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THINKING THROUGH FERMENTING

Microbes, Identities, and the Culture of Care

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The taste of partial spoilage can become a passion,
an embrace of the earthy side of life that
expresses itself best in paradoxes.
Harold McGee

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This work is dedicated to all the multispecies companionships that shape our existence: to the others who live with us and around us, seen and unseen.

To my family, and to the family I have gathered along the way, whose love and support continue to shape the person I am becoming.

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INTRODUCTION

The term *fermentation* derives from the Latin *fervere*, meaning "to boil." Often described as a "cold fire," it is an effervescent process through which microorganisms transform the flavor, texture, and stability of foods. As Katz (2020, p. 10) writes, "anything bubbly, anything in a state of excitement or agitation, can be said to be fermenting."

Fermentation is ubiquitous: it permeates not only the microbial worlds of food but also resonates metaphorically within culture, politics, and ideas — all of which exist in continuous states of transformation. Beyond a biochemical reaction, fermentation can also be understood as a form of activism, or even rebellion. Today, the simple act of preparing a jar of sauerkraut at home can be read as a gesture of resistance against the fast-paced rhythm of modern life. Home fermentation resists the industrial logic that has standardized taste and drained food of its soul and significance. To ferment is to reclaim agency: it is an act that nourishes both our inner and outer worlds, powered by thousands of microbes that work against uniformity by enriching our bodies and our surroundings. Fermentation, however, does not only nourish the individual body — it also feeds the culture and society that surround us. As Anna Tsing (2015) reminds us in *The Mushroom at the End of the World*, life itself unfolds through entanglement, collaboration, and regeneration within the ruins of modern systems. In this sense, fermentation echoes the idea that "we have never been individuals" (Gilbert *et al.* 2012) but rather constellations of relations — microbial, cultural, and ecological — continually shaping and being shaped by one another.

Moreover, fermentation embodies a relationship of care — firstly towards ourselves, as we take time to chop, salt, and mix our own vegetables, and then towards the microbes themselves, feeding and guiding them through the transition from life to transformation. In this *sympoietic* process — this practice of *making-with* — when we later consume what we have become, we complete the circle of life, nourishing both body and meaning (Haraway 2016). This act reminds us that eating is never a solitary gesture but part of a continuous exchange — a dialogue between self and the world. Heldke (2018) emphasizes the interconnection between food, culture, and society as parts of a single, entangled whole. In the context of fermentation, these principles become tangible. On a biological level, food fermentation depends on organisms invisible to the naked eye — yeasts, bacteria, and molds — that metabolize sugars into acids or alcohols, generating complex aromatic profiles while extending the shelf life of foods (Katz 2020).

Fermentation is more than a biochemical reaction. Fermented products are living systems, constantly evolving and transforming. In this sense, they nourish us from within and beyond, reminding us that transformation is an essential condition of life itself. Throughout history, every

culture has developed distinctive fermentation techniques, shaped by geography, climate, and the specific microbial ecologies of their environments. Yet, fermentation is not solely determined by place; it is also profoundly personal. Compared to the raw ingredients from which they are made, fermented foods have unique flavors, textures, appearances, and functionalities (Tamang *et al.* 2020). The microorganisms residing on human skin, inhabiting our hands, and circulating in the spaces we occupy, contribute to the singularity of each ferment. Thus, fermentation becomes an intimate dialogue between the self and the food placed before it. Moreover, fermentation transcends its biochemical mechanisms to encompass broader philosophical and cultural dimensions. It engages with questions of identity, temporality, and relationality, standing at the crossroads of the material, metaphorical, and symbolic. For this reason, while this thesis is primarily philosophical, it necessarily draws on additional fields such as anthropology, microbiology, and cultural studies to reflect the complexity of a phenomenon that is at once universal and deeply situated.

The aim is to shed light on the intricate microbial worlds that surround and constitute us, and to consider their implications for rethinking human identity, responsibility, and coexistence. The present work suggests a broad and integrated vision of the world of fermentation. Traditionally, fermentation has been studied primarily through microbiological and chemical perspectives, focusing on processes, reactions, and measurable outcomes. While these dimensions are essential, they capture only a part of a much larger picture. The purpose of this research is therefore to create a dialogue between scientific knowledge and humanistic inquiry, uniting two visions that are often treated separately. My interest in focusing on fermentation arises from several motivations. First and foremost, it is driven by a deep personal passion for food, fermentation, and food cultures. I believe that food represents the most intimate relationship we have with ourselves, with those we love, and with the environments that sustain us. Fermentation, in particular, is deeply rooted in place. It is shaped by an expression of the ecological and cultural context in which it develops. Consider, for instance, how one may feel an instant connection to the intricate flavors of blue cheese, yet struggle with the pungency of kimchi or natto — while, for a Korean friend, the experience is reversed. Fermentation thus reflects not only biochemical transformations, but also cultural identities, memories, and aesthetic boundaries. This project is also informed by my professional experiences in Michelin-starred restaurants, where I had the opportunity to experiment and create with fermentations in practice. These experiences allowed me to appreciate fermentation both as a creative culinary tool and as a complex chemical process, sparking my desire to explore the interplay between practice and theory. Finally, my years of study at the University of Pollenzo have opened up a new perspective: philosophy. Our academic journey encouraged us to view food through a holistic and critical lens, questioning not only how we eat but also what it means to eat in relation to identity, culture, and

ecology. This philosophical perspective makes it possible to reframe fermentation as more than a scientific phenomenon: as a relational act, and even a way of thinking.

Every act of fermentation — from the microbial transformation of milk into yogurt through pH and temperature variations, to the fermentation of grains that produces bubbling beer or bread, or the pressing of ripe grapes that becomes wine capable of evolving and preserving over time — tells a story of transformation. These processes unveil an underlying interconnection: an embodied (and often tacit) form of knowledge transmitted through practice rather than writing. Throughout human history and across cultures, such transformations have expressed — and continue to express — a profound relationality, one that speaks not only of evolution but also of the continuous transition between life and death, the closing and reopening of the circle of existence. In all these metamorphoses, we can sense — without seeing — an invisible web of coexistence and interdependence among humans, culture, microbes, and food. These connections and their symbolic meanings have been recognized since the earliest forms of food transformation, which attributed sacred and ritual value to products such as wine and bread — foods dense with symbols that persist to this day. As Perullo (2020) argues, wine should not be understood as a fixed object but as a relational event: a form of knowledge that emerges through experience, interpretation, and embodied participation. In this sense, the symbolic depth of these foods lies not only in their historical ritual value, but in the way they continue to generate meaning through the act of encountering them.

By weaving together these personal, scientific, and philosophical dimensions, this research aims to unify aspects of fermentation that have long been studied in isolation. The ambition is to restore its full complexity (material, symbolic, and metaphorical), revealing how fermentation can serve as both a biological process and a cultural practice that challenges us to rethink our relationship with food, with time, and with the invisible worlds that surround us. The research was conducted using academic databases such as Google Scholar and EBSCO, which made it possible to consult a wide range of scientific articles and papers. Additional materials were gathered from the library of the University of Gastronomic Sciences in Pollenzo, whose extensive collection of books on gastronomy, philosophy, and fermentation proved fundamental to the successful development of this work.

The thesis consists in three main chapters: the first chapter explores the concept of relational subjectivity and fermentation as a relational practice, introducing the philosophical and scientific foundations upon which this inquiry is built. It examines how microbes challenge our anthropocentric understanding of individuality and agency, inviting us to reconsider what it means to exist *with*, rather than *apart from*, other forms of life. Through the lens of thinkers such as Haraway, Latour, and Ingold, this section investigates how microbial processes can be understood as models of symbiosis,

communication, and co-becoming, forming the groundwork for a more entangled vision of life and knowledge.

The second chapter focuses on embodied knowledge, fermentation, care, and culture looking beyond the human, exploring how microbial activity becomes a site of encounter between biology, philosophy, and the senses. Fermentation is not treated solely as a biochemical process, but as a practice of care and reciprocity, where the maker, the microbes, and the environment co-create conditions for transformation. As Patel (2008) suggests in her work on *embodied thinking and learning in practice*, the kitchen itself becomes a site of thought, where cognition is distributed across bodies, tools, and materials, and where making and thinking are inseparable acts.

The third chapter addresses the philosophy of taste and repulsion, showing how perception governs (and is governed by) our moral, cultural, and aesthetic distinctions. It considers how microbial life and fermentation transform our understanding of what is edible, permissible, and beautiful through processes of renewal. This reflection culminates in a case study on kombucha, a living symbiotic culture that serves both as metaphor and material example of coexistence, interdependence, and creative decay.

In conclusion, this thesis contributes to a post-anthropocentric vision of gastronomy, proposing a redefinition of self and identity through the intimate relationship between humans and ferments. By weaving philosophical thoughts with scientific understanding and lived experience, it shows how fermentation — both microbially and metaphorically — has shaped human history, culture, and imagination. Finally, it reflects on the ethics of care and the responsibility we carry toward such an invisible world, framing fermentation as an act of creation, of attention and reciprocity, and even of rebellion — a subtle yet radical gesture that resists separation, control, and the illusion of human autonomy.

1. FERMENTATION AND THE ONTOLOGY OF BECOMING

1.1 THE MICROBIAL ECOLOGIES

Fermentation is one of the most ancient and fundamental processes in the history of food transformation. Fermented foods were not exactly human inventions; they are natural phenomena that people observed and then learned how to cultivate (Katz 2012, p. 12). They have been consumed by humans for thousands of years. Although they were likely produced initially as a means of preservation, it would have been readily apparent that these foods possessed other desirable attributes (Tamang *et al.* 2020). Biochemically, fermentation can be defined as a metabolic process in which microorganisms convert organic substrates, primarily carbohydrates, into simpler compounds such as organic acids, alcohols, and carbon dioxide under anaerobic or microaerophilic conditions (Adams & Moss 2008). This process allows food to be preserved, enhances flavor and texture, creates new sensory and nutritional properties that would otherwise not emerge through ordinary cooking or storage (Belitz, Grosch & Schieberle 2009).

