropology might relate to it.

### Ambitions: Food and Multispecies Eating in Anthropology

The current fascination with the topic of food and eating in public and scholarly discourse relates to its literally essential relevance in life, but also its multi-dimensionality and boundary-crossing aspects (Sutton 2014, 133). Food, at least since the later decades of the 20th century, is deeply entangled with political, social, cultural, ethical, ecological and economic issues and embedded in diverse, often conflicting interests. Importantly, this heightened preoccupation reflects the emergence of new regimes of the body and body management as well as growing biopolitical concern with what people eat (Warde 2016, 1). In this postgenomic era, the reactivity of the genome to environments both outside and inside the body (Niewöhner/Lock 2018, 681) means that the human body cannot be sensibly conceived as detached from its surroundings any longer. Our emerging understanding of the human body as populated by all kinds of microbial populations further attests to this shift (Paxson 2008; Sariola/Gilbert 2020). Also, the concern about global environmental change, planetary boundaries and land use competition links food and eating practices to issues of ecological change and degradation on a planetary scale—not to mention human health through increased risk of zoonoses. The security of food supply and distribution and its geopolitical governance, both present and projected into the future, are resurfacing as global ecological and political challenges (Sommerville et al. 2014). Food and eating, in this new configuration, emerge as a set of practices that introduce ambiguities into received modern understandings of subjectivity and objectivity; something that delivers the environment directly into us, relates us to the environment, breaks with our assumed boundaries and turns us into environment. ›We‹, as it were, are emerging as a multispecies organism. In fact, ›we‹ may never have been a modern, singular, and ontologically separated entity in the first place (Latour 1993; Strathern 1988).

Our attempt, then, is to bring together this multispecies body in its ontological uncertainty with the multispecies body of a future that appears ever more precarious and is likely to bring drastic changes into an uncertain present—a future in which our multispecies bodies will emerge related to new materialities, technologies, landscapes, and foodstuffs.

We understand our endeavour as part of a broader attempt to understand changing nature culture relations in the emerging Anthropocene; an attempt that also changes anthropology itself, which has long understood eating mostly as a social practice in which matter appeared only as a carrier of symbolic meaning. Eating in its socio-materiality (Landecker 2010, 2011; Gherardi 2017) is still a rather novel perspective in the long history of the anthropology of food and eating.

Food and eating have served in anthropology as a lens for analysing processes and structures such as political and social organisation, gender, economic value-creation, consumption, production, regulation and governance (Mintz/Du Bois 2002; Welz/Andilios 2004; Bauer et al. 2004). With the different turns in anthropology and the orientation towards embodiment, materiality, and practice, recent research focuses increasingly on dimensions of taste, affectivity and the senses in practices of consumption, preparation and eating (e.g., Pink 2009; Hennion 2007). Following the line of thought addressed by this special issue, some research (e.g., Mol 2008, 2012, cf. Jensen this issue) has sought to promote a practical engagement with the consequences of a relational ontology and the disruption of traditional modern boundaries that had served to consolidate the separation of nature and culture, and related sets of dichotomous categories (mind/body, male/female, self/Other), enabling a transgression of the separation between the natural and the social sciences. An anthropological agenda for researching food and eating arguably needs to include the alimentary and physiological aspects of ingestion (Warde 2016, 58) as well as the collective multi-species effort that the process of ingesting appears to be, resulting in an agenda that facilitates an investigation of the particular (re-)configuration of the very boundaries between what is eaten and what eats (e.g., Mol 2008).

