

**Communicating With the Microbial Other:
Reorienting humans and microbes in polylogue**

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Abstract:

What does it mean to communicate with the trillions of microbial beings that comprise our bodies and surroundings? Microbes are incomprehensible—or so the narrative has been to sidestep an engagement with them. Additionally, microbes are “invisible,” and unlike other organisms, they are ubiquitous, unruly, and necessary for our thriving. This paper uses other examples of communicating with incomprehensible others (e.g., machines, infants, and other species) for insights on how to still engage in communicating with microbes. To theorize human-microbe communications, this paper specifically focuses on fermentation practices to disentangle the material-discursive and ethico-political aspects of human-microbe encounters through food (e.g., pickling, bread-baking, sake-brewing). It draws on the work of John Durham Peters to reorient human-microbe communications towards polylogue, where many speak and many hear simultaneously. Doing so shifts the problem away from assessing the accuracy of the intended microbial message (“what are they saying?”) and towards one of assuming a self-reflexive disposition (“how can I position myself to best ‘hear’ what is being said?”). It is a reorientation of how we-humans might attune to and listen for others’ cues. The issue of incomprehensibility, then, might be better held as a reality to accept than a challenge to overcome, and that accepting this reality comes with a set of responsibilities for living in an imbricated, more-than-human, highly microbial world. This paper contributes to both food studies and communication studies by expanding the analytical frame beyond representations and significations of food/microbes in media to instead analyze how ferments mediate relations.

Keywords: human-microbe relationship, microbes, fermentation, food as media, material practices, incomprehensibility, sensory cues, John Durham Peters, polylogue

“Dolphins can perhaps hear many of their fellows speaking at once;
[...] a polylogue in which everyone spoke and everyone heard”
(Peters 2001, p. 261)

Introduction: Communicating with Microbes

What does it mean to communicate with the trillions of microbial beings that comprise our bodies and surroundings? Many communication models presume a human speaker in interpersonal (Adler & Rodman, 2006), encoded (Hall, 1973), or transactional communications (Barnlund, 1989), where individuals interact through verbal and nonverbal messages. Scientific research has shown that more-than-human species communicate by signals that are just as intricate: bees dance to transmit complex coordinates for pollen gathering, plants release volatile compounds to attract pollinators or send out distress calls, and fungal species can send electrical signals through their hyphae and to relay messages to species nearby. These cues—choreographed, chemical, and electrical—convey ideas from one organism to another in ways that may not be sensible, let alone *sense-able*, to the human sensor; nevertheless, they make up the ongoing conversations between the myriad species that animate our worlds.

To be sure, differences between species may keep communication incomprehensible, but to grapple with this question of how to communicate across species could help us build a nuanced and variable set of practices that we may need to call upon in the future, for we cannot say to microbes “stop killing us” and expect them to do anything of the sort, no more than we can apprehend their saying the same to us. And yet, this happens all the time.

We are composite, hybrid beings, composed of as many human cells as we are microbial ones (Sender et al., 2016, Gilbert et al., 2012). Yet our ideas about conversing with microbes remains under-examined. To better theorize human-microbe communications, I look to the triangulate model of food, fermentation, and microbiota because the material practices of making ferments provide recurring encounters where humans and microbes engage with one another. Whether intentionally or unbeknownst, humans and microbes repeatedly meet, and studying our correspondence could help us reimagine human-microbe relations in more than antagonistic or opportunistic terms (i.e., beyond their being helpful or harmful to us). Given our inseparability and interdependence, we would do well to take seriously the challenges and affordances of human-microbe communications. As I will later explain, I argue that expanding the scope of communicating to microbes who are difficult to see, but are nevertheless ubiquitous and unruly, can trouble some of the assumptions we tend to carry as humans.

