Nested Bodies

Fermentation as Embodied Praxis

A critical and process documentation thesis paper submitted in partial fulfillment of the requirements for the degree of Master of Design, Interaction Design, Emily Carr University, 2021.

Julie Van Oyen
Bachelor of Kinesiology,
University of British Columbia (2012)
Bachelor of Design, Interaction Design,
Emily Carr University (2019)

Abstract

The craft practice of fermentation prioritizes embodied know-how in the maker, and collaboration between the practitioner, fermenting microbes, and other beings and elements implicated in the process. This project draws from embodied design research methodologies to develop a material fermentation practice into a process-led research praxis, wherein theories of embodiment and the relational bodily self can be explored. This project then proposes how this embodied, multispecies praxis may cultivate a deeply relational connection between humans and the ecosystems they are embedded within, in order to conceive of and exercise more caring relations.

Keywords

Embodied design, embodied knowledge, fermentation, multispecies, praxis, relational self

This thesis is typeset in Cormorant Garamond and Aboriginal Serif (https://www.languagegeek.com/font/fontdownload.html).

Acknowledgments

Thank you to my supervisor Katherine Gillieson, for your unending support, thorough reviews, and infectious excitement during the development of this project and document.

Thank you Rita Wong and Lisa Grocott for your reviews and thoughtful comments, which have been instrumental in shaping what this document is today.

Thank you Sonia, Max, and Tamar for sharing your sourdough starters with me, and thank you to the ferments' microbial constituents for sticking around as I bungled my way through learning to work together.

Thank you to Bob for never once complaining about the proliferation of bubbling jars and odd smells in our home through the course of this project (and for a while yet, probably).

Contents

Land Acknowledgment

This work took place on the unceded territories of the xwməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish) and Səlílwətaʔ/Selilwitulh (Tsleil-Waututh) Nations.

As someone seeking to become a good relative, I gratefully acknowledge not only where this work took place, but the ways in which responsibility to the living land have informed it. This project is concerned with confronting and disassembling ideas and perceptions of human-nature duality. It recognizes how their residual effects impact the real, lived, experiences of colonial ideologies and their related systemic forces including extractive economic systems and instrumentalist views of the living world. I hope that by questioning the ideological foundations of these harmful relationships, this project may in small ways serve just and sustainable ways of living and working.

"We also refer to the land and our bodies with the same root syllable. This means that the flesh which is our body is pieces of the land come to us through the things which the land is. The soil, the water, the air, and all other life-forms contributed part to be our flesh."
- Jeannette Armstrong,
Keepers of the Earth

"...But I am talking now
of the way the body speaks,
and the wind, that keeps saying,
firmly, lovingly:

a little while and then this body
will be stone; then
it will be water; then
it will be air."
- Mary Oliver, *What the Body Says*

Glossary of Terms

Embodied Design
Design ideation, speculation, engagement, and analysis in which the body and its senses are engaged "to be leveraged in an emergent design space" (Wilde et al., 2017, p. 5159). Drawing primarily from theories of phenomenology, pragmatist aesthetics and embodied cognition, it encompasses "embodied, embedded, and enacted minds" (Wilde et al., 2017, p. 5159).

Embodied Knowledge or "Know-how"
Knowledge held within and distributed across the body, which enables us to conduct a task or series of tasks without needing to be consciously aware of the individual actions taken. This knowledge is developed through sensory perception, bodily experience, repetition and physical memory (Merleau-Ponty, 1962).

Fermentation
A material craft practice in which practitioners aim to produce ideal conditions for a specific multispecies community of microbes (bacteria, molds, and yeasts) to proliferate within a food substrate. The microbes' metabolic activities within this food alters it to possibly become more nutritious, preserved for a period of time, and distinctly flavoured (Redzepi and Zilber, 2018).

Interaction Design
The design of interactions between beings (human and/or nonhuman) and tools, systems, and/or services. These may or may not be comprised of digital elements. Their design takes into account wide-ranging considerations such as aesthetics, motion, sound, space, time, subjective experience, and behaviour (Höök, 2018).

Praxis
According to Merriam-Webster, praxis is the practical application of a theory. In the context of this project, a material fermentation practice becomes an embodied research praxis wherein theories of embodiment and the relational bodily self can be explored (Hey, 2017).

Relational Self
Carrying alongside the sense of the self the recognition that we are interconnected on a fundamental level with all other beings, and the elements of the earth and air, into our lives and work (Hey, 2017). There is no separation between our bodies and the ecosystems we are a part of (Armstrong, 1995, 2002).

1. Introduction

The dominant traditions of Western thought have long favoured the analytical mind and symbolic language as characteristics which set humans apart from the rest of the living world, propping up ideals of human exceptionalism and anthropocentrism (Rodman, 1980; Eckersley, 1992; Armstrong, 1995). Eckersley (1992) defines anthropocentrism[1] as "the belief that there is a clear and morally relevant dividing line between humankind and the rest of nature, that humankind is the only principle source of value or meaning in the world" (p. 51). These ideas have resulted in massive and widespread exploitative relations enacted by humans on ecosystems and other beings. As observed by Okanagan scholar Jeannette Armstrong (1995), this Western lens promotes displacement and disparity between self and ecosystems, and can be seen as incongruent with being a healthy, whole person or community. This renders us unable to enact good relations with other beings and ecosystems. *In Matters of Care: Speculative Ethics in More Than Human Worlds*, Marìa Puig de la Bellacasa (2017) identifies a need for creating alternative ethics of collectivity and care within our living world. However, for a revolution in ethics to occur, a revolution in perception must first develop (Rodman, 1980).

