aromatic *Brevibacterium linens,* that contribute to an aged cheese's complex flavor (*Brevibacterium linens* is closely related to *Brevibacterium epidermis,* native to the "warm, humid clefts between human toes" [Enserink 2002:90]). Maria Trumpler, who makes a natural-rind cheese, Vermont Ayr, later assured me, "It's the bacteria who do all the work of making the cheese—they make the flavor, they make the texture. All we have to do is not get in their way." I work with Nicholas, the

mini-lecteur corps amer sourbodies mini-reader

2022.05.16

10/10/2012 Sandor Katz Van Kraalingen - Callmann

"no multicellular organism has existed & bacteria"

or changing attitudes to bacteria

acid → fermentation reversals

same thing ⇄ place / space

different pasta shapes

compost is fermentation

bury rice in tourist (korea)

☆ temperature ☆ — traditional: • seasonal • ambient • low tech • passive •

"transformative action of microbial organism"
SK def of fermentation

vs

"production of energy ∴ oxygen"
biologist def of fermentation

(1) rotting fermentation? is fermentation rotting?

rot ↔ rancid

↳ bacteria / microorganism dance

decay / putrefaction

(1) non-food fermentation?

drying / heavy salting / fermentation

↳ dormant microorganisms re-awakened by water

(2) can you ferment bugs?

Ouverts sur l'extérieur :
les systèmes, la reproduction et le métabolisme

Heather Davis 2020

de la publication à venir : **Peter Flemming : Sourbodies + Low Places**

[english version follows]

L'une des questions qui m'a toujours intrigué est la suivante : comment percevons-nous les limites d'un organisme, quel qu'il soit ? Autrement dit, où commence et où finit le corps – qu'il s'agisse du mien ou du vôtre ? Il peut sembler quelque peu absurde de s'interroger à ce sujet. Ce n'est pas que j'arrive mal à comprendre comment enfiler mes chaussures, déplacer une tasse ou encore à savoir que je touche quelqu'un. Dans la réalité quotidienne, les entités se présentent de manière suffisamment différenciée. Mais il existe une autre perception, cette sensation persistante et tenace qu'une partie importante de notre être corporel est en fait l'expression du travail développemental et générationnel de tant d'autres créatures, et que notre différenciation des autres êtres vivants est en réalité plutôt complexe et n'existe peut-être que sur le plan pratique, pour nous aider à naviguer dans le monde. Par exemple, on souligne souvent le fait que la majorité des cellules de notre corps ne sont pas d'origine humaine, mais qu'il s'agit plutôt de microorganismes. Effectivement, les cellules microorganiques sont dix fois plus nombreuses que les cellules humaines[1]. Considérant cela, comment pourrais-je penser que mon corps m'appartient vraiment ? Et si nous abordons la question de la matière en soi, notamment du point de vue de la physique quantique, les choses se complexifient davantage, comme le démontre avec éloquence Karen Barad dans son explication du concept d'intra-action[2].

L'obsession de Peter Flemming pour les systèmes éveillent en moi plusieurs questions. Quelles sont les limites de l'interdépendance ? Comment définir l'extérieur d'un système ? En quoi un être se distingue-t-il de son environnement ? Dans le présent article, je propose brièvement trois axes de réflexion fondés sur les systèmes, la reproduction et le métabolisme – à la manière de Flemming – qui pourraient s'avérer utiles pour mieux comprendre le monde et la constitution du corps humain, toujours plurielle et fondamentalement ouverte.

Les systèmes

Au milieu du 20e siècle, la discipline écologique introduit la métaphore des systèmes, avec l'émergence de la notion d'« écosystème » qui nous semble aujourd'hui évidente. La pensée systémique présente le net avantage d'identifier des correspondances et de proposer un ordre du monde qui ne s'inscrit pas dans une structure hiérarchique, mais bien en réseau, où les connexions latérales prévalent sur les classements à plusieurs niveaux. Cette approche a permis de concevoir le monde au-delà de l'humain avec plus d'humilité. Avoir compris que le monde n'est pas organisé selon une structure pyramidale, mais qu'il est régi par des transferts latéraux dont nous sommes tous parties prenantes, constitue l'un des aspects fondamentaux de la réflexion écologique dans le cadre du paradigme euro-occidental. Gregory Bateson compte parmi les penseurs à avoir forgé ce lien entre la théorie des systèmes et l'écologie. L'une de mes citations favorites de ce théoricien résume à bien des égards plusieurs questions sur l'intra-action fondamentale de la matière ainsi que des enjeux plus vastes sur le bien-être : « Le système écomental appelé lac Érié est une partie de votre système écomental plus vaste, et […] si ce lac devient malade, sa maladie sera inoculée au système plus vaste de *votre* pensée et de *votre* expérience[3] ». Ici, l'organisme – que nous pensions au nôtre ou à celui du lac – s'étend ou se transmet vers l'extérieur. Se refusant en outre à séparer l'esprit du corps, Bateson appréhende la conscience elle-même comme une partie intrinsèque des connexions latérales du monde et de ses entités.

Les systèmes ludiques et assez absurdes que conçoit Peter Flemming nous invitent à considérer des structures écomentales plus vastes. L'installation *Low Places* [Bas-fonds] (2019) en offre un bon exemple. Ce système sensible à la température est formé de seaux d'eau et de sable. Les seaux d'eau « rivalisent » pour s'approprier le plus de liquide possible, tandis que l'unique seau de sable se déplace au gré de leurs caprices. Le mécanisme régissant ces mouvements repose sur un ensemble de règles simples qui illustrent comment

certaines ressources – l'eau tout particulièrement – sont devenues des objets de concurrence. Mais au-delà de la simple critique de l'accumulation du capital ou des ressources, ce système se sabote lui-même. En effet, il s'ouvre sur l'extérieur, car l'eau et le sable ont, par leur nature même, des comportements qui leur sont propres. Reliés à des capteurs thermiques disséminés dans la salle, les éléments ne fonctionnent pas de manière indépendante et rigoureusement contrôlée, mais plutôt selon les mécanismes écologiques, où les systèmes sont toujours ouverts sur l'extérieur. Autrement dit, ces petits systèmes composés de seaux « égoïstes » illustrent les principes de la tragédie des biens communs[4], mais surtout, ils les bafouent viscéralement en prenant en compte les forces extérieures, les acteurs ignorés, la prolifération de la vie et la coconstitution de la réalité. L'installation montre que nos modèles nous dépassent toujours et qu'appréhender le monde et l'environnement selon une approche systémique fait place à un grand nombre de facteurs sur lesquels nous n'avons pas de prise.

La reproduction

La série *Sourbodies* [Corps amers] (2019) représente un système de désir en perpétuelle évasion. Abordant la notion de système selon une tout autre perspective, elle se distingue à plusieurs égards de la production habituelle de Flemming. D'entrée de jeu, en lieu et place d'un système portant sur l'idée d'accumulation, l'artiste propose ici une visualisation de la transformation de bactéries et d'aliments par lactofermentation. *Sourbodies* donne à voir et à entendre le processus de transformation – par l'action de bactéries – de concombres en cornichons ou de gingembre et de sucre en bière de gingembre. Ce « système » pousse la métaphore des réseaux à son point de rupture – où il y a tellement d'échanges entre les bactéries et les levures dans l'air, les composants des aliments, l'humidité et la température ambiantes et, ultimement, ce système délicat et complexe qu'est le corps humain, que toutes ces interactions finissent par embrouiller l'esprit.