At the microbiological level, fermentation is carried out by a wide range of microorganisms, including yeasts, lactic acid bacteria, acetic acid bacteria, and filamentous fungi, each providing distinct biochemical reactions and ecological dynamics (Tamang, Watanabe & Holzapfel 2016). Yeasts such as *Saccharomyces cerevisiae* metabolize sugars into ethanol and carbon dioxide, while lactic acid bacteria like *Lactobacillus*, *Leuconostoc*, and *Pediococcus* transform sugars primarily into lactic acid, contributing to the acidification and preservation of food. Molds, including *Aspergillus* and *Rhizopus*, secrete enzymes that break down complex carbohydrates and proteins, facilitating both flavor development and nutrient availability (Hutkins 2006). From a chemical perspective, fermentation involves a complex interplay of enzymatic reactions that alter the molecular composition of food. Carbohydrates are converted through glycolysis and fermentation pathways into energy-rich end products such as lactic acid, ethanol, or acetic acid. These transformations not only inhibit the growth of spoilage organisms but also generate volatile compounds responsible for the characteristic aroma and taste of fermented foods. Proteins and lipids are likewise modified, releasing peptides, amino acids, and fatty acids that further enrich the sensorial and nutritional profile of the product (Belitz *et al.* 2009).

Flavorful and rich umami cheeses owe their complexity to the breakdown of long lipid chains into short-chain fatty acids that easily reach our senses. As Heather Paxson (2013, p. 4) observes, “preparing food — such as making cheese — invites creativity; through food, and food preparation, people solidify a sense of self and connect (or distance) themselves from others.” In this light,

fermentation and cheesemaking emerge not only as biochemical processes but also as cultural and relational acts — practices through which individuals engage with materiality, memory, and identity. Each transformation, whether microbial or human, becomes a gesture of connection, an act that ties sensory experience to social and ethical meaning. Historically, food fermentation has been practiced within a sense of community and commoning. An example of this is the collective production of wine or kimchi in Korea. This is due to the fact that traditionally fermented foods speak the language of their human and more-than-human ecology, reflecting the unique environmental niche and the specific characteristics of the bacteria inhabiting our hands, the air, and the surrounding environment. For instance, the French vin Jaune or the production of Sherry in Spain demonstrate this connection: in both cases, the barrels containing the wine develop an internal layer of microflora composed of yeasts and bacteria, which regulate oxidation and guide the fermentation process. Fermentation thus reflects a strong co-evolutionary relationship, where processes are, as Katz (2012, p. 10) describes, "*infinitely interconnected*."

Moreover, bacteria have attracted increasing interest in recent years. As Sawant *et al.* (2025) explain, the evolution of microbial capabilities has led to significant shifts in the global food industry and consumer preferences. There is now a growing demand for foods that not only satisfy basic nutritional needs but also contribute to overall health and well-being — so-called functional foods, which offer additional health benefits beyond their inherent nutritional value. Fermentation plays a crucial role in this evolution, as microorganisms can enhance the bioavailability and concentration of essential nutrients such as vitamins, minerals, and amino acids in food products. For example, through fermentation, microbes can increase the levels of B vitamins or convert nutrient precursors into bioactive compounds, making them more easily absorbed by the human body. With the advancement of microbial sciences and industrial biotechnology, researchers and producers have learned to identify, isolate, and select specific strains of bacteria and yeasts. These strains are now packaged, commercialized, and distributed globally, allowing their application across a wide range of environmental conditions and cultures. This scientific progress has given us the ability to experiment, innovate, and develop an unprecedented variety of new fermented products.

Following the Covid-19 pandemic, microbes returned to the center of public attention. The widespread use of antimicrobial agents, sanitizing gels, and disinfectants fostered an atmosphere of excessive hygiene, often resulting in a form of germophobia — a pervasive fear of microbial life. This constant sanitization, combined with prolonged indoor confinement and reduced exposure to environmental microbiota, sunlight, and soil, has been associated with an imbalance of the human microbiome and an increased prevalence of mental health issues such as stress and depression (Logan

& Katzman 2005; Rook 2013; Prescott 2020). While part of the population developed a heightened anxiety toward microbes — what Katz (2012, p. 13) described as a "*war on bacteria*" — another part began to recognize their essential role in maintaining ecological balance, immunity, and well-being. This ambivalence was also reflected in food cultures, where fermented foods and microbial practices gained renewed attention as both symbols of reconnection with nature and counter-narratives to excessive sterilization. The post-pandemic awareness reshaped public attitudes toward microbial life, influencing not only consumers but also farmers, producers, and chefs.

In response, fermented foods have come to embody a growing desire for products that combine sensory richness with enhanced nutritional bioavailability. This revival has taken place not only within the industrial food sector but has also been driven by fine dining restaurants such as *Noma* in Copenhagen and *Mugaritz* in San Sebastián. These pioneering kitchens were among the first to explore the full potential of fermentation in terms of flavor, texture, and sustainability, using microbial transformation as both a creative tool and a no-waste approach. Both restaurants have since become international reference points, establishing dedicated fermentation labs and educational programs that continue to inspire chefs and researchers worldwide.

Yet, the human relationship with fermentation is far from new. Over time, humans have learned to consume overripe fruits with alcoholic aromas, and later to domesticate microbial activity, developing diverse fermentation techniques across cultures, from sourdough and yogurt to kimchi, miso, and wine. As Katz (2012) notes, fermentation represents both a biological process and a cultural practice, one that reflects humanity's evolving relationship with the microbial world. Thus, while rooted in biochemistry and microbiology, fermentation also embodies a profound ecological and relational dimension, positioning humans as co-creators alongside invisible microbial agents. Ultimately, fermentation reveals how scientific understanding and cultural practice converge within a shared ecological framework. It invites us to reconsider knowledge as a living process — one that emerges from cooperation, adaptation, and the constant negotiation between human intention and microbial agency.

1.2 RELATIONAL SUBJECTIVITY

Our relationship with microorganisms has existed since the very emergence of human beings on Earth. This interrelation does not concern only humans and microbes but involves all forms of life that surround us. Plants, for instance, benefit from the presence of mycorrhizae living in their roots. This invisible, symbiotic network enables more efficient nutrient uptake and supports plant resilience (Martin *et al.* 2024; Wu *et al.* 2024). In agricultural contexts, mycorrhizal inoculation has shown positive effects on crop performance and quality (Oggiano *et al.* 2021; Thünen Report 88). Moreover,

arbuscular mycorrhiza can enhance phosphorus acquisition and, under low-P conditions, stimulate biological nitrogen fixation, further strengthening plant nutrition and stress tolerance (Ingraffia *et al.* 2019; Ahmed *et al.* 2025).

As Tsing (2015) observes, bacteria laid the foundation for the oxygen-rich atmosphere that sustains life, an equilibrium maintained by plants which, in turn, depend on fungi able to digest rocks and release the minerals that nourish the soil. Just as microbes and plants live in constant relationship with the environment, so too do humans — our lives are deeply entangled with those of bacteria, fungi, and microorganisms that have long overlapped with our existence. Tsing reminds us that "humans, pines, and fungi find simultaneous ways to live and to make life possible for others: these are multispecies worlds" (Tsing 2015, p. 51). Likewise, "all organisms create ecological niches in which to live, altering the earth, the air, and the water". Following her observation, we can see how this perspective challenges anthropocentrism, the worldview that places the human species at the center by providing it with the primary power of transforming the world. In contrast, Tsing proposes a shared, multispecies process that challenges the assumption that only humans can shape reality. In this sense, fermentation becomes a practice of reconnection between humans and microbes — a relational process in which each depends on the other, challenging the human-centered view that positions microbes as enemies to be fought. Within this perspective, microbial activity embodies participation and care in the generation of new forms of life and community. Just as humans, pines, and fungi co-create landscapes after fire, fermentation reflects this collaborative renewal, reminding us that we are immersed in the same web of life.

In this light, fermentation stands as a quiet metaphor for coexistence — a reminder that transformation, decay, and creation are not separate acts but continuous gestures of life. Through the invisible work of microbes, humans learn to collaborate with change itself, embracing the porous boundaries between self and the world. Fungi, once again, play a fundamental role in this cycle, acting as a bridge between decay, death, and new birth: by breaking down organic matter and returning it to the soil, they make possible the emergence of new life through their relationships with plants and microorganisms. Within this framework of co-relation and interbeing between humans and microbes, the statement by the philosopher Ludwig Feuerbach, "Man is what he eats" (1850/2017), can be read quite literally. What we consume nourishes not only our cells but also the microbial communities that, in turn, influence our health and identity. For instance, prebiotics provide nourishment to the beneficial bacteria — our probiotics — living within our intestines, sustaining the balance and functionality of this symbiotic system. Recent studies have demonstrated that a healthy gut microbiota is closely linked to the proper functioning of the central nervous system, while dysbiosis — or

microbial imbalance — has been associated with conditions such as anxiety, depression, schizophrenia, and autism spectrum disorders (Clapp *et al.* 2017).

To capture this complexity, the concept of the holobiont has been introduced (Rosenberg *et al.* 2007), describing the organism as an integrated assemblage composed of the host and its persistent populations of symbionts. This perspective radically reframes our understanding of individuality: an organism is no longer a closed entity, but a collective of interconnected beings, co-evolving and co-creating the conditions of their shared existence. As Gilbert, Sapp, and Tauber (2012) argue in "We Have Never Been Individuals," our bodies must be understood as holobionts whose anatomical, physiological, immunological, and developmental functions have evolved through the shared relationships of different species. The human body thus represents a complex ecosystem of interactions both inside and outside the boundaries of our skin.

As Katz (2020, p. 1) reminds us, even the skin is an edge that separates that which is within us from that which is outside us. Yet sunlight absorbs into it and countless other creatures can pierce it — it is in fact a porous membrane, an open site of exchange and communication between the two. Through the skin, the body regulates temperature and interacts continuously with the surrounding microbial world. This living interface reminds us that our bodies are not isolated entities but fermentative landscapes, constantly negotiating the balance between protection and permeability, self and the environment.