From a more-than-human perspective at the intersection of anthropology and science and technology studies, practices of eating do not consist of passive material foodstuff being ingested by a human subject, but are analysed as assemblages bringing together different human and non-human actors that are caught up in an ongoing process of »objectification« (Miller 2005); or more-than-human subjectification, if you prefer. Thus neither the human entity nor the material stuff considered ›food‹ are essentially preconfigured. They are enacted in the process of eating and thus become multiple over diverse sets of practices (Mol 2012). The same holds for practices of production, of distribution, supply and waste. A single foodstuff can be enacted as different edibles. From a biological point of view, nutrients do not act by themselves, they only become useful in relation to other nutrients and body parts, therefore in relational practice. From a social and cultural point of view, food is constantly transformed as it relates to other foods, people, objects, places, histories, affects and knowledge. Food and eating connects our outer with our inner world. Eating and ingesting is a process of making relations between the eaters' environments and their inner laboratories. This is not only about relating through eating to others as a social process, it is always also about making practical material relations with the world. As the food journalist Michael Pollan puts it:

»We have to think about not just feeding ourselves, but feeding all those other cells that we move through life together with. When you look at food [...] it's not just a thing, it's not just a product. It's a relationship with other species in nature.« (Pollan 2016: Episode 4, min 46)

In this article, we employ a notion of the human body that »does not abruptly end at the outside layer of its skin but extends into its environment as much as the environment extends

into it« (Hoel/Carusi 2017, 8). We are interested in exploring what such thinking can do in the Anthropocene. Since the late 1980s, the study of the human body as it is lived (Scheper-Hughes/Lock 1987; Lock/Farquhar 2007) has emerged in anthropology and beyond:

»Seen as contingent formations of space, time, and materiality, lived bodies have begun to be comprehended as assemblages of practices, discourses, images, institutional arrangements, and specific places and projects. There has been a proliferation of fascinating empirical studies multiplying the kinds of bodies that can be perceived and widening the scholarly vision of human capacities.« (Lock/Farquhar 2007, 1)

An understanding of the body in which its boundary »[...] is no concrete, literal, self-possessed wall [but rather] a self-maintained and constantly changing semipermeable barrier« (Margulis/Sagan 2007, 17) can help us understand how eating is a more-than-human practice always in relation to dynamic environments. It challenges us to continuously situate the body and its biology both in terms of how it is lived and how it is known in historical and practical terms (Haraway 1988; Niewöhner 2011; Niewöhner/Lock 2018). The body as practiced is necessarily a body multiple (Mol 2002) with the stability of embodied phenomena across practices emerging as a phenomenon to be explained.

Thus with our three cases we venture beyond a human-environment interaction perspective within which boundaries and modes of interaction shift. Rather we consider phenomena such as bodies, microbes, environments and foodstuffs as always emergent in an ongoing process of *becoming* (Deleuze/Guattari 1987) that is best captured through process ontologies (Dupré 2014). By process ontology we refer to any metaphysics that considers events and processes the basic building blocks of reality rather than stable substances. Process ontologies underpin some feminist critique (e.g., Barad 2003), process philosophy (e.g., Bergson or Whitehead) and a philosophy of becoming (Deleuze/Guattari 1987). Process ontologies decentre subject-object distinctions as both contribute to processes through which subjects and objects come into being in the first place. This differs markedly from an understanding of active subjects giving form to or making sense of passive objects (cf. Eitel/Meurer this issue). In our case then, eating is not about an active human subject devouring passive matter. Rather, eating is a process through which subject and object are configured and reconfigured, for example as a multispecies self-incorporating multiple Other. *Thinking through eating*, such as Annemarie Mol (2008) has brilliantly shown with the example of eating an apple, and in particular thinking through more-than-human eating, helps us to challenge the ontological politics of our research, of our theories and our methodologies. It enables us to move towards an increasingly embodied research practice (e.g., Bartos 2017). For food may not only be good to think with, but also good to eat (Warde 2016, 57). Unpacking the materiality of what we taste, chew, swallow and digest, we propose an understanding of food employing Madeleine Akrich's notion of the script (1992): Foodstuffs today are increasingly engineered or designed substances that are meant to shape our bodies and some of their permanent symbionts in specific ways through ingestion.