Sourbodies s'enquiert de la constitution de l'intégrité physique par l'entremise de l'activité bactérienne et nous invite à considérer le corps humain comme une communauté d'êtres. Elle incarne aussi quelque chose de pervers sur le plan de la représentation. On y observe entre autres une sorte de ballon longiligne, vivement coloré et parsemé de motifs bulbeux, tel un jouet sexuel, se gonfler au rythme indolent du processus de fermentation. Ailleurs, la libération de gaz donne lentement forme à une main gantée. Le choix de ces éléments gonflables pour illustrer le processus de fermentation attire l'attention sur le rôle conjoint queer des bactéries dans le corps. L'œuvre incite à une reconsidération de notre conception de la reproduction, qui se résume à la réplication d'une lignée germinale précise par la transmission de l'ADN de deux humains à un troisième ; elle figure ainsi ces processus coévolutifs du devenir réciproque d'un humain et d'un cornichon ou d'un humain et d'une choucroute.L'œuvre fait référence à un mode de reproduction qui existe chez les bactéries, au transfert génétique horizontal et au rôle des bactéries dans les processus évolutifs : un mode de reproduction queer. Nous avons beaucoup à apprendre des bactéries en matière de genre et de reproduction. Comme l'écrit Myra Hird : « Les bactéries franchissent les barrières entre les espèces (en effet, elles ne sauraient être associées à une "espèce"), pratiquent l'hypersexualité, transmettent des gènes purs par méiose, orchestrent des permutations génétiques et résistent victorieusement à la mort. […] Les bactéries ne jouent pas les difficiles : elles échangent volontiers des gènes avec n'importe quel organisme vivant de la planète, y compris le corps humain[5] ». Manifestations ludiques de différents types d'insertion, d'interpénétration et de codevenir physique des bactéries dans le corps humain, le gant, le ballon et, de manière plus explicite, le condom évoquent tous une sexualité queer.

Le métabolisme

Quel est le lien entre ces notions de reproduction et de système et la question initiale de la constitution des différents corps ? Durant les deux derniers siècles, la science occidentale a défini la vie à partir de deux mécanismes : la reproduction et le métabolisme. La reproduction était comprise comme la continuation de la vie via la lignée germinale au fil des générations, tandis que le métabolisme était considéré comme la continuation de la vie par le soi somatique. Avec la découverte de la génétique et de l'ADN, ces deux catégories en sont venues à définir la vie selon un rapport hiérarchique. Toutefois, cette conception a été considérablement modifiée par les recherches récentes sur le rôle du métabolisme. En effet, le métabolisme gère non seulement la constitution et la continuation du soi, il participe à une métamorphose du soi depuis l'intérieur. Comme le

montrent les travaux fascinants et éclairants de Hannah Landecker, la recherche récente « semble indiquer que les composants des plantes pénètrent dans les organismes qui les consomment et participent à la régulation de leurs gènes, ce qui entraîne des changements physiologiques[6] ». Cette découverte bouscule certaines idées reçues véhiculées par le discours occidental euro-américain qui suppose que les plantes « cessent d'être des végétaux dès qu'on les ingurgite[7] ». En fait, des éléments tiers subsistent au sein de notre organisme et transforment son expression épigénétique. Nous sommes littéralement faits de ce que nous mangeons.

Si nous prenons ces découvertes scientifiques au sérieux, nous devons repenser cette tendance à croire que nous sommes séparés de notre environnement. Cela implique une modification de « l'unité considérée – passant de l'organisme, dans sa conception traditionnelle, à celle de "système vivant"[8] ». Que signifierait dès lors d'envisager l'œuvre de Flemming – non seulement ses pièces issues de ses expériences avec des bactéries symbiotiques, mais aussi ses systèmes construits et intrinsèquement ouverts – comme une remise en cause de l'entité corporelle ? Comment sommes-nous à la fois et simultanément nous-mêmes et d'autres ? Comment réimaginer notre constitution environnementale au moyen de systèmes qui échappent sans cesse à notre entendement et à notre contrôle, ces systèmes issus de processus réciproques qui excèdent toujours les paramètres fixés, qui s'ouvrent toujours sur l'extérieur ?

Ouvrages cités

BARAD, Karen. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning,* Durham, Duke University Press, 2007.

BATESON, Gregory. *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution and Epistemology*, Chicago, University of Chicago, 1999.

LANDECKER, Hannah. « Metabolism, Reproduction, and the Aftermath of Categories », *S&F Online*, vol. 11, nº 3 (été 2013). <http://sfonline.barnard.edu/life-un-ltd-feminism-bioscience-race/metabolism-reproduction-and-the-aftermath-of-categories/>.

HIRD, Myra J. « Animal Trans », dans GIFFNEY, Noreen, et Myra J. HIRD. *Queering the Non/Human*, Aldershot (Hampshire), Ashgate, 2008, p. 227-248.

NATIONAL INSTITUTE OF HEALTH. « NIH Human Microbiome Project defines normal bacterial makeup of the body », 13 juin 2012. <www.nih.gov/news-events/news-releases/nih-human-microbiome-project-defines-normal-bacterial-makeup-body>.

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[1] U.S. Department of Health & Human Services, National Institutes of Health,« NIH Human Microbiome Project », 13 juin 2012. <www.nih.gov/news-events/news-releases/nih-human-microbiome-project-defines-normal-bacterial-makeup-body>.

[2] Pour ceux qui ne connaissent pas les travaux de Barad, le néologisme « intra-action » s'inspire du terme interaction. Plutôt que d'appréhender un monde comme étant composé d'êtres constitués qui entrent en interaction, Barad s'appuie sur sa formation en physique quantique pour proposer la théorie suivante : les êtres voient le jour par médiation de processus mutuels liés à leur devenir. L'intra-action fait appel à cette dynamique des forces. Pour en savoir davantage, consultez l'ouvrage *Meeting the Universe Halfway* – et plus particulièrement le chapitre IV. Karen Michelle Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Durham, Duke University Press, 2007.

[3] « […]the eco-mental system called Lake Erie is a part of your wider eco-mental system—and…if Lake Erie is driven insane, its insanity is incorporated in the larger system of *your* thought and experience. » Gregory Bateson, *Steps to an Ecology of Mind*, Chicago, University of Chicago Press, 2000, p. 492. [Trad. libre] Il existe une version française de cet ouvrage : *Vers une écologie de l'esprit*, traduit par Ferial Drosso, Laurencine Lot et Eugène Simion, Éditions du Seuil, Paris, 1977.

[4] Définie par Garrett Hardin dans un article paru en 1968 dans la revue *Science*, la tragédie des biens communs survient quand chaque personne agit égoïstement, en fonction de ses propres intérêts, ce qui entraîne la raréfaction des ressources communes. Son argument repose sur une vision fondamentalement cynique du comportement humain.

[5] Myra J. Hird, « Animal Trans », dans Giffney, Noreen, et Myra J. Hird (dir.), *Queering the Non/Human*, Aldershot (Hampshire), Ashgate, 2008, p. 239. [Trad. libre]

[6] Hannah Landecker, « Metabolism, Reproduction, and the Aftermath of Categories », *S&F Online*, vol. 11, nº 3 (été 2013). <http://sfonline.barnard.edu/life-un-ltd-feminism-bioscience-race/metabolism-reproduction-and-the-aftermath-of-categories/>.

[7] Ibid.

[8] Ibid.