1.3 ONTOLOGIES OF BECOMING

As Ingold (2001) writes, *there is a state not of being but of becoming*. In other words, he proposes a shift from ontology to ontogeny. While ontology concerns what it takes for something to exist — its essence or mode of being — ontogeny refers to the process through which that being comes into existence: its growth, transformation, and unfolding through relations. Translating this concept into the context of the present thesis, raw materials belong to the realm of ontogeny, as they are not static entities but participants in ongoing processes of formation and transformation. Each ingredient — living or apparently inert — is part of a dynamic web of becoming: biological, chemical, and relational. In the act of fermentation, this process becomes tangible. Raw matter comes to life through transformation, in an ongoing cycle where life and death continuously intertwine. Vegetables, for instance, decompose and regenerate through microbial activity, entering into new forms of existence.

Considered from a materially ontogenetic perspective, eating is an activity in which one freestanding substance ingests another and turns it into parts of itself. Lions eat impala. Cows eat grass. The grass was separate; now it is not. The impala was freestanding; now some of it has become lion substance (Heldke 2018). In the context of fermentation, this dynamic unfolds on a microscopic

scale: not through predation or destruction, but through a continuous cycle of microbial competition, succession, and renewal. Within the fermenting matrix, countless microorganisms struggle for dominance — some thrive, others die, and in dying, create the very conditions that allow new forms of life to emerge. The death of one colony nourishes another; the transformation of one species becomes the substrate for the next. Fermentation thus reveals a vital ecology of tension and exchange, where coexistence is inseparable from conflict, and decay itself becomes a generative force of balance and renewal. Microbes consume sugars and reshape matter, while we, in turn, consume the outcomes of their labor. The act of fermentation thus mirrors the ontological entanglement of life itself — a symbiotic becoming in which creation and decay, self and other, continuously exchange places. This interdependent process finds its most vivid expression in the practice of fermentation. The bacteria present on our hands and in our environment interact with those already inhabiting the vegetables themselves. These microbes, in a sense, "speak" of the soil in which the vegetables were grown, and later, in the jar, they connect and bond with the microbial life of our kitchens. Yet fermentation is not an instantaneous event: it is a slow process that unfolds through time and care. In this encounter, both entities — the maker and the fermenting matter — undergo mutual transformation, becoming new entities in which one can no longer be clearly distinguished from the other. Much like lichens, which are neither singularly fungus nor alga but a composite being born of symbiosis, fermentation blurs the boundaries between self and other, culture and nature, human and microbe (Gilbert *et al.* 2012).

Fermentation thus alters both the substance of the ingredient and the identity of the maker, revealing how matter and subject co-evolve within the same vital continuum. This relationship extends into our gut. Following Lisa Heldke's (2018) "donut theory," we are *creatures with a hole through our centers* — our digestive system exposes the most intimate part of ourselves to the external world. Through eating, the outer world literally passes through us: we eat the world, bite by bite, incorporating food, components, and microbes that become part of our internal ecosystem (Midgley 1996). Like plumbing, our gut represents a complex microbial culture integrated within a broader biological system. Here, microbes act as mediators of flow — of nutrients, energy, and meaning — sometimes harmonizing the system, sometimes disturbing it. The same microbial agents that sustain life can, when imbalanced, become vectors of malfunction. Fermentation, in this light, mirrors our own inner processes: a delicate equilibrium between creation and decay, between self and other (Boisvert & Heldke 2016)

Yet eating is far more than a biological necessity—it is an act that transgresses boundaries, capable of bringing peace, creating community, and uniting souls. Eating is an intimate act, rich in both written and unwritten meanings and rules. As an ontological relationship, it offers a radically different interpretation, as suggested by Heldke (2012): eating is not the mere assimilation of one

substance by another, but a moment of mutual transformation, where the boundaries between eater and eaten, subject and object, dissolve. Through this lens, food is not an inert object but a participant in a shared process of becoming, an agent that co-produces life. This perspective resonates with Haraway's (2016) notion of sympoiesis, "making-with," in which all beings, human and nonhuman, are enmeshed in the same fabric of interdependent creation.

1.4 FERMENTATION AND POST-ANTHROPOCENTRISM

Greek philosophers viewed the world as *Kosmos,* an ordered and harmonious structure more a living organism rather than a mechanical system, where, as Capra and Mattei (2015) explain, every element of nature had an intrinsic purpose and contributed to the integrity of the whole. This vision of nature as an integrated, self-regulating order was gradually disrupted during the Middle Ages and the early modern period, when nature began to be perceived as a *machine*, composed of discrete elements that could be isolated, analyzed, and manipulated. This mechanistic worldview deeply influenced the classical sciences of life and matter, which for centuries sought to understand organisms by breaking them down into their smallest components. As Brillat-Savarin (1999, p. 50) observes, "Scientists lent themselves to a study of gastronomy. They examined, analyzed and classified alimentary substances, and reduced them to their simplest elements." It was only with the rise of 19th-century organicism that a new conception emerged: life was no longer understood as the sum of isolated parts, but as the result of complementary and interdependent systems. This paradigm shift profoundly altered the prevailing view of individuality, challenging the dichotomies between self and non-self, subject and object, that had shaped Western thought for centuries. Post-anthropocentrism introduces a new conception and vision of humanity and of the world in which we are immersed.

Microbes represent one of the most fundamental and revealing forms of coexistence for humans, embodying the very principles of interdependence and relationality. Our survival, in fact, depends on them: the human gut alone hosts an estimated 10–100 trillion microorganisms — the gut microbiota (Turnbaugh & Gordon 2009) — forming a vast ecosystem that shapes not only our digestion and immunity but also our mental and emotional well-being.

In this vision, where the distinction between body and mind collapses, the concept of mutualism and parasitism arise. Parasitism, often framed in opposition to mutualism, challenges the simplistic moral distinction between "good" and "bad" forms of coexistence. As Heldke (2025) suggests, some parasitic relationships may in fact contribute to the flourishing of the individual: they can be understood as "mutualists-at-one-remove," organisms that, by stimulating or provoking others, indirectly sustain the host's vitality. In manageable quantities, for instance, parasitic organisms can spur beneficial microbes in the human immune system to strengthen their responses. Seen from this

perspective, parasitism does not contradict the logic of interdependence but rather makes it more evident. As Haraway (2016) reminds us, life is "a practice of becoming-with," where dependency and vulnerability are intrinsic to all forms of existence. Parasites inhabit us and transform us, revealing that individuality is not a fixed state but a dynamic negotiation within networks of exchange, tension, and care. They remind us that living together also means living through one another. In this sense, bacteria embody a crucial example of the parasitic-mutualistic dynamics that shape our lives.

Following the ideas of Tsing (2015) and Ingold (2020), we may also think of ourselves as lichens — symbiotic organisms composed of fungi and algae so intimately intertwined that it is impossible to distinguish where one ends and the other begins. Our body perfectly mirrors this metaphor: we are constituted by a community of microbial and human cells (Gilbert 2012; Tsing 2015), a living assemblage shaped through continuous interaction.[1] In this sense, bacteria stand at the intersection of parasitic and mutualistic relations, revealing the intricate balance that sustains life itself. Fermented foods stand as a tangible manifestation of this relationship. They have been part of the human diet since long before the invention of pottery: even during the time of hunter-gatherers, our ancestors knew how to recognize and collect overripe fruits as an early form of spontaneous fermentation. Once humans began to settle and produce containers and storage vessels, fermentation became a key practice for preservation, and food safety. These deep and ancient connections with microbes have made nutrients more bioavailable and food more digestible — relationships that continue to sustain us today. Fermentation, in this sense, helps us transcend human anthropocentrism, revealing a web of relations in which the "I" cannot exist without the "we."

The relationship with fermentation becomes a key point from which to reflect and detach ourselves from the anthropocentric vision, a terminology that fails to include all living beings on the planet, as it primarily reflects the worldview and modes of action of Western societies. Within this framework, Haraway plays a crucial role in giving voice to the "other," speaking of multispecies organisms interconnected through symbiotic relations. Her thought stands in opposition to the binary and finalistic vision of heteronormative reproduction, in which each sex maintains fixed and distinctive roles and life is measured through a linear model of genetic transmission. Fermentation emerges as a practice that challenges the linear and hierarchical logic of reproduction. Rather than a solitary or purely technical act, it invites participation, sharing, and the creation of *kin* through collaborative transformation. This process reflects a dynamic exchange that occurs both within the

[1] Ingold (2011) strongly criticizes the notion of "interaction," arguing that it presupposes pre-formed, separate entities that come together only after the fact. Instead, he proposes the idea of correspondence, a process through which beings grow with one another in mutual rhythms of attention, movement, and transformation. Similarly, Barad (2007) rejects "interaction" in favor of intra-action, emphasizing that entities do not pre-exist their relations but emerge through them. Seen through this lens, microbial-human relations in fermentation are not additive exchanges but co-creative processes in which both partners continually take shape.

fermented product and among the bodies and environments involved in its making. The more cultures and people come together, the more microbial life — and consequently, vitality — appears in the jar.

Within this living assemblage, bacteria communicate and co-create a new form of kinship. Their interactions give rise to something that is neither purely human nor purely microbial, but an *intreccio di presenze*: a tentacular network of relations in constant change. A practice such as the collective preparation of kimchi illustrates this perfectly: families gather to share gestures, knowledge, and care, embodying a multispecies collaboration that transcends generations. As Haraway reminds us, making kin is not about biological reproduction but about cultivating *ongoingness*, the continuous weaving of relations across species and time (Haraway 2016, pp. 99–103). Fermentation, therefore, subverts the human/non-human reproductive paradigm, replacing the model of sexual union with an encounter between species, a reciprocal transformation through which both entities are altered. Thus, fermentation can be read as a political and ethical act of co-creation, an alternative way of making life that resists the boundaries imposed by heteronormative and anthropocentric frameworks. Yet this reconfiguration of reproduction is not without tension: if fermentation decenters the human and dissolves clear distinctions between self and other, it also raises questions about responsibility, agency, and control. What does it mean to "create" with beings whose agency exceeds our comprehension? Where does care end and manipulation begin?

