

Microbial Antagonism in the Trentino Alps

Negotiating Spacetimes and Ownership through the Production of Raw Milk Cheese in Alpine High Mountain Summer Pastures

Roberta Raffaetà

In this paper I analyze fermentation practices in the production of cheese in Alpine high mountain summer pastures and their connection to politics of space, heritage, and ownership in times of ecological, social, scientific, and economic transition. In the Trentino Alps, fermentation is a technology for enacting different spacetimes in that it is not only a technical act but is also connected to how people practice and give meaning to places. I will focus on how fermentation participates in the composition of different human, more-than-human, and microbial spacetimes, which I call “utopias,” “heterotopias,” and “atopias.” In these spacetimes, fermentation translates space into cheese through different logics: overlap, transduction, or abstraction. Discussing how fermentation is managed and perceived gives us the opportunity to reflect on who owns the Alps and leads to a debate on how to constitute sustainable and just futures. Fermentation plays a key role in scientific innovation as well as in social innovation as to how the Alps will be assigned value and ownership.

In this paper I analyze fermentation as a technology for enacting different spacetimes (Munn 1990) between local and global demands in the Alps and as a means through which to rethink ownership of and entitlements to tradition and innovation. According to Munn’s pioneering work, there is a conjuncture between space and time as both dimensions emerge and transform in relation to the practices that social actors deploy in specific places. While Heather Paxson in this issue (2021) employs the term “timespace” to analyze how the specific temporality of artisanal cheese chain capitalism and its perishability is also spatial in terms of mobility and environmental conditions, in my paper I focus instead on how people live and take care of a specific space and interact with temporality and how this leads to different ontological configurations.

I focus on the fermentation practices that occur when cheese makers (*casari*; singular, *casaro*) make cheese from raw milk produced by the cows that live with them on *malghe* (singular, *malga*) in Giudicarie, a valley located in Trentino, a region in the northeast of Italy. The term *malga* encompasses both the grazing areas of summer mountain pastures and the buildings and infrastructures used by humans and animals. A *malga* is typically made up of a building where workers live (usually a kitchen and a few sleeping rooms) and one or more rooms for processing the milk and storing the dairy products. Attached to that is the shelter for the animals.

I analyze how fermentation participates in the composition of different human, more-than-human, and microbial spacetimes, which I call “utopias,” “heterotopias,” and “atopias.” In utopias, fermentation, cheese, and place are idealized to such an extent that they become disconnected from the actual sociopolitical ecosystem in which they are grounded. In utopias, I

encounter Michele and Rosa, cheese experts and activists, and two *casari*, Daniel and Gianluigi Rocca, all believers in the conservation of traditional food according to a logic of an overlap between nature and culture. This logic has strong ethical undertones, guided by the compass of an ideal alignment between nature and culture.

A heterotopia (Foucault 1986) is a space that is “other” and that cultivates difference by enabling the creation of new meanings from a given and conventional configuration. This is the situation for many new-generation *casari* living in *malghe*, such as Enzo, Paolo, and Alessio, as well as for *malga*-dwelling cheese experts and researchers such as Francesco Gubert. These *malga* dwellers recognize the evanescence of a fixed notion of nature and act according to a logic of transduction by engaging with nature in an effort to configure horizons of sustainable ecological cohabitation in contemporary times. I adopt the concept of transduction from Helmreich (2009), who derives it from the field of acoustics to point out the role of “lateral attention . . . surroundings, circumstances that allow resonance, reverberation, echo” in the appreciation of how “subjects, objects, and field emerge from material relations that cannot be modelled in advance” (230).

Finally, atopias draw attention to what happens when space is absent or elided, as is the case for a group of researchers led by Italo, who selected a single *malga* strain to produce a bio-functional cheese. A logic of abstraction guides these researchers who, in the rush toward innovation, dismiss the importance of attributing value to the complex web that entangles their invention with the *malga* ecosystem. This article puts their view into a dialogue with the concerns expressed by university professor and mountain zootechnology activist Michele Corti, who

Roberta Raffaetà is Associate Professor in the Department of Philosophy and Cultural Heritage of Ca’ Foscari University of Venice (Malcanton Marcorà, Dorsoduro 3484, D, 30123 Venezia [roberta.raffaeta@unive.it]). This paper was submitted 6 VI 20, accepted 17 II 21, and electronically published 16 VII 21.

has strong ideas about local people's rights over the ownership of biodiversity. I will also contrast these researchers' views with recent advances in microbiome science, advances that pose questions that have the potential to reconfigure what innovation and ownership mean.

In the Alps, spacetimes are translated in terms of *tipicità* (typicality) and taste. In 2016 the Trento Chamber of Commerce introduced the brand Trentino di Malga, linked to a procedural guideline¹ that specifies the use of either a starter made of selected microbial strains found in malga cheeses or of *lattoinnesto*. The starter, here called Fermountain, was created by a research institute (AB)² in a project (2011–2016) that aimed to map and select the microbial strains of raw milk cheeses produced in malghe. The project was carried out together with the Trentino Chamber of Commerce and the casari themselves, who welcomed the prospect of enhancing the quality of their cheese. *Lattoinnesto*, on the other hand, is used by casari who want to keep a stronger local signature on their cheese by creating their own starter from former cultures. This is done by heating up the raw milk to a temperature of about 55°–65°C in order to kill off pathogens and the microbes that prevent fermentation.

The branding of malga cheese, whether made with starter or *lattoinnesto*, makes it a tourist attraction with a distinctive taste. But taste—like *tipicità* and place—has been reconceptualized in postgenomic times as something played out at the molecular level too. My analysis draws inspiration from Hannah Landecker's (2011, 2016, 2019) work on how science is being reconfigured by postgenomics and by the work of Cristina Grasseni (2009, 2017) and Heather Paxson (2008) on the intersection between fermentation and politics. Grasseni has illustrated how, in Italy, cheese is an open arena for struggles over heritage and how such struggles have an economic and identity undertone played out in a transnational space that can redress perceptions of locality. In the North American context, Paxson has analyzed the "microbiopolitics" of raw milk cheese in relation to safety and hygiene.

I will illustrate how people use fermentation to different ends and with different worldviews in an attempt to express the multivocality that surrounds fermentation as a technology. Utopias, heterotopias, and atopias are not sharply defined, self-containing categories; one, more often than not, seeps into the other. These stories, therefore, are not juxtaposed in order to find or indicate the "truth" but rather to invite critical reflection across difference as well as across similarities to "provoke encounters across difference that produce new articulations" (Fortun 2012:455).

Setting and Methodology

In Trentino, malghe and their pastures are a common good. They are on historically undivided grazing land owned by the

municipality or confederation of villages (*regole*) that govern the territory.