Opening to the outside:
on systems, reproduction and metabolism

Heather Davis 2020

from the forthcoming publication: **Peter Flemming : Sourbodies + Low Places**

One of the questions that has persistently dogged me is how do we understand the borders of any organism? In other words, where does my body, or any body, begin or end? This may seem slightly absurd. It's not that I have trouble understanding how to put on my shoes, or move a cup, or know when I am touching another person. There is a daily reality of things that appear as differentiated beings that seems clear enough. And yet, there is another sense, this persistent nagging sensation, in which so much of our bodily being is actually the unfolding and generational work of so many other beings, and that our differentiation from other beings is actually quite complicated, and maybe only exists on a practical level of navigating the world. For example, there is the frequently cited fact that the majority of the cells in our body are not human, but are rather microorganisms. In fact, microorganism cells in our bodies outnumber human cells ten to one.[1] So, how, in the face of this, can I really think of my body as my own? And when we get into the question of matter itself, particularly through the knowledge generated by quantum physics, it gets even more messy, as Karen Barad has eloquently laid out in her explication of intra-action.[2]

Peter Flemming's obsessions with systems reminds me of these questions: what are the limits of interdependency? How do we define the outside of a system? In what sense can a being be distinguished from its surrounds? I have briefly explore here three ways in which thinking through systems, reproduction and metabolism, along with Flemming, might be useful for coming to an understanding of the world and our bodily constitution that is always plural, and radically open.

1. Systems

In the mid-twentieth century the study of ecology turned to thinking through the metaphor of systems, with the rise of what we now take for granted as an 'ecosystem.' Systems thinking has the obvious advantage of mapping relations and puts forward an ordering of the world not as a hierarchical structure, but as a web, where lateral, enmeshed connections are privileged over tiered and ranked orders of beings. This approach has been useful in coming to a humbler relation with the more-than-human world. Understanding that the world is ordered, not through a pyramidal structure, but rather through lateral transfer, where we are all entangled, is one of the fundamental insights of thinking ecologically, within a Euro-Western paradigm. One of the thinkers who developed this relation of systems thinking to ecology was Gregory Bateson. In one of my favorite quotes from him, that in many ways sums up questions of the fundamental intra-action of matter and broader questions of well-being, he writes, "the eco-mental system called Lake Erie is a part of your wider eco-mental system—and… if Lake Erie is driven insane, its insanity is incorporated in the larger system of *your* thought and experience."[3] Here, the body, whether we are thinking of our own bodies or the body of the lake, is extended, or transmitted, outwards. Additionally, he refuses the separation of the mind from the body, understanding consciousness itself to be part of the lateral connections of the world and its beings.

The playful, and rather absurd systems that Flemming creates asks us to consider these wider eco-mental systems. *Low Places* (2019) is just such a work. It is a temperature-responsive system that consists of rigged buckets of water and sand. The buckets 'compete' over a certain amount of water, and the bucket of sand

[1] National Institutes of Health, "NIH Human Microbiome Project," U.S. Department of Health & Human Services, June 13, 2012, https://www.nih.gov/news-events/news-releases/nih-human-microbiome-project-defines-normal-bacterial-makeup-body.

[2] For those unfamiliar with Barad's work, intra-action is a neologism and play on the word "interaction." However, instead of understanding that the world is composed of constituted beings, who then interact, Barad puts forward the theoretical intervention, stemming from her training in quantum physics, that beings come into existence through mutual processes of becoming. Intra-action refers to this dynamism of forces. For more see *Meeting the Universe Halfway,* especially chapter Four. Karen Michelle Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007).

[3] Gregory Bateson, *Steps to an Ecology of Mind*, University of Chicago Press ed (Chicago: University of Chicago Press, 2000), 492.

moves at the whims of the water buckets which are all trying to contain the maximum amount of water. The formula that governs these movements is based on a simple set of rules that serve to illustrate the ways in which resources, especially water, have become the basis for competition. But the system also undermines itself. It opens to the outside beyond a simple critique of capital accumulation, or resource accumulation, because the water and sand are built to have their own behaviours. They are connected to temperature sensors in the room, so that they don't act independently, in a rigorously controlled manner, but rather through the mechanisms of ecology, where the system is always open to the outside. In other words, these small-scale systems that illustrate principles of the tragedy of the commons,[4] designed with 'selfish' buckets, also, and importantly, undermine this principle, asking after the outside forces, the unaccounted actors, the proliferation of life, and the co-constitution of reality. The system is built to illustrate how our models are always beyond us, how a systems approach to understanding the world and the environment necessarily opens to so many factors that it escapes our grasp.

2. Reproduction

Sourbodies (2019) is a system of desire that is always escaping. In many ways, it represents a departure from Flemming's regular practice, visualizing systems in an entirely different way. Most obviously, the concerns revolve around the visualization of the transformation of bacteria and food through lacto-fermentation, rather than building systems that comment on questions of accumulation. *Sourbodies* both visualizes and sonifies how bacteria change cucumbers into pickles or ginger and sugar into ginger beer. The 'system' here is one that extends the metaphor of networks to its breaking point, where there are so many exchanges, between bacteria and yeast in the air, between the composition of the food, between the humidity and temperature of the room, and ultimately, the complicated and nuanced system of a human body, that it begins to scramble the mind.

Sourbodies asks after the constitution of bodily integrity through the work of bacteria, inviting us to think of our bodies as a community of beings. There is also something perverse in their representation. We watch as a brightly coloured balloon, slim, with repeating bulbous patterns, reminiscent of a sex toy, slowly inflates as the fermentation proceeds. In another example, a gloved hand begins to take shape through the release of the gases. The choice of these inflatables for illustrating the processes of fermentation points to the queer co-implication of bacteria into our bodily being. They invite a reconsideration of the way that we understand reproduction to be only situated in the replication of a particular germ line, through our DNA from two humans to the next, rather than through these co-evolutionary processes, of mutual becoming of human and pickle or human and sauerkraut. They suggest a form of reproduction that exists in relation to bacteria, to lateral gene transfer and to the role of bacteria in evolutionary processes, a queer reproduction. Bacteria themselves have a lot to teach humans about gender and reproduction. As Myra Hird writes, "bacteria cross species barriers (indeed, bacteria cannot be referred to as a species), perform hypersex, pass on pure genes through meiosis, shuffle genes and successfully resist death…Bacteria are not picky, and will avidly exchange genes with just about any living organism anywhere in the world, including the human body."[5] The gloves, balloons, and more explicitly, the condom all invoke a queer sexuality, playfully asserting the kinds of insertions, imbrications, and bodily co-becomings of bacteria with our bodies.

[4] Defined by Garrett Hardin in a paper published in *Science* in 1968, the tragedy of the commons is when each person acts out of their own selfish interests, resulting in the depletion of shared resources. His argument relies upon a fundamentally cynical view of human behavior.
[5] Myra J. Hird, "Animal Trans," in *Queering the Non/Human*, ed. Noreen Giffney and Myra J. Hird (Aldershot, Hampshire: Ashgate, 2008), 239.

3. Metabolism

How do these questions of reproduction and systems relate back to the original question of the constitution of various bodies? In the last two hundred years in Western science, life was defined through two mechanisms: reproduction and metabolism.

Reproduction was understood to be the continuation of life through the germ line over the generations, while metabolism was the continuation of life that created the somatic self. These two categories have come to define life in a hierarchical relationship, through the ascendency of genetics and DNA. Recently, however, there have been significant changes to the ways in which we have come to understand reproduction and metabolism by re-examining the role of metabolism. Metabolism is not just the process of constituting and continuing the self, but is, rather, a making-different of the self from the inside. As Hannah Landecker's fascinating and brilliant work shows, recent research "suggests that components of plants enter the bodies that eat them and participate in regulating those bodies' genes, leading to physiological change."[6] This revelation upends some of the received wisdom of Western Euro-American discourse that presumes that plants "stop being plants as soon as they are eaten."[7] In reality, others persist within our bodies, changing the epigenetic expressions of our bodies. We are literally composed of what we eat.