It is important to at least note that the relational understandings we draw on do not originate in recent developments of Euro-Western academic narrative (Todd 2016, 8). Various of these recent ›realisations‹ in Western academic practice of relationality and of the agency of other-than-human entities have long been and continue to be lived reality in many parts of the world. They have been pushed to the margins of academic discourse with the same ignorance with which Western political economy and power have marginalised indigenous and other communities that now bear the brunt of the effects of this colonisation

rooted in ›modern‹ separations of nature and culture (Kopenawa/Albert 2013; Kohn 2015). Thus, it is crucial for anthropology to not ignore the particularity of ›modern‹ ontologies that have brought about the Anthropocene, to resist the all-too-easy universalising of bodies and modes of relationalities, and to enter into dialogue with voices from outside and from the margins of academia.

### Case I: Reconfiguring Body|Mind Relations Speculatively in Future Food Design

This case is distilled from a literature and discourse analysis on eating practices conducted by Anna Heitger as part of her dissertation research with the Food4Future consortium. We take the latest food report from the London-based experimental food studio »Bompas & Parr« as one example of a wide range of similar anticipatory practices that frame designed food as the means of new forms of self-management. The example of an imagined future sharpens our sense for possible trajectories when we set it against actual current practices in the next two cases.

The self-proclaimed predictions for the year 2020 include, amongst other things, the use of gut bacteria from »carefully selected donors, who boast [...] peak mental and physical conditions« to produce »healthy mind inducing products« via fermentation processes (Bompas & Parr 2020). This idea rests on emerging knowledge about the gut brain axis and on current practices of faecal microbiota transplantation used to treat bacterial disbalances in the human gut (see next section for more detail). Bompas & Parr illustrate this vision with a close-up photo of the skin of a female abdomen being twisted by two hands as if to suggest a physical engineering of the gut—an unusual sight in an age of photoshopped perfect female



Fig. 1 »Prediction 3: Gut Brain Axis Fermentation« (Bompas & Parr 2020)

bodies. A strange ambiguity arises from the mismatch between the need for fit, healthy and intelligent donors and the contortion of the gut to reach the objective of mental health.

Bompas & Parr's rendering of the body as a site of intervention is plausible because it is concordant with current discourses of health and practices of dieting, fitness, and self-optimisation and -improvement. The materiality of the body emerges as contingent and optional subject to purposeful alterations. This articulation of the body as subject to be optimised is only plausible, because it arises in an historical conjuncture within which a specific imperative of being ›healthy‹ has emerged in medicalised discourse and related technologies of the self (Heitger 2019). Measurements such as the Body Mass Index (BMI) or the calorie act as important tools in these practices, generating links between body weight, physical constitution, fitness and food intake incorporated within a specific biopolitics. Bompas & Parr's vision of altering the self through ingesting engineered foodstuff pushes to a new level the way in which food intake, as well as the selection of foodstuff, of material quantities and qualities, the practices of preparation, the rhythms and intervals of eating emerge as subject to individual choice and an all too well-known biopolitical normativity.

Yet Bompas & Parr go further in their anticipations of the future of food and eating: In their vision, science will not only explore the ways in which particular foodstuff affects human mental health via the metabolic system. They also envisage that our dreams and dreaming habits will become subject to eating interventions:

»Perhaps in the future, world leaders and inventors will eat certain foods to enhance their dreams in order to come up with inventions that could save the planet from a climate crisis.« (Bompas & Parr 2020).

While the train of thought might seem peculiar—to be imagining the invention of dream-enhancing foods that would then allow to be thinking (or rather, dreaming) of how to solve a crisis that is already a crisis in the very present (and has been for some time) —, this idea exhibits important elements of the logic governing dominant techno-utopian visions. The present precarity of those affected by the very problem the designers claim to set out to solve is disregarded. Instead, the agency of conceiving and executing the necessary actions to »save the planet from a climate crisis« lies with »world leaders« and »inventors«. Whereas in daily life mere mortals are interpellated as biopolitical subjects consuming food-as-nutrients in responsible ways, world leaders eat to dream the path to fulfilling the anthropocenic calling: human rule over nature.

