

## In Relation to Microbes: Fermenting Cultures from Food to Soil

**Valdimar Tr. Hafstein**  
*University of Iceland*  
Iceland

**Áki Guðni Karlsson**  
*University of Iceland*  
Iceland

**Veera Kinnunen**  
*University of Oulu*  
Finland

### Fermentation as Vernacular Microbiology

The sun shines brightly in the cool Icelandic spring weather as a middle-aged man wearing a baseball cap and sunglasses pours thick, milky liquid through a clean cloth into a glass bowl. His audience follows the performance in focused silence. We are at the Erpsstaðir Creamery in western Iceland. It is our first stop in a series of workshops, in which we are going to discuss living cultures of living cultures, that is, vernacular practices of working with microbes. Our host, dairy master Þorgrímur Einar Guðbjartsson, is demonstrating how skyr, an Icelandic fermented dairy product, was traditionally made.

Skyr is a good example of the ongoing renaissance of microbial cultures, the phenomena that our small multidisciplinary group has set out to investigate. As part of the ongoing social success of the gut microbiome, the rich biocultural heritage of fermented foods, such as skyr, has been rebranded and successfully commercialized as healthy food, using terms like “probiotic.” Although the microbial cultures of food products produced at industrial scale are generally far more homogenous than the “wild” cultures, produced on a small scale on the farm, in the home, or by craftspeople, imaginaries of unique and ancient microbial cultures run rampant in the narratives created around them (Pétursson and Hafstein 2022). References to “heirloom microbes,” sometimes trademarked or patented, form part of marketing strategies that may be referred to as heritage branding (Hafstein, Pétursson and Marteinson 2024).

Indeed, the history of Icelandic skyr pre-dates the comparatively recent scientific discovery of microbes by a millennium, at least. According to one origin story that Þorgrímur tells, the skyr cultures arrived in Iceland in the armpits of the first settlers over a thousand years ago. For centuries, protein-rich skyr was a side-product of but-

ter-making and provided an important source of nutrition in the Icelandic countryside, where the more valuable butter was produced for trade. Our human digestion has always benefited from the labor of microbes; not only those working in our own gut, but also from diverse ways of preparing and preserving food by fermentation: curing, souring, and pickling (Hendy et al. 2021). As fermentation activist Sandor Katz puts it, fermentation allows the food to be pre-digested before it enters the mouth (Katz 2012, 30).

The term “fermentation” refers to slightly different things in different contexts, but it may be defined simply as a microbial metabolism that converts carbon compounds to energy anaerobically (Hendy et al. 2022, S198). Fermentation processes take place in cells naturally, but they have also been utilized intentionally in food preservation and preparation by human cultures since prehistoric times. Dunn et al. (2020) hypothesize that already hominins have very likely used fermentation in processing food, and even other-than-human carnivores are known to preserve meat by taking advantage of its fermenting qualities (see Dunn et al. 2020; Speth 2017). Adopting fermentation practices also affected lived environments: as fermentation practices were typically carried out with the help of bodily microbes, humans began to spread their genomes across environments. For instance, the *Lactobacillus* species used in sourdough breads are body-related (Gänzle and Ripari, 2016) and *Streptococcus thermophilus* used to ferment skyr and yoghurt is an ancestrally mouth-associated bacteria species (Goh et al. 2011). Circulating certain bacterial strains in food intensified their presence in the lived environment, resulting in “extended guts,” which allowed digestion to happen where food was fermented (Dunn et al. 2020, 9). Therefore, it is not far-fetched to see fermented foods as an extension of the human body and its abilities, as part of a social microbiome (Sarkar et al. 2020), or a “communal gut.”

With emphasis on the biocultural and ecological effects of fermentation, it may be understood more broadly as a collaboration between species and kinds, a process where “microbes, animals and people thrive, where biodiversity becomes more than a gathering of species,” in the words of Mutlu Sirakova: “a web of relations and interactions that holds its own stories” (2023, 251). This formulation sheds light on how, together, humans and other-than-humans transform and create their conditions of living and even their own biological make up (see Lock and Nguyen 2018, 335). Thinking with fermentation provides tools to reimagine humans as “ensembles of biosocial relations” (Pálsson 2013a, 24) and to cross the nature-culture divide that has been an organizing principle of Western knowledge for a long time (see e.g. Theriault 2017; Thompson 2019; Ingold 2000).