As Katz suggests, fermentation reveals the porous boundaries between species, substances, and meanings. Through its multispecies entanglements, it destabilizes the idea of the human as an autonomous and self-sufficient being, redefining life as a continuous, open-ended process of relational becoming. This resonates with Andreas Weber's call for an "enlivened" worldview, in which beings are not isolated subjects but relational processes sustained by reciprocity, vulnerability, and interdependence within the more-than-human world (Weber 2019). In this sense, fermentation embodies a post-anthropocentric ontology: it blurs the divisions between nature and culture, human and non-human, subject and object. It invites us to rethink the act of making life not as domination or control, but as participation and reciprocity.

Yet, this theoretical shift also manifests in the everyday gestures of those who ferment, through care, attention, and responsibility toward the invisible. The second chapter will therefore explore how the ethics of care and embodied practices give form to this relational understanding of fermentation, grounding philosophy in the gestures of making *kins.* Fermentation, as explored throughout this chapter, emerges as both a biological and philosophical phenomenon — a living metaphor for the ontology of becoming. From its biochemical foundations to its cultural expressions, it reveals a world in which life is sustained by interdependence rather than isolation. Microbes, yeasts, and molds do not merely transform matter; they enact a form of sympoietic creation that binds together humans,

environments, and non-human agents in ongoing cycles of transformation. Through fermentation, the boundaries between self and other, subject and object, nature and culture, become porous and negotiable. It is within this dynamic of collaboration — where decay gives birth to renewal, and vulnerability becomes a site of creativity — that a post-anthropocentric understanding of existence takes shape. Fermentation thus teaches us that to live is to co-create: to participate in the subtle exchanges that weave together all forms of life. It is not only a process of preservation, but a philosophy of relation — an invitation to rethink identity, care, and responsibility through the microbial entanglements that sustain our world.

2. CARE, CULTURE, AND ETHICS IN THE PRACTICE OF FERMENTATION

The present chapter explores the practice of fermentation through the perspective of care and practical connection. In this context, care is understood not merely as an emotional attitude or a moral virtue, but as an ethical and relational practice — a way of being in the world that acknowledges vulnerability, interdependence, and responsibility (Saito 2022). The concept of care is deeply intertwined with culture: *care* and *culture* are two faces of the same process of cultivation, both referring to acts of tending, maintaining, and transmitting life.

Drawing from Richard Dawkins' original conception of the *meme* as a cultural replicator (1976), Katz (2012, p. 6) reinterprets the term through the metaphor of fermentation, where "memes are transmitted through words, concept, images processes" as well as through secret recipes, ways of cooking, eating, and foraging. These acts of sharing and transformation generate what we call *culture*: a living, breathing web of knowledge, bacteria, and memory.

Etymologically, the word *culture* comes from the Latin *cultura*, derived from *colere*, meaning "to cultivate" or "to care for." To culture is to cultivate — the land, animals, and even microbial life — through gestures of attention and maintenance. Today, we speak of "cultured" foods, "cultured" bacteria, or even "cultured" meat and milk. Yet in every case, what defines culture is the network of living relationships that it sustains: an invisible fabric of life woven by humans, non-humans, and microbial agents (Katz 2012, p. 6). Within this framework, humans may be seen as *living vessels* in which bacteria act and cohabit. Fermentation makes this interdependence visible: it is a practice of care that demands observation, patience, and reciprocity. Through it, we nurture microbial life — and are, in turn, nurtured by it. Yet this relationality also invites a reflection on the language of *colonization*: humans often describe microbes as entities to be "controlled," "managed," or "tamed," reproducing hierarchies reminiscent of colonial logics that position one form of life as dominant over another. Fermentation complicates this narrative. Instead of conquest, it requires negotiation; instead of domination, collaboration. Thus, culture embodies both a biological process and an ethical stance: an ongoing act of caring for the visible and invisible forces that allow life to continue and transform — without reducing them to territories to be occupied, but recognizing them as partners in co-creation.

2.1 CARE AS RESPONSIBILITY TOWARD THE INVISIBLE

The concept of *care* provides a deeper lens through which to approach everyday life. In common language, "care" encompasses a wide range of domains — from the assistance offered to patients in

hospitals, to the relationships between parents and children, or the attention given to loved ones. Yet beyond these familiar contexts, care also implies a broader attitude of attention and responsiveness: an openness to the needs, vulnerabilities, and transformations *of the other*. In this sense, caring becomes not merely an action, but a mode of being — a way of relating to the world and to others through responsibility, reciprocity, and presence. Here, "the other" extends beyond the human realm to include non-human nature and even the artificial world in which we situate ourselves — all part of a broader web of relationships that we continuously cultivate and nurture. It represents "*a mode of being in the world*," intertwining the aesthetic and the ethical dimensions of existence. This relationship of care is not limited to a one-sided moral action in which a subject takes care of an object, but rather emerges as a shared responsibility — one enacted *through* the other, grounded in empathy, attention, and a relational attitude. Fermentation thus becomes a perfect example of *mutual transformation:* a process in which the subject transforms the other, and the other, in turn, transforms the subject — both bound together through an ongoing act of care. Within this framework, Saito invites us to see ethics and aesthetics as two interconnected dimensions — two sides that communicate and coexist. She moves beyond the modern philosophical view that separates the *ethical* sphere, associated with what is *right*, from the *aesthetic*, linked with *art* or *beauty*. As she argues (Saito 2022), the aesthetic is not confined to the realm of art but is embedded in the ordinary gestures through which we engage with the world. Everyday aesthetics thus becomes an ethical practice — a way of living attentively, responsibly, and with sensitivity to the consequences of our actions.

Interpreted in this light, fermentation exemplifies an *aesthetics of care*: an ongoing dialogue between the maker and the microbial world, where beauty arises through the ethics of participation, patience, and co-creation. A bubbling jar becomes a living manifestation of time, transformation, and care, a relationship that evolves through life itself. Watching the bubbles rise, sensing the slow metamorphosis of textures, or tasting the shifting pungent and funky notes becomes an act of care, a way of attuning to the rhythms of life unfolding beyond our control. Fermented products can be read as expressions of *care* intertwined with aesthetics — an encounter between the intentional gestures of the maker and the invisible agencies of microbes. Ingredients become colors on a living canvas (plants, animals, and minerals forming the palette), while time and microbial activity serve as the medium through which new forms and meanings emerge. This aesthetics of becoming extends beyond the fermenting jar.

Similarly, some restaurants embody this vision: the beauty of the plate intertwines with the act of hospitality, where welcoming and nourishing guests become gestures of attention and empathy. In haute cuisine, particularly within Michelin-starred contexts, this ethics materializes through meticulous care — each guest is received according to their needs, and every detail of preparation

and presentation reflects precision, respect, and sensibility. Here, beauty cannot be separated from responsibility; it is enacted through gestures of care that sustain both the sensory and ethical dimensions of the dining experience. Care, therefore, encompasses the ongoing practice of fermentation and the creative process that unfolds with it, continuously exploring the boundaries of gastronomy. From this perspective, fermentation represents a relational practice of care directed toward the invisible. Drawing from Emmanuel Lévinas (1969), it may be understood as a responsibility toward the *Other* — an opening toward what exceeds the self, here embodied by the invisible microbial life with which we coexist.[2] As Saito reminds us, the practice of care unfolds in the ordinariness of everyday life — in gestures that sustain, repair, and attend to what is fragile. In fermentation, this ethic materializes through waiting, tasting, and tending to invisible transformations. Timothy Morton extends this awareness beyond perception itself with his example of climate change as "taking responsibility for something you can't see," taking care of it regardless (Morton 2010, p. 99). Such action—both spontaneous and deliberate—embodies the deepest form of care: an ethical response to coexistence itself.

2.2 BECOMING-WITH: CARE AND CULTURE BEYOND THE HUMAN

This section explores how the practice of fermentation reveals a mode of *care* that exceeds human intention — a form of *culture* sustained through multispecies collaboration and response. Drawing on the works of Haraway, Heldke, Morton and Ingold, it reimagines fermentation as a sympoietic and ethical process: one in which humans and microbes *become-with* one another through acts of attention, reciprocity, and shared transformation.

As already discussed, fermentation is not only a technique of food transformation but also an act of *cultivation* — a way of tending to life at multiple scales. The very word *culture* holds this dual meaning: it refers both to the microbial communities we nurture and to the collective practices through which knowledge, habits, and values are transmitted. To ferment, then, is to care — to participate in a living process that requires attention, patience, and responsiveness. This intimate act reveals how culture itself is sustained: not as an abstract system of symbols, but as a material and relational practice that binds humans and non-humans in continuous co-creation. Several thinkers have expanded this understanding of care and culture beyond the human sphere, exploring how life forms, meanings, and relations emerge through acts of shared becoming. Among them, Haraway and Heldke offer two complementary perspectives that illuminate fermentation as an interspecies practice of care — one that reshapes the very idea of what it means to think, act, and live together.

[2] Despite its fruitful implications and insights, the concept developed by Lévinas will not be further expanded upon here, as its scope exceeds the specific focus of this thesis.

In *Staying with the Trouble*, Haraway invites us to *make kin* with other species — to recognize our shared entanglement in what she calls the ongoing "sympoiesis" of life (Haraway 2016, p. 58). Sympoiesis, literally "making-with," challenges the modern illusion of autonomous selfhood: no being makes itself alone. It is a crucial point where she moves the subjectivity and selfness of humans, reminding us of our indissoluble connections — "kins" — with the world. Haraway imagines beings, the *Camilles,* as hybrid entities born from multispecies collaboration and care — speculative figures who embody the possibility of living and dying well *together* on a damaged planet. Through them, Haraway reminds us that culture is not an exclusively human achievement but a collective, cross-species process of *becoming-with* — a ceaseless co-creation of worlds. In a similar vein, Morton (2016) expands this vision by describing ecological awareness as a loop — a continuous feedback system in which all beings and actions are interconnected. Both authors invite us to move beyond anthropocentric narratives and to perceive life as a web of reciprocal relations, where existence itself unfolds through mutual responsiveness and co-creation The ecosystem, like human existence itself, is cyclical: our daily gestures "such as switching on a car in the morning" generate feedback loops that reverberate across larger spheres of life, affecting climate, communities, and the biosphere as a whole (Morton 2016, pp. 7-9).