Such anticipations illustrate an important feature of food enacted in futuristic visions: The incorporation of a novel substance with novel characteristics and potentialities evokes, or is imagined to be evoking, a new subject and a new, altered and already futuristic body. In our notion of scripted food, different bodies and different multispecies selves emerge through literally *eating the script* written and built into food, shaping our multispecies body from the social and cultural to the very molecular level of our bodies. These dimensions are not separate but intersect in ways yet unknown as food is incorporated. Incorporation in this sense implies the capacity to alter the body's »inner laboratory« (Landecker 2010) and thus also affect mental capacities in intended but most likely also in many unintended ways. Eating in this sense is not only about incorporating a single substance that is active in different ways through processes of pasteurisation, sterilisation or fermentation for example, but is about incorporating a complex and scripted technology. As such, it extends the body into its environment, as becomes visible when we ask how eating differentially scripted food can potentially alter environment-human relations in multiple ways: Who are the embod-

ied multispecies selves emergent from such anticipatory projects? How do different multispecies selves emerge, and how are these differences configured? Innovations that try to push further and make bodies ›plastic‹ through biotechnological interventions are always embedded within wider epistemic and biopolitical projects (Landecker 2010). The narrow focus on edible substances and their effect on the immediate interaction of body-mind-food in techno-utopian projects does not foreground these projects. We come to some of these wider issues in our third case. Let us first turn to a reality check for eager techno-utopists and delve into current practices of microbiome research and application.

### Case II: Reconfiguring Human|Non-Human Relation in More-Than-Human Microbiome Practices

The alarming increase in non-communicable diseases such as allergies, heart conditions, and diabetes, has brought a growing concern and a proliferation in research about the relation between food and health (Sanabria/Yates-Doerr 2015). Globally today, the undernourishment of about 690 million people (and rising again due to the current pandemic), goes hand in hand with a high prevalence of obesity (FAO 2020). Global health agencies are making an effort to foreground and spread knowledge about the link between eating and health (Roberts 2015; Sanabria/Yates-Doerr 2015). Scientific and public concern about healthy eating is increasingly shifting its attention from the individual body to a panoply of subjects related to the production and consumption of food, and the human, technological, and microbial actors involved in it (Sanabria/Yates-Doerr 2015). A rapidly growing field in this research on eating and health is the study of the human microbiome and its relation with nutrition and health. And this brings us to our second case: The more-than-human microbiome. As part of her doctoral research Sabine Biedermann followed ways of *doing* a human microbiome, both as an epistemic object and a socio-material entity, by analysing scientific journal articles and health blog posts, attending microbiome talks and research meetings in Berlin and the Boston area, attending a pharmaceutical microbiome drug development summit, and engaging with people tinkering with their microbiomes outside of institutionalised laboratories.

Research on the microbiome negotiates new edibilities and is translated into new understandings of food, taste, and dietary guidelines. On the one hand, microbiota research shows that ›we‹ are not only feeding the ›human‹ part in us, defined as what is composed of human cells, but also ›our‹ microbes. On the other hand, it makes clear that we are also eating microbes and that microbes are also eating the food we eat before we eat it (e.g., Benezra 2016; Greenhough et al. 2020; Paxson/Helmreich 2014), which is most visible in fermented food. Caring for the microbiome in order to sustain and maintain health involves a close inspection of the diet and of medical drugs as well as of commonplace life exposure to ›the environment‹ in general: ›people should be aware, that when something is labelled as completely safe, that might be so for the humans, but not so much for the microbes.« (Spector 2018) Caring for our microbes means caring for relations between other beings, substances and the environment as these relations shape ›our‹ microbiome. We do not exist extracted from what seems to be outside of our bodies, but are actually deeply entangled with it. The work of Margaret Lock and Hannah Landecker for instance shows how the boundary of the skin, previously thought as a clear delimitation between body and environment, disappears when thinking with/through epigenetics and the microbiome (Lock 2018; Niewöhner/Lock 2018; Landecker 2011). Hannah Landecker and Chris Kelty, as they