At the heart of what it means to communicate with microbial life is the roadblock of incomprehensibility I mentioned earlier, which both produces and is produced by differences across species. I cannot understand you, you cannot understand me, we are irreconcilably different, and thus cannot engage with each other. This conceptual roadblock is nothing new, reflecting normative understandings of who is worth speaking to, and who can be made to make sense. Often, those considered incomprehensible are spoken for, where intentional or inadvertent interpretations overwrite what would have been expressed. (In a fermentation context, this

speaking-for is best reflected in troubleshooting guides for sourdough starters, which tend to equate a bubbly starter with it being happy.) Yet, we do not and, arguably, *cannot* know for certain what microbes or ferments feel, demonstrating that communication tends to reflect our own desires rather than a fidelitous representation of what is happening. Communications scholar John Durham Peters (2001) describes this human penchant aptly: “‘Communication’ gives us an image of humanity, not as standing on an ontological ladder betwixt the beasts and the angels, but as a nexus within a biological network and circuit of information flows” (p. 244). If, as Peters notes, communication is being theorized in our own eyes, by our own eyes, and if we are always and already comprised of microbes, then our communication models would need to address this incomprehensibility head on and take seriously how our bodies/worlds are in and of themselves instances of biological—and multispecies, hypersocial—networks of information flows.

This paper acknowledges the desire to communicate with microbes as they become increasingly recognized as active constituents of and contributors to networks of information flows.¹ Whether in health networks (e.g., antibiotic resistance), ecological networks (e.g., bioremediation), or food networks (e.g., product recalls), microbes cut across multiple sectors, making their incomprehensibility both a logistical and discursive quagmire, one that can even be fatal. Our inability to apprehend microbes may be less a question of capacity and more a stand-in for our own moral disengagement with microbes—out of sight, out of mind. To stop at incomprehensibility, then, is to keep clutch of anthropocentric and obsolete ways of being. As Haraway notes, to avoid making contact with others on the basis of our inability to know them “is a denial of mortal entanglements [...] for which we are responsible and in which we respond” (2008, p. 226). Excusing ourselves on the basis of incomprehensibility would make our absolutism a message unto itself, declaring a call of disengagement, an unwillingness, a giving into the trouble and still expecting some outside force to reconcile the differences for us. Microbial incomprehensibility asks us to participate in other ways, inserting ourselves in the ongoing calls-and-responses already underway. As such, this paper attempts to balance the not-knowing of incomprehensibility with the aspirational hope of wanting-to-know all the same.

I begin by expanding on the importance of studying food, microbes, and communication together. I then explain how and why food—specifically, fermented foods—serves as a generative focus for studying the human-microbe relationship and why we ought to bother theorizing communicating with microbial life. Here, I offer a unique theoretical framework that relies on approaching food as media. My hope is that this conceptual move contributes to both the fields of food studies and communication studies by expanding analyses beyond representations of food in media or beyond (tech-)mediated foods. I then analyze the barriers that make communication with microbes difficult—microbes are “invisible” (explanation for scare quotes included), ubiquitous, and unruly—followed by a parallel analysis of what other difficulties arise when trying to communicate with incomprehensible others (e.g., machines, infants, and other species). In latter sections, I argue that theorizing communications with microbes requires that we move away from a dialogic model towards one of polylogue, where many speak and many hear simultaneously, and I conclude with politico-ethical concerns that emerge from theorizing human-microbe communications.

Studying Human-Microbe Communications Through Food

Theorizing communications across humans and microbes seems to take place in artistic and design settings (Bäumel, 2018, Chen et al., n.d.). It is also being researched in applied settings, such as biomedicine which aims to understand the gut-brain axis through studying chemo-neurological interactions between human hosts and gut microbes (Mittal et al., 2017). While disciplines like anthropology (Lyons 2020) and Science and Technologies Studies (Brives, Rest, and Sariola, 2021) have examined empirical and embodied ways of communicating with microbial life, curiously, the idea of human-microbe communications remains under-theorized within the discipline of communications and (new) media studies, when we have the conceptual tools to examine both the material affordances and the discursive meanings that emerge from meaning-making practices.