This legal identification derives from the fact that in the past, malghe have had a key role in the social and economic life of the Alps: "A handful of men can herd the animals of the entire village, milk them, and produce cheese in bulk. The rest of the population is thereby freed for the vital summer task of haying" (Netting 1972:141). As discussed by Viazzo (1989:276–285), the "close corporate communities" in the Alps served to preserve the delicate balance between animal population and hay production. In Giudicarie (Franceschini 2008; Poletti 2009), the community was particularly closed because of special privileges granted historically by the diocese,³ and these enclosed conditions contributed to the establishment of an egalitarian pattern of social stratification that has been defined as a "national-communism autarchy."⁴ Within this moral economy, the production of cheese was very important. I often heard it said that the casaro was the most important person in the village after the priest and the teacher.

In the second half of the twentieth century, the importance of malghe, casari, and livestock declined because of major socio-economic changes in the region. After the First World War Trentino became part of Italy, and after the Second World War, it started its transformation from a mainly agriculture- and livestock-based subsistence economy to a tourist destination of worldwide renown thanks to its natural beauty and a thriving ski industry. Many people left the farms and malghe, and many experienced casari went to work in creameries. Autochthonous breeds of cattle were hybridized with other species; these new breeds were no more than 10%–20% pasture fed, their feed supplemented with industrial feedstuff. As a consequence, nowadays it is easier for breeders to keep their cattle in barns in the village. In 1843 there were more than 500 malghe; in 2000 there were only 100.

In the same years that the value of malghe was falling for breeders, it was growing for tourism (Avanzini et al. 2019; Gretter, Goio, and Gios 2010). Over the last few years, however, young people have been revitalizing malghe and retransforming them. In this process, cheese has reemerged as a luxury commodity, and the fermentation processes have withstood the different ways—illustrated in this paper—of conceiving human and nonhuman cohabitation, health, and property.

This paper is based on a summer (2019) spent visiting 12 different malghe in Giudicarie and studying the socio-material assemblages found there. Giudicarie is also where I live, having moved there from Milan as a child. I could be defined as a "new highlander" (Bender and Kanitscheider 2012; Dematteis 2011).

3. Given the valley's strategic position for viability and military operations between the German and Latin territories, archbishops historically have been quite benevolent landlords, granting exemptions and facilitations (*Privilegi*) to the inhabitants and allowing them to establish their own rules (*Regole*).

4. This definition was suggested to me by the historian Aldo Gottardi, an expert in local history and working at the Centro Studi Judicaria.

1. https://www.palazzoroccabruna.it/sites/default/files/uploads/documents/Disciplinare_Trentino_Malga_Registrato_Agosto_2018.pdf.

2. AB is an anonymized name; see note 16.

My outlook is that of an insider who is also partly an outsider. The insights derived from the fieldwork in malghe have been combined with more than five years of ethnography in metagenomics labs (Raffaetà 2020), mainly in Italy, observing how scientists produce knowledge about the microbiome.

Utopias

One spring evening at sunset I met Michele, a representative of Slow Food's cheese department, and Rosa, coordinator of an association of casari. Malga cheese, Michele explained, is unique because "it creates a symphony of flavors that would never be possible with starters." Much of the flavor comes from the raw milk, but microbes still have the major role: "the multivocality of taste and aroma come from heterofermenting strains that are probably not present in starters because they are virtually unmanageable. They 'eat' a substance, producing different substances according to the specific conditions at that specific place, day, and time. This is what gives malga cheese its uniqueness and, consequently, its distinctness."⁵

Michele warns, however, that in the absence of starters some precautions are needed: "Microbes are plump and easy-going; they're slow. But you have to take care of them, you have to point them in the right direction. You can do it if you observe them, get to know them, and enter into a dialogue with them. You try once, then again . . . it takes time, love, and patience." Teaming up with microbes binds and engages the malga casari in enlarged time frames different from the accelerated timescale of industrial production (Grasseni 2005). The fermentation of malga cheese happens because of a combination of interactions between "slow" microbes as they lazily produce metabolites and break down substances and between all these processes and constant human care (salting and looking after the wheels of cheese).

Caring for microbes and cheese may also mean caring for cows. Daniel is a 36-year-old casaro who studied art and music and then took to rearing cattle and working in malghe because of his deep love for animals. His childhood dream was to have a farm, but he could never come to terms with the fact of having to kill the animals at a certain point. And now, despite all the stereotypes of tough men working on malghe, he confesses to me that he still has the same problem. He keeps the calves with their mothers until they are grown up even though it goes against his economic interests. He owns 15 cows, and during the summer on the malga he takes care of his own and the malga manager's cattle, a total of about 35 cows.

He proudly tells me that his cows feed entirely on pasture during the summer and eat only hay in winter, whereas currently most cows on malghe are given feedstuff in order to increase the milk yield. Despite that, he is convinced that his cows produce quite a lot of milk "because they are healthy," underlining the interdependence between a cow's health and

fermentation processes. Daniel explains that the milk from his cows ferments more easily because "a pasture-only diet makes the cow's rumen bigger. The biodiversity and liveliness of the enzymes in my cows' milk is incomparable, compared to milk from other cows." Daniel uses only rennet to make cheese, no starters, not even *lattoinnesto* "because it is a selection, however you look at it. Why should I spoil nature? Why should I have a cheese worse than something nature already makes? Nature doesn't need any help!"

Being true to nature is, according to Daniel, the recipe for safety and is more important than hygiene norms. Veterinarians, he says, "generate a lot of terrorism" about hygiene but "if you get your cows to lead a healthy life it's difficult they'll get sick, and so their milk will be healthy too." The problem, according to Daniel, is that feedstuff makes cow's bodies very acidic because corn is acidic. This makes them get ill often, and it makes their milk and cheese unsafe. He milks his cows by hand and gives them no antibiotics, and only small amounts of magnesium and thyme oil if they get infections.

He points out to me that his cows are long-lived (two of them are 17 years old, and the average age is six) and hardy. The year before, Guendalina (one of his cows) broke her hips. This made her eligible for the slaughterhouse, according to conventional practice, but Daniel treated and cured her. "She's a bit ugly to look at—she still has the sores. But she's alive!" Daniel's care for his cows may be interpreted as a practice similar to forms of repair and maintenance, as opposed to the modernist appeal to newness, to the "bright and shiny" (Jackson 2014:227). Daniel's cows are not just "producers" of cheese, and Daniel is not there simply to take advantage of their "services." Through his caring acts—sometimes irrational from a purely economic perspective—he actually participates in their world. This makes him aware of the interdependent configuration of humans, cows, milk, and cheese. Maria Puig de la Bellacasa (2015) has noted that "care requires thinking from the perspective of the maintenance of a web of relations involved in the very possibility of ecosystems rather than only from their possible benefits to humans" (701). Daniel decries the ideology of maximum and intensive production, an ideology that forces not only humans but also more-than-humans to disengage from mutual care and to reduce what counts as care "to a manageable 'conduct' of tasks to follow," hence cutting out "the possibility of developing relations of care that fall out of its constricted targets. Productionism transforms care from a co-constructed interdependent relation into mere control of the *object* of care" (Puig de la Bellacasa 2015:700).