discuss the agency of short chain fatty acids and metabolisms, talk about »[...] entities that breach certain assumed distinctions between outside and inside« and that might encourage a remapping of »sense and viscera, environment and gene, context and content in contemporary life science« (Landecker/Kelty 2019, 55). Microorganisms are these kinds of entities, making it clear how we are always also already environment and how the perceived material environment operates within us. Treating the body as multi-species kin (Haraway 2016) then requires a new ethics of eating as a relational practice. It requires ›us‹ to think of ›our‹ microcompanions and what might make them thrive or starve. Who benefits from our eating might have to be subjected to a non-anthropocentric analysis:

»If the body is sensate through and through, and not a matter of surface and depth in which everything that crosses the boundary is converted from external to internal with a consequent loss of agency and identity, then paying attention to how metabolism converts and interconverts seems an appropriate locus of understanding the mutually transforming meeting points of biology and society.« (Landecker/Kelty 2019, 64)

Microbiome research also makes evident that the human body cannot be separated from ›nature‹ and that there can be no nature/nurture divide. Both make each other constantly in a microbial mediated body. And as the body is in constant change and highly unstable, a universal body cannot exist. No two people are the same when looking at the microbiome. We share 95% of our genes, but only approximately 25 percent of our microbiome, so we are very individual when it comes to our microbiome (Spector 2018). The microbiome is not a well-defined and delimited organ, organism or ecological system with specific functions but is fluid, constantly mutating in materiality and meaning. This makes it extremely hard to come to standard microbiome therapies or replicable human experiments. As a researcher in the Boston area put it: »[...] most of the studies on gut microbiota are made on lab rats, isolated from the environment and social interaction«, and »lab-mice limitations are being widely studied now.« (Fieldnotes SB 16.10.2019) Another common statement at microbiome talks is that »we don't really know what is going on« and that researchers are »wildly speculating what the answers are« (ibid.). These are all signs of an emerging field of research struggling to develop appropriate and standardised model organisms, experimental systems, and conceptual tools.

Yet this vast uncertainty of an emergent scientific field does not stop microbiome enthusiasts from trying to engage with their microbiome to optimise their health or cure rare ailments. In the following we go into more detail on a case from the field where a person that became an expert in feeding, and starving, his microbiome to heal a skin condition experiments and tinkers ›in the wild‹ as a viable alternative to allopathic medicine, learning to sense and collaborate with his microbiome.

While scientists seeking precision, predictability, reliability and replicability are troubled by the versatility and restlessness of the microbiome, do-it-yourself (DIY) practices outside of scientific labs develop very different ways of tinkering with the microbiome embracing its vivid nature and encouraging multi-species encounters. The DIY community cultures or starves microbes for purposes of health, taste and food preservation. There is no rigorous tracking and testing, but experimentation is encouraged. The idea is not only to culture the bacteria in a ferment, but to create an environment that allows beneficial bacteria to thrive inside and outside of the body and that reduces the number of ›bad‹ ones. Humans learn to attune to microorganisms, microorganisms multiply and transform edi-



bles, waste, bodies and soil. There is collaboration, one is not working against the other, but organisms are working with each other. If the bacteria refuse to collaborate, health is not achieved. And for the bacteria to collaborate, the environment has to be probiotic. The human has to collaborate with the bacteria, giving them the necessary means for survival and keeping them safe from hazards.

An example of this is the SIBO Diet (Small Intestine Bacterial Overgrowth) that avoids FODMAP's (Fermentable Oligosaccharides, Disaccharides, Monosaccharides, and Polyols), very popular in alternative health blogs (e.g., Wells 2016; McCoy 2018). The idea of this diet is to starve bacteria which are growing in the small intestine when they should only be in the colon by not giving them what they like, namely the FODMAP short chain carbohydrates and sugar alcohols that are poorly absorbed by the body. Anecdotal evidence suggests that this can heal a number of conditions that affect us—from the human skin to the human mood.