Employing a communications framework to this question hinges on studying food *as* media, or how food mediates our relationships to others, human and nonhuman. Inspired by Wendy Chun's (2009) formulation of "Race and/as Technology," focusing on food as media directs our attention to the emergent properties of each encounter without abstracting away from the materiality of the bodies interpellated and involved. In the same way race functions as a technology in configuring our world, food functions as a mediator in our relationships with other beings. Thus, studying food as media moves the focal point beyond representations *of* food towards ethical relations *in* and *through* food practices. For instance, food-as-media enables us to ask the epistemic question of how we come to know plants, animals, or microbes in acts of eating, and to do so with particular attention to how ideas and actions connect.

This focus on ethics echo Kember and Zylinska's (2012) reminder that our entanglements with nonhuman entities show how mediation can be embodied and relational, connecting our biological and social lives in intimate, real ways. As a medium, food connects multiple species with differential stakes: some organisms live at the expense of others, but no one can live indefinitely as a matter of constraint. Taken one step further, ferments mediate multiple relationships, brokering the affordances of food ingredients, humans, microbes, time, and place. These relations do not reflect a priori configurations between humans and microbes; rather, ferments point to emergent relations that come about over the course of a food's transformation. Put simply, fermented foods mediate the human-microbe relationship.

I employ this theoretical framing due to the tendency for media to caricature microbes along helpful/harmful binaries. (Think of the fangs and halos that decorate illustrations of microbes to connote their harmfulness and helpfulness respectively.) This either-or bifurcation frames microbial ontologies in terms of utility and externalizes them as prosthetic to human existence, which does little for the co-constituted bodies that we collectively occupy. Deciding upfront which microbes are good and bad closes down other modes of relating to them. Since microbes are difficult to see and detect, we cannot relate to them as easily, not like we do with a dog, a cell phone, or other companion (pace, Haraway). We cannot hold microbes with our hands, yet they touch us. And they touch our insides without our feeling their every move. Our bodies are imbricated in ways that confound us, yet we are inescapably a part of microbial worlds.

Recall Myra Hird's (2009) argument that humans are already part of the relational economy of other species, microbes notwithstanding, and she calls upon the linked diets between humans, cows, grasses, and gut bacteria as proof of our interconnected metabolisms (p.143). Or, as Jamie Lorimer notes, we have been using life to beget more life even before the boom of modern probiotic supplements (Lorimer, 2020). The well-worn categories of good/bad microbes continue to frame human lives as being separate from microbial ones, when in fact we cannot selectively choose when microbes are an expendable resource and when they are a life-enabling cohabitant. They are both. We are both.

We cannot disengage from microbes, not physically at least, which suggests a shift towards *living with* microbes instead of *living off of them*, even if this entails living with beings that continue to be incompatible with our lives. As such, we would do well to imagine our relations with microbes as being more than a thought experiment if we are to continue relying on microbes for everything from mood to biomedicine to biomanufacturing. This work of reimagining cannot be seen as some cure that fixes the human-microbe relationship once and for all; rather, it is one step in the incremental reordering of where humans fit in a more-than-human, one might even say microbial, world. That said, I do not wish to deputize myself as a microbial mouthpiece or a so-called microbe whisperer, for doing so would reignite the very anthropocentric fire that I am trying to stomp out. In a way this paper attempts to note a change in disposition than to expound upon a newfangled skill to acquire.

I contend that we stand to gain crucial insights by studying the extant practices that engage with microbes *because* they are incomprehensible to us, not in spite of it. I present a few examples here, which are by no means exhaustive, in the hopes of probing at a future together. How we act now (or do not act) and position ourselves matter because our metabolic lifeways entwine now, and will continue to do so. Given that our histories with microbes span millennia and co-evolved through (food) cultures, I turn to fermentation to better understand the practices of engaging with microbial life.

The Material Practices of Fermentation: working with “invisible,” ubiquitous, and unruly microbes

Fermentation lays bare the invisible relations that connect people with microbes, environments, and the countless plant and animal species that become food. With no singular way to practice it, fermentation encompasses multiplicitous practices, for what works here and now may not be applicable elsewhere or elsewhen. Its material practices can tangle up the variable participants of each encounter, including the human-eater, the microbial-eater, the food ingredients eaten, the ambient environment, the embodied know-how, the regulations that govern such practices, the language that describes such relations, and more. Given this complexity, how one chooses to act—based on how one makes sense of microbial presence—configures what it means to be in response-able relations with microbial life.