### **Microbial Ontologies**

Over the last two decades, we have come to realize that nature is infinitely more diverse than we had previously imagined. Facilitated by new DNA sequencing technologies that vastly extend our perception of such diversity, this realization is contemporaneous with a challenge posed within the humanities and social sciences to an anthropocentric narrowing of the scientific imagination. Taken together, the discovery

of microbial multitudes and the recent posthuman turn offer every reason to reconsider foundational notions and concerns of fields of knowledge such as social sciences and humanities.

Recent advances in metagenomics (the study of genetic material directly from environmental samples) leave no doubt that microbes are the dominant life form on the planet. Microbes are everywhere: in the depths of the ocean and up in the clouds, in the polar ice sheets, as well as geysers and hot springs; also in our kitchens and gardens, milk and vegetables, our skins and genitals, our mouths and guts. Microbes are a generic term for a plethora of diverse micro-organisms ranging from bacteria to archaea and fungi. They have been around for 3.5 billion years, the first form of life on Earth and always by far the most widespread, dominating the planet in quantity, and altering the chemistry of the earth so that other life forms may exist and evolve. Animal life—including that of human animals—has never been separate from microbial life (see e.g., Margulis and Sagan 2002). Indeed, it turns out that human cultures are inextricable from microbial cultures. Such studies reveal a dizzying variety of microbial organisms that make up the microbiome of animals, plants, and soils, and they have profoundly shaken even our most basic understanding of what it is to be human (Rees et al. 2018). The realization of just how crucial and vital the microbial multitude is forms the premise of the so-called “microbial turn” that heralds the emergence of new posthuman or more-than-human perspectives in the social sciences (Paxson and Helmreich, 2014; see also Brives and Zimmer 2021).

The term posthumanism has been used to group together theories and approaches that seek to decenter humans by accounting for the meaning-making and agency of other life forms during the Anthropocene epoch (Elton 2019). For the past two decades, posthumanist theories have been developed in various disciplines such as food studies (Elton 2019), feminist philosophy (Braidotti 2018), public health (Rock et al. 2014; Hinchliffe et al. 2017; Sariola et al. 2020), folklore (Thompson 2019), geography (Whatmore 2002), feminist environmental studies (Hamilton and Neimanis 2018) and indigenous studies (Liboiron 2021). Diverse approaches, such as nonrepresentational theory, new materialism, and multispecies ethnography all engage with the ontological, epistemological, and methodological possibilities of exploring intimate connections between different life forms (e.g. Elton 2019; Kirksey and Helmreich, 2010; Ogden et al., 2013; Wolf, 2015; Hey 2017). These approaches build on theoretical groundwork by scholars such as Barad (2003), Braidotti (2017), Haraway (2008), Latour (1993), and Deleuze and Guattari (2004). What pulls these different posthumanist strands together is the rejection of the dominant Western worldview that constructs nature as separate from humans.

Guided by posthumanist thought (Haraway 2008, 2016), symbiogenetic evolutionary theories (Margulis 2002), and new microbial research, we have learned to understand the human organism as a “composite of many species” (Paxson 2008, 38–39). The numbers vary a bit, but by all accounts, “we” are outnumbered: less than half of our bodies’ cells are human (ca. 1:1.3), the majority consisting of a multitude of microbial species with whom we co-exist in the most intimate way imaginable, co-consuming and co-producing (Sender, Fuchs and Milo 2016a, 2016b). Human bodies

are increasingly understood as holobionts or supraorganisms comprising bacteria, archaea, eukaryotes, and viruses with whom we have coevolved (Morar and Bohannan 2019; Gilbert et al. 2012; Sariola and Gilbert 2020). Gilbert and Sapp crystallize the emerging symbiotic ethos poetically by proposing that “we have never been individuals,” but instead, “we are all lichen,” referring to symbiotic life-forms comprised of fungi and cyanobacteria (2012, 336). Or, as Pálsson puts it: “If humans are assemblies of aggregates of life forms, the outcomes of ensembles of biosocial relations, then they have not simply co-evolved with more-than-human microbes; humans are microbes, in a literal sense” (2013b, 241).