If we take these scientific findings seriously, we need to re-think how we understand the separation of ourselves from our environment. This involves an alteration of "the unit under consideration—from the organism, more traditionally understood, to the "living system."[8] What would it mean, then, to understand Flemming's work as challenging conceptions of bodily being, not only through his experiments with symbiotic bacteria, but also through the systems that he builds that are inherently open? How are we both and simultaneously ourselves and others? How might we re-imagine our environmental constitution through systems always beyond our understanding or control, always a mutually unfolding process that exceeds set parameters, always opening to the outside?

Works Cited

Barad, Karen. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning.* Durham: Duke University Press, 2007.

Bateson, Gregory. *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution and Epistemology*. Chicago: University of Chicago, 1999.

Landecker, Hannah. "Metabolism, Reproduction, and the Aftermath of Categories" S&F Online 11.3 (Summer 2013) http://sfonline.barnard.edu/life-un-ltd-feminism-bioscience-race/metabolism-reproduction-and-the-aftermath-of-categories/

Hird, Myra J. "Animal Trans." In *Queering the Non/Human*, edited by Noreen Giffney and Myra J. Hird, 227-248. Aldershot, Hampshire: Ashgate, 2008.

National Institute of Health. "NIH Human Microbiome Project defines normal bacterial makeup of the body" (June 13, 2012) https://www.nih.gov/news-events/news-releases/nih-human-microbiome-project-defines-normal-bacterial-makeup-body

[6] Hannah Landecker, "Metabolism, Reproduction, and the Aftermath of Categories," S&F Online 11, no. 3 (Summer 2013), http://sfonline.barnard.edu/life-un-ltd-feminism-bioscience-race/metabolism-reproduction-and-the-aftermath-of-categories/.
[7] Landecker, "Metabolism, Reproduction, and the Aftermath of Categories."
[8] Landecker, "Metabolism, Reproduction, and the Aftermath of Categories."

POST-PASTEURIAN CULTURES:
The Microbiopolitics of Raw-Milk Cheese in the United States

HEATHER PAXSON - Massachusetts Institute of Technology, 2008

(extracts)

People in the United States live in a Pasteurian world. Many blame colds on germs, demand antibiotics from doctors, and drink ultra-pasteurized milk and juice, while politicians on the campaign trail slather on hand sanitizer. Yet there are post-Pasteurians in their midst: dissenters who insist that not all bugs are bad, not only that microbes are a fact of life but that many also enhance human life. Resisting the hyperhygienic dream of Pasteurians, post-Pasteurians might be concerned about antibiotic resistance, may embrace the naked handshake as a populist virtue (like Democratic presidential hopeful Bill Richardson [Leibovich 2006]), or may fashion informal social-economic channels to procure unpasteurized milk (Altiok 2006; Johnston 2006). Others produce, or pay premium price for, the gustatory and enzymatic richness of raw-milk cheese—the ethnographic object of this article.

In the last decade, new, handcrafted U.S. cheeses have mushroomed at farmers' markets, at restaurants, and in the media (Ogden 2007; Roberts 2007; Tewksbury 2002; Werlin 2000). Membership in the American Cheese Society, a not-for-profit organization of artisan and specialty producers, retailers, distributors, a few dairy scientists, and food writers, has increased exponentially in recent years. According to Jeff Roberts, author of The Atlas of American Artisan Cheese (2007), which profiles 345 small producers from Maine to Hawaii, the number of artisan cheese makers nationwide has doubled since 2000 (personal communication, August 2, 2007). More and more of the new U.S. cheeses are made from raw, unpasteurized milk. 1 Boosters hope that niche marketing, with "raw milk" and "artisanal" joining "organic," might make cheese making a value-adding strategy that can save small dairy farms. Vermont dairy farms numbered 3,216 in 1983, the year the American Cheese Society was founded; by 2003, only 1,459 remained. Some of the most visible artisan cheese makers are early retirees launching a second career with capital earned in lucrative professions (business, law) or are young adults setting out to practice the lessons of sustainable development and critiques of global agribusiness learned in liberal arts colleges. These producers tend to make high-end table cheeses that might sell in urban markets for as much as $27 a pound (retailers generally double wholesale prices). Many of the most experienced artisans are former hippies or back-to-the-landers who for decades have been crafting farmhouse cheese for local markets and now suddenly find themselves part of a new "movement." A growing number of farmstead cheese makers are dairy farmers who turn raw, sometimes organic milk into Cheddar, Gouda, Jack, Feta, and other "everyday" cheeses that retail between $9 and $14 a pound (Paxson 2006). Not all artisanally produced cheeses appeal strictly to elite tastes and privileged incomes.

All cheese producers face restrictions on getting raw-milk cheese to U.S. markets. By U.S. law (21CFR133.182), cheese made from raw milk must be aged at least 60 days at a temperature no less than 1.7 ◦ C (35 ◦ F) before being sold or imported. The 60-day rule means to offer protection against pathogenic microbes that could thrive in the moist environment of a soft cheese. While the Food and Drug Administration (FDA) views raw-milk cheese as a potential biohazard, riddled with bad bugs, aficionados see it as the reverse: as a traditional food processed for safety by the action of "good" microorganisms — bacteria, yeast, mold — on proteins found in milk.

This article proposes a theoretical frame for understanding current debates over the gustatory value and health and safety of raw-milk cheese in the United States, debates that open into what Sidney Mintz identifies as a conundrum of democratic capitalist societies: "how to provide protection to the citizenry on one hand, yet maintain freedom of choice on [the] other" (2002:27). I introduce the notion of microbiopolitics to call attention to the fact that dissent over how to live with microorganisms reflects disagreement about how humans ought live with one another. Microbiopolitics is one way to frame questions of food ethics and governance.

If Foucault (1978) has argued that the 19th century saw the rise of biopolitics, the fashioning of new categories of persons to facilitate the statistical measurement and rational management of populations, largely via sex and reproduction, Bruno Latour, in The Pasteurization of France (1988), tracks a parallel history, describing the accommodation of microbial life into the very constitution of this social field. Prior to Pasteur, Latour writes, Europeans had thought that butchers sold only meat, but then they discovered salmonella hitching a ride. It had been thought that birth involved but three players—midwife, mother, infant—but other agents were found to be present (Latour 1988:35). Latour argues that with microbes revealed to be controlled, hygienists, government officials, and economists laid the

groundwork for what they believed to be “pure” social relations—relations that would not be derailed by microbial interruption, that could be predicted and thus rationally ordered. Biopolitics, then, is joined by microbiopolitics: the creation of categories of microscopic biological agents; the anthropocentric evaluation of such agents; and the elaboration of appropriate human behaviors vis-à-vis microorganisms engaged in infection, inoculation, and digestion.

...

In keeping with a biotechnological sensibility, advocates and practitioners suggest that care of these microbes may pay unexpected dividends for humans. Mateo Kehler looks to raw-milk cheese—produced safely only at an artisan scale—to provide a future for family farmers and to preserve Vermont’s “working landscape” because it requires clean milk from animals on pasture and fresh-dried hay, not commodity corn. This is sustainable biotechnology in service of an alternative agriculture critical of globalization and agribusiness—even, perhaps, a kind of biopolitics that asks for pastoral practices extending beyond the care of the (human) self. Similar to the implications of Enticott’s and Marcellino’s research, Kehler’s vision offers an expression of localism, a people’s connection to the land, to a place, to a shared way of life. Raw-milk cheese is readily enlisted into alternative agrofood politics.