Consider the immediacy of deciding which microbes to enable, eradicate or let live in repetitive encounters of fermentation. A blue fuzz on the side of a container, a ropey white on a ferment's surface, a smell that wafts equal parts nail polish remover and citrus—each of these

compel the fermenter to decide and act upon microbial cues, and these iterative life-death decisions routinely make up the process of fermentation. Thus, the hands-on *doings* of fermentation—aerating, cleaning, removing, feeding, backslopping, sterilizing—epitomizes what Karen Barad (2007) calls ethico-onto-epistem-ologies, which weaves together questions of being, knowing, and doing into one. As a lively process, the doing of fermentation asks us to nuance what a microbe *is* and *can be* in our attempts at apprehending microbial life (i.e. onto-epistemologically) in the incremental moments of fermenting.

What complicates microbial encounters is threefold: (1) microbes are difficult to see and detect, (2) they are everywhere, all of the time, and (3) they are on the move and morphing perpetually. As a set of millennia-old practices, fermentation accounts for these characteristics.

The material practices of fermentation find indirect ways of engaging with microbes precisely because they are difficult to see and detect. (Most ways of seeing microbes are mediated by apparatuses such as microscopes and dyes. Even without sight, our ability to detect microbes is mediated by sensory organs like our noses or tongues.) Of course, not all microbes are invisible. The fruiting bodies of fungi (i.e., mushrooms) and the bright yellow meshwork of *Physarum polycephalum* (a.k.a., slime molds) can be seen by the unaided human eye. But countless other bacteria, yeasts, protists, and archaea exist on a scale that we cannot easily register, until or unless their colonies become sizeable enough for us to notice (e.g., in biofilms, through a stench). And, since multiple species exist in any given space, the material practices of fermentation tend to create conditions that are conducive for certain species to thrive while excluding others. Eventually, these practices of working with the “invisibility” and ubiquity of microbes become codified into place-specific food practices: rinse this with boiling water, set this out to dry in the sun, wipe this down with 80-proof alcohol. Each of these material practices can kill some microbes and not others, and although modern technoscience would have us believe otherwise, these practices need not be elaborate.

As a tangible example, consider two cucumbers picked from the same plant. With one, a person might slice, salt, and store it for some time, while the other cucumber is left untouched. Imagine what would happen over several days and weeks. The cucumber that received hands-on treatment could become lacto-fermented pickles while the untouched one would likely rot over time. The outcomes do not inhere to the cucumbers per se; rather, the hands-on practices of handling the cucumbers can enable certain microbes to transform the vegetable into a preserved, edible pickle, whereas the lack of handling created the conditions for ambient microbes to jumpstart the natural process of decomposition. An axiom I learned at a natural sake brewery summarizes this parable succinctly: “actively fermenting something will keep it from rotting.”ⁱⁱ Human practices matter, especially in the hands-on doings of fermentation.

Microbes are also on the move, whether we are aware of this or not. Take breadmaking, for example, where exchanges with microbes take place on a two-way trajectory. A recent experiment distributed identical sourdough starters to bakers across the world and noted the changes in microbial profiles (Reese et al. 2020). Initially, the microbes in the starters correlated with the microbes in the flour, which is to be expected since flour is the primary ingredient that bakers incorporate. But over time, the microbial profiles of the starter began to reflect the skin microbiota of the bakers, *and* an analysis of the bakers showed an increase in sourdough

microbes living on their skin. In this dual exchange, the bakers' skin came to resemble their breads in terms of microbial profile and vice versa, demonstrating how foods can enable microbial relationships by way of hands-on practices. The boundaries of self rarely stand incontrovertible and instead give way to a permeable, porous sense of being. Our skin is teeming, our contours ill-defined, or, to borrow a phrase Anna Tsing, the edges of our being remain unruly (2012). Since we maintain contact with microbes at all times, microbes may be influencing the unique taste signatures of people who bake, cook, or brew.