Up there, high in the Alps, it seems easier to make utopias come true. More than one casaro described malghe as "the last bastion of anarchy." I had ample opportunity to grasp what the beatitude of this idyllic existence is. After milking duties, the only task before you is to enjoy life. Daniel sits on a bench with a friend playing jazzlike music. Cows graze quietly around us and calves snuggle up to their mums while Daniel's girlfriend, their dogs, my son, and I look on, surrounded by and drawing nourishment from the majesty of the Dolomites.

5. All interviews were conducted in Italian and translated into English by me.

But the image of Guendalina, who I had seen that morning, at dawn, during the hand-milking, did not leave me. Guendalina looked not only ugly but also quite unhealthy. Her sores were pus-filled and her tail looked like it was rotting. The cows in general looked very skinny. At breakfast, I took a bite of the cheese and it tasted a bit too bitter, as bitter as the tone of Daniel's voice when he was telling me how the local authority did not care about his malga. There was no guarantee of infrastructural maintenance and not a single signpost to the malga down in the valley or anywhere along the road. This made it more difficult for Daniel to sell his cheese to tourists going past his malga on their way to the more famous attractions farther up the valley.

Daniel notes, "If it wasn't for the European entitlements the mountain culture would completely disappear." In 2001–2003, the European Community granted "entitlements" to farmers that could be used to obtain direct funding.⁶ The value of an entitlement in Italy is now about 220 euros per hectare. Starting in 2005, these entitlements could be sold or bought by farmers without being tied to any specific piece of land and independently of production.⁷ Because of this, Alpine pastures became attractive prospects because they cover extensive areas and give access to large numbers of entitlements, and land could be rented very cheaply. Also, the European Union (EU) funding is increased by 50% for "greening" or, rather, actions aimed at restoring biodiversity, which is easier to do in mountain pastures than in the plain. This has created the conditions for speculation, with entrepreneurs (often not local) increasing the bid in the public allocation of pastures and keeping out small-scale and local farmers. In Trentino, municipalities allocate malghe for a period of up to five years in a public selection process, the outcome of which is based on both the economic proposal and the project content.⁸ As pastureland is a common good, municipalities ought to allocate the pastures in such a way as to benefit the entire community, but they often attach more value to quick profit than to the quality of a project. In fact, large-scale intensive livestock concerns have been known to buy pastures for the sole purpose of demonstrating—on paper—the minimum ratio between number of cows and hectares. Sometimes no cows were actually put out to pasture, or speculators

brought up breeds of cattle unsuitable for pasture feeding that became ill or died.⁹

Daniel's malga had been allocated to a local entrepreneur, a large-scale intensive livestock owner. The entrepreneur earns more than EUR 250,000 in EU entitlements while Daniel only gets 60 euros per day from his entitlements as a fixed-rate independent farmer, and his girlfriend, a migrant from Thailand, earns 40 euros per day for helping him. To make ends meet, he sells cheese. And so it turns out that the preservation of malghe cheese, linked to free-floating entitlements that generate huge profits for their owners, is materially based on underpaid labor.

Guendalina's purulent sores and the bitter taste of cheese are clues that hint at the spatiotemporal disconnections between Daniel's aspirations and the actual economic and political neglect of the malga ecosystem. They make apparent the frictions between an ideology of care and an ideology of profit. In this context, Daniel performs a utopia, a place that does not exist, because his ideals of care regarding an enlarged community of humans and more-than-humans find no support in how the malga system is managed at either a local or a global scale at the beginning of the twenty-first century. With his fermentation choices, Daniel composes an ontological configuration in which a fixed idea of nature overlaps with a fixed idea of culture.

In my further wanderings among the malghe, I met another casaro who was not using starter: Gianluigi Rocca, working in malghe for more than 40 summers. A world-renowned artist teaching at the Accademia di Belle Arti di Brera in Milan, he is a poet and writer who has edited inspiring artwork and volumes (Rocca 2007, 2009) on malga culture. The artist's role is indeed to live in utopia. His cheese is not just food but "a piece of art" (Sardo 2003). For other casari, though, living in utopia may come at a price. Daniel's cheese does, after all, have a bitter aftertaste. Maybe wild microbes are not always the best ones.

Rosa and Michele's utopia seems similarly shaky. Rosa thinks that the strong emotional attachment to the association of casari that was so evident 20 years ago, when it was founded, has gone. The spirit of *resistenza casearia* (resistance of the casari) has dwindled. Rosa is the daughter of a cheese maturer who managed four malghe. She traveled the world, lived for a long time in California, and, on returning, enthusiastically embraced the cause of casari emancipation. But when we met, she confessed her doubts as to whether she would do it again. Malghe were a different thing compared to those of her father's time, and now there is very little motivation for casari to produce cheese faithful to the tradition. The casari should have had a more active role from the very beginning, Rosa says; it should have been them—not her—leading the push for change.

6. One entitlement corresponds to 1 hectare.

7. For official documents, see <https://www.gazzettaufficiale.it/eli/id/2005/12/15/05A11756/sg>; <http://www.titolipac.it/>; https://europa.eu/rapid/press-release_MEMO-13-631_it.htm (accessed August 10, 2019).

8. The Trentino provincial authorities issued a document (Guidelines for the Allocation of Pasture Lands and Related Infrastructures and for the Contractual Agreement). This document is quite ambiguous because in the first part it clearly states that the evaluation of the offers will be made on the basis of the economic offer. In the second part it is specified that 70% of points will be awarded for the quality of the project in order to price the actions with a view to preserve the traditional biosocial landscape (use of autochthonous breeds, production of cheese with traditional processes, etc.). This ambiguity seems to leave the manager with a considerable degree of choice and room for maneuver.

9. For a newspaper report on these speculations in Giudicarie, see https://www.questotrentino.it/articolo/8521/portati_a_morire_in_malga.htm (accessed July 16, 2019).

Heterotopias

Either we're in that world, otherwise there's not much meaning to making cheese like in the past! But to be in that world means a whole series of things, starting from having low barns¹⁰ with the ceiling made of wooden beams, and above that the hayloft, so that when you walked on the hay a fine dust came down. The milk was hand-milked, outdoors. It was filtered with *dase*¹¹ to stop cow hairs getting through, and there were resins and bacterial ferments that gave a kind of edge to the milk. Then the milk was cooked in the pot and there was smoke, lots of smoke all day long, sterilizing everything. Now we sterilize the cows' teats before and after milking, and there are milking machines that are rubber tubes passing through steel and ending up in the cooling machinery, which is cleaned with detergents.