This project explores fermentation as an embodied praxis for shifting perceptions and resisting oppressive hierarchies between human and non-human beings and systems. Conducting research from a body-first perspective invites into the work ecosystems within which our bodies are nested (and which we have nested within us), in order to help cultivate the notion of a relational self which connects to (and wishes to conserve) the living world and beings around us. An embodied approach has potential to directly counter ideas of human exceptionalism: it conceives of our beings not as detached objects clearly separated from the world, but rather as always corporeally embedded within it, and therefore inseparable from it.

[*1*] *Anthropocentrism is a complex, layered, and laden term. Other definitions have been explored within the field of environmental ethics; see Brennan & Lo (2020).*

Interaction design has much to offer and explore within embodied research, as it is concerned with motion, space, subjective experience, and behaviour. Additionally, as emerging technologies are moving interactions out from behind screens and into the surrounding world, interaction design is increasingly concerned with "the intertwined relationship between us as living organisms, acting changing, creating tools and systems in the world, and us at the same time making these tools part of ourselves" (Höök, 2018, p. 31). In my exploration of fermentation as embodied praxis, I will first introduce the embodied research methodologies I have adapted for this project. Second, I will describe the layered and embodied fermentation work through which I have explored embodiment, the relational self, and the linkage between the human body and our shared, more-than-human worlds. I will describe how fermentation is not simply a material craft practice; it deals with soma, the subjective body-self, movement, sensory engagement, and experience — all matters of concern within embodied research and interaction design. Finally, using the framework offered by Wilde et al. (2017), I will reflect on how embodied research such as this may position us to explore our relational selves, contributing to a situated sense of designing in and with the living world we inhabit.

2. Bodies of Work

I am the first to say that I am not necessarily an artisan when it comes to fermentation. My practice has been relatively basic from a craft perspective, and at first glance one may not see any designed outcome or object at all. However, the intent is not to find solutions, but rather to establish the craft practice of fermentation as a praxis through which to explore ideas of embodiment and the relational self working in collaboration with multispecies agents (Hey, 2017). According to Merriam-Webster, praxis is the practical application of a theory. As a designer, I use craft tactics (if even in a basic sense) to interact with ideas to develop sensitivities and shape approaches for designing in and with the world. There are methodologies within the social sciences and humanities, the arts, and within design itself, which have been developed to take a body-first research perspective. I have selected and adapted methods from them in order to develop a material fermentation practice into an embodied research praxis wherein theories of embodiment and the relational bodily self can be explored.

Due to its open character, embodied research is practiced across fields, disciplines, and cultural contexts (Spatz, 2017). There is a rich lineage of embodied theory, research and practices within the visual and performing arts (see Vicuña, as cited by Museum of Contemporary Art, 2007; Olsen, 2002; O'Connor, 2005; Berrigan, 2014; Spatz, 2017), social sciences and humanities (Chadwick, 2017), with particularly important contributions by intersectional feminist scholars and practitioners taking nonwhite/ nonwestern perspectives (see brown, 2019; Lorde, 1984/2020; Kimmerer, 2014; Pinto, 2020; Simpson, 2017). Within mental health disciplines, therapists have been exploring healing trauma and reconnecting with and decolonizing the self through bodily awareness and somatic therapies (Menakem, 2017; van der Kolk, 2015). Eco-philosophers, often led by eco-feminist perspectives, have been employing the body as a physical and

conceptual pathway to sensory integration with living ecosystems (Haraway, 2016; Margulis & Sagan, 2007; Abram, 1996).

For this project, the greatest influence has come from the work of Indigenous Okanagan scholar Jeannette Armstrong, whose work relates how the Okanagan word for body contains as its root the word for land (1995, 2002). She describes how this notion of land and body as inextricable implicates the human into a reciprocal relationship to land through their body: "The land feeds [us]; but we feed the land as well....we give our bodies back to the land in a really physical way" (2002, 5:56). This is done through applying the body to care for the surrounding land, and to vocalize its needs in all community decision making processes (Armstrong, 2002). The body as vessel for the living, knowing land has been a core concept in their work, which is often missing or incomplete in Western examples of embodied praxis. Additionally, these ideas trouble the ideological foundations of extractive and instrumentalist views pervading Western thought and action[2].

A guide for bodily design discourse has come from the work of researchers Danielle Wilde, Anna Vallgårda, and Oscar Tomico. Their embodied design framework enables designers to describe their research and contextualize it alongside their peers in the field, in order to build a more connected community of embodied design researchers (2017). They describe embodied design as involving ideation, speculation, engagement, and analysis methods which put the role of the body in the fore. They also give an initial practice review which maps the various practitioner- researchers in the field. Other creative practitioners such as Ben Spatz (performance) and Kristina Höök (interaction design) have also offered methodologies through which to work through embodied experience.

2.1 Fermentation as Embodied Praxis

In *Embodied Research: A Methodology*, Spatz (2017)describes embodied research as similar to action, practice-based, and performance research methodologies, but distinct from them in the degree to which it centres embodiment. The primary objects of investigation are the possibilities and potentials of individual or multiple bodies, and their subjective sensory perception, movement, emotion, and embodied knowledge, practice and technique (Spatz, 2017). According to Spatz, technological research might ask: "*What can metal do? What can networked computers do?*" Discursive research might ask: "*What can poetry do? What can mathematical figures and symbols do? What can musical notation do*?" Meanwhile, embodied research asks: "*What can bodies do? What can fingers do? What can bodily rhythms do?*" (p. 5). Here, to keep the subjective, experiencing body at the forefront of inquiry, I have asked: *What can an embodied craft practice of fermentation do?*

[2] *Armstrong (2011) tells us that in order to move beyond human exceptionalism, non-Indigenous people must learn from Indigenous scholarship and knowledge. This can be done in dialogue, with respect and humility, following Indigenous understandings of reciprocity with place and with each other (Armstrong, 2011).*

Höök (2018) invites us to reframe how we understand interaction design, a predominantly symbolic and language-oriented discipline, as one which centres bodily movement and sensory appreciation. She calls on designers to engage deeply with and get to know "the material" of the experiential, subjective body, its sense and affordances (also known as the *soma*) (Höök, 2018). Her rationale for the importance of developing body-first sensitivities centres on designing better and healthier emerging technologies, but also touches on ways in which humans may connect with other living bodies via their soma. For example, she recounts her personal experience of riding a horse and describes the perception that together they were forming a "centaur self" (Höök, 2018, p. xvi). The more relaxed she became during the ride, the less she consciously thought about what was happening, the more cohesive and collaborative they were as a pair. This lens has been particularly generative within the context of my project.