We are always and already entangled with microbial life and, by extension, we are always and already surrounded by the potential to engage with microbial communications. The difficulty, of course, is being able to discern which of their many messages we can interpret when microbes are perpetually exchanging cues with other communicators nearby. Rather than superimpose a human limitation of one-speaker to listener (i.e., in dialogue), I call upon John Durham Peters' concept of polylogue to explode the speaker-to-listener ratio exponentially, freeing up the potential to engage with the many microbes that make up our surrounds.

In so doing, the problem becomes not one of assessing the accuracy of the intended *microbial* message ("what are they saying?") but one of assuming a *self-reflexive* disposition ("how can I position myself to best 'hear' what is being said?"). It is a reorientation of how we might attune to and listen for others.

Call-and-Response with Incomprehensible Others and the Hope for Polylogue

Peters defines communication as an "exchange, that is, a transfer times two" (Peters, 2001, p.8). This understanding of communication enables ways of analyzing the exchanges that take place with seemingly incomprehensible others where the cues might be digital, gestural, chemical, or otherwise outside of what constitutes an intended message. By incomprehensible, I mean to suggest that the exchanges are incommensurate, differing in magnitudes, direction, orientation, trajectory, volume, or scale. In what follows, I present a few cases to examine what is being exchanged and how, including comprehending machines through language, comprehending infants through affect, and comprehending species through consumption. To account for multiplicitous cues, I use call-and-response as a common frame for analysis.

Consider the NukaBot, a robotic vessel designed to measure and indicate when the pickles inside of it are fermenting towards deliciousness (Chen, Ogura, and Young 2019). Nuka pickles combine two simultaneous ferments: one entails fermenting a pickling medium of rice bran, salt, and water (called the nukadoko), and the other entails placing pickles-to-be inside this medium to inoculate and transform them into pickles. Without the bot, nuka pots can sometimes require multiple 'turnings' a day when they are placed in warm, humid environments; for each turning, the medium would be aerated, the vegetables replaced, and the fermenter would make incremental adjustments depending on how salty, sour, or pungent the pickles taste.

To technologically assist with these adjustments, the NukaBot uses digital sensors to measure criteria like salinity and acidity and, through a pre-recorded voiceover, will announce to the human fermenter that it suggests aerating, mixing, or harvesting the ferments. Consistent

with the bot imaginary (Reeves and Nass, 1996; Woods 2018), the NukaBot functions as a polite service assistant by fulfilling the checklist of human-tasks in fermentation.

That the NukaBot compiles data and digitizes them in up-to-date announcements evokes a sense of more-than-human communication (see the subfield of computer-human interactions for more on this topic). But, crucially, the bot does not cultivate a dispositional ethic, partly because it is not rendered capable of responding openly. For comparison, I look to Midori-san, a conversational plant that reacts to people watering it with text-based responses. Elizabeth Swanstrom (2016) uses the Midori-san example to demonstrate how nonhuman experiences can be understood in human terms through what she calls “correspondence” wherein “[d]igital technology allows nature to speak” (p. 92).

Nature may very well ‘speak’ but not in its own tongue; digital technology necessarily translates the speech into a script comprehensible to humans. Similar to Peters’ analysis of the Turing tests, predetermining the terms of engagement with these machines “ends up reaffirming the inescapable anthropomorphism that drives our interactions with each other” (2001, p.240). In these instances, we have set the bounds of communication in our own parameters, which, in the case of the NukaBot, prioritizes taste. As one listens for the verbal calls from the NukaBot, the unpredictabilities of microbial life get replaced with knowledge provided by the machine’s algorithms. In contrast, one must “listen” for all sensorial cues in hands-on nuka-making, which, develop into a catalog of know-how over time.

For both the NukaBot and Midori-san, the human fermenter/waterer can only engage in preset ways based on the message’s contents. Without a means of communicating outside of their design-confines, the machines call out to humans in human-speak, and the human responds *not to the machine* but to the original ‘purpose’ for which the machine was created (e.g., art, fermentation, entertainment). It is not an exchange but mismatched transfers, and the call-and-response only continues until one side tires, disengages, or breaks. The mismatch could be explained by the primacy placed on the content of the machine’s message, since the relational premise becomes moot when the bot is designed to fulfill a service role.