With these words, Enzo, a casaro since 2003, makes it clear that it is not possible to make the cheese of the past because it is not possible to remake the malghe of the past. In the past, milk had about 3 billion microbes (as against the maximum limit of 100,000 set by EU hygiene laws introduced in 1993) and was part of a bacterially balanced ecosystem. Enzo calls this balance "microbial antagonism": a diversity of bacteria forming an organizational structure that was able to prevent the development of pathogens. In contrast, "the milk that arrives now in the churn is a white sheet, a no-man's-land that can be colonized easily by dangerous bacteria."

Enzo uses Fermountain starter even though he likes experimenting sometimes with lattoinnesto. He processes the milk of 60 cows, also making cheese for a number of village markets. According to him, hygiene precautions are important now because of the "ethnic war" of hygiene laws that, since the 1960s, have been destroying the microbial balance of milk acquired over the centuries. Hygiene norms—such as the one that eliminates wood and replaces it with Teflon, steel, and plastic or the one that sanitizes everything with detergents and uses fans to eliminate fumes—have created a milk that, according to Enzo, is precariously out of balance. The modernization of cheese making (milking machines, starters, etc.) is unavoidable, he argues, because now we are caught up in a vicious circle where hygiene calls for yet more hygiene. And cleaner milk needs help in its fermentation. According to Enzo, all these things make escaping into past dreams a dangerous and pointless endeavor; casari have no choice but to live in current spacetimes.

Malga spacetime is, however, peculiar, and that is part of its appeal. Paolo is 30 years old, anarchic, vegan, and pacifist, and he practices yoga and enjoys drugs. He has been working on malghe for 11 years, and five years ago he took over the

running of a malga, moving up with his wife and his two children. He fenced off his malga in order to bar the entry of tourists who arrive in great numbers because the malga is reachable by car: "I'm sorry to do this, but they come in and think everything is on show just to please them." He has 15 autochthonous cows, plus some dry cows (non-milk-producing) belonging to other breeders. These are big cows, not ideal for malghe, but Paolo has put all cultural purity worries behind him. "They are poor reincarnated souls, so I give them a bit of enjoyment." And he hand-milks them so as to enjoy "this luxury, sitting in front of the Brenta with no generator noise to spoil the idyll."¹²

Despite his utopian vision, Paolo is well aware that his freedom to live an anarchic life depends precisely on the fact that he can produce a reliable cheese. After trying out many mixtures, he decided to use Fermountain starter, even if "just a sprinkling." He showed me the bag of Fermountain and with a wry smile added, "This is all milk powder. Do you think I'm going to put 500 milligrams of powdered milk in my cheese?!" He thinks Fermountain is a good compromise between the quality it provides and the harsh malga environment. Even though the cheese made with his own lattoinnesto is higher quality, he thinks that Fermountain creates the right conditions for letting the raw milk bacterial community work better. He criticizes lattoinnesto advocates "who've never been on a malga! The conditions on a malga aren't right for it: it's dirty, there are lots of things that you need to look out for. To use lattoinnesto you have to be thorough and careful; you have to check your cows every morning: if they get a kidney blockage or something they can all die. Nowadays malghe are full of anarchists, dropouts, and borderliners and they're not that thorough!" Contemporary malghe are often described as a seaport, a refuge for anarchists, or a place where "the last of the last work."

As well as being "the last bastion of anarchy," malghe are also places for gourmets. According to Francesco Gubert, a casaro and an Italian Organization of Cheese Tasters (ONAF) master taster who has also been involved in the first stage of the Fermountain project and is now a representative of the Trentino di Malga brand, a certain degree of standardization is not an impediment to pleasure but, rather, a trigger. Extreme aromatic intensity, a characteristic of cheese made with no starter, is not suited to what he calls the "modern consumer" (see also Dickau 2019).

What do I expect of a malga cheese, now, in 2020? Intense aromatic typical notes: it has to taste of grass (vegetal notes), lactic notes (butter and malga), and perhaps also some animal notes may emerge, some subtle fermented notes, etc. It doesn't have to taste of [*hesitation*] cow shit, it doesn't have to have too intense notes. It doesn't have to get descriptors like "rotten egg" or "boiled egg." Many [cheeses] really taste of urine. In some orthodox places they sell you exorbitantly priced cheeses that are very low quality. Essentially, these are

10. In the past, malghe had low roofs so they could be warmed up easily with the cows' breath. In this warmth, people would spend the evenings chatting and gossiping together (*fare filò*).

11. A receptacle with a mesh of small wooden sticks at the center.

12. Brenta Dolomites, part of the Italian Dolomites.

flawed cheeses. This is because that's what they're looking for: *tipicità* is linked to the presence of these severe aromas. If you want to offer people tastes of your cheese and you want it narrated—I also do that—it has to be in order: it has to have many aromatic sparks, it has to have diversity, biodiversity, it cannot be flawed. For example, it cannot have too bitter a taste: a bit is fine but not like in the cheeses of the past, when it covered everything.

Fermountain, according to Gubert, makes it possible to avoid “occasional variability” in which “you do not govern the variables, so you can have peaks of excellence but also flawed cheeses” and hence to promote a “typical variability, which means a cheese that trims off the fringes of defectiveness or extreme aromatic expression but remains identifiable with its *malga* and between *malghe*.” Fermountain comes in six different microbial mixtures (corresponding to six areas), to maximize biodiversity.

Elderly people have told Gubert that cheese often “tasted of everything but not cheese” and that it was eaten because of hunger and poverty.¹³ Fermountain, according to Gubert, allows the expression of typical notes but cleansed of harsh tones. He knows from personal experience how harsh *malga* life can be: in an autobiographical novel he described how his desire to “escape from responsibilities and obligations” (by moving to a *malga*) became a nightmare, from which he escaped with great relief: “Driving back in the night, all of a sudden, the city lights appear before me: my return to civilization, I thought. I feel an abyss between the mountain world that I am leaving behind me and the city, which greets me with its powerful lights. Two worlds so close and yet so different at the same time” (Gubert 2019:114). Gubert will go back to *malghe* many times. That first experience was formative, triggering him to bring productive transformations to *malga* spacetime through his involvement in the development of the Fermountain starter that, according to Gubert, provides an experience of otherness without being out of time and space.