Taking this politics a step further, Sandor Katz, in complaining about the standardization enforced through global commodity trade, sliding smoothly between human and microbial cultures, argues, “One small but tangible way to resist the homogenization of culture is to involve yourself in the harnessing and gentle manipulation of wild microbial cultures. . . . Build your body’s cultural ecology as you engage and honor the life forces all around you” (2003:27). Picking up on perhaps a different life force, the Cheese Nun scales up to the level of Creation, valuing the biodiversity of cheese mold because, when she looks through her microscope, she sees “something microcosmic that opens up a world to me, a vision,” an experience she likens to that of Saint Benedict, who “saw the whole world in a ray of light” (Thompson 2006). Microbes’ reputation is being dusted off. Renewed appreciation for what Conn described in an 1892 talk, “Some Uses of Bacteria,” may help to explain the intense anxiety and self-doubt that run alongside the anticipatory maternal virtue expressed by pregnant women concerned with what they eat. The ethical subjectivity they adopt is consistent with biomedicine (what in other work I call an ethic of well-being [Paxson 2004]) and firmly anchored in Pasteurian thinking—the limits of which consumers are increasingly aware.

Aimed at a variety of moral ends, a post-Pasteurian care of the self goes through the obligatory passage point of caring for the microbe—the good microbe, the Lactobacilus or Penicillium companion species whose bodies and cultures are coproduced with human ones. In so doing, post-Pasteurians make explicit that human and microbial nature–culture is the ongoing outcome, not raw material, of history. For some, this suggests new opportunities to cultivate—with practical care, scientific literacy, and political consciousness—an artisan agriculture that might remain biologically, environmentally, civically, and financially viable.

Abstract

Out of concern for public health, the U.S. government bans the sale of cheese made from unpasteurized milk if it is aged fewer than 60 days. But while the FDA views raw-milk cheese as a potential biohazard, riddled with pathogenic microbes, aficionados see it as the reverse: as a traditional food processed for safety by the action of good microbes. This article offers a theoretical frame for understanding the recent rise in American artisan raw-milk cheese production, as well as wider debates over food localism, nutrition, and safety. Drawing on ethnographic interviews with cheese makers and purveyors and on participant-labor conducted on a Vermont sheep dairy farm, I develop the concept of microbiopolitics to analyze how farmer–cheese makers, industry consultants, retailers, and consumers negotiate Pasteurian (hygienic) and post-Pasteurian (probiotic) attitudes about the microbial agents at the heart of raw-milk cheese and controversies about this nature–culture hybrid.

Keywords: biopolitics, food politics and safety, alternative agriculture, microbes, raw-milk cheese

A different kind of cleaning, a different type of polishing

Maya Hey 2019

I arrived at Terada Honké's share-house, or informal dormitory, at the peak of winter's cold. It was January, when saké preparations are revved up in full gear, that influenza was tearing through all of Japan and a nasty cold had acutely taken hold of the brewery. One by one, the brewers were calling in sick for the first time in years.

After observing the shared dining spaces, I noticed that dish soap was nowhere to be found.

"Should we ... just buy soap?" asked one of the other apprentices.

But nobody answered. Each of us, in our varying degrees of outsider, were hesitant to impose our "common sense" onto our host.

"When in Rome ..." smirked the German.

"You mean Kozaki," quipped the Italian.

To be sure, colds are contagious, but I didn't have the heart to insist that pre-war Japan — and, for that matter, many other parts of the world — didn't depend on soap as much as us Westerners. Caught between understanding a soap-free household and being skeptical of it, I spent the remainder of my fieldwork picking apart what it means to (be) clean.

As one of two natural saké breweries in all of Japan, Terada Honké does not rely on chemical sanitizers when brewing their saké. Instead, they follow a kind of prevention philosophy that operates from a different worldview towards microbial life.

In the European — or more broadly Euro-influenced — context, the legacy of Louis Pasteur lives on in public health protocols related to food preparation. One of Pasteur's more famous experiments involved two flasks of meat broth, one of which was kept at sterile conditions while the other was open to the ambient surroundings. Pasteur concluded that the sterile conditions prevented microbial growth, naming microbes as the cause for rot and decomposition.

This became the basis for his namesake food preservation procedure: *pasteurization*. The process eradicates microbes and extends its shelf life. In turn, food spoils when new microbes — like mold spores — take advantage of the "clean slate," colonize that food and excrete wastes that are often toxic to humans.

Problematizing Pasteurian logic

Up until Pasteur's research, people believed that death and disease happened spontaneously. Beer turned murky, herds of livestock died overnight and dog bites turned people mad — all without explanation. In this sense, Pasteur's findings isolated the causative agent for contamination, which helped demonstrate why people, foods, and animals exposed to those pathogens were later harmed.

That said, it is worth noting that Pasteur's findings represent one worldview, albeit a dominant one.

While the scientific method helped validate Pasteur's findings, it didn't hurt that historical context was on his side: the Napoleonic wars justified the need for sanitary hospitals; friends in the publishing sector promoted Pasteur's findings over other dissenting voices; and a social movement of incompetent hygienists became the backdrop to frame Pasteur as public hero because he revealed the invisible force behind death.

In other words, Pasteur didn't "discover" some truth about microbial life; he — and his gang — constructed that knowledge and helped it become accepted as fact.

During my own fieldwork, I relied on feminist critiques of science, which take issue with the objectivity claim that "X" is true because some standard deemed it to be true. Often these standards are arbitrarily set by those in power. As a result, who — or how — that standard was determined is far from politically neutral.

In particular, I follow the ideas of feminist thinker Donna Haraway, who argues that knowledge is situated and *made to be true* instead of automatically true. She calls playing the objectivity card "the god trick" because the only way to explain truth is to evoke some invisible, all-knowing power. Why is something true? One might say because it's objective. Because gods can see everything from nowhere.

But it is impossible to have an aerial view that can know everything. Our perspectives as humans are partial and dependent on where we stand in society, as raced, classed, gendered, situated people. So rather than blindly accept Pasteur's finding as absolute truth, it would be better to acknowledge that his findings are *situated* in the context of colonial Europe.

Situated knowledge also helps me understand my experience at Terada Honké as being situated in a particular context, instead of judging my experiences as categorically right or wrong. During the work day we wash our hands and spray our

hands with alcohol before each task. But, because there isn't the belief that chemical sanitizers will save us from a spoiled product, the brewers must do *more work* to create optimal conditions for the target microbes.

The stakes are higher without a safety net.

Redefining Clean

Imagine two petri plates, one sterile and one already colonized by microbial life. Petri plates are designed to grow microorganisms on them so that they can be studied in a laboratory context; from the microbe's perspective, it's like open land for grabbing. What happens when you introduce a new microbe to both plates? Of course, much would depend on the exact species, but the sterile petri plate will likely be colonized first. Why?

To put it simply, there are more resources available — like nutrients or space — for the new microbe to establish itself. This concept was determined in the late 1800s, when Elie Metchnikoff used existing bacteria to ward off cholera. The existing bacteria interfered with the growth of new bacteria, acting as a kind of protective barrier.

Applying this idea back to the work at Terada Honké, the lack of chemical sanitizers — or the practice of propagating wild starters — creates the ambient conditions for work surfaces and workers to be covered in existing microbes. The work of the brewers, then, is to cultivate that protective barrier of existing microbes and letting them flourish.

In this sense, clean is not a state of emptiness. It is to manage what is already there and to do so with the foresight of preventing future messes.

Thus their "prevention" system operates differently; the baseline for "clean" isn't a status to achieve. It is a verb. We clean frequently and precisely, with attention to details like scrubbing with well water, rinsing and immersing in boiling water, or using specific tools that get into crevices that plastic cannot — like the bamboo *sasara* brush — or setting tools outside to expose to the wind and UV rays of the sun.