Following these notions, fermentation may be considered an embodied research practice due to the prioritization of *embodied know-how* in producing successful (delicious and nutritious) ferments (Hey, 2017). *Embodied knowledge* or *know-how* is knowledge held within and distributed across the body, and is developed through sensory perception, bodily experience, repetition and physical memory (Merleau-Ponty, 1962). This knowledge is not centralized in the analytical mind; rather, it does not differentiate between mind and body at all, and results from their interdependence (Höök, 2018). Examples of embodied know-how range from everyday activities such as riding a bicycle, to crafts such as weaving, dance, and taste-testing ferments.

3. Case Studies

This project involves a material practice of fermentation through which I have explored these ideas of embodiment, the relational self, and multispecies collaboration. As an interaction designer accustomed to designing digital applications and services, my early forays into designing for human-nonhuman interactions were dominated by these kinds of tools: for example, an at-home fermentation app and a citizen science platform reporting on forest health. However, with each new concept, I felt more strongly that the most interesting and informative interactions were those between humans and nonhumans themselves, rather than with the digital mediator in between.

In *Thoughts on Interaction Design*, John Kolko (2011) defines interaction design as the "creation of a dialogue between a person and a product, system, or service" (p. 15). Systems need not be digital; according to Donella Meadows (1993), a system "must consist of three kinds of things: elements, interconnections, and a function or purpose". As seen in the example of an ecosystem, these elements may be living (or nonliving) beings, and their entangled dependencies for life may be considered purposeful interconnections (Meadows, 1993). Furthermore, as described by Höök (2018), interaction design takes into account wide-ranging considerations such as aesthetics, motion, sound, space, time, subjective experience, and behaviour (2018). The moving, sensing and perceiving body is therefore as much the material of interaction design as are digital tools and systems. On these grounds, interaction design may concern itself with dialogues between bodies and ecosystems.

Heather Paxson (2008) relates the material practice of fermentation as part of modern craft knowledge, which connects us not only to traditional homesteading practices and our own cultural history, "but to our environ-

ment on the deepest possible level" (p. 117). It is a material craft practice in which practitioners aim to produce ideal conditions for a specific multi-species community of microbes (bacteria, molds, and yeasts) to proliferate within a food substrate. These microbes find their way into the mix from the food itself, the ambient environment, and even the fermenter's hands (Hey, 2017). The microbes' metabolic activities within this food alters it to become more nutritious, preserved for a period of time, and imbued with particular flavour (Şanlier et al., 2019; Redzepi & Zilber, 2018). This produces food and drink such as sourdough bread, injera, miso, sauerkraut, cheese, kimchi, kombucha, beer, kefir, saké, and wine. Fermentation has a long history, and is practiced cross-culturally: due to its place-based nature, it is an important identifier of heritage foodways and cultural groups. For example, many regions throughout the world have their own traditional fermented foods which have been prepared for centuries (Nout et al., 1983). These are often used to signal group identity (Jang et al., 2015), and to support food sovereignty efforts (Yotova, 2017; Ham, 2017), as well as alternative food economies of giving or trading ferments (Jasarevic, 2015; Katz, 2016).

Ferments proliferate and perish according to the conditions provided by the practitioner, the food substrate (flour, soybean, cabbage, etc.), and the surrounding environment, making it an "emergent and context dependent process" (Hey, 2017, p.153). Due to this dynamic and shifting nature, fermentation privileges *embodied know-how*, specifically the development of knowledge that is distributed across the senses: even a novice fermenter can often more easily tell whether a ferment is ready by smelling or tasting it, than by reading a description in a recipe book. This develops a collaborative relationship between the maker's body and the ferment, which when examined holds implications for one's experience of being a subjective, perceiving body embedded in the world, with others.

The following two case studies recount the specific techniques and methods that were employed in order to explore these implications. Embodied research methodologies encouraged starting with the lived experience, by which practitioner-researcher engages first through their own body. This involved a solo[3] embodied practice, in an at-home fermentation lab. Aside from the fermentation practice described above, methods also included written notation and multimedia documentation in order to archive and document the work. The written notation documents the project using the form of a practitioner narrative, for its descriptive and subjective quality (Spatz, 2017). As Spatz (2017) describes, a practitioner narrative works by folding technical detail into a story about a particular moment of practice (p. 22, 2017). The written notation also includes speculative and embodied drawing[4]: a method for thinking- and moving-through via the overlapping

[3] *"Solo" as in one human body/practioner/participant/maker/eater; this of course contains multitudes of micrbiota in and on the body.*

[4] *See page 23 for an example of how speculative drawing enabled thinking alongside Wilde et al.'s (2017) framework. The small sketches explore transformation, motion, and conceptions of wholeness beyond mind-body connection.*

of the material, experiential, and visual (Topfer, 2011-2014). The exploratory nature of speculative drawing often allows it to take shape in the midst of questions and thinking that is unclear and unsure.