And this feeling of spatiotemporal dislocation, while being in the present and here, was exactly the kind of experience I had when I visited Alessio's *malga*. Alessio, together with his wife, three children, and in-laws runs a *malga* where tourists can also get meals made with local produce (*agriturismo*). When I arrive I am welcomed by the scene of a calf drinking milk from its mum. They look well fed and clean, and the barn smells good. Pigs, donkeys, and horses populate a lively educational farm. Alessio's cows (all autochthonous breeds) “eat wild herbs, hypericum, and Achillea and climb 300 meters every day.” Alessio keeps the use of feedstock—rigorously non-GMO—to a minimum and is happy to have a moderate production of milk “because if you look at quantity alone, the quality is lowered. For me and my wife it's very important to care about this because at least it gives us a ‘why’ to tell to our

children, otherwise how could we justify it when they see us being busy all day long?”

Alessio's love for *malga* life started in 2004, when he was 21 years old with a steady job and went to a *malga* in the summer because of a “fantasized dream,” but “the *malga* is like a lightning bolt: it gets you and it never leaves you. . . . I found myself in the middle of the grass with a stick in my hand looking at the cows and I understood that, until then, I hadn't understood anything about life.” He likes everything about living in the *malga*: “the forest, the water, the grass, the smell of the barn, the dogs working, the [cow] bells, the pastures, the rhythms. It's not that you finish your work and then go home to relax. You are here and here you remain. You don't need a watch, you follow the rhythm of the cows: when they're tired and it's too hot, they sit in the shade, then they stand up and go to pasture and you follow them.” It was several years before he realized that *malga* life could be not just a whim but a job. Initially, his family was against his life choice and he “had no model. I didn't know anyone before me who'd transformed *malga* life into a sustainable life in modern times.” As for the tourism aspect, his *malga* manager used to say to him “if some tourist asks for a glass of water, kick him out.” When he and his wife first tried providing meals to tourists, his contract was not renewed by the manager who said that he wanted to employ “a shepherd that's just a shepherd.” In the village there were rumors that Daniel and his wife were earning money using other people's property, pastureland being a common good. Once they were able to get their own *malga*, they opened it up to tourists, transforming it. Being in the Inversion Project¹⁴ helped him “give a conceptual shape to what I was doing.” This project helped mountain farms to become resilient and sustainable while also generating value with the improvement and narration of traditional mountain activities. Alessio learned about animal well-being, which is “crucial to the quality of the cheese. It's not enough to give an antibiotic when an animal is sick. You have to understand what's going wrong in her environment.”

For the cheese making, Alessio usually produces his own *lattoinnesto* “because this is the trademark of our *malga*. We believe in what we are doing. I would like to open each wheel of cheese to see how it's turned out.” The hectic rhythm of managing the *malga* and running an *agriturismo*, however, makes it sometimes impossible to look after the *lattoinnesto*. On these occasions, he sees Fermountain as a good substitute. The *agriturismo* gives the day a more rigid structure than on a conventional *malga*. Caring for tourists may be a distraction from caring for cheese and animals but is seen as a good compromise. As Grasseni (2017) has noted, reinventing traditional activities is a process of “calibration . . . redefining and interpreting tradition in the face of multiple pressures and encroachments” (1).

13. For historical accounts of the value of cheese in former times, see Gobbetti, Neviani, and Fox (2018) and Viazzo and Woolf (2002).

14. <http://www.progettoinversion.it/>, funded by the Province of Trento with European funds.

The calibration done by Enzo, Paolo, and Alessio in their fermentation techniques has not only cultural and economic effects but also biological ones. Unlike industrial starters, Fermountain starter, rather than killing the biodiverse microbiome of raw milk, engages with it, allowing the expression of its features in variable ways, and this is influenced by a variety of factors such as climate, the relative abundance or ripeness of specific herbs, the techniques used, and the mood of the casaro and the cows. Paolo's irreverent use of Fermountain is based on the conviction that the quality of cheese is given not so much by the starter as by the quality of the milk, and by his experience as a casaro: "I will tell my secrets only to my daughter and only when she is old enough to know not to spread them around." Enzo confesses to using Fermountain not only because of convenience but also because it produces good cheese, which "maintains its variability, allowing the mountain microbes in the raw milk to be expressed." He showed me how Fermountain cheese has small holes in it, explaining that these holes "arrive from the mountain" and are a typical sign of heterolactic fermenters, which do not help the acidification but give aroma. Enzo studied the art of dairy craft at a historical school in the Veneto region for three years, because to make good cheeses "you have to know what is inside it [curd] and what you extract from it. You add your sensibility, which has an impact, and knowledge is important too."

Technique, knowledge, and the unpredictability of the raw milk microbial community are transduced by Fermountain into cheese. The logic of transduction (Helmreich 2009) is different from a logic of reinvention or translation: it is not adherence to contemporary demands. It is entering into dialogue with them and provoking, at the same time, a phase shift or a displacement (Agamben 2008). These heterotopias not only bring an experience of otherness but they also prefigure an ethical model of how humans and nonhumans could live and flourish together by careful acts of reciprocal attentiveness and obligation. In this, nature and culture do not overlap but engage with each other. A logic of transduction is open to the opportunity of difference within contemporary spacetimes, so producing heterotopia, while avoiding getting lost in utopia. What happens, though, when space is edited out?

Atopias

In 2012,¹⁵ Michele Corti, a university professor of mountain zootechnics and influential supporter of ruralist positions, declared that Fermountain appeared to be a project mainly in the interest of researchers, neglecting the role of *casari*:

Who owns the 500 isolated "wild" strains? . . . This is not an unimportant question, considering that in the future someone might be tempted to sell this "biodiversity" to multinational companies. They will say (in scandalized tones) that this insinuation of mine is malevolent, that they are acting in

15. <http://www.ruralpini.it/Inforegioni18.07.12-Fermalga.htm> (accessed May 20, 2019); my own translation from Italian.

the public interest and bla, bla. But I insist on saying that what we have here is an *ethical problem*. This biodiversity that belonged to the malghe (to its owners, to the casari who generated and conserved it). Did anyone make them aware of the fact that they were selling a good linked to their patrimony? Are we aware of the fact that this is what has taken place in the Lagorai and other "traditional" malghe, just like those pharmaceutical companies stole the biodiversity of indigenous people? (Emphasis in the original.)

While Corti's concern points to a relevant issue, the spirit and aim of Fermountain was to help the casari who were in difficulty with their cheese production and to support the malga lifestyle. The project, led by AB research institute, was initially conceived in its research translation department. Staff in that department had been in daily contact with breeders and casari, and the project followed in the wake of years of dialogue and exchange. AB had the ownership of the strains collected. This was secured by a contract signed by the casari. The casari were told that their strains were to be used only for producing malga cheese.