Within this same perspective, fermentation embodies the core of a "*strange loop*": a condition in which material and immaterial, visible and invisible elements converge in the act of making ferments (Morton 2016, p. 7). This process transforms not only the microbiota and our diet but also the social and ecological communities that surround us. In this circular relationship, fermentation reveals the human as part of a larger *strange loop* — what Morton describes as the recursive structure of coexistence, where boundaries between subjects and objects, humans and non-humans, dissolve into mutual entanglement. In this sense, fermentation can be seen as a form of *dark ecology*: a practice that confronts the intimacy and inevitability of our interdependence with non-human forces, acknowledging the shadowy, invisible processes that sustain life. Just as microbial communities coalesce in a jar of fermenting vegetables, Haraway's Camilles illustrate how life persists through relational processes of composition, contamination, and care. In both cases, boundaries blur: individuality dissolves into a mesh of dependencies. Fermentation, like sympoiesis, is an art of co-making — a choreography of human intention and microbial agency that resists mastery and control. It requires *response-ability*, the ethical capacity to respond to, and to be transformed by, others — human and more-than-human alike. Similarly, Heldke challenges the anthropocentric assumption that agency and decision-making belong solely to humans. In her essay *When Bacteria Decide*, she argues that microbial life engages in forms of practical reasoning, coordination, and collective responsiveness (Heldke 2012). Her work disrupts the Cartesian divide between mind and matter,

suggesting that bacteria, too, *think* — not through cognition, but through situated responsiveness to their environments. This expanded notion of agency invites a redefinition of ethics as a distributed, interspecies affair: a practice of *attunement* rather than domination.

Through fermentation, these ideas find tangible expression. To ferment is to enter into an ecological relationship of care — a slow, reciprocal dialogue with microbial others. It is both a *practice of attention* and a *practice of surrender*: the human cultivator sets the conditions, but the microbes perform the transformation. In this shared labor, agency becomes relational rather than individual, echoing Haraway's and Heldke's calls for a more-than-human ethics of co-creation. "The less well-known noun weird means destiny or magical power and, by extension, the wielders of that power, the Fates or Norns. In this sense weird is connected with worth, not the noun but the verb, which has to do with happening or becoming" (Morton 2016, p. 5). Morton's reflection opens a dialogue with the magical forces of fate — those invisible agencies that unfold beyond human sight, transforming matter through time and relation. To care for a ferment is to engage with this quiet magic: to trust in processes that escape full comprehension, to tend to what is alive yet imperceptible. The jar becomes a site of both vulnerability and imagination, where the boundary between the human and the microbial blurs, and where transformation depends on patience rather than control. As Bachelard (1948) suggests, the imagination of matter is inseparable from repose — from the slow, interior rhythm through which transformation occurs. Fermentation, too, unfolds in this temporality of repose: a quiet gestation in which matter works upon itself, reorganizing life from within. The fermenting jar is therefore not only a vessel of transformation but a chamber of intimacy, where stillness and becoming coincide.

In this *weird* ecology of care, as Morton would put it, imagination itself becomes an ethical act — the capacity to envision and accompany what is not yet visible, what is still becoming. Through fermentation, we practice a form of care that honors the fragile, recursive, and enchanted loops that sustain life. Fermentation is both a practice of *care* and a *site of culture*: a living system in which matter, meaning, and relationship are continuously cultivated, exchanged, and renewed. To ferment is to acknowledge our dependency on others — to live within a web of relations that demands patience, reciprocity, and humility. In the slow transformation of microbial life, *care* and *culture* intertwine, offering a model for reimagining ethics as a collective art of living and becoming together. As Ingold insists, to live is not to stand apart from the world but to *correspond* with it — to move along with the flows of materials, forces, and beings that compose it (Ingold 2020). Culture, in this view, is not a structure of inherited meanings but an unfolding process of attention and participation, continually made and remade through our engagements with others. Fermentation mirrors this correspondence: it teaches us that knowledge and care arise not from mastery, but from *being in the*

midst of things, from learning to move, listen, and grow with the living currents of the world. Fermentation is providing us with an "*École de patience et d'humilité*" — a school of patience and humility (Do 2024, p. 21).

2.3 EMBODIED AND RELATIONAL PRACTICE

Morton's notion of *ecognosis* — describes a mode of knowing that allows the world to reveal itself, a form of awareness that coexists with other beings rather than seeking to control them. (Morton 2016, p. 5) — invites us to reimagine knowledge as a practice of attunement rather than mastery. To "know in a loop" means to participate in a process of reciprocal becoming, where understanding emerges not from distance or clarity, but from entanglement and response. This "weird knowing," (Morton 2016, p. 5) as Morton calls it, acknowledges the impossibility of full comprehension: it accepts strangeness as a permanent condition of coexistence. Knowledge, in this sense, is understood as part of a larger human–non-human world. Fermentation, similarly, teaches us to recognize our impossibility of seeing the whole picture, yet still to appreciate being part of a greater relational process — to carry it forward with care and participation.

In this vision, Gaston Bachelard calls us to action: he gives voice to the *language of matter*, expressed through the dialectic of "hard and soft" (Bachelard 1948, p. 13). He invites us to reflect on the interaction that matter establishes with us — what he calls *the resistance of matter* — which draws us into a living relationship with the world. Action, for Bachelard, is always cosmological: every gesture, however small, participates in the universal rhythm of energy and creation. As Bachelard writes, "The resistant world lifts us out of our static reality, beyond ourselves, initiating us into the mysteries of energy. Henceforth we are awakened beings" (Bachelard 1948, p. 14). Thus, we can say that the humble act of cutting vegetables, salting, mixing, washing, or massaging cabbage leaves becomes more than a recipe — it is a dialogue with life itself. Through these gestures, new energies of transformation are generated. Matter becomes alive, awakening in us the same vital force, the *energy of will*, that animates the earth. To act upon matter is to enter into relation with the world — to be "lifted out of our static reality" and initiated "into the mysteries of energy" (Bachelard 1948, p. 14).

Lisa Heldke (2016) translates this epistemology into the kitchen, where knowing is never abstract but embodied, partial, and situated. In her view, cooking — and by extension, fermenting — is a practice of *ecognosis*: we do not simply apply knowledge; we enter into dialogue with materials that resist, surprise, and transform us. To "think in the kitchen" is to cultivate a humble awareness that knowing happens through touch, smell, and time — through care. Thus, between Morton's dark ecology and Heldke's culinary philosophy lies a shared ethics: a recognition that all knowledge is

relational, that to know is to care, and that care begins where control ends. In the act of fermentation, this care takes form as a slow, responsive exchange — a *weird loop* of transformation in which we are both knowing and known. In the practice of fermentation, knowledge is often underestimated. People are afraid of not knowing enough to take responsibility for products that, if handled incorrectly, could become harmful. Knowing, here, seems to require technique and written knowledge — chemistry, microbiology, or food safety. Yet this relationship has existed for thousands of years, long before bacteria or yeast were even given names. Knowledge here becomes *embodied*: it is carried through gestures, through the scar of a knife that has sliced countless vegetables, through the careful hands of elders who guide us with their experience. It is a knowledge embedded in culture and community — shared, transmitted, and practiced. In this way, a new sense of relationship, trust, and belonging emerges, "a space where life crosses the boundary between organism and environment" (Ingold 2001, p. 93).

In recent years, many fermenters and restaurants have contributed to this dialogue by publishing books that bridge scientific and cultural understanding: *The Noma Guide to Fermentation*, Sandor Katz's works, or, in the Italian context, Martino Beria's publications. These books, in a sense, take us by the hand and introduce us to the living world of global food fermentations, a world where knowledge is not owned but continuously shared, transformed, and renewed. Through them, fermentation reveals itself not merely as a culinary technique but as a way of knowing and relating — an *embodied practice of care* in which humans and microbes mutually transform one another, dissolving the boundaries between subject and object, culture and nature, self and other. Within fermentation, care materializes in gestures of observation, timing, and responsiveness: the maker must listen to the needs of microbial cultures, respect their rhythms, and cultivate the right environmental conditions for their growth. This attentive involvement resonates with Haraway's (2016) invitation to make kin — to form bonds of responsibility and companionship beyond the human, embracing microbes as co-participants in the continuous becoming of life.

In this same spirit, the Korean artist Jiwon Woo project *Son-mat* — meaning "the taste of the hand" — explores the microbial world that inhabits our skin, particularly through the act of cooking and touching food.[3] By collecting microbial samples from four families across three generations, Woo demonstrates how the "good food" made with love by mothers and grandmothers carries traces of their microbial identity — yeasts and bacteria that live with and through them. Here, the embodied practice of care becomes tangible: it is not merely symbolic but biological, inscribed in the living cultures that inhabit our hands. Woo's work gives visible form to the invisible bonds of transmission, showing how affection, memory, and microbial life intertwine in the foods we prepare and share.

[3] Cf. https://www.woojiwon.com/mht-bad.

Through her lens, *care* emerges as both an emotional and ecological act — one that sustains kinship across generations and species alike. Woo's work opens up a window of opportunity to understand comfort food under different lengths: showing that taste itself can be linked to the direct action of bacteria. This relationship described by Woo also takes shape in a more common and practical tradition within Western society: the making of sourdough. This ancient practice, carried forward since the time of the Roman Empire, embodies a continuous dialogue between humans and microbes — a relationship of care, attention, and mutual transformation.