3.1 Lacto-fermented Cabbage: Making-With

Lacto-fermentation has been practiced cross-culturally for centuries to preserve seasonal fruits and vegetables. Bacteria present on their surface, such as *Lactobacillus*, convert sugars in the plant matter into lactic acid when submerged in a salt brine. This acidity inhibits the growth of other microbes which may compromise the livelihood of those working together in the ferment (Christensen, 2020). Once fermented, they can be kept in a cool dark place (such as a cellar or refrigerator) for months on end (Christensen, 2020). The lacto-fermentation of cabbage has a long history, and is practiced in various regions to produce culturally important ferments, such as kimchi in Korea and sauerkraut in Europe, Russia, and North America (Nout et al., 1983).

This case study drew inspiration from my experiences helping my mother can local peaches and tomatoes as a child: long summer days filled with fragrant boxes of cull fruit from a friend's orchard, hot glass jars, and bubbling juice and syrup. Filled jar upon filled jar were laid out on old newspaper across the kitchen floor, my young but avid ears put to the task of monitoring for the satisfying "pop!" of each one as it sealed. If they sealed properly as they cooled, they would be stored in our cellar to bring the taste of melting sunshine to the long winter darkness ahead of us. In *Wild Fermentation, Sandor Katz* (2016) relates how using the microbes present on the produce itself may preserve fruits and vegetables. The heat pasteurization we used when I was young would have killed much of these, which in its own way preserved the food. Curious about a craft practice which connects to place and human relationship, as canning with my mother did, but also interested in human-nonhuman relationship, I moved to lacto-fermentation for this project.

Instructions were followed from recipes posted online such as Emma Christensen's (2020), author, editor, and graduate of the Cambridge School for Culinary Arts. The exploration involved rinsing, peeling and thinly chopping locally-grown organic cabbage, sprinkling and massaging it by hand with sea salt, and packing it into a clean jar. Organic produce was sourced to increase the likelihood that the microbes from the living, local soil would still be present. Before chopping and packing I washed my hands and the jar with soap and water, but did not follow hyper sanitization techniques such as those practiced in industrial cheesemaking and other "fermentation" processes (Paxson, 2018). The cabbage was left open on a countertop in my home for five or six days, and periodically pressed

Hold

Chop

Salt

Massage

with a smaller glass vessel that fit into the mouth of the jar, in efforts to press the cabbage under the surface of its juices. The microbes present on the vegetables, the ambient apartment air, and my own skin produced a unique culture of fermenting microbes. These conditions produced a sauerkraut-like ferment that likely could not have been exactly re-created anywhere else in this world (Dunn, 2018).

Fermenting

During this days-long process, in order to ascertain the state of the ferment, I would periodically smell and taste it, a sensory "attuning-to" relying on embodied knowledge to confirm whether or not it was time to refrigerate and slow the fermentation process. At first it smelled like fresh cabbage and mildly salty, but then over time, as the *Lactobacillus* and others proliferated, it began to smell sharper and funkier. In parallel, bubbles appeared on the surface of the brine, the gaseous byproducts a further indicator of active fermentation and the production of lactic acid. Once it smelled and tasted appealing, I refrigerated it to stall the process at that specific stage (though it did not cease to be a dynamic entity; it continued to taste slightly more acidic over time, as I ate my way through the jar).

A ferment

Microbes and I repeated this process many times for the duration of this project, each time with different results. The ferments would taste different: more or less acidic, sweet, and/or "funky". This variable funk-factor at times produced an odour so pungent, I dared not feed the ferment to myself or anyone else. It is difficult to describe in writing the difference between good funk and bad, but the nose knows. Recipes from the online community of lacto-fermenters urge: "…use your best judgement when fermenting. If something smells or tastes moldy or unappetizing, trust your senses and toss the batch." (Christensen, 2020). What I sensed as appealing correlates to what is safe, nutritious, and delicious for humans (Flachs & Orkin, 2019). This knowing sensory perception has been developed through human evolution for our wellbeing, but has developed alongside others: it entangles our lives with the lives of ferments and other beings we have been eating and living with throughout our shared histories (Flachs & Orkin, 2019).

3.2 Sourdough: Nested Bodies

After working with microbes to produce fermented cabbage, I was inspired to expand my fermentation practice to sourdough by interdisciplinary researcher Maya Hey. In her article, Fermenting Communications, Hey (2017) explores how sourdough culture (the sharing of starters between people) creates bridges of communication between human and nonhuman bodies. A starter "born" in one kitchen can make its way through many others by way of being shared; within it are "borne" the traces of other bodies it has lived alongside.

A sourdough starter begins as nothing more than flour and water, left at room temperature in an unsealed container. Over one to two weeks, a wide range of microbes (including bacteria, molds and yeasts) from the flour and water mix, as well as the surroundings, populate the mixture (Leonti et al., 2019). The human fermenter must pay close attention to its smell, consistency, and other qualities, in order to sense when it has been populated by the specific species needed for it to become a sourdough starter. It will begin to smell like bread, and it must be regularly "fed" with flour to support these flour-eating microbes and those which thrive within the byproducts of this eating. Eventually, if successful, the necessary species will proliferate and fall into balance alongside each other, forming a symbiotic culture of bacteria and yeasts. This "culture" perpetuates itself due to each of the species living best within the conditions made by the others' metabolic activities (in particular, the acidity produced through the metabolizing of flour) (Katz, 2016). It is this acidity that gives the dough its characteristic "sour" flavour.

Once balance is attained, regular cycles of feeding with fresh flour and water (weekly if refrigerated, once to twice daily if not) must be followed to maintain it. As it is not an exact science, it is not necessary to be exact with feeding measurements; usually, the amount of flour and water required to feed it takes about half the volume of the starter itself. Here, what matters most is being consistent and developing the embodied know-how to sense how your starter is doing. Before feeding, the starters are halved in order to maintain a volume appropriate for whatever jar or container they live in, leaving room for them to bubble up with activity after being fed. The discard from this may be used as a levain in foods such as bread, muffins and pancakes, in place of industrially produced, dried yeast. If this cycle is not consistently maintained (an admittedly easy occurrence) and the starter becomes imbalanced, it may develop a rotten smell and black, grey, pink, or green fungal or mould growth on the top. In these cases it is necessary to "backslop": in other words, give a spoonful of it a fresh start in a new, clean container with fresh flour.