In recent years, researchers in AB's research innovation department looked again at the Fermountain microbial samples. They found that one of the microbial strains in a malga cheese highly enhances the production of gamma aminobutyric acid (GABA), with very positive health effects. They published a paper mentioning the possibility of producing a bioactive cheese made from raw alpine milk, hence contributing to the promotion of malga cheese. But they also hinted at the possibility of producing it with non-malga pasteurized milk to facilitate the optimization of GABA production, referring to the standardization and reproducibility of the results.¹⁶

Fermenting cheese with selected strains that have nutraceutical properties is fully within the contemporary: it addresses northern global demand for the health of decaying bodies within decaying environments. And yet, it creates a spacetime in which space-material attachments and mutual obligations are edited out. This is atopia, a term that underscores the absence or negation of space. In this context, atopia is a spacetime produced by practicing biotechnology with no awareness of the connections that link one strain to an entire ecosystem and a spacetime.

According to Italo, a researcher involved in the paper and "wild" an expert in Italian dairy production, the attachment of

16. I do not cite the original paper in order to reduce to a minimum the chance of identifying the research group. The final version of this paper has been reviewed and discussed with one of the researchers who led the cited study. He felt uncomfortable about some of the questions raised. Therefore, to protect my informants, I have opted for the maximum degree of anonymization. The paper has been cited not to create a scandal or apportion blame but, by analyzing a situated case study, to illustrate the complexities of technoscientific innovation and negotiating different ways of conceiving the production of malga cheese, each based on different notions of profitability, health/hygiene, and property (intellectual as well as material).

microbes to place is overestimated because of an anthropocentric bias: “Humans have cycles of about 25 years to reproduce; microbes reproduce themselves within minutes. There are no strains typical of a certain area or product. In two weeks, microbes already are something else. Tipicità is fine for tourists but you cannot measure it with scientific methods.” Helmreich (2003:348) has already drawn attention to the commercial opportunities that open up when you acknowledge the extraordinary reproductive capacities of microbes (further heightened by what is called lateral gene transfer):¹⁷ biotech companies can patent a bacterium simply by embedding it “in a different set of relations” to those of its original context.¹⁸ Italo’s argument also resonates with anthropological arguments about tradition as invention/reinvention and as a site of social and economic struggles. Italo emphasized that the process of isolating, purifying, and selecting the strain is “costly, hard, and takes time,” therefore rejecting the idea that casari might be able to reclaim any kind of right. The policy on intellectual property,¹⁹ indeed, links rights more to invention than to maintenance or protection. Moreover, the technique used to produce the cheese also has a role (Paxson and Helmreich 2014), confirming the much-debated fact that a domain called “nature,” neatly distinguished from one called “culture,” does not exist.

Italo’s observations appear legitimate, but only if we keep considering microbes exclusively as singular biological identities. Microbes behave as single cells in some circumstances, while in others as a community, exhibiting “multiscale interactions” (O’Malley 2014:169). That is why some scholars have proposed to shift the attention from microbes as genetic entities to microbes as metabolic paths (Baptiste and Dupré 2013; Dupré 2013), and to their biosignatures, which mark an “absent presence” (Paxson and Helmreich 2014:182). Microbes are not only “tiny individuals” (Clarke 2010:321) but also *are* an ecosystem that exists with and through the microbial community that makes it. The traditional dogma of microbial limitless dispersibility—also known as cosmopolitanism—is subject to debate (Jenkins et al. 2007; Lindström and Langenheder 2011). In some cases, specific environments are associated with specific microbes, and vice versa, because dispersal requires the existence of multiple factors that may occur with difficulty in circumstances different to those of the origin (O’Malley 2014:164–165). Microbes are pleomorphic: the same microorganism can take on different forms and functions according to the circumstances. It is in the intimate relationship between a place and the cheese produced there—malga cheese lovers suggest—that its unique value lies.

17. Transfer of genetic material not through descent but through spatial proximity.

18. It was indeed a bacterium, in 1980, that was the first genetically modified organism to be patented. See *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).

19. Since 1992 there has been a Convention on Biological Diversity, with two supplementary agreements: the Cartagena Protocol (entered into force 2003) and the Nagoya Protocol (2014). The latter protocol

Nowadays, metabolomics and proteomics employ metagenomic techniques to try to trace microbial relationships and reproduce them, but, as the many researchers I have interviewed in the last five years told me, we are not yet there (Raffaetà 2020). It is possible to create very simplified models and test them, but understanding the multiple causes of a microbe thriving, sleeping, or dying is still beyond the grasp of scientists. A telling example of this is fecal transplant: it has a quite high rate of success, but scientists are not yet in agreement about the reasons for its effectiveness. Sterile feces, for example, are effective anyway in treating severe infections. As Vanessa, a researcher working on this, told me, “We’re surfing in a sea bigger than us because we do not know much. Not only are we not yet able to know whether a microbe is good or bad, but as for knowing whether the effect is due to the process or the microbes, we’re at ground zero.”

Against this complexity, the idea to produce a nutraceutical cheese was a consequence of the “molecular vision” inherited from genetics (Raffaetà 2020). Abstracting microbes from their sociobiological topoi risks neglecting aspects of the environment that, according to the casari and cheese amateurs I encountered, make malga cheese special.

Speaking with Alessandro, a leading scientist in the field of fermentation, I was reassured that working with fermented food is different from working with feces: “We have less limitations because, although it is true that we cannot cultivate more than 10% of gut microbes, for fermented food this percentage is higher.” However, many scientists fail to grasp the modifications that occur, over time, in long-lived sourdoughs because “we do not care about who are subdominants, we do not care about the metacommunity but we simply look for the presence/absence of certain microbes and therefore we lose a more comprehensive view.”

In a logic quite similar to this, Italo linked the importance of a strain to its relative presence in the cheese, associating dominant strains to tipicità:

The strain we found was not dominant, it was present in traces and not in all cheeses and therefore is not typical. By definition, tipicità is a series of features that characterize a certain product and therefore has to be recurrent: if a certain feature or strain is found only once in 100, for example, it cannot be considered recurrent or typical. In absence of a starter, it is unlikely that casari can produce cheese with recurrent—and therefore—typical characteristics. Paradoxically,

aims to strengthen the fair and equitable sharing of benefits arising from the utilization of genetic resources. These policies, however, have been criticized with regard to their ethico-political undertones and application (Brush 1999; Hayden 2003; Moran, King, and Carlson 2001; Orlove and Brush 1996). For example, bacteria are not mentioned in the fifth report of the European Union to the Convention on Biological Diversity, published in 2014, even though their “biovalue” (Waldby 2002) has increased exponentially with the rapid expansion of microbiome research in the last decade.

PDO²⁰ products are more typical because the starters are standardized.