Leonard<sup>1</sup>, a 38-year old male with a recurring skin problem, followed the SIBO diet for a month to »heal« his skin. He has tried soaps, creams and has seen different doctors. He is disappointed, because nothing helps, and he also has the feeling that doctors trained in allopathic medicine do not take the time to explore options or take his concerns seriously as long as it is not a life-threatening issue. He has conducted some kind of swipe test of the skin with a doctor while he was visiting Chile and the results said that there is a certain kind of microorganism overgrowing on his skin. He explains that it is the same one that causes rosacea and talks about »them« as tiny creatures that have dwelled on his skin and have been reproducing. When he takes antibiotics, it goes away. So the logical explanation for him is that antibiotics kill the microbes and therefore clear his skin. But they come back after he stops and he cannot be on antibiotics all the time, he says. This got him to look more into bacterial overgrowth in and on humans and that is how he learned about special diets that »starve« the »bad« microbes so that a healthy microbial balance can be restored.

He has installed an app on his smartphone that classifies every foodstuff into red, orange or green. He can eat as many green foodstuffs as he wants, needs to avoid the red ones altogether, and can occasionally have orange ones. By doing this, he is attempting to hack his microbiome, starving bacteria that are growing where they should not, in his case his skin, and then reintroducing beneficial bacteria by eating ferments. While he follows this diet, we talk about changes on his skin, his digestion, mood and energy. We share meals and comment on the ingredients and how they affect the microbial communities in his body. He says something »funny« has been happening in his stomach the past few days. His bowel movements are different and there is movement and noise in his abdominal area. We playfully talk about the microorganisms dying inside of him and putting up a fight as they starve. »Give me carbs!«, he says in a funny voice. In addition, he is taking »angocin«, a plant-based antiviral and antimicrobial. His skin is looking good. Yet he is afraid his condition will return as soon as he stops the angocin, just as it happens when he stops antibiotics. He also does not intend to follow a SIBO diet for the rest of his life. The idea is to go on it for a month or two, then slowly reintroduce the »forbidden« food and »recolonize with sauerkraut and kombucha« (Fieldnotes SB 27.03.2018).

In a way, he is beginning to learn how to sense his microbiome, to attune himself to microbial activity in and on him. So what he has been feeding has not been the human embodied subject, but the commensal microbes while starving the pathogens. And what he was eating was not only foodstuff, but edibles made edible by microbes. Acknowledging microbial life in food and in himself slowly changed his body image and perception as well as everyday eating and cooking practices. He does not have any scientific proof that the changes

in his microbiome are occurring and considering the current status of the science on these processes, he will not have any hard evidence any time soon. Yet he operates—not without a certain rigour — a biofeedback process by controlling intake and sensing changes in his body: the smells, the sounds, the skin texture. They all transform as his diet shifts. And this he attributes to these tiny creatures he talks about. Acknowledging his multi-species body leads him to experiment with new practices of food and eating.

### Case III: Reconfiguring Environment|Body Relations Sustainably in Future Food (Bio-)Politics

Our last case takes us into a major research consortium funded by the German Ministry of Education and Research<sup>2</sup>. The interdisciplinary project Food4Future (F4F), launched in 2019 for five years in the first instance, aims at generating new approaches to the future of food and eating in Germany and at developing new technologies for food production as well as new foodstuffs that could be eaten in the future. Particular about its approach is the postulation of two future scenarios: a no-trade scenario where food production needs to occur more or less exclusively in Germany itself; and a no-land scenario that assumes that land cannot be used for food production any longer. These scenarios have been selected as tools for imagining the future and, particularly, for realising interventions in the present. Discussions shift between talking about the future imagined in these two scenarios as a possibility and talking about interventions in the present, revealing the project's inherently anticipatory mode.<sup>3</sup> The ambitious project is in its early stages. We are interested here in the rationale that underpins the project as well as much of the ministerial funding stream as a whole. The key issue is food security for Germany in an increasingly uncertain global future. Already today, we see major changes to land use practices and agricultural production due to rapid global environmental change, first and foremost climate change.