I heard brewers joke that 30 percent of the work is actually brewing, with the remaining 70 percent as cleaning. Rather than follow the Pasteurian logic of eradicating all species, Terada Honké embraces the wild and the unpredictable to create thriving communities.

'Polishing the Heart'

Fermentation is the very stuff of working with, not on, microbial life, and the logic of Terada Honké is to create the best environment for human and microbes to support each other.

In my first weeks working at the brewery, I found it slightly shocking that most of the brewers did not — or could not — drink alcohol. I had assumed that the brewers were there, in part, to enjoy the *taste* of natural saké.

In conversations with several brewers, I found that a stronger reason for why many return for the seasonal work at Terada Honké had to do with their fermentation philosophy of being in service of others, including other species and other humans.

When asked about why he continues working with Terada Honké, one brewer explained that the saké-making process was proxy for practicing how to be a more mindful, selfless human. He calls it "polishing the heart."

Another brewer emphasized that the purpose of Terada Honké was to help people grow. To have fun with one another. To give thanks to the water. To promote local farmers producing organic rice. To practice these forms of support on a daily basis.

"It's a kind of training, you know? It's here that I refine who I am," said the brewer.

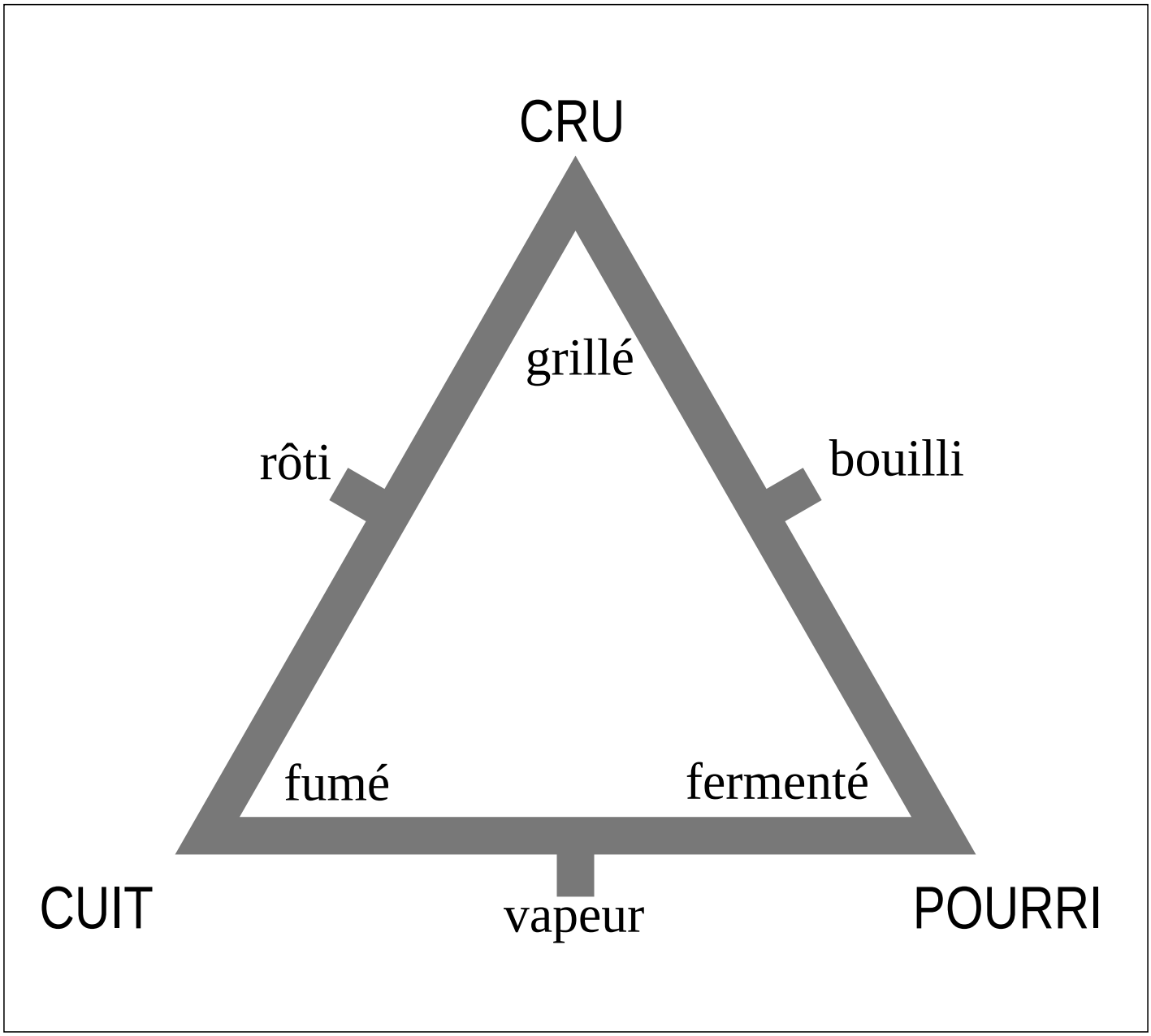
Working with the brewery helped me understand the importance of working with microbes, rather than sterilizing them out of existence.

Terada Honké uses fermentation as a philosophical model for living together with microbial life, without exerting absolute control over the fermentation process. The brewers focus on building environments in which various species can thrive across difference.

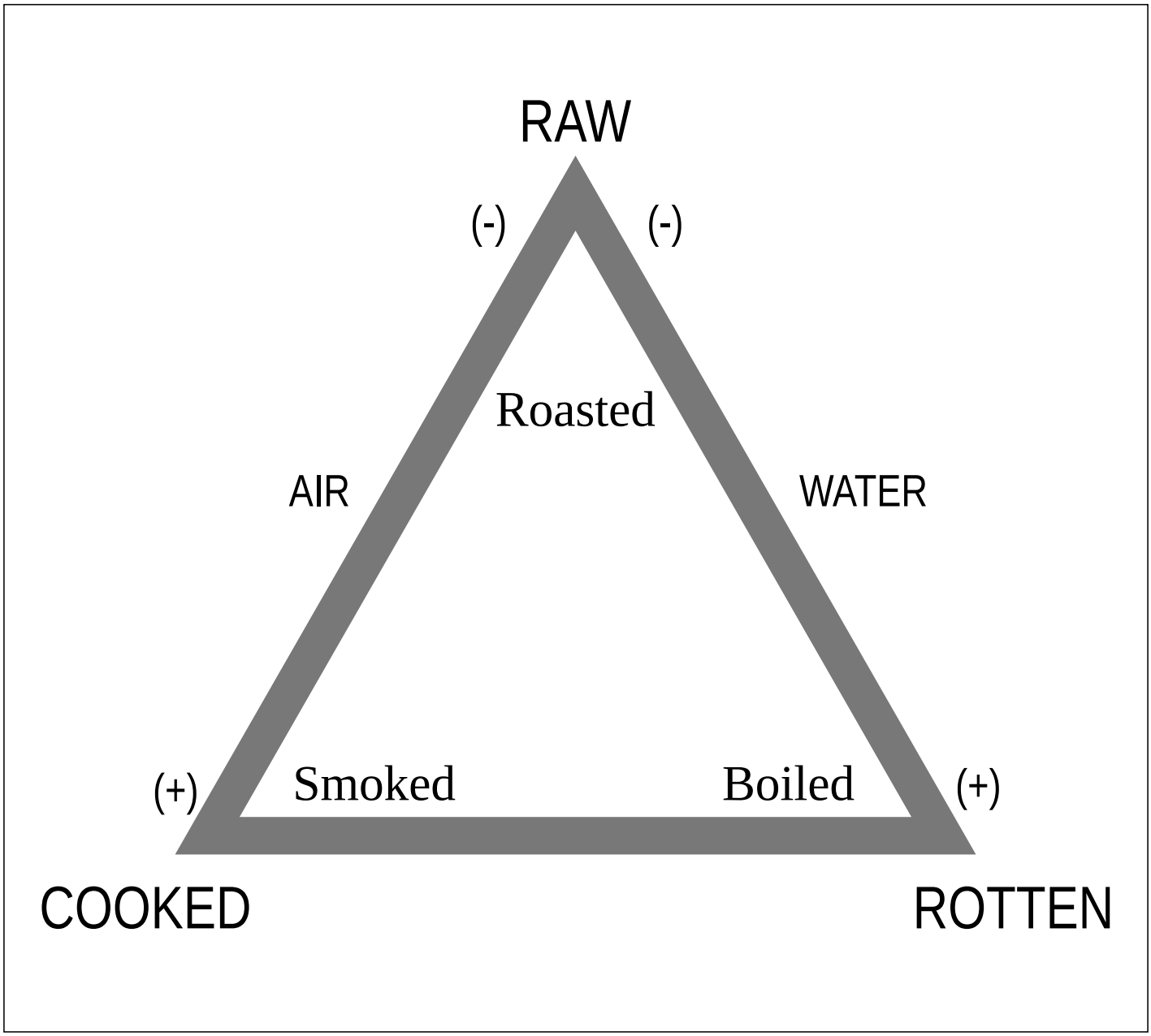
My hopes are to use the embodied experiences I had in Kozaki to think through collaborative, non-extractive futures, so that we do not resort to dominating or exterminating what we cannot see or easily understand. This experience may be the starting seed for envisioning a collective ethic that spans different kinds of species.