Valuing relational messages over content messages might be one way of bridging communications with incomprehensible others. Relational messages communicate the social dynamics between speakers and listeners through embodied, gestural, or affective means, such that these messages can still be communicated when textual/content messages remain incomprehensible. Here I apply the concept of vitality affects as theorized by philosopher Cynthia Willett, who studies the relational exchanges people have with infants to better understand ethical relationships with other species. In *Interspecies Ethics*, she calls upon infants precisely because they can neither use language nor mimetic drive (yet), thereby requiring a particular kind of affective attunement to connect with human speakers. She calls these attunements vitality affects, which are “dynamic, *kinetic* patterns” such as crescendo or decrescendo when speech is delivered (2016, p. 90, original emphasis).

It is through these vitality affects that mother and child can participate in proto-conversations without requiring the infant’s subjecthood, sense of self, or intentionality. Through variations in communication format (e.g., cooing sounds), interest develops with the infant and

continues in the form of interplay: “The play is improvisational, not planned. Affect attunement across sensory modalities constitutes the basis for a call-and-response exchange at a level that may be preverbal, nonrational, and mysterious and yet vital for the ethicality of biosocial bonds” (p.91). Willett bases her argument in the classic notion of eros in its most basic, nonsexual, nonreductive expression of desire. Peters echoes a similar idea about eros, which “involve[s] a reciprocal coupling of speaker and hearer, a closed communication circuit” (2001, p.46). The mother-infant dyad continues to reciprocate in the form of improvised play, channeling their attention towards wonder and hope, call and response.

Breast milk functions as another form of call-and-response in the mother-infant dyad, but herein lies an opportunity to question multispecies relations. Anthropologist Megan Tracy (2021) traces the productive labor asked of cows in making milk for both humans and calves, and highlights the discrepancies that emerge when microbes disrupt our expectations about what is and is not acceptable in reproductive technologies. For both cows and humans, microbes connect mammary glands to the gut in the form of “cross talk,” where the contents of breast milk (as immunological “medicine”) changes in response to the infant’s saliva. For humans, this connection is both personalized and seemingly sacrosanct: “breast milk is a private conversation between mother and child [...]. The messages we are sending each other are literally made of ourselves” (Garbes 2015, as cited in Tracy 2021).

One obvious disconnect is that humans are granted kinship relations that lactating cows are not, but Tracy points out that this relational framing also absents the “cowness” of cows in surreptitious ways. Whereas in human–infant relations, microbes are seen as welcome mediator for boosting immune function, to think of microbes in cow–calf relations forces us to see cows in a reproductive light, not just a productive one. So “[w]hatever cowness happens must happen *in* the rumen and *not* in the mammary glands—both reinforcing the species’ line and avoiding destabilizing the settled question of who mammary glands are *for* in both cows and humans” (p.6-7, original emphasis). The materiality of milk-producing bodies complicates our presumptions about what microbes are, where they ought to be, and who is worthy of communicative exchange.

What emerges from Tracy’s analyses are hierarchies of permissibility that disrupt our assumptions about unidirectional consumption (e.g., you are what you eat) and linear orderings (e.g., the so-called Great Chain of Being). We expect microbes in certain places and not others; we explain microbial activity in terms of our gain and not theirs; we permit some fermentative transformations and reject others (see also Tracy and Howes-Michel 2018); anything else is incomprehensible. That is, we couple certain calls with certain responses to make sense of what is happening, and we do so according to our own schema, worldview, and biases. Similar to a Baradian agential cut, *we* do this coupling in non-innocent ways.

Instead of coupling the mother–infant dyad, or any of the mammary–mouth, mammary–gut, microbe–mouth, gut–microbe dyads, applying the concept of polylogue can help us see the multiple, simultaneous instances of call-and-response. The notion of polylogue widens the scope of what is communicating and how, before we couple them off into call-and-response dyads. As noted in the epigraph, Peters equates the experience of polylogue as hearing many speakers at once, akin to a quasi-democratic moment “in which everyone spoke and everyone heard”

(p.261). In the previous examples, we can imagine the hands-on practices of turning nukadoko mean that polylogue happens on multiple sensorial channels, and to use the NukaBot limits those channels to a pithy set of prefabricated lines. Polylogue acknowledges the relational messages conveyed through several affective cues in proto-speech with infants, including voice, touch, facial expression, and eros. Polylogue does not tidy up the complexity so much as it recognizes the variety of cues, communicated by a range of ‘speakers,’ even when they are incomprehensible.