What about a *tipicità* based on variability (as in the concept of “typical variability” suggested by Gubert) instead of standardization? Alessandro expresses a view that is sensitive to the different roles microbes can play at certain times and in certain places and that can shift over time, keeping the microbial balance of a starter the same, yet at the same time different. As already noted, this makes fermentation a very delicate matter about which we still have limited knowledge. As emphasized by Papadopoulos (2018:183), technoscientific invention is always something mediated and anticipated in a human and more-than-human collective: “Experimental achievement and invention are mediated by many different trajectories and actors already *before* it has taken place, even before it has been formulated. If we neglect this, we neglect the invisible and indeed invisibilized labors of so many different human, animal, and inorganic actors that contribute to the making of facts.” This leads us to ask questions not only about which kind of technoscientific innovation but also which forms of entitlements we should support and develop when thinking about fermented foods: “It is difficult to separate content from context, bodies from environments, when the environment (microbes, fermentable carbohydrates) is not just something to be converted into the body by the genetic machinery commanding an enzyme army” (Kelty and Landecker 2019:63). Is it possible to imagine and advance intellectual property as associated not just with the isolation, selection, purification, invention, or manipulation of a biological entity but also with the skillful maintenance, repair, and variable reproduction of an entire ecosystem?

Conclusion

I have illustrated how the fermentation of malga cheese in Giudicarie is not knowledge passed unchanged from generation to generation but a process that, according to different logics (overlap, transduction, abstraction) participates in the creation of different spacetimes. These underscore different ways of coupling space and time with politics. While utopia is an ideal but nonlivable space in which nature and culture rigidly overlap, and atopia edits out space by abstracting it, heterotopia is a space that invites different encounters, even if not without frictions. In this, fermentation is a way to transduce knowledge, expertise, technique, microbial communities, and the ecosystem of which they are part into cheese. From being food for premodern hunger and then a commodity to please postmodern palates, cheese is transitioning toward being valued as “superfood” through its abstract connection to a “superplace,” namely, the alpine ecosystem of the malga. Its role in contemporary times seems to be that of providing a moral

economy in which continuous and moderately uncontrolled variability is prized against standardization. In malghe the relationship between nature and culture has not yet been settled and their ongoing differential differentiation may have generative effects. It is, indeed, the nonreproducibility of malga cheese, its unpredictable fermentation, that makes it typical and valuable.

Can the encounter between these different stories generate new meanings and social configurations? For example, could we take variability to be part of what is generally considered innovation and invention? If this is the case, not just biological entities but entire ecosystems and processes will have to be part of intellectual property rights: not an “ownership” but an *altership*, since what connects a person to an object is not exclusive of what connects that person to other human and nonhuman persons” (Brightman, Fausto, and Grotti 2016:19). How should the benefits be accounted for and shared? What is the “community” (casari, shepherds, malga owners, residents, new highlanders, researchers, cows, pigs, donkeys, tourists, bears, wolves, forests, rocks . . .)? Who belongs to the Alps (Raffaetà and Duff 2013) and who “owns” them (Kezich 2018; Varotto and Castiglioni 2012)? Which spacetimes will we be willing to support in the Alps: utopias, heterotopias, or atopias? Geographically and metaphorically, the Alps have always represented the limit. Can this become, instead, a political horizon?

In this paper I argue that to try to answer these questions we need a generative dialogue between whoever can contribute to a discussion about what is the just constitution of the Alpine ecosystem. The sharing of views between the different actors, agendas, and visions involved is needed because ecosystems are “socially made, not given” (Olson 2018:6). The concept of “microbial antagonism” mentioned by Enzo provides some insights into how to do it. Microbial antagonism counteracts pathogens not by directly blocking them but, rather, by transforming the entire system from a field of struggle into one of healthy cohabitation. In microbial antagonism, the encounter of diversity is not the problem but the solution because a new configuration can emerge from the encounter of entities that are never stabilized but are always and already in need of identification (Laclau and Mouffe 1985). Embracing this view would make fermentation a technology for social innovation rather than only a technology for technoscientific innovation.

Acknowledgments

I thank all the people who have shared with me their knowledge about the topic of this paper. I would like to dedicate this article to the memory of Agitu Ideo Gudeta, one of those new Trentino casari, horribly killed on December 29, 2020, by a collaborator. Her sad story points to the difficulties of keeping alternative spacetimes alive in absence of sociopolitical support. I also thank Luca Riccadonna for granting me access to many casari, Aldo Gottardi and the Centro Studi Judicara for

20. Protected Designation of Origin.

their support in the collection and analysis of historical data, Rachel Vaughn for her careful reading and for encouraging me to elaborate on the concept of “microbial antagonism,” and Robert Elliot for his careful editing. Last but not least, I am deeply grateful to the organizers and participants in the Wenner-Gren symposium in October 2019 in Sintra, Portugal, who provided not only useful feedback but also an exceptional and inspirational example of scholarly collegiality that will stay with me forever.