All of the sourdough starters I work with are from other people. One starter is from a friend, who received it from a friend, whom I have never met, despite being connected in a rather intimate, bodily way through our ferments. The second is a starter which hails back to 1940's France, passed through French and then Canadian bakers' hands over generations, going through countless microbial and human iterations before being given to me by a professional baker friend who works at a locally-owned bakery in Mount Pleasant, Vancouver. The third is a ferment born in the home of a colleague, meaning that they started it in their own home from a simple substrate of just flour and water. Thus began inter- and intra-species rela-

Feed

Mix

Fed

Rising

tionships, with the microbial cultures forming bridges between the multiple humans involved. With fermentation, "bodies meet despite differences in time, species and scales" (Hey, 2017, p. 150).

Three ferments to feed daily amounts to quite a lot of hands-on work over the course of a master degree. My fermentation practice ultimately became more about my labour to sustain the starters, rather than the other way around. Halving, then feeding, sometimes backslopping, and washing jars and implements became an automatic process by which my hands worked. The actions brought to mind thoughts of nested relations between my sensing and working body, its microbes, and those of the land I am on, the ambient air, the watershed, and the other human bodies who worked with the ferments before me. My occasional consumption of sourdough bread and pancakes from the sourdough discard (the result of halving) closed the loop — my gut microbes consumed that which I had consumed, which had consumed me. Occasions on which I had given the discard from my starters to others (friends, family members, and colleagues) enacted this process with yet another circle of human and microbial bodies.

Three starters

Balanced

Imbalanced (*mouldy*)

Eat

Make

Bake

4. Embodied Knowledge and the Relational Self

> *"So the recuperation of the incarnate, sensorial dimension of experience brings with it a recuperation of the living landscape in which we are corporeally embedded."*
> Abram, 1996, p. 65

The framework offered by Wilde et al. (2017) includes a set of questions with which to analyze the fermentation practice, shifting it to an embodied research praxis. In efforts to better connect and align the embodied design research community, they have developed and tested the following questions through which to discuss the work:

1. "What is done to *disrupt* the usual way of doing [something] or the current state of affairs?"
2. "What is *destabilised* by this disruption? What norms, traditions, structures or systems become — conceptually or physically — unstable?"
3. "What *emerges* from this destabilisation? What does it bring into awareness? How is the previous landscape altered?"
4. "What does this entire process *embody*? What idea, quality, or feeling does the process give tangible or visible form to?" (pp. 5161-5162)

The following sections will address each of these questions respectively.

4.1 Embodied Know-How: Disrupting mind-body duality in the practitioner

Since ferments are in a shifting state of becoming, practitioners must become aware of and attuned to minute biochemical changes to know how and when to halve, backslop, feed, and eat a ferment. They must develop visual, olfactory, auditory, and tactile sensitivity to assess its state at any given time (Hey, 2017). Over time, this sensitivity is heightened by ongoing

encounters with ferments, building a "sense memory" (Hey, 2017, p. 153) in the practitioner which carries over into successive making. This sensory sensitivity and memory culminates in an embodied knowledge that is distributed across the senses. Recipe books cannot sufficiently substitute for the embodied know-how that comes with the cumulative effect of the maker immersing their senses in the process. In this way, fermentation practice "distributes knowledge across the body instead of centralizing it in the analytical mind." (Hey, p. 153).

The two case studies in this paper provided rich sensory activity in the midst of my days, which were otherwise spent sitting behind the computer designing digital interfaces. The timing of my usual day was disrupted, punctuated by repetitive physical movement and sensory experience involved with washing, chopping, salting, massaging, packing, halving, feeding, stirring, mixing, cooking, baking, sniffing, tasting, feeling, and eating. The entangled needs of our living bodies shaped the structure of each day. It highlighted the connection between a more whole, embodied self and the living world, more so than I had felt in my design work for some time.

4.2 Embodiment: Destabilizing anthropocentric views of interaction

Höök (2018) explores phenomenologist Marcel Merleau-Ponty's ideas of embodiment as our subjective self, the way we perceive the world through our bodily and social presence (p. xix). It is the way we perceive and experience; "always in the world, with our bodies, sociality, and practices — we are inseparable from it" (Höök, 2018, p. xxi). Höök (2018) goes on to explore this in a design context, emphasizing how a first-person, bodily perspective (as opposed to third-person) may help designers design in a way which cares more for the life-worlds they impact. The world we experience sensorily and subjectively through our bodily experience of everyday living must be considered: rather than individual, it is a collective dimension — "the common field of our lives and the other lives with which ours are entwined" (Abram, 1996, p. 40).

Over the course of this project, microbes from my body have joined the multispecies community of microbes within the ferment (Dunn, 2018). This community achieved a balance, but *it has not solely been due to human action that these conditions arose* — it involved plants, water, air, and the microbes themselves which produced conditions beneficial to their companion species also hosted by the starter. They then in turn metabolized the food to become more nutritionally available to the microbes within the body of the eater (as in gut microbes, etc.). In this project, we have all fed, worked, and eaten — closing the circle of nested beings engaged together in inter-

dependent lifemaking (Haraway, 2016). Consequently, ideas of humans at the centre of the implicated [eco]systems and life-making processes have been destabilized.