The rationale comprises two distinct biopolitical dimensions that become closely related through the specifics of the project. The first dimension targets food production. F4F tries to optimise a set of edible species, namely locusts and algae, to improve their adaptability to a range of environmental conditions and to increase their nutritious value to humans. This might be considered a form of biopolitical form of preparedness that is not aimed at political subjects but their organismic environments, though of course the ultimate concern is anthropocentric. It is a form of molecularising the environment (Landecker 2011), i.e. understanding the environment predominantly as a source of active ingredients for human health and well-being. The second biopolitical dimension of the F4F project targets the human subject. The project aims to develop a self-tracking app as an intervention into food consumption habits that need to become adapted to the emerging concerns about global environmental change. Similar to other already existing self-tracking apps that aim at regulating processes of input and output of a mechanical body via measurement and data analysis, this app rests on a notion of the body as a site of intervention. The app is meant to support individuals in navigating eating preferences and practices. Yet rather than being aimed at individual health, the app also addresses the sustainability of eating practices. It is envisaged to help individuals adopt eating practices that help to navigate the uncertainty of food consumption in the Anthropocene, avoid overconsumption and restrict oneself to only the nutrients necessary for survival. Food security for Germany can only be guaranteed for uncertain futures if Germans learn to eat sustainably, i.e. if they eat foodstuffs that can be grown on a planet inside planetary boundaries. Eating in and for a safe and just operating

space is something that needs to be learned and it cannot be learned through embodied aesthetic experience alone (Rockström et al. 2009). It involves cognitive learning, acquiring new habits and accepting responsibility not only for oneself but for the environment both locally and on a planetary scale.

Typical for late liberal societies, sustainable eating is addressed not as a collective or even more-than-human concern, but as a matter of individual choice in an optimised decision architecture. The inscription of responsibility into a self-tracking app envisages autonomous actors taking responsibility for their choices of the right foodstuffs that are available through a bioengineered environment. Individual health features as a co-benefit of such an intervention. It provides additional motivation should people fail to be able to show face to an abstract planet or distant kin that demand and deserve solidarity (Haraway 2008).

### In Conclusion: Ontonorms of a New Bio/Geopolitics?

Our three cases all deal with food and eating. They demonstrate how in this domain modern distinctions between body-mind, body-microbial environment, and body-planetary environment are becoming troublesome. Scripted foods, unruly microbes and planetary boundaries all involved in eating as making relations are best understood as hybrids in the Latourian sense. They question the human skin as our last line of defence (Bentley 1941). They force us to consider our actions in terms of their effects on the planet and on the microbial—something so far beyond the human scale (Niewöhner/Beck 2017) that it takes major research infrastructures to even begin to understand what this may mean.

We believe our cases are typical examples of the kind of trouble that awaits us in the Anthropocene. The dominant political economy of the last fifty to a hundred years is giving rise to an anthropogenic biology (Fitzgerald et al. 2020), both at organismic and at ecosystem level, if you still care to hold on to this distinction. This is giving rise to an anthropogenic bios for which our biological knowledge is badly equipped. Process ontologies that can help to situate biologies historically and practically are only now re/emerging and have certainly not reached mainstream science. Hence violations of modern boundaries spell trouble. Staying with this trouble (Haraway 2016), however, is a difficult task.

In our cases, almost all actors are reverting back to established modes of trying to gain control over emerging ontological uncertainty: Food designers are invoking images of world leaders—picture white males—that explore new technologies to solve the world's problems. The relationality of the naturally engineered gut-brain-dream axis is treated playfully and creatively, but only so far as not to question received hegemonies. Science as the ultimately modern practice is overwhelmed by the sheer complexity of multi-lateral eating. It sticks to its guns hunting down causality in model organisms and snapshots in time. The biohacker might seem like a tinkerer at first, yet it is also his acute suffering that makes him take risks and experiment on himself in ways that mimic science without resources or training. And researchers and funding bodies in Germany revert to established biopolitical modes of governmentality in the face of fundamental uncertainty. It is hard to justify experimentation and tinkering if you are accountable in very straightforward terms or if you are suffering.