References Cited

- Agamben, Giorgio. 2008. *Che cos'è il contemporaneo?* Milano: Nottetempo.
- Avanzini, Marco, Andrea Bonoldi, Geremia Gios, and Isabella Salvador. 2019. Main drivers of the evolution of grazing in the alpine area of Valli del Leno (Trentino, northern Italy) during the last two centuries: natural resources, labour and investments. *Historia Agraria* 78:37–65.
- Baptiste, Eric, and John Dupré. 2013. Towards a processual microbial ontology. *Biology and Philosophy* 28(2):379–404.
- Bender, Oliver, and Sigrun Kanitscheider. 2012. New immigration into the European Alps: emerging research issues. *Mountain Research and Development* 32(2):235–241.
- Brightman, M., C. Fausto, and V. Grotti. 2016. *Ownership and nurture: studies in native Amazonian property relations*. Oxford: Berghahn.
- Brush, Stephen B. 1999. Bioprospecting the public domain. *Cultural Anthropology* 14(4):535–555.
- Clarke, Ellen. 2010. The problem of biological individuality. *Biological Theory* 5(4):312–325.
- Dematteis, Giuseppe, ed. 2011. *Montanari per scelta: indizi di rinascita nella montagna piemontese*. Milano: Franco Angeli.
- Dickau, Joel. 2019. Bad to chew: a commentary on the taste of texture. *Food, Culture and Society* 22(5):566–575.
- Dupré, John. 2013. I. Living causes. *Aristotelian Society Supplementary Volume* 87(1):19–37.
- Fortun, Kim. 2012. Ethnography in late industrialism. *Cultural Anthropology* 27(3):446–464.
- Foucault, Michel. 1986. Of other spaces. *Diacritics* 16(1):22–27.
- Franceschini, Italo. 2008. *L'alpeggio in Val Rendena tra Medioevo e prima età moderna*. Trento: Centro Studi Judicaria.
- Gobbetti, Marco, Erasmo Neviani, and Patrick Fox, eds. 2018. *The cheeses of Italy: science and technology*. Cham, Switzerland: Springer.
- Grasseni, Cristina. 2005. Slow foods, fast genes: timescapes of authenticity and innovation in the anthropology of food. *Cambridge Anthropology* 25(2):79–94.
- . 2009. *Developing skill, developing vision: practices of locality at the foot of the Alps*. Oxford: Berghahn.
- . 2017. *The heritage arena: reinventing cheese in the Italian Alps*. Oxford: Berghahn.
- Gretter, Alessandro, Ilaria Goio, and Geremia Gios. 2010. Beyond commons: new perspectives and roles for common properties. In *Local economies and global competitiveness*. Dallago Bruno and Chiara Guglielmetti, eds. Pp. 175–189. London: Palgrave Macmillan.
- Gubert, Francesco. 2019. *Novanta giorni: diario di una stagione in alpeggio*. Independently published.
- Hayden, Cori. 2003. *When nature goes public: the making and unmaking of bioprospecting in Mexico*. Princeton, NJ: Princeton University Press.
- Helmreich, Stefan. 2003. Trees and seas of information: alien kinship and the biopolitics of gene transfer in marine biology and biotechnology. *American Ethnologist* 30(3):340–358.
- . 2009. *Alien ocean: anthropological voyages in microbial seas*. Berkeley: University of California Press.
- Jackson, Steven J. 2014. Rethinking repair. In *Media technologies: essays on communication, materiality and society*. Gillespie Tarleton, Pablo J. Boczkowski, and Kirsten A. Foot, eds. Pp. 221–240. Cambridge, MA: MIT Press.
- Jenkins, David G., Camille R. Brescacin, Craig V. Duxbury, Jennifer A. Elliott, Jennafer A. Evans, Katherine R. Grablow, Melissa Hilleagass, et al. 2007. Does size matter for dispersal distance? *Global Ecology and Biogeography* 16(4):415–425.
- Kelty, Christopher, and Hannah Landecker. 2019. Outside in: microbiomes, epigenomes, visceral sensing, and metabolic ethics. In *After practice: thinking through matter(s) and meaning relationally*. Jörg Niewöhner, ed. Pp. 53–65. Berlin: Panama.
- Kezich, Giovanni. 2018. Mario Rigoni Stern e l'antropologia delle Alpi. In *Mario Rigoni Stern: u uomo, tante storie, nessun confine*. Anna Maria Cavalarin and Arianna Scapin, eds. Pp. 103–114. Scarmagno, Torino: Priuli & Verlucca.
- Laclau, Ernesto, and Chantal Mouffe. 1985. *Hegemony and socialist strategy*. London: Verso.
- Landecker, Hannah. 2011. Food as exposure: nutritional epigenetics and the new metabolism. *BioSocieties* 6(2):167–194.
- . 2016. The social as signal in the body of chromatin. *Sociological Review* 64(1 suppl.):79–99.
- . 2019. On the odor of rancid butter, a twenty-first century update. *History of Anthropology Newsletter*, vol. 43. <http://histanthro.org/notes/odor-of-rancid-butter/>.
- Lindström, Eva S., and Silke Langenheder. 2011. Local and regional factors influencing bacterial community assembly. *Environmental Microbiology Reports* 4:1–9.
- Moran, Katie, Steven R. King, and Thomas J. Carlson. 2001. Biodiversity prospecting: lessons and prospects. *Annual Review of Anthropology* 30(1):505–526.
- Munn, Nancy. 1990. Constructing regional worlds in experience: Kula exchange, witchcraft and Gawan local events. *Man* 25:1–17.
- Netting, Robert M. 1972. What Alpine peasants have in common: observation on communal tenure in a Swiss village. *Human Ecology* 4:135–146.
- Olson, Valerie. 2018. *American extreme: the making of a solar ecosystem*. Minneapolis: University of Minnesota Press.
- O'Malley, Maureen. 2014. *Philosophy of microbiology*. Cambridge: Cambridge University Press.
- Orlove, Benjamin S., and Stephen B. Brush. 1996. Anthropology and the conservation of biodiversity. *Annual Review of Anthropology* 25(1):329–352.
- Papadopoulos, D. 2018. *Experimental practice: technoscience, alterontologies, and more-than-social movements*. Durham, NC: Duke University Press.
- Paxson, Heather. 2008. Post-Pasteurian cultures: the microbiopolitics of raw-milk cheese in the United States. *Cultural Anthropology* 23(1):15–47.
- . 2021. Protecting perishable values: timescapes of moving fermented foods across oceans and international borders. *Current Anthropology* 62(suppl. 24):SXXX–SXXX.
- Paxson, Heather, and Stefan Helmreich. 2014. The perils and promises of microbial abundance: novel natures and model ecosystems, from artisanal cheese to alien seas. *Social Studies of Science* 44(2):165–193.
- Poletti, Gianni, ed. 2009. *Statuti della Giudicarie*. Trento: Associazione di promozione Sociale Il Chiese–CGS.
- Puig de la Bellacasa, Maria. 2015. Making time for soil: technoscientific futurity and the pace of care. *Social Studies of Science* 45(5):691–716.
- Raffaetà, Roberta. 2020. *Antropologia dei microbi*. Roma: CISU.
- Raffaetà, Roberta, and Cameron Duff. 2013. Putting belonging into place: place experience and sense of belonging among Ecuadorian migrants in an Italian Alpine region. *City and Society: A Journal of the American Anthropological Association* 25(3):328–347.
- Rocca, Gianni. 2007. *L'uomo di nuvole e lana*. Caderzone-Val Rendena (TN): Edizioni Museo della Malga.
- . 2009. *Giorni di malga*. Caderzone-Val Rendena (TN): Edizioni Museo della Malga.
- Sardo, Pietro. 2003. La squisita inutilità dei formaggi di montagna. *L'Alpe* 9:46–49.
- Varotto, Mauro, and Barbara Castiglioni, eds. 2012. *Di chi sono le Alpi? appartenenze politiche, economiche e culturali nel mondo alpino contemporaneo*. Padova: Padova University Press.
- Viazzo, Pier Paolo. 1989. *Upland communities: environment, population and social structure in the Alps since the sixteenth century*. Cambridge: Cambridge University Press.
- Viazzo, Pier Paolo, and Stuart Woolf, eds. 2002. *Formaggi e mercati: economie d'alpeggio in Valle d'Aosta e Haute-Savoie*. Aosta: Le Chateau.
- Waldby, Catherine. 2002. Stem cells, tissue cultures and the production of biovalue. *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine* 6(3):305–323.