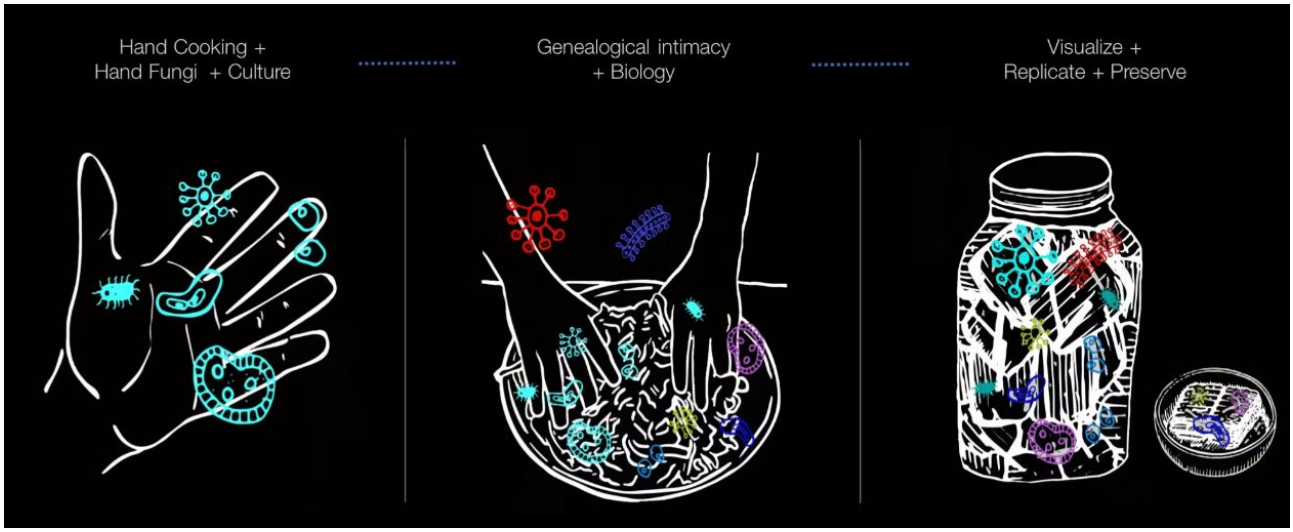

Figure 1: Jiwon Woo | Mother's Hand Taste (Son-mat) | Bio Art and Design Award

Recent scientific studies have revealed that this bond is far from passive or linear, but deeply co-constitutive. As Hey (2023, pp. 11–25) explains:

> Initially, the microbes in the starters correlated with those 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-associated microbes.

In other words, through the act of repeated kneading, touching, and tending, bakers and microbes shape one another. The sourdough becomes a living record of their shared environment — a microbial memory that carries traces of both the grain and the human body.

This example shows how the relationship with microbes should not be understood in parasitic terms, but rather as a co-creative partnership: one in which humans depend on microbial activity for transformation, yet their presence remains essential for the process to unfold. The act of feeding, observing, and maintaining the starter creates a space of reciprocal agency — a shared choreography

of life and care. Sourdough, in this sense, exemplifies the sympoietic nature of fermentation: a process of *making-with* where culture, both microbial and human, continuously emerges through embodied collaboration. As Haraway (2016) would suggest, this "making-with" represents a practice of response-ability — the capacity to respond to and with other forms of life — while, in Ingold's (2020) terms, it embodies a correspondence: a rhythmic movement of attention and transformation through which humans and microbes learn to grow together in time.

Chapter two has explored fermentation as an embodied and relational practice of care, where knowledge, culture, and sensibility form the fundamental lenses through which we approach and engage with the world. Beyond its material process, fermentation reveals itself as a metaphor for coexistence: a humble, everyday act that transforms not only what we eat, but also how we live with and care for others — human and more-than-human alike. Fermented food and drinks are, as Katz writes, *"*quite literally alive with flavour and nutrition. Their flavours tend to be strong and pronounced. Think of stinky cheese, tangy sauerkraut, rich earthy miso, smooth sublime wines. Though not everyone loves every flavour of fermentation" (Katz 2016, p. 1). This observation captures the very paradox of fermentation: a process that generates life through decay, attraction through repulsion. The flavors that emerge from fermentation are intense, sometimes even overwhelming. They speak of transformation, of the invisible labor of microbes that convert what is raw, inert, or even putrid into something nourishing and complex. Fermented foods thus challenge the boundaries of taste — they invite us to explore what lies between the pleasant and the unpleasant, between attraction and aversion.

3. THE NATURE AND BOUNDARIES OF DISGUST

Disgust manifests its own
characteristic boldly changes.
Carolyn Korsmeyer

3.1 WHAT IS DISGUST?

"Disgust is a powerful, visceral emotion. It is rooted so deeply in bodily responses that some theorists have hesitated even to classify it as an emotion in the fullest sense, considering it more akin to involuntary reactions such as nausea, retching, and the startle recoil. Like these it is an aversive response and belongs among the body's protective mechanisms" as Korsmeyer and Smith point out in their introduction "Visceral Values" to Kolnai's *On Disgust* (Kolnai 2003, p. 1). Taste and disgust are inseparably linked: they are two sides of the same embodied reaction. One invites incorporation, the other rejects it. They emerge from the very center of our corporeal being — our gut — and both reveal how profoundly our bodies mediate the relation between self and world.

However, taste is not only a biological response but a cultural and ethical act. It reflects our diet, our beliefs, and the foods that have nourished us since birth. As argued earlier in this work, taste is inseparable from identity: it encodes the environments, traditions, and histories that shape our sensibilities. Disgust, on the other hand, expresses the limits of that familiarity. It is a deep, visceral reaction that signals the body's refusal to incorporate something perceived as threatening, impure, or alien. Spaid further shows how the cultural relativity of taste adds another layer of complexity to this dynamic, exemplified by:

> Japanese delicacy natto, a traditional breakfast 'superfood' that apparently smells 'like the marriage of ammonia and a tire fire', yet 127.9 million Japanese consume 14 billion pounds of it annually (135 grams daily). Had [Kant] heard of this gnarly delight, it would only confirm his view that smells arouse sensory judgements, or reflective judgements regarding the agreeable; though not aesthetical judgements of taste, whose attribution of beauty is universally communicable. (Spaid 2021, p. 77)

Natto can represent one among the "food identities, the repeated acts of consuming a food [that] can bolster a person's sense of self: I am who I am because I/we eat this food" (Hey 2022). Is a way of reconnecting to home, to travel with tastes or to be repulsed by them. This example illustrates how sensory boundaries are culturally negotiated. What evokes disgust in one context may signify

comfort, nourishment, or even beauty in another. The case of *natto* demonstrates that taste is not fixed but learned, relational, evolving through habituation, exposure, and care. The line between taste and disgust, therefore, is not absolute — it is porous, shifting with culture, memory, and experience. Fermentation, situated precisely at this threshold, teaches us to reconsider our sensory hierarchies: to perceive value in what initially repels us, and to recognize transformation as a form of embodied wisdom. Disgust, as an emotion tied to the tension between the familiar and the unfamiliar, often overlaps with fear; although they are distinct responses, they can amplify and intertwine with one another.

3.2 THE ETHICS OF THE UNFAMILIAR

If disgust marks the boundary between the self and the world, knowledge has the potential to soften that boundary, transforming aversion into curiosity and even into pleasure. What once repelled us can, through understanding, become a source of attraction — a process that Perullo (2016) calls *dressed taste*. In the act of tasting Perullo distinguishes between *naked pleasure* and *dressed taste. Naked pleasure* refers to immediate gratification: the spontaneous, instinctive enjoyment of flavor without reflection. *Dressed taste*, by contrast, emerges when pleasure is mediated by knowledge, memory, and meaning. "Here taste is 'dressed,' controlled, and dedicated to appreciation as the capacity of understanding over time" (Perullo 2016, p. 53). It is the pleasure that comes not only from the senses, but from awareness — from recognizing the histories, values, and processes embodied in what we eat. In this sense, knowledge can act as a bridge between disgust and appreciation. Through learning, we "dress" the raw sensation of taste with context, transforming what was once foreign or unpleasant into something comprehensible and even desirable. To understand how deeply knowledge and taste intertwine, Perullo traces the genealogy of the very word "to know," showing that, in Italian and Latin, cognition and taste share a common root. Perullo, following Calvino, recalls how Niccolò Tommaseo distinguished between a direct impression — before any intention or reflection — and a reflective exploration aimed at recognition and intellectual appreciation. Thus, *sapere* (to know) derives from the Latin *sapio* ("to have taste," "to taste"), suggesting that tasting involves both immediate sensation and reflective discernment. According to Tommaseo, taste is a double faculty: it refers to the instant, epidermal experience of flavor and to *good sense*, the ability to orient and choose among experiences (Perullo 2016, p. 61). Through this etymological reflection, the act of tasting becomes a metaphor for thinking itself: a form of knowledge that is both sensory and

intellectual, instinctive and interpretive. To *dress* taste with knowledge is not to sterilize it but to cultivate attentiveness — to learn to perceive more, not less.[4]

Knowledge, in this sense, functions as a mode of *care*: it helps us stay with what disturbs us, to linger with the unfamiliar long enough for it to reveal its complexity. Through education, practice, and cultural encounter, disgust becomes porous; we begin to sense the world not as a hierarchy of pure and impure but as a web of ongoing transformations. In this way, *dressed taste*, and hence *taste pleasure* serves as a pedagogical act. It teaches us to relate differently to matter, to understand eating as an exchange of meaning as much as of nutrients. To know taste is to expand its field beyond the limits of comfort, embracing the interplay of attraction and repulsion that defines all living processes.