It turns out that I also caught "the January cold" within my first week of arriving at Terada Honké. When my fever peaked, the brewery's matriarch brought me warm *amazake,* a sweet fermented rice drink that functions in the same way that Western foodways have relied on chicken soup for ailments.

Looking back on that moment, catching that cold was a way to check my own humanly ego and see the value of practicing humanity towards others who might be suffering. Now that I'm wrapping up my fieldwork here in Kozaki, I see that I am blessed to be surrounded by such vitalizing and convivial communities, both human and microbe.



Le triangle culinaire (Lévi-Strauss, 1968)



The Culinary Triangle (Lévi-Strauss, 1968)

Cooked or Fermented? The Thermal Logic of Social Transformation

Elena Beregow 2018 (extracts)

Abstract

This article investigates the relation of thermal metaphors and thermal materiality in two distinct models of transformation: cooking and fermenting. Against the dominant – and often unreflected – use of metaphors of temperature in social and cultural theory, the essay conceives of cooking and fermenting as cultural techniques. Focusing on the work of Claude Lévi-Strauss as paradigmatic case for the metaphorization of temperature, I show how the culinary triangle with its poles of the raw and the cooked is intertwined with his metaphor of hot and cold cultures. By emphazising the category of the rotted as parasitic third, I argue that it not only complicates the inscribed linear logic of social transformation from the raw (cold cultures) to the cooked (hot cultures), but also that it confuses the nature/culture distinction. A close look at the materiality of the rotted and its associated fermentation practices reveals it as mediaecological nature-cultural technique which oscillates between two thermopolitical strategies: Pasteurization as a technique of purification on the one hand and the Post-Pasteurian rediscovery of flourishing bacterial life on the other. The new enthusiasm for fermentation that is being articulated in both fermentation subcultures and social and cultural theory, will be critically discussed. Challenging the embracement of cyclical life in the critico-theoretical imagination, I aim at highlighting the irritation of this cycle in and through fermentation as a process that always confronts us with the counterpart of life: death and decay.

... **Necrological Vitalism**

There is something miraculous about a common substance like juice turning into wine, a mysterious transformation that – not coincidentally – is the crucial motif of many myths. For a long time, the word ‘fermentation’ was translated as ‘boiling’, but people could not tell how this boiling was possible without heat. Michael Pollan (2013: 291) speaks of ‘fermentation’s cold fire’ in order to emphasize the puzzle of the process. The common ground for all types of fermentation is the liveliness of its agents, the bacteria. Fermentation presupposes the movement of living bacteria that transform organic matter into acids, gas or alcohol. Enzymes, consisting of molecules, the smallest units of living matter, are reduced to simple foods, either for themselves or for other living beings. This primal metabolic process breaks living things down, reducing them so that their energies and atoms can be reused (Buckenhüskes, 2013: 12ff.). While cooking relies on an external source of heat, fermentation is always based on an internal mechanism ruled by molecular biological laws: a ferment produces its energy internally and can be seen as a sort of molecular biological cooking process, while specific molecular groups simultaneously remain in their untransformed “raw” state (Vilgis, 2013b: 39).

The transformation process of fermented foods is particularly dramatic. The external transformation is most likely visible and can be sensed through vision, taste and smell: the colors and textures of the substrate usually change, fermentation intensifies foods’ flavor, but also alters it, producing new tastes like umami and sweetness (ibid.: 44f.). By contrast, the inner transformation is opaque, because it happens at a microscopic scale that is invisible to the naked eye. Foods become much more nutritious because the process synthesizes entirely new vitamins. Foods become more digestible because long chains of proteins, fats and carbohydrates are broken down into simpler, safer forms. And finally, foods become more durable and can be stored longer.

When it comes to human digestion, the fermentation has the same energy-saving function as cooking: fermenting is a form of pre-digestion and thereby saves energy. Gaston Bachelard notes: ‘The yeast mixed into dough aids digestion. And digestion is a form of cooking which begins with the fer-mentation of the yeast. Blaise de Vigenere asserts this explicitly: “Leavening added to dough cooks it from within”’ (Bachelard, 2011: 92). But unlike cooking, fermentation does not kill off enzymes; rather, it cultivates them. The energy is not generated by the fuel but is self-generated by the metabolism of the microbes penetrating the substrate. The bacteria, fungi or enzymes keep the fermentation going through their own enzyme-catalyzed metabolism. Small metabolisms are embedded in bigger ones and converge in huge cyclic rhythms in steady repetition.

The specific temporality constituted by fermentation seems to be one of cyclic memory, of slowdown and conservation, but, importantly, it generates a movement that involves not only life but also death. In fact, the life of these bacteria means decay, decomposition, rot; due to this paradoxical character of life processes that work on their own dissolution, Eugene Thacker (2012: 26) speaks of fermentation as a laboratory for a ‘necrological vitalism’. As I will discuss in my concluding section, this uncanny figure of flourishing death via self-digestion demonstrates the limits of the assumed cyclic logic of endless repetition.

... **Entering the Pasteurian Laboratory: A Thermal Micro-biopolitics of Bacteria**

... Like fermentation, pasteurization depends on a time-temperature relationship. Instead of letting the bacteria flourish, however, pasteurization kills off all pathogenic microorganisms in liquids like milk or juice by shortly heating it up. After this elimination of the native bacteria, one can start with a blank page and add only the 'useful' purebred culture bacteria from outside to speed the process up and to guarantee a standardized product without any nasty surprises. Pasteurization is a control mode that works preventively (see Lemke, 2010) by presenting an upstream thermal answer to a thermal problem – a way of infiltrating a purely immanent process by employing its own logic. However, pasteurization extracts and transfers the subtly tempered media ecology of fermentation into a regime of extreme temperatures hostile to life by reintroducing the cooking principle – extreme heat – and by replacing the 'natural' storage function of fermentation by hygiene practices of extreme coldness: cool storage, cold chains, freezing.