Within a posthumanist framework, more-than-humans have agency that can put things in motion, trigger effects, and influence outcomes. However, Sayes has noted that “nonhumans do not have agency by *themselves*, if only because they are never by themselves” (Sayes 2014, 144). Agency between humans and nonhumans should thus more accurately be defined as relational and “spun” between social actors (Whatmore 2002, 4). In this multispecies world, human existence therefore unfolds in relationships that connect us to microbes (Heldke 2018; Paxson 2008; 2016; Brives, Rest and Sariola 2021), mushrooms (Tsing 2012; Felder et al. 2012), bees (Moore and Kosut, 2014), and dogs (Haraway 2008; Mechling 1989). These relationships illustrate everything from kinship relations and relationships of dependence, as well as struggles and relationships of antagonism (Haraway 2008; Yong 2016; Elton 2019). Taken together they demonstrate the constant power dynamics that take place every day in which humans do not always emerge as winners (Paxson et al. 2014; Lorimer 2016; Standley and Bogich 2013; Gröndal 2019). This relational understanding of the agency of humans and more-than-humans raises questions about how people and other life forms such as microbes mutually shape life and death on a day-to-day basis.

### **Studying Cultures of Cultures**

Although metagenomic research can still be said to be at its inception, it is already changing how people imagine health, disease, and the relationship between humans and their environment (Lederberg 2004; Brives et al. 2015; Du Plessis 2017; Maroney 2018; Voelkner 2019; Broom, et al. 2019; Cañada 2019; Doron et al., 2019). As a result of increasing understanding of the vitality and ubiquity of microbial life, a paradigm shift is underway: rather than seeing microbes as inherently bad (pathogenic) or good (beneficial), a growing body of research has moved on from a narrow focus on germ theory—that certain diseases are caused by the invasion of the discrete body by foreign microorganisms—to a broader ecological understanding of human-microbial relationships, incorporating socioeconomic, cultural, spatial, and political contexts (Benezra 2023; Benezra et al. 2012; Ironstone 2019; Lorimer 2020; Paxson 2019, 2014, 2008; Sarmiento 2020; Tracy et al. 2018). The “microbial turn” thus brings forward new questions and challenges to scientific research (Benezra 2023; Greenhough et al. 2020; Heldke 2018; Paxson 2008, 2014; Fishel 2017).

Technoscientific innovation and policy agendas in connection with the human microbiome call for increased participation of social scientists in this emerging field (Stil-

goe et al., 2013; “Time for the social sciences,” 2015). Social and natural scientists are encouraged to join hands and facilitate new and better understandings of how human and microbial worlds intersect (Benezra et al., 2012). Scholars within the social sciences and the humanities have heeded this call, shifting their attention to how microbes and humans live as “companion species” (Haraway, 2003; Beck, 2019), and how “human health, disease resistance, development and evolution have depended and continue to depend on interactions with microbes” (O’Malley and Dupré 2007, 158).

In his influential book from 1988, *The Pasteurization of France*, Bruno Latour (1993) describes the scientific “discovery” of microbes in the 19<sup>th</sup> century, and how new antimicrobial practices of food processing and hygiene became synonymous with microbiologist Louis Pasteur. Armed with discoveries in bacteriology, his disciples, the “Pasteurists” sought to transform human society, foodways, urban environments, health, and sexuality by controlling the spread of invisible threats to healthy life—the microbes. In so doing, they cemented the cultural imaginary of microbes as synonymous with disease, decay, and death for over a century. Coined by Heather Paxson (2008, 2014), the term “microbiopolitics” captures how human and microbial cultures are controlled and shaped by politics, social practices, biology, and landscapes. In the wake of the microbial turn in early the 2000s, Paxson identifies a movement that has sought to break free from the hegemonic Pasteurian microbiopolitical regime. With a nod to Latour, Paxson calls this movement Post-Pasteurianism. In the Post-Pasteurian imagination, human life is “symbiotic, multiple, mutualist, and in community with a nonself on which it depends” (Ironstone 2019, 336). Building on Paxson, Penelope Ironstone (2019) suggests the term “affirmative microbiopolitics” to challenge us to consider human-microbe relations outside the dominant immunitarian model that defines all microbes as intruding others to be eradicated. Instead, it becomes vital to theorize the human microbiome as a generative multitude, something that will enable us to change our thoughts and our practices, as well as to re-imagine who we are. As pointed out by Alexander Kriss (2013), the human microbiome “fundamentally threatens dominant Western conceptions of the self. We are not autonomous beings but a colony of diverse life, a human microbial collective.” This is reflected in recent scientific papers that refer to humans as only one of a multitude of ecological creatures, along with the full spectrum of the life universe/biomasses (Wahlqvist 2016).