Unsurprisingly then, perhaps, in the face of ontological uncertainty, all our cases enact well-known ontonorms through their practices. We borrow this term from Mol (2012) to refer to the dominant normativity that is enacted through relating heterogeneous agents in the practices of eating and food production: enhancement, health, and sustainability main-

ly pursued through technologies of the self, modern understandings of human-environment interaction and national modes of governmentality. These are well-known biopolitical registers. Yet the cases also begin to suggest how anthropocenic relationality exceeds and escapes these approaches of biopolitical governance.

Eating practices in the Anthropocene demonstrate how body-mind-environment relations are being reconfigured. Such more-than-human eating is hard to fathom in biopolitical terms. The subject of biopolitical governance is the embodied human subject capable of self technological management and is the population in need of regulation. They are targets for interventions and as such clearly demarcated from their environment and from other species. As it turns out, however, the eating subject of the Anthropocene is a multi-species collective. The organisational structure of this collective is anything but clear at this point. It appears metastable insofar as it is capable of preserving some sort of form through time, able and willing to offer relatively stable interfaces to an ›outside‹. Yet underneath this metastable form significant movement is persistent. How does one address such a multispecies collective? How does one intervene into it? Governmentality might work for agents capable of understanding and managing themselves. Understanding oneself, however, becomes something altogether different if the multi-species collective does not have a material, cognitive and ethical centre.

What then might the biopolitical governance of more-than-human subjects look like? Would it not be a form of geopolitics? Geopolitical interventions into the non-human environment follow very different logics. From the hygiene and social medicine policies of the 19th century through drenching African landscapes with DDT to proliferating genetically modified mosquitoes in Latin American cities to spraying dense urban quarters against SARS-CoV-2: Geopolitical interventions directed at non-human life and territory operate in very different ways from their biopolitical counterparts. They do not understand their targets as reflexive political subjects, but as commodified nature. So governance through crude command and control seems apt. In the Anthropocene, however, geopolitical interventions are always also biopolitical interventions as they affect human companion species. The externalities of our political economy feed directly into an anthropogenic biology which does not stop at our skin. Eating is only the most obvious way of making relations.

Our cases of more-than-human eating bodies stand exemplarily for many similar cases—some of which are discussed in this special issue—, when they demonstrate how geo- and biopolitics become entangled. How multi-species meta-organisms become subject to governance is as yet unclear. What is clear is that biopolitical and geopolitical interventions have lost their self-evident subjects. Biopolitical interventions into human subjects are also interventions into environments; geopolitical interventions into landscapes and territory are also interventions into human beings. Our cases also demonstrate that a bio/geopolitics has not emerged yet. We have reported practices in an anticipatory mode, i.e. practices that lead to decisions today on the basis of futures imagined in very specific ways. The response to these futures is conventional and entails the well-known biopolitical repertoire. Anthropological inquiry in the Anthropocene should watch the increasing entanglement of bio- and geopolitical modes of governance carefully. The multiple uncertainties involved in this development present important sites of intervention. The shape of new forms of governance will critically depend on the kind of knowledge produced to understand multi-species organisms and more-than-human practices such as eating and fermenting. This is an opening for some creative and perhaps even non-metaphorical parasitic ethnography (Marcus 2000) that keeps such practices open for careful experimentation.

## Endnotes

- 1 Name has been changed to protect the identity.
- 2 Anna Heitger and Jörg Niewöhner are part of this consortium.
- 3 Interestingly enough, the scenario of a pandemic threatening supply chains and routines of food consumption that became our present, was barely mentioned during a visioning exercise only weeks before the Corona situation began to unfold.

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