In a fermentation context, polylogue accepts that the cues surrounding fermenters and microbes are too many to sift through and, even then, only a fraction can be detected by human sense organs. This makes communication inherently partial and imperfect. Since we cannot comprehend the totality of polylogue, the calls-and-responses we choose to attune to have politico-ethical consequences (e.g., framing lactation between human mother and infant as a kinship relation when cows and calves are not afforded the same reveals an anthropocentric disposition). To be aware of this limitation would be one way to account for ethicality in the human-microbe relationships because it casts a light on our own priorities, privileges, and presuppositions. I argue that the partiality and incomplete nature of polylogue cannot underwrite our disengagement from it (recall Haraway’s assertion that incomprehensibility slips into denial about our moral/mortal entanglements with others), but compel us to approach it otherwise. The issue of incomprehensibility, then, might be better held as a reality to accept than a challenge to overcome, and that accepting this reality comes with a set of responsibilities for living in an imbricated, more-than-human world.

In the swarm of polylogic calls and responses, we have a history of honing in on the human communicators, in fermentation but in other contexts as well. Following other critiques aimed at anthropocentrism, perhaps it is high time we take seriously the capacity for others to speak. “Communications is perhaps the ultimate border crossing concept, traversing the bounds of species, machines, and even divinity” writes Peters, and it “invites consideration of our relations to these creatures—each marked in some way as ‘other’ to ‘man,’ the old center of the humanist universe” (p.229). Our attempts at making sense of incomprehensible others may be driven by our own existential queries of where we fit in the organismal order of things. A greater danger would be to presume microbes do not communicate or do not communicate anything worthwhile to us, when, perhaps, we have much to learn from practicing a stance of listening.

Living with the Other

In his discussion about communicating with nonhuman creatures, Peters notes that the question of how to communicate with animals, machines, extra-terrestrials “serve as allegories of social otherness—women, racial and sexual others, the insane, children, the senile, or one’s own dear self” (p.229). Man used to be defined by his ability to communicate, Peters explains, and, with each new being that comes into his purview, he has had to make sense of these others and recalibrate where and how each fits in the relation-scape of being. Part of Peters’ argument is that this sense-making need is both historically engrained and necessary for our future. I agree with Peters that considering the ever-expansive list of others will be a key to communicating across difference. Ultimately, to whom we extend communications is a politico-ethical question, not one of linguistic or physical capacity, and I argue that the politics and ethics of non-

anthropocentrism will need to reach beyond multispecies concerns to include intersectional concerns.

Why connect the two? The practices of working with microbes—making pickles, baking sourdough, sharing skin—point to our being connected in literal, material ways. However, since microbes remain difficult to see and sense, we-humans tend to act on what we *can* see, which are the facets we recognize as being different from us. That is, embodied differences underwrite who is us and who is other. In fermentation contexts, this line-drawing of self/other can manifest in actual, non-allegorical ways.

In sake production, women were historically kept out of particular processing steps due to the fear that microbes might pass from their skin onto rice destined for koji. Koji is rice inoculated with the fungus *Aspergillus oryzae* and functions as a key ingredient in sake because of its high enzyme content. As a fungal ferment, koji preparations take place in humid rooms separate from the rest of the brewery; so, what is brought into the room tends to stay. Especially when menstrual cycles require the handling of bodily fluids, women's hands can carry acidic bacteria that, when transferred to rice in koji-making, could start other fermentation processes that detract from koji's value as an enzyme producer in sake-brewing.¹ To this day, some breweries refuse to let women into these koji-making spaces for compounded reasons of biology and misogyny. Other breweries will require a minimum apprenticeship of two weeks' time because this is the amount of time it takes for the bacterial effects of human microbiota to become apparent. In the event that an apprentice brewer carries a bacterial strain known to adversely affect sake flavor (e.g., *Lactobacillus spp. hiochi*), they are reassigned a section or kindly asked to leave the brewery.