Empirical studies dealing with various microbiopolitics have explored new ways of thinking about companionship and hospitality – through “gut buddies” to tackle autoimmune disease as more-than-human achievements (Lorimer 2016), relating with the soil in the Anthropocene (Abrahamsson et al. 2014; Meulemans 2017, 2020; Krzywoszynska 2019, 2020; Krzywoszynska et al. 2020), and the microbiopolitics of colonial science in ancestral microbiome research (Maroney, 2017; Benezra, 2020). Geographer Jamie Lorimer refers to such practices as “going probiotic,” to seek out alternatives to the “antibiotic model” of the 20th century in fields ranging from diet, health, and hygiene to environmental and planetary management. He proposes that probiotic practices are “working with rather than against ecological dynamics” to create “future visions for life on an increasingly unruly planet” (Lorimer 2019, 100).

### **Crafting Food, Soil, Sense and Sociality**

The guests gathered to witness Guðbjartsson's skyr-making performance at the Erpsstaðir Creamery are a group of academics from fields of folklore and ethnology, anthropology, sociology, nutrition sciences, molecular sciences, microbiology, and environmental sciences. Together, we have set out to study the emergence of microbial practices such as skyr-making or sourdough baking, which have for long been marginalized and are now being rediscovered in a new context (see e.g. Lorimer 2020; Paxson 2008). We are interested in the imaginaries and narratives that come to play when microbial relations are forged anew. We all share a belief that to understand a complex phenomenon, such as relating to microbes in everyday life, scholars must leave the safety of disciplinary silos and collaborate, as difficult as it may be. Our aim is to examine vernacular fermentation practices from food to soil, hoping to provide new understandings and perspectives on microbial relations in everyday life.

In what follows, we take seriously the theoretical and methodological challenge that the microbial turn poses to cultural analysis, rising to it with the tools of ethnography, from participant observation to in-depth interviews to qualitative questionnaires, in dialogue with research in biological and nutrition sciences. This special issue of *Cultural Analysis* presents six ethnographic articles that each in its own way addresses the symbiotic living of humans and microbes and seeks to unveil how that coexistence is shaped through cultural practices. Each of the six empirical studies analyzes how human-microbial relations are cultivated, challenged, talked about, and imagined in everyday life. The authors are folklorists, ethnologists, sociologists, anthropologists, and nutrition scientists and their topics range from soil to food, from farming and baking to eating and composting, and from gardens to kitchens. Taken together, the articles bring into relief varied and conflicting social practices involved in human-microbial relations, including the circulation of microbial matter, narratives, and epistemologies within and between the communities that these engender (cf. Jasarevic, 2015; Hey et al., 2018; Houf, 2019; Spackman, 2018; Yarbrough et al., 2020). Indeed, fermentation of food and compost may be seen as a form of interspecies communication (Hey 2019), mediated by scent, sound, taste, touch, sight and thermoception, and complemented by stories, anecdotes, jokes, memes, and narrative bits and pieces that convey a shared sense of belonging. The research focuses on the generative power of such relations: making food, health, soil, sense, and sociality.

Some of the authors represented in this issue have collaborated for several years in an interdisciplinary research project based at the University of Iceland, called "Symbiosis: Human-Microbial Relations in Everyday Life," studying the effects and affects of these relations, as well as their social imaginaries, and how microbial matter and its transmission help to generate practices, consciousness, life-worlds, imaginaries, narratives, gut feelings, and social bonds. Others have come together in Nordic workshops under the banner "Craftlife: Crafting Food, Soil, Sense and Sociality" or in conference panels on related topics at meetings of SIEF (International Society for Ethnology and Folklore), AFS (American Folklore Society), and the Nordic Ethnology and Folklore Conference.

This special issue presents some of the outcomes of our collaboration. The focus of attention is on “metabolic everyday practices” such as making sourdough, preparing, and eating fermented foods, and waste management and composting. These practices are of course thoroughly entangled and often affect each other. As Amber Benezra notes, when the focus is on microbial relations, bodies and environments cannot be separated from each other (Benezra 2023). Not only do bodies impact environments and vice versa. Bodies, too, *are* environments.

The collection of essays in this issue provides glimpses into a variety of traditional and emerging microbial practices ranging from agriculture to culinary experimentations, and from age-old foodways to novel and not-so-novel methods of waste care. Our attention is on the ways in which people seek to maintain or to re-establish more affirmative (Ironstone 2019), “probiotic” relations (Lorimer 2020) with their microbial “messmates” (Haraway 2016). We do not wish, however, to suggest that microbial practices could—or should—enable establishing a neat chain of value-creation from food to waste, or a circle of eternal redemption. Microbial relations are more uncertain than that. This is also the reason we resist the temptation of organizing the articles hierarchically from food to waste; instead, we gather them around sites of engagement: the kitchen and the garden.