A strong smell or slimy texture, when reinterpreted through culture or science, ceases to be simply offensive: it becomes a signifier of complexity, life, or authenticity. While it is often triggered by food or organic matter, its reach extends far beyond the edible. We can feel disgust at wounds, images, bodily fluids, or even memories — phenomena that confront us with the fragility and materiality of life itself. In this sense, disgust is both protective and revelatory: it exposes the threshold at which the self resists contact, and thereby defines what counts as acceptable or unacceptable, human or inhuman. Fear of the unknown can generate disgust, as Kolnai notes: "Fear is hardly a more immediate reaction than disgust; it is however more independent since every feeling of disgust, without necessarily including fear, yet alludes to it somehow. Indeed, it is sometimes-falsely, but not without foundation-taken as a variant of fear" (Kolnai 2003, pp. 31–32). While fear of the unknown creates repulsions, here knowledge does not eliminate disgust — it reframes it, converting revulsion into recognition.

Fermented foods offer one of the clearest examples of this dynamic. Their pungent aromas and unusual textures often provoke instinctive aversion, especially in those unaccustomed to them. For outsiders, *natto* can appear repellent; for Japanese eaters, it represents nourishment, cultural identity, and microbial vitality. The difference lies not in the food itself but in the framework of knowledge and culture surrounding it. Understanding *natto*'s fermentation process, its probiotic properties, and its symbolic place in Japanese cuisine can transform disgust into appreciation. Through this *dressing* of taste, the unfamiliar becomes meaningful. The growing wave of the fermentation trend — visible in the increasing popularity of kombucha, fermented vegetables, and plant-based proteins such as tofu — illustrates how knowledge and curiosity shape our encounters with food. These products speak a language of cultural contamination and exchange: a dialogue between traditions, techniques, and sensibilities that travel and transform as they meet new contexts. Knowledge begins with curiosity —

[4] In this thesis, however, I will not address the question of expertise or technical mastery, since it lies beyond the scope of this discussion; rather, my focus remains on how knowing mediates our sensory and emotional relationship with food.

an *impulse* to approach what is unknown, to learn about an ingredient and, through it, the stories, skills, and practices that sustain it. Kombucha, in particular, exemplifies this phenomenon: as more and more companies produce it, workshops and home-brewing classes have emerged, inviting people to learn the craft of fermentation and to engage bodily with microbial life. It is a form of sympoietic learning — a co-creation between body, cultures, and microbes — through which the disgusting "transformed into something profoundly beautiful" (Korsmeyer 2002, p. 220), quite literally, delicious.

Figure 2: Scooby with molds

As knowledge deepens perception, it also leads us into the unstable zone where meaning and matter collide, and where the familiar becomes strange again. This is the terrain of disgust: a sensory threshold that exposes the fragility of our boundaries and opens the possibility for transformation. Crossing this threshold allows us to see how taste and disgust are not opposites but entangled forces that shape our encounters with food, bodies, and the microbial worlds that sustain us. According to Spinoza, "all emotions are a mixture of desire, pleasure, and pain, connected to the idea of an intentional object an early version of the notion that emotions begin with undifferentiated arousal and become particularized according to their objects" (cited in Korsmeyer 2011, p. 19). Disgust, in this sense, carries a double meaning: it can simultaneously repel and attract, invoking pleasure through proximity and knowledge of matter itself. Emotions emerge at the threshold between inside and outside — between the body and the world that surrounds it. Thus, disgust can be read as a boundary emotion, revealing the fragile interface where the self encounters the foreign, where incorporation becomes uncertain, and the body must decide whether to welcome or reject the unfamiliar.

Food once again plays an intentional role within this process. It is never neutral but always charged with taste, memory, culture, and meaning. Through food, the experience of disgust becomes an embodied negotiation with alterity — a sensory confrontation that demands interpretation. Fermentation, in particular, invites us to challenge our aesthetic, emotional, and cultural boundaries. The bubbling, spilling jars that emit strange and sometimes unpleasant smells remind us how deeply *human* fermentation is, and how much *humanity* there is in what appears rotten or decomposing. The sensory unease that accompanies fermentation is not merely a warning sign but an invitation to knowledge — a call to recognize decay not as the opposite of life, but as one of its essential modes of transformation. Understanding becomes the key to overcoming the instinctive recoil. What at first provokes disgust can, through familiarity and care, turn into appreciation. This process marks a peculiar intimacy where repulsion gradually transforms into recognition. In such encounters, microbes become teachers: they challenge our sensory hierarchies and reveal the instability of our aesthetic and moral categories. Objects that have been dead too long and have started to decompose can also provoke fascination, even reverence. Disgust thus opens a space for reflection, an aesthetic of contamination where the limits of beauty, taste, and knowledge dissolve. As Korsmeyer maintains, reactions of aversion can shift dramatically once a substance is properly identified. The pungent aroma of blue cheese, for instance, shares chemical similarities with the smell of vomit, provoking immediate disgust when encountered without context. Yet once recognized as cheese, that same odor reorganizes itself into something "piquant," even desirable. The transformation does not occur at the level of sensation but at the level of perception (and therefore, also meaning): foods acquire aesthetic value when we understand *what* they are. Recognition and identification thus enter directly into the valence of pleasure and displeasure, revealing how knowledge can convert repulsion into appreciation. In this sense, disgust is not a dead end but a threshold, an invitation to reinterpret what the senses initially resist (Korsmeyer 2011, p. 6).

As Italo Calvino suggests, "the true journey is the introjection of an 'outside' different from our normal one" (Calvino 1992, p. 12). Eating fermented foods is precisely such a journey: a practice of incorporation where the living matter we consume continues to act within us, metabolically and symbolically. Fermentation enacts a form of relational cannibalism — an exchange where the *other* becomes part of us, not only nourishing the body but altering the microbial ecosystem of the gut. Ingesting fermentation is therefore an act of transformation on multiple levels: biological, perceptual, and philosophical. The organic and inorganic, the living and the decomposing, merge within us, teaching that to live is always to incorporate, to digest, to decompose, and to be transformed by what once seemed disgusting. Eating fermented foods is, in this sense, a form of intimate collaboration with decomposition. In the dim overlap between vitality and decay, we encounter what Morton would

call a “dark ecology”: a recognition that no life is pure, and that every act of nourishment carries the shadow of dissolution. Fermentation is not the opposite of decay — it is decay *under care*, a process of controlled putrefaction that reveals the generative power of transformation. The same microbial forces that break down organic matter in a compost heap or a forgotten jar are those that reside within us, regulating digestion, producing heat, transforming nutrients, and sustaining life. Our bodies, too, are constantly fermenting. Each breath, each drop of sweat, each pulse of saliva, bile, or gastric acid is part of an ongoing chemical dialogue between inner and outer worlds. In this perspective, the fluids of our body mirror the processes that occur in the fermenting jar. Saliva begins the transformation of starches into sugars; lactic bacteria in our intestines ferment fibers into acids; enzymes deconstruct proteins into simpler forms. The distinction between the human and the microbial, between life and rot, becomes increasingly porous. As Morton would suggest, we live within a “dark ecology” where no entity is pure, and where the borders between vitality and decay are perpetually shifting. The body is not a closed system but a fluid ecosystem, a warm fermentation vessel continuously metabolizing the world (Morton 2016). Fermentation reminds us that to live is to decompose, to be constantly undone and remade through chemical exchanges. The smell of fermenting cabbage, the tang of sourdough, or the funk of aged cheese are sensory traces of processes that also occur within ourselves. In the moment of disgust, when we recoil from these smells, we are in fact encountering the material truth of our own condition: that our bodies, too, are colonies of bacteria, exhaling gases, secreting acids, constantly dissolving and reassembling. Decomposition is not the end of life but its continuation by other means. Seen this way, the line between the delicious and the disgusting becomes blurred. What ferments and what rots differ only by degree and intention. As Katz (2012) argues, fermentation transforms what might otherwise be regarded as rotten into something nourishing and charged with new meaning. The boundary between the edible and the inedible, the pure and the impure, is continually negotiated through the senses. The fluids of fermentation — brine, whey, vinegar, alcohol — echo the fluids of the human body, each mediating transformation and preserving life through controlled decay. Fermentation thus embodies a deep ecological truth: that creation and decomposition, pleasure and repulsion, are inseparable parts of the same metabolic dance.

This understanding invites a profound ethical reorientation. To ferment, to decompose, to digest are all acts of care — acknowledging that to sustain life is also to surrender to its cycles of breakdown and renewal. Ingesting fermentation becomes an act of participation in this cycle: we absorb the decomposing other, allowing it to transform us from within. In this sense, the body becomes both a site and metaphor of coexistence, where disgust no longer signals rejection but recognition: the recognition that our vitality depends on our capacity to host, incorporate, and be fermented by the world. This embodied recognition opens toward a darker, yet more relational, ecological vision. As

Morton (2016) and Heldke (2018) remind us, learning to coexist with decay means learning to think through practice, to embrace the viscous, the fluid, the decomposing as part of our shared condition. Fermentation thus becomes not only a gastronomic act but a philosophical one: a pedagogy of entanglement where taste, disgust, and care dissolve the illusion of separation and teach us to stay, quite literally, with the trouble.

4. CASE STUDY

4.1 SHARING IS CARING

The following case study is the result of a personal experience that combines my passion for learning, teaching, and creating with others. I believe that sharing is one of the most powerful ways to learn: it is not only about acquiring technical or theoretical skills, but about entering into relationships. In the previous chapters, I discussed fermentation as both a biological and philosophical phenomenon — a process of transformation, care, and correspondence between human and microbial life. In the following case study, theory meets practice through a series of fermentation workshops I conducted, where the act of making became an act of sharing.

Sharing, in this sense, is not limited to the exchange of knowledge; it is the movement of energy between people, the weaving of connections through gestures, smells, and tastes. Food becomes the medium of encounter — a language through which people explore new boundaries, experiment, and co-create meaning together. These workshops, therefore, are not only practical moments of learning, but living expressions of the ideas explored throughout this thesis: fermentation as care, culture, and collaboration.