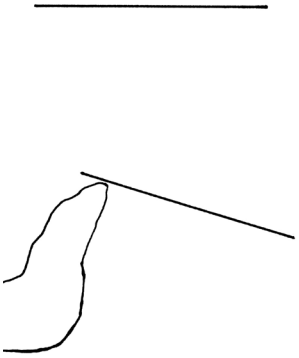
4.3 The Emergent Relational Self

Embodied knowledge, when examined in the context of collaborative multispecies making, holds implications for one's experience of being a subjective, perceiving body embedded in the world, engaged in life-making processes with others (Haraway, 2016). This, along with the engagement of our subjective self in the making and eating process, produces ongoing multispecies engagements that can serve as the basis for cultivating a "participatory, relational self" (Heldke in Hey, 2017, p. 155). This in turn "dismantles the hierarchical separation" (Hey, 2017, p. 156) between human and microbial agents of fermentation. We "do not precede their relatings; [we] make each other" through our "irresistible attraction to enfolding each other" which is the "vital motor of living and dying on earth." (Haraway, p.58) In other words, I have not "made" my ferments, they have made me. I am now made up of flour from my local mill, water from my local watershed, and the microbes from multitudinal sources: these have become my food, which has become the food of the microbes within my body. There is in fact no separation.

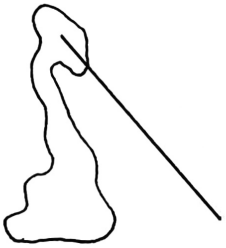
Ongoing cycles of living and sensing together conducted over the course of this project became a tangible, experiential way to explore ideas such as those presented by Armstrong: "The soil, the air, and all other life-forms contributed part to be our flesh" (1995). My flesh is made of the ferments I have lived and worked with, and their "flesh" is made of me (and other human/nonhuman collaborators along the way). As David Abram (1996) describes in *The Spell of the Sensuous*, Merleau-Ponty describes a collective Flesh which signifies both our flesh and "the flesh of the world." (p. 66). The Flesh is the intangible life matrix that generates both the perceiver and the perceived as interconnected limbs of itself. It is the reciprocal presence of the sentient in the sensible (other beings, which are sensed by us) and of the sensible in the sentient (we are simultaneously being sensed by those we are sensing). When approached this way, we can see that our own sensory perceptions and soma are but our part of "a vast, interpenetrating webwork of perceptions and sensations borne by countless other bodies" (Abram, p. 65). When we consider this, Abram (1996) suggests it could influence our behaviour and dominant assumptions of human exceptionalism.

Developing a relational self promotes a view of selfhood that is in relation to others, as opposed to separate or excepted from. In this way, the human is decentred and agency is distributed across others involved in the

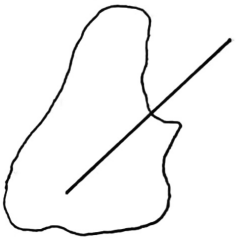
interactions (such as microbes) (Heldke in Hey, 2017). In fermentation, "a relational self can frame the human(s) as neither the sole actor(s) nor the sole eater(s)" of the process" (Hey, 2017, p. 156). It helps us reconceive the human as simply one of many participants in a wider meshwork of relationships. Through this project, I thought about my body and self differently. It became more wondrously porous in concept and experience. I thought about my design work differently. I saw how my social, subjective, aesthetic life was fully entangled with the lives of other beings (e.g. received ferments from other humans' homes). I understood all of this in a subjective, corporeal way — truly from the inside out. Nothing, no one, lives alone (Dunn, 2018). We are entangled in a meshwork of life which is inextricable from itself: this is closer to Puig de la Bellacasa's "ongoing collective reimagining of ecological existences" within our living world, as mentioned in the introduction.



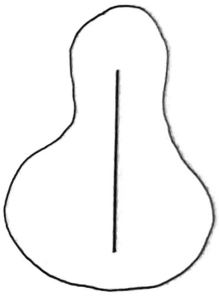
Disrupt



Destabilize



Emerge



Embody

4.4 Embodying a relational interaction praxis

In her book, *Matters of Care: Speculative Ethics in More Than Human Worlds*, Marìa Puig de la Bellacasa (2017) considers everyday activities of sustaining and perpetuating life, and their potential to transform Western relations to natural worlds as merely resources to support human life. To reimagine more caring relations, she uses a definition of care from Joan Tronto: care "includes everything that we do to maintain, continue and repair our world so that we can live in it as well as possible" (as cited in Puig de la Bellacasa, 2017, p. 3). This world includes "our bodies, our selves, and our environment, all of which we seek to interweave in a complex, life-sustaining web" (Tronto, in Puig de la Bellacasa, 2017, p. 3). An interconnected, relational understanding of care is in line with Puig de la Bellacasa's (2017) acknowledging the always-situated implications of care, and that to care means to enter into a relationship of mutual obligation and reciprocity. This extends to our work as designers. A change in the designer's aesthetic capacity, in an embodied sense through expanded sensory understanding, in turn changes their approach to design. If built into the common repertoire of interaction design, an embodied sensitivity may contribute to the development of a relational self in both the designer and the end-user (Höök, 2018).

Puig de la Bellacasa (2017) engages with Merleau-Ponty's conception of perceiver/perceived being one and the same through touch, and then extends this to say that to touch is to care: "In particular, touch's unique quality of reversibility, that is, the fact of being touched by that which we touch, puts reciprocity at the heart of thinking and living with care." (Puig de la Bellacasa, p. 20). She describes this reciprocity of care as having less to do with individual actors giving and then receiving, but by "a collective

disseminated force" (Puig de la Bellacasa, p. 20). This collective force, as enacted through the living and sensing body, can be experienced as something far greater than any human actor(s). When reminded of this, we can consider ourselves corporeally embedded within the world, neither above or below other beings, and responsible to act as such.