### **...in the Garden**

In their article “Compostories,” Helga Ögmundardóttir and Eysteinn Ari Bragason analyze responses to qualitative questionnaires about composting collected in collaboration with the ethnological archives of the National Museum of Iceland. They set out to examine how people who compost in Iceland talk about, perceive, and relate to their composts. As their analysis highlights, the motivations that drive composting practices range from the purely practical (the need to handle organic waste efficiently) to the spiritual (seeking deeper connection with nature). Regardless of their driving motivation, many respondents recount stories about forging a stronger connection and commitment to earth and living beings, including earthworms, insects, animals, and birds, through their composting practice. The most widely shared “compostory” relates to the morally elevating power of composting. The connection between compost and morals has also been noted by environmental author Michael Pollan, who writes that there is a certain “halo of righteousness” that has come to hover over compost and those who make it. However, to the surprise of the authors, the topic of “microbes” rarely came up except in response to questions that specifically raise it. Even then, the responses are sometimes perplexed: “I try to answer this seriously even though the questions are getting stranger and stranger” (Ögmundardóttir and Bragason, this issue). This may serve to remind us that humans have for millennia collaborated successfully with the diverse, invisible life forms now rather clumsily grouped under the generic term “microbes” (from the Greek “mikros” and “bios,” literally small life) (Dunn et al. 2021). Only the scientific concept is a latecomer; coined in 1878, its popularization in the ongoing “microbiomania” (Helmreich, Roosth and Friedner 2025) is only a product of the last decade. Moreover, the results reveal that

despite all the commercial and scientific hype, the microbial or “probiotic” (Lorimer, 2020) turn is probably still relatively restricted, even marginal; not a dominant ontology steering national policies and urban planning, nor yet affecting most people’s routines and life choices.

Maria Giovanna Cassa’s article, “Setting the Table for Relatedness: Fermentation in Designing Permaculture Projects in Sardinia,” recounts the story of the author’s “changing epistemology.” It reflects how Cassa navigates her way as an ethnographer to the Sardinian permaculture movement and how she works and discusses with practicing permaculturalists; how she herself then becomes involved with the movement and how it has affected her thinking. Through fleeting, practical encounters, Cassa provides glimpses into how the general ethical principles of permaculture (“earth care, people care, and fair share”) are turned to praxis in rural Sardinia by combining traditional local customs and cutting-edge probiotic practices. Cassa illustrates how the international permacultural movement has provided a means for people living in the Sardinian countryside to reconnect with the land and to resist extractivist and exploitative forces from mainland Italy. For Cassa, as well as for the permacultural movement within which she works, symbiotic microbial communities represent an ally but also a reference model for designing a healthier world.

Veera Kinnunen’s article, “Speaking with Microbes: Smell as Transspecies Conversation,” forms a bridge between the garden and the kitchen as sites of engagement. The article draws on ethnographic fieldwork among bokashi composting practitioners in Finland. Bokashi is a method for handling organic waste through fermenting. It originates in Japan and has been gaining popularity in urban areas in the global North. Kinnunen explores how bokashi makers attune themselves to the needs of waste matter in a sensory and visceral way. She notes that the sense of smell becomes a vital sensory modality for engaging with and reaching out to the invisible microbial communities “working” in the fermenting matter; she argues for an understanding of smell as a form of transspecies communication.

### **...and in the Kitchen**

In their article “In the Company of Bread: Sourdough Baking as Symbiotic Care,” Ragnheiður Másól Sturludóttir and Jón Þór Pétursson examine the cultures of sourdough bakers in pandemic and post-pandemic Iceland. In Iceland, as everywhere in the affluent North, the shutting down of the world during the Covid-19 pandemic was not only experienced as a collective disaster, which it of course was; for those with the time and means to stay at home, it also provided a possibility to go back to basics in one’s own life and to engage in meaningful action, such as culinary experiments or home gardening. Paradoxically, safeguarding citizens from a pathogenic microscopic agent made them seek connection with other, more “friendly” microscopic agents, such as *Saccharomyces cerevisiae*, the yeast that has been used to leaven bread. In lockdown conditions, people had time to tend to and cultivate homegrown sourdough starters instead of using industrially produced yeast. Drawing from rich ethnographic material, Sturludóttir and Pétursson suggest that sourdough baking can