Figure 3: Veggies in a jar

The fermentation workshops took place in the garden of the University of Gastronomic Sciences, a choice that was anything but casual. As discussed throughout the previous pages, fermentation is ubiquitous: it unfolds wherever life occurs, in the soil, in the air, and within every living body. Conducting the workshops outdoors, in direct contact with the elements, was therefore an intentional gesture, a way of learning with the environment rather than controlling it. The garden, with its changing light, scents, and sounds, became an open laboratory, where the boundaries between the cultivated and the wild were gently dissolved. By working outdoors and engaging with spontaneous vegetation, we allowed microbial life to join us freely. The air, the soil, and the tools all contributed to their invisible presence. This openness reflected the philosophy underlying the entire thesis: fermentation as collaboration — an art of care that resists control, embraces uncertainty, and celebrates the entanglement between human and non-

human worlds. As Skinner (2022, p. 220) explains: “Food sits at the intersection of the self and the other. What we create and share is produce and absorb by the individual body.” In this sense, fermentation is made by multitude: by people that work together with a shared goal and the action of the bacterias, both present in our hand and the environment.

4.2 MICROBES IN A JAR

What unfolded inside each jar, though invisible to the eye, was far from passive. The interaction between salt concentration, temperature, and the native microbiota of the vegetables set in motion a sequence of microbial successions. Lactic acid bacteria — *Leuconostoc*, *Lactobacillus* — emerged, declined, and gave way to one another, each species preparing the conditions for the next. Some microorganisms thrived; others died, releasing enzymes and nutrients that sustained new microbial life. These cycles of competition, death, and renewal echoed the ecological relationality discussed in earlier chapters: transformation as an entangled choreography of becoming-with. The jars thus became living ecologies — microcosms where matter, microbes, and time co-evolved without the need for mastery.

Each encounter began with an exploration of the territory and its multiple layers of identity. Participants gathered around long wooden tables covered with seasonal vegetables, flowers and wild herbs. Before each session, we took short foraging walks — collecting wild fennel, rosemary, and bay leaves — using them not only for flavor but as symbolic bridges between place and practice, rooting our fermentations in the landscape that sustained them. In this simple act, the workshops embodied what I previously described as *relational ontology*: the understanding that life and knowledge emerge from the interplay of bodies, materials, and environments. Walking through the garden became a way to connect with the surroundings, to remember and acknowledge that we are always in relationship with the place that hosts us. Each fermentation was therefore *situated*: local, contextual, and inseparable from its environment. The jars created during the workshops carried a unique microbial signature: the invisible imprint of the garden’s air, soil, and season.

This atmosphere encouraged an approach to fermentation that was as much ecological as social. The rhythmic acts of chopping, salting, and packing vegetables into jars were accompanied by conversation, curiosity, and laughter. Participants shared memories of family traditions, cultural rituals, and personal reflections, revealing how, as Haraway suggests, *worlds are made in company*. By working outdoors, we invited microbial life to join us freely: the air, the soil, and the tools contributed to their invisible presence, making visible the principle of sympoiesis — “making-with” — that runs throughout this research.

Not all moments, however, were harmonious. Some jars emitted sharp, almost aggressive aromas as fermentation accelerated; others produced bubbling overflows, cloudy brines, or textures that participants described as "alive," "strange," or even "slightly disturbing." These reactions opened a space to discuss how taste is shaped not only by pleasure but by initial aversion. As explored in the chapter on disgust, what is unfamiliar often feels unsettling at first, yet this very strangeness can become the first step toward appreciation. When participants learned to interpret these signals — gas production, acidity, surface yeasts — not as signs of rot but as indicators of microbial vitality, their discomfort shifted into curiosity. Disgust, in this context, became a threshold: an invitation to reframe what the senses initially resisted. Uncertainty played a central role in each workshop. Some jars developed yeast on the surface; others fermented too quickly in the afternoon heat; a few batches had to be adjusted with more salt or repacked due to excess liquid. These imperfections were not treated as errors but as pedagogical moments — occasions to embrace the inherent unpredictability of living processes. Rather than forcing control, participants learned to read the signs of microbial activity, adjusting their actions in response. This dynamic illustrates that care is not the opposite of risk, but its companion: an ongoing negotiation between intention, matter, and time.

4.3 FERMENTATION AS A WAY OF THINKING

Through these workshops, fermentation emerged as more than a culinary technique: it became a method of inquiry. Participants confronted the limits of prediction, the necessity of patience, and the ethical stance of working with rather than against living matter. To ferment is to adopt a different epistemological stance, one that values slowness over immediacy, attentiveness over dominance, and relationality over individuality. The process encouraged a mode of thinking that is iterative, responsive, and attuned to the agency of non-human collaborators. In this sense, fermentation became a philosophical practice: a way of learning by doing, sensing, and becoming-with. Each meeting concluded with a shared moment of tasting. Participants sampled some of the ferments that I had been preparing at home — such as kimchi, vegan cheese, kombuchas and fermented vegetables or fruits — while also bringing their own creations from different cultural backgrounds, such as *shio koji*, a mixture of salt, koji, and water used to marinate and tenderize raw ingredients. Through these exchanges, the ancient and the new intertwined; tradition met experimentation, and diverse sensibilities converged in the same act of care.

Figure 4: Soda bottle

Ultimately, this case study embodies the essence of this thesis: that fermentation is not only a process transformation, but a way of thinking and living otherwise — an embodied philosophy of care, a language of relation, and a quiet rebellion against separation. In its bubbling jars and patient rhythms, it teaches us to dwell within the loop of life — to become, with microbes and with one another, participants in the shared art of making worlds. As the team at Mugaritz reminds us, "fermenting is, above all, transforming: daring to provoke and decontextualize references of all kinds".[5] Through these workshops, this daring took shape — not as an act of domination over matter, but as a gesture of trust, curiosity, and coexistence. All participants were encouraged to experiment freely, without taking too much control. In this act of preparation, they created a variety of jars, each one becoming an expression of their individuality — a reflection of taste, intuition, and curiosity.

[5] https://www.mugaritz.com/en/i-d/obsesion-que-fermenta-transformar-a-traves-del-penicillium-3/.

5. FINAL REMARKS

The only limitation to fermentation
is imagination.

The time I dedicated to writing this thesis has been, above all, a time for myself — a moment of sensing, reflecting, and slowly growing alongside the ideas and practices explored here. It was a crescendo of learning, creating, trusting, and at times surrendering to the process. Like every meaningful journey, it came with its highs and lows, each of them offering essential lessons.

This reflective path mirrors the very processes I have described throughout the thesis began by reframing the relationship between humans, non-humans, and microbes through the lenses of post-anthropocentrism and care, showing how our lives are enmeshed within microbial agencies that shape our bodies, environments, and cultures. The initial theoretical grounding established a crucial premise: we do not exist above or beyond microbial life — we exist *with* it, *through* it, and *as part* of it. Within this framework, care emerged not as mastery or control, but as *correspondence*: a way of attending, responding, and co-creating across species boundaries. Building on this foundation, the thesis turned to fermentation as a practice where human and microbial worlds meet and mutually transform one another. Fermentation became the conceptual hinge through which the subsequent exploration of taste, disgust, and knowledge unfolded. These reflections converged with the analysis developed in the middle chapters, which examined how taste and disgust operate as relational dynamics that mediate our encounters with the unfamiliar. Knowledge — embodied, sensory, and cultural — was shown to play a central role in reframing these encounters.

Throughout the thesis, taste has revealed itself as far more than a sensory event. Drawing on Perullo's distinction between naked pleasure and *dressed taste*, it became clear that knowledge shapes perception, blurring the lines between attraction and aversion. Disgust emerged as a threshold emotion: a moment when the unfamiliar challenges the integrity of the self, demanding interpretation rather than rejection. Knowledge does not eliminate this discomfort; it reframes it, allowing repulsion to transform gradually into recognition. Fermentation served as a central field through which to understand these dynamics. As both a biological and cultural practice, it makes visible the continuity between life and decay, reminding us that transformation and decomposition are not opposites but two faces of the same process. Fermentation is *decay under care*: a cultivated, intentional form of putrefaction that demonstrates the generative, transformative power of microbial life.

The case study of the fermentation workshops gave concrete form to these theoretical insights, showing how knowledge becomes embodied through shared practice. Learning to ferment requires entering into correspondence with microbial activity, accepting uncertainty, slowness, and co-creation as essential components of the process. These workshops revealed how cultures — microbial, human, and more-than-human — converge, and how care manifests as a relational posture grounded in reciprocity, patience, and attentiveness. Engaging with thinkers such as Haraway, Ingold, Tsing, Heldke, and Morton deepened this perspective, allowing fermentation to emerge as more than a gastronomic technique. It becomes a conceptual framework and a pedagogical tool, a way of learning to stay with what is unfamiliar, to inhabit ambiguity, and to perceive the world as a dense mesh of relations rather than a set of discrete, controllable units. Through the act of writing and observing the microbial world along seasonal changes have shaped the forward-looking reflection that closes this work.

In recent years, several authors have approached fermentation through anthropological, philosophical, and ecological lenses, highlighting its potential to rethink relationships between humans and the more-than-human world. This thesis positions itself within that emerging body and aims to contribute to an interdisciplinary understanding of fermentation — one that reveals connections, dependencies, and forms of agency that conventional frameworks often overlook. My curiosity continues to guide me. I imagine creating fermentation in which academic research, personal practice, and the desire to share knowledge can converge — spaces where learning is carried out through doing, where microbial, human, and more-than-human cultures meet, and where fermentation becomes a medium for ecological awareness, community-building, and creative experimentation. If fermentation is also a matter of imagination and creation, my future will continue to unfold through food — not only in kitchens but across disciplines and environments committed to low-impact, upcycled, and transformative practices in a changing climate. In this sense, the present work seeks to build yet another bridge between humans and non-humans, between scientific studies and philosophical inquiry, showing how these domains can inform, nourish, and transform one another.

Ultimately, fermentation teaches a fundamental truth: that care and transformation require time, patience, and the willingness to coexist with forces we cannot fully control. To ferment is to participate in a shared becoming — to make kin with the microscopic, to welcome the unfamiliar, and to recognize that our lives are sustained by the very processes of decay that we often fear. In this sense, fermentation is not only a practice but a lesson: a way of staying with the trouble, of tasting the world differently, and of cultivating an ethic of the unfamiliar.

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