By following Armstrong's, Merleau-Ponty's, Höök's, and Puig de la Bellacasa's ideas, we can see that it is not simply the human body but a larger, connected life-body we are implicating in our designs, and finally that implicating this body necessitates a relationship of care and obligation not just to the human body, but to the overarching life-body. As such, care for the "body-self is not separable from peoplecare and Earthcare" (Puig de la Bellacasa, p. 150). These ideas provide the framework for my fermentation practice: by working via a material practice such as fermentation, engaging with more-than-human actors such as microbes, plants, and water, and following embodied design methods, I am implicating in my design work the life-body or Flesh of which we are all a part, and myself in a caring reciprocal and obligatory relationship with it.

5. Conclusion

The explorations within this project utilised an at-home fermentation lab, selected and adapted embodied research methodologies, and involved other exploratory work (such as drawings and sensory sketches involving the body, sensory experience, and other beings), and practitioner narrative. Conducting research from a body-first perspective invited into the work ecosystems within which my body is nested (and which I have nested within me). Halving, then feeding, sometimes backslopping, and washing jars and implements became an automatic process by which my hands worked. The actions brought to mind thoughts of nested relations between my sensing and working body, its microbes, and those of the land I am on, the ambient air, the watershed, and the other human bodies who worked with the ferments before me.

Wilde's et al. (2017) embodied design framework aided this work by offering prompts through which to discuss and contextualize the sometimes difficult-to-describe work of embodied exploration. Through these, I have described how a material fermentation practice holds implications for one's experience of being a subjective, perceiving body embedded in the world, with others. Mind-body separation in the maker is *disrupted*, as the praxis engages knowledge which is not centralized in the analytical mind. Rather, it does not differentiate between mind and body at all, and results from their interdependence. Ideas of human exceptionalism within interactions and making are *destabilized*: the human is not the only maker, nor the only eater, of this process. The microbes the human seeds and feeds within the ferment, in turn seed and feed the microbes within the human: multiple human and innumerable microbial bodies form nested collective bodies. A more relational self *emerges*, felt through the body as this sensitivity develops. Developing a relational self promotes a view of selfhood that is in relation to others, as opposed to separate or excepted from. A change

in the designer's perception, in an embodied sense through expanded sensory understanding, in turn changes their approach to design.

Building this kind of body-first approach into the common repertoire of interaction design may contribute to a more situated sense of designing in and with the living world around us: it invites into the work ecosystems within which our bodies are nested (and which we have nested within us), in order to help cultivate the perception of a relational self which is deeply invested in our interconnected living systems. By *embodying* a relational design research praxis through engaging with more-than-human actors such as microbes, plants, and water, and following embodied design methods, I am implicating in my design work the life-body or Flesh of which we are all a part, and myself in a caring reciprocal and obligatory relationship with it.

This work aims to contribute to a reframing of how we understand interaction design, a predominantly symbolic and language-oriented discipline, as one which centres bodily movement and sensory appreciation. It has shifted my own conceptions and experience of my daily service design practice, in that it has developed my understanding of entanglements with human and nonhuman stakeholders in any work that I do. It has driven home the concept that we are in fact made from our relatings with each other (Haraway, 2016). There is a necessity for interaction design as a field to encourage the development of body-first sensitivities of researchers and practitioners: rationale for this often centres on designing better and healthier emerging technologies, but this project has been concerned with ways in which we may connect with other living bodies and systems via the soma. In our common assumptions of human exceptionalism, we often forget how entangled we are with myriad other living systems. Interaction design being concerned with experience, this project has been primarily concerned with shifting experience such that we perceive the truth of our shared existence. It has been less about doing and creating, than becoming, being.

This project was developed in an intimate and domestic context, and thus I cannot claim that it may have far-reaching impacts on others, nor that it may solve large and systemic problems. adrienne maree brown's concept of fractals may serve as a useful concept for considering how this project may scale; if "how we are at the small scale is how we are at the large" (brown, 2017, p.45), then a small and close praxis such as this may indeed impact larger paradigms and eventually contribute to a dismantling of human exceptionalism on a societal scale. However, for now it remains just one project that has profoundly shifted the worldview and practice of just one human, and her constituent microbes.

Reference List

Abram, D. (1996). *The Spell of the Sensuous*. Penguin Random House LLC.

Armstrong, J. (1995). *Keepers of the Earth*. http://sacredland.org/wp-content/PDFs/KeepersoftheEarth.pdf

Armstrong, J. (2002). *Human Relationship as Land Ethic*. [Video]. YouTube. https://www.youtube.com/watch?v=qwNoX3MNisE&ab_channel=Bioneers

Armstrong, J. (2011). *Indigenization* [Video]. TEDxOkanagan College. You Tube. https://www.youtube.com/watch?v=jLOfXsFlb18&ab_channel=TEDxTalks

brown, a. m. (2017). *Emergent strategy: shaping change, changing worlds.* Ak Press.

Berrigan, C. (2014). Life Cycle of a Common Weed. In E. Kirksey (Ed.) *The Multispecies Salon* (pp. 164-178). Duke University Press.

Brennan, A. & Lo, Y. Environmental Ethics. In E. N. Zalta (Ed.) *The Stanford Encyclopedia of Philosophy* (Winter 2020 Edition). https://plato.stanford.edu/archives/win2020/entries/ethics-environmental/>.

brown, a. m. (2019). *Pleasure activism: The politics of feeling good*. AK Press.

Chadwick, R. (2017). Embodied methodologies: challenges, reflections and strategies. *Qualitative Research*, 17(1), 54–74. https://doi.

org/10.1177/14687941166560 35

Christensen, E. (2020, January 29). *How to Make Homemade Sauerkraut in a Mason Jar*. Retrieved March 15, 2021, from https://www.thek itchn.com/how-to-make-homemade-sauerkraut-in-a-mason-jar-193124

De La Bellacasa, M. P. (2017). *Matters of care : speculative ethics in more than human worlds.* University Of Minnesota Press.