be conceived of as symbiotic care as it demands temporal commitment and careful interspecies collaboration. They illustrate how sourdough making demands allying with living organisms, the sourdough starter, which the bakers often affectionately call “the mother.” Research participants humbly admit that they cannot fully control the life of microbes, only create suitable conditions for them by pacing their routines and living conditions optimally for the sourdough starter to thrive. Passing the sourdough mothers as a gift to fellow bakers or next-of-kin creates microbiological as well as emotional bonds and kinships between human and microbial communities across time and space. Moreover, the sourdough bakers considered their baking a form of care, in the sense of taking care of others but also of themselves. It allowed the bakers to engage in an emotionally meaningful, corporeal doing that allowed them to slow down from the hectic pace of modern living and tune instead into the symbiotic rhythm of the sourdough mother.

Lindsey Foltz’s article, “Microbial Entanglements in the Bulgarian Cellar: Control, Collaboration, and Quiet Food Sovereignty,” provides a somewhat different perspective on fermentation practices. Whereas the other articles study practices that re-connect with microbial heritages or adopt and develop novel relations with microbes, Foltz examines East European “cultures of cultures” that have thrived for centuries. Under socialism in the 20th century, fermenting and preserving food was not only a common means of securing nutrition but also a way of pursuing a meaningful life and establishing social relations. Foltz examines fermenting as a social practice in contemporary Bulgaria that is intrinsically linked to other practices of everyday life, such as shopping, gardening, gathering, cooking, and eating. The article explores sustained practices of domestic fermentation in post-socialist Bulgaria and argues that food preservation provides a sense of sovereignty and safety under circumstances of chronic uncertainty coupled with a tradition of mistrust towards corporations and authorities. Due to the unbroken tradition of home preservation, “cultures of cultures” related to food preservation have flourished up to the present day, including the embodied skills and the microbial cultures needed. Therefore, Foltz proposes that the fermentation vessels of Bulgarian homes could be treated as a form of “biocultural refugia” (Barthel et al., 2013), “microcosms of diversity made in collaboration between humans and their more than human counterparts from fruit flies to bacteria and yeast” (p. 111).

In the final article in this issue, Bryndís Eva Birgisdóttir, Áki Guðni Karlsson, and Jón Þór Pétursson explore together the effects and affects of dietary transformations in their article on “Fermented Living: Challenges in Adopting a Fermented Dietary Regime and the Role of Food Memories in Acquiring New Tastes.” Their article is the outcome of interdisciplinary collaboration between nutrition scientists and ethnologists. The collaboratively conducted dietary intervention study examined the effects of fermented food consumption on 120 voluntary research participants. The analysis combines microbiological research methods to measure change in the composition of the intestinal and skin microbiome, metabolic-related markers, inflammatory factors, and metabolomic patterns, with social scientific methods, such as qualitative questionnaires and semi-structured interviews. The article presents a qualitative understanding of challenges that faced research participants and hindered them in adopting

a new diet, despite its health-claims. The authors illustrate how interviews highlight the underlying motivations, expectations, and fears of the participants, which may have a direct but otherwise invisible effect on the outcomes of the study. The authors point out that lay understandings of “healthiness” sometimes contradict the logics of nutrition science.

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To conclude, this compilation of empirical articles illustrates that microbiosocial relations are not formed in a vacuum, but co-shaped in relation to other species, environments, practices, and histories. As Amber Benezra (2023, 17) aptly remarks, the composition of the microbiome is affected by “how and where we are born, what food we eat, who we live with and love.” Microbes are transferred laterally, crossing bodies and boundaries, creating bonds and kinships between species and kinds who share nutrition, living environments, and breathe the same air. From the microbial point of view, then, the borders between “inside” and “outside,” “human” and “environment” are always fuzzy. Therefore, the cultural analysis of “cultures of cultures” (Brives et al. 2021; Hendy et al. 2021) calls for an ecological approach, which steers analytical focus from individual humans to multispecies collectives and how they co-shape their conditions and environments. Empirical research on microbial relations also makes it very clear that we are never alone, neither in life nor in science; we have no other choice, therefore, than to learn from other fields and seek fruitful dialogues across disciplinary divides. Because, unlike our universities, life itself is interdisciplinary.

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