In this example, women/apprentices are marked with difference when in fact what is exceptional about them is arbitrarily decided by humans, a cue interpreted by their unchecked biases. The marked difference also conflates two forms of embodiment: social difference as expressed by gender, and microbiological difference as expressed in different practices. The rationale for excluding certain people from fermentation spaces may be explained by microbial differences when social reasons may be the driver, and vice versa, and this slippage brings into stark relief the need to consider multispecies and intersectional concerns in the same spheres, both disciplinarily in the form of academic inquiry and politically in how spaces are governed. To be sure, this form of discrimination is not unique to koji production; consider the purity politics associated with alewives, Louis Pasteur's beer of national revenge, and the hyper-masculine homebrew-turned-homebro industry (see also Hey 2022). Peters reminds us that communication has the power to help us confront how we conceive of and treat beings who are other to us, because communications:

are exercises not only in self-knowledge, but in *living with the other*. The concept of communication has the virtue of refusing to let us think of those tasks separately. The key question for twentieth-century communication theory—a question at once philosophical, moral, and political—is how wide and deep our empathy for otherness can reach, how ready we are to see 'the human as precisely what is different.'

(Peters 2001, p. 230, emphasis added)

Arguably, the question for twenty-first century communication theory grapples with the question of *given our differences*, how do we continue to widen and deepen our empathy? In wrestling with the humans that we have been, perhaps we can imagine *how else* we might practice our humanity—in both intersectional and multispecies scales. Fermentation is but one way of engaging with our layered identities, as already having multispecies and intersectional facets.

Conclusion

We are always and already in contact with microbial life, such that the potential to engage with them is always and already something we could act upon. What matters is the desire to connect on a relational scale—for we are already connected physically—Which we can tap into when we (re)imagine the communication model fractionating into multiple polylogues happening everywhere, all at once. Granted, microbes may very well remain incomprehensible often and to many, but the onus rests with us to ascertain how best to position ourselves as hearers in this polylogue, not the least of which because we cannot live without microbial life when they can thrive just fine without us. We may continue to waive ourselves from needing to engage with microbes because we cannot communicate with them. I argue the reverse: we must engage with them *because* we cannot sense them or communicate with them on our terms.

Microbes have been border-crossing since before laboratories ever attempted to contain them, partly because microbes do not observe the boundaries we construct. Borders are never a one-and-done line drawn but a perpetual ethical quandary calculated at each encounter, with relationships re-established at every spritz of hand sanitizer, every act of eating, every night of teeth brushing, every push of a public turnstile. Which is to say, it is the practices, the mundane, day-to-day tasks of everyday life that define our terms of engagement, not the sensational ones that terrorize us (though they certainly catch our attention and force us to imagine what we cannot immediately see).

Microbes will continue to move about regardless of whether we want them to. They will hitch a ride on aprons, on nails, and on unintended spittle in the practice of speech. This is normal; this is how we have been living. What I propose here is a shift in disposition, because how we account for microbes in the swarm of polylogue will be an ongoing political and ethical endeavor, and how we choose to position ourselves and listen in will impact our future relationships.

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Notes:

- i Microbes are increasingly rewriting cause and effect models that we had previously taken for granted. Consider, for instance, how disease mechanisms for Parkinson’s now go beyond neuro-physiological factors to include microbiological agents; or, how our mental health and mood are governed by microbial fluctuations in our gut.
- ii My thanks to Terada Honke for conveying this to me during field research:
「発酵すれば腐らない。」
- iii Two disclaimers worth keeping in mind: women are not the only ones who menstruate, and menstruation is not the only instance where handling body fluids can transfer microbes.

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Citing this article:

Hey, Maya. (2023). Communicating With the Microbial Other: How the material practices of fermentation connect humans and microbes in polylogue. *Global Media Journal -- Canadian Edition*, 15 (1), pp. 12-25.