Dunn, R. R. (2018). *Never home alone: From microbes to millipedes, camel crick ets, and honeybees, the natural history of where we live*. New Basic Books.

Eckersley, R. (1992). *Environmentalism and political theory.* State University of New York Press,

Flachs, A., & Orkin, J. (2019). Fermentation and the Ethnobiology of Microbial Entanglement. *Ethnobiology Letters*, 10(1), 35-39. doi:10.2307/26910053

Ham, J. R. (2017). Cooking to Be Modern but Eating to Be Healthy: The Role of Dawa-Dawa in Contemporary Ghanaian Foodways. *Food, Culture & Society* 20:237–56. DOI:10.1080/15528014.2017.1305827.

Haraway, D. (2016). Staying with the Trouble: Making Kin in the Chthulucene. Duke University Press.

Heldke, L. M. (1992). Food politics, political food. *Cooking, Eating, Thinking. Transformative Philosophies of Food*, 301-27.

Hey, M. (2017). Fermenting Communications: Fermentation Praxis as Interspecies Communication. In M. Tromble & P. Olynyk (Eds.) *Interspecies Communication* (pp. 149-157) Public.

Höök, K. (2018). *Designing with the body: Somaesthetic interaction design*. The MIT Press.

Jang, D., K. R. Chung, H. J. Yang, K. Kim, and D. Y. Kwon. 2015. Discussion on the Origin of Kimchi, Representative of Korean Unique Fermented Vegetables. *Journal of Ethnic Foods* 2:126–36. DOI:10.1016/j.jef.2015.08.005.

Jasarevic, L. 2015. The Thing in a Jar: Mushrooms and Ontological Speculations in Post-Yugoslavia. *Cultural Anthropology* 30:36–64. DOI:10.14506/ca30.1.04.

Katz, S. E. (2016). *Wild fermentation: The flavor, nutrition, and craft of live-culture foods.* Chelsea Green Publishing.

Kimmerer, R. W. (2014). *Braiding sweetgrass : indigenous wisdom, scientific knowledge and the teachings of plants*. Milkweed Editions.

Kolko, J. (2011). *Thoughts on Interaction Design*. Morgan Kaufmann.

Leonti, A., Parla, K., Vetri, M., & Lee, A.T. (2019). *Flour lab: an at-home guide to baking with freshly milled grains*. Clarkson Potter/Publishers.

Lorde, A. (2020). Sister Outsider. In R. Gay (Ed.) *Selected Works of Audre Lorde* (pp.). WW Norton. (Original work published in 1984).

Margulis, L. & Sagan, D. (2007). *Dazzle Gradually: Reflections on the Nature of Nature.* Chelsea Green Publishing Company.

Meadows, D. H. (2009). *Thinking in Systems: A Primer*. Earthscan.

Merleau-Ponty, M. (1962). *Phenomenology of perception*. Routledge.

Museum of Contemporary Art. (2007). *WACK! Art and the Feminist Revolution* [Exhibition catalogue]. Cambridge, MA: MIT Press.

Nout, M.J. & Sarkar, Prabir & Beuchat, L.R.. (1983). Indigenous fermented foods. *Food microbiology: fundamentals and frontiers*, 3rd edition.

O'Connor, E. (2005). Embodied knowledge: The experience of meaning and the struggle towards proficiency in glassblowing. *Ethnography*, 6(2), 183-204. http://www.jstor.org/stable/24047956

Oelschlaeger, M. 1991. *The idea of wilderness: From prehistory to the age of ecology*. Yale University Press

Olsen, A. (2002). *Body And Earth: An Experiential Guide*. Middlebury College Press.

Oliver, M. (2017). *Devotions: the selected poems of Mary Oliver.* NW Orchard LLC.

Pinto, S. (2020). *Infamous Bodies: Early black women's celebrity and the afterlives of rights*. Duke University Press.

Paxson, H. (2008). Post-Pasteurian Cultures: The Microbiopolitics of Raw Milk Cheese in the United States. *Cultural Anthropology*. 23(1), pp. 15-47. https://doi.org/10.1111/j.1548-1360.2008.00002.x

Redzepi, R. and Zilber, D. (2018). *The Noma Guide to Fermentation.* Artisan.

Menakem, R. (2017). *My grandmother's hands: racialized trauma and the pathway to mending our hearts and bodies.* Central Recovery Press.

Rodman, J. (1980). Paradigm change in political science: An ecological perspective. *American Behavioral Scientist*. 24: 49-78.

Şanlier N, Gökcen BB, Sezgin AC. Health benefits of fermented foods. *Crit Rev Food Sci Nutr*. 2019;59(3):506-527. doi:10.1080/10408398.2017.1383355. Epub 2017 Oct 20. PMID: 28945458.

Simpson, L. (2017). *As we have always done : indigenous freedom through radical resistance*. University Of Minnesota Press.

Spatz, B. (2017). Embodied Research: A Methodology. *Liminalities: A Journal of Performance Studies*, 13(2). http://liminalities.net/13-2/embodied.pdf

Tronto, J.C. (1993). *Moral Boundaries: A Political Argument for an Ethic of Care*. New York: Routledge.

van der Kolk, B. (2015). *The body keeps the score : brain, mind and body in the healing of trauma*. Penguin Books.

Wilde, D., Vallgårda, A., & Tomico, O. (2017). Embodied Design Ideation Methods: Analyzing the Power of Estrangement. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, 5158-5170. doi:10.1145/3025453.3025873

Yotova, M. 2017. The "Goodness" of Homemade Yogurt: Self-Provisioning as Sustainable Food Practices in Post-Socialist Bulgaria. *Local Environment* 23:1063–74. DOI:10.1080/13549839.2017.1420048.