... Strikingly, the micro-biopolitics of bacteria make the distinction between metaphor and materiality vanish: though the notion of 'pure social relations' might be a fantasy, it is literally realized by eliminating living bacteria. The politics of purity is a material politics of segregation between the species of humans and bacteria – a politics, however, that quickly comes to its limits.

Letting Go: The Utopian Energy of Fermenting?

In recent years, a distinct, even opposing, way of dealing with bacteria entered the social and political scenery: letting go. The opponents of industrial fermentation, also known as Post-Pasteurians, defend spontaneous and wild forms of fermentation; they abstain from pasteurization and passionately criticize the political regimes of killing bacteria. Sandor Katz, a prominent protagonist of the fermentation subculture, writes in his book *Wild Fermentation*:

> *Fermentation is everywhere, always. . . . Microscopic bacteria and fungi (encompassing yeasts and molds) are in every breath we take and every bite we eat. Try – as many do – to eradicate them with antibacterial soaps, antifungal creams, and antibiotic drugs, there is no escaping them. They are ubiquitous agents of transformation, feasting upon decaying matter, constantly shifting dynamic life forces from one miraculous and horrible creation to the next.*
> *(Katz, 2003: 2)*

Interestingly, Katz's critique centers on a strong, vitalist notion of life that derives from the liveliness of the bacteria. The crafting practices aim at becoming independent from the lifeless, overprocessed food of the industry: 'Industrially produced food is dead. It severs our connection to the life forces that sustain us and deprives us of our access to the powerful magic so abundantly present in the natural world' (ibid.: 27). Instead, the goal is to cooperate and engage with the bacteria in a sort of interspecies network – a notion that strongly recalls Donna Haraway's 'compost': 'I am a compost-ist, not an posthuman-ist: we are all compost, not posthuman', she claims (2015: 161). The theoretical appeal of the compost lies in its endless, nonsubjective process of becoming that opens up to a radicalization of posthumanist thinking (also see Hird, 2010). It expands the approach of 'companion species' (Haraway, 2008) from humans and animals to plants, bacteria and fungi, 'our biotic and abiotic symp-poietic collaborators, co-laborers' (Haraway, 2015: 161), intermingling with the other species in a huge movement of recycling.

... What Haraway outlines here is an excessive image of the compost – the hotter the better. But as euphorically as Haraway presents the compostism, isn't it somewhat resigned in the end? The compost is the waste disposal of the Anthropocene, it collects its garbage in order to rescue what is left and to feed the remains to a huge movement of recycling and sustainability. Echoing these ideas, some even speak of a 'fermentational turn' to praise the practice of fermenting as a synonym for theoretical and political-ethical visions. The very material practice of fermentation and composting becomes intertwined with the symbolic-political critique connected to it and seems to blur the distinction between metaphor and materiality. However, despite of the materialist narrative Haraway and the fermentation activists have in common, their politicizising attempts re-metaphorize fermentation – and by constructing an image of interspecies relations in places tend to forget over the fragile yet strictly organized media and control practices that are immanent to fermentation both on the level of human control and on selfcontrol of the microbial culture (also see Helmreich & Paxson, 2013). As I have shown throughout the essay, even wild fermentation installs a highly regulative media environment, depending on selective boundaries between the fermenting inside and the non-fermenting outside. This leads us to the question of the temporality of fermentation again: Limiting fermentation to the endless cycle of ubiquitous, flourishing life and renewal – as vitalist accounts tend to do – means to overlook that fermentation irritates and interrupts this very cyclical logic of life by introducing the irreducible principles of death and mortification.

The Enlightenment Is the Booty: Slavs and Tatars

Katarzyna Czeczot and Ewa Tatar in conversation with the art collective

2017

(extracts)

Katarzyna Czeczot: When was the first time you encountered pickles? Do you make pickles yourselves?

Slavs and Tatars: We only consume the pickles of our elders. But our plan is to open a pickle bar in Berlin in 2017. We're big fans of the pickle pavilion at the Dorogomilovsky Market in Moscow, where Russia's colonial footprint is displayed in all its fermented complexity.

ET: Lately you have been doing a lot of research into Towarzystwo Szubrawców (The Society of Rascals), a nineteenth-century society in Vilnius, and in various ways connecting them with pickles. The connection is not so obvious; can you explain it?

S&T: We often conduct parallel research into things that, at first glance, don't appear to have any co-relation. Given its recent fad as a form of eco-friendly, bourgeois nativism, we thought it's time to consider the political agency of pickling, or how to politicize the concept of fermentation. We can apply it, for instance, to the increasing nationalist rhetoric in Poland, or the Brexit vote in the UK. Fermentation allows us to renegotiate our understanding of the other, of the foreigner, in so far as the firstthe Other is the microbe. A bacterium is usually considered a bad thing. Nowadays we pasteurize everything to kill bacteria. But the pendulum of pasteurization has swung too far, to the point of eradicating or eliminating microbes. Fermentation allows us to think of the microbe and the bacteria as the original foreigner and thereby question our anthropocentric world.

Katarzyna Czeczot: So souring cucumbers is a metaphor of the other who is not to be excluded from or included in the community (in the process of assimilation, for instance), but is originally inside.

S&T: It challenges the Cartesian idea of the world, where we are the center and we are rational subjects, while the bacteria are unwanted beings, something we need to get rid of. Souring has an appealing double meaning. It can mean to turn bitter or rotten, or an emotional state of dejection. But it also implies a transmogrification. Souring is the preservation or activation of a substance into another substance. You become something else.

... **KC:** There is, of course, a paradox in this concept of politicizing pickles. Take for instance the debate surrounding Poland's entry into the EU. Within Poland, opponents of the accession warned that the EU would put an end to pickles, because sour cucumbers and sauerkraut do not meet EU food regulations. Pickles became a symbol of Polish uniqueness and Polish identity, which the EU was bent on destroying. Fermentation became a tool in defense of national purity.

S&T: Pickle juice contains within itself two antithetical ends. Sok kiszony (Polish) is used as a hangover cure. And in America, it is now being marketed as a sports drink to enhance performance. So on the one hand, you have the preternaturally Slavic idea of destroying your body and then restoring it, and, in America, it is of course positivist: the new Gatorade, a neo-liberal beverage for high-performance. **...** If anything, we stand in the metaphysicians' corner, with the mystics, against the raging Cartesians. We find the partisanship of art quite tiring: as if we must agree with the subject matters we investigate. We find the Szubrawcy interesting because they do not fit anywhere in the spectrum of Polish historiography. We even found out that the name "Szubrawcy" comes from the river Rawiec, coming from the Czech Republic, which was the river used on the bursztyn (amber) road. And szubrawcy were the people who were always stealing there, like river pirates.

ET: This pirate idea of stealing and redistributing illustrates the methodology of Slavs and Tatars.

S&T: I hadn't thought about that, but it makes sense, especially if the Enlightenment is the booty.

... **ET:** Let's talk about the shovel. It's an instrument of work and the rural class, and yet somehow also the symbol on the cover of the T. Szubrawców weekly.

KC: It is funny. The shovel, according to the Szubrawcy, was to be an instrument of the scientists. They wanted to redefine it, appropriate it, steal it from the witch who flies on it and present it as a tool of the modern thinker, taking the side of individual achievements.

S&T: I thought that Baba Yaga flies on a broom.

KC: There are versions of the myth in which she flies on a shovel.

S&T: The shovel speaks to our anti-modernist understanding of the avant-garde and innovation itself. Let's think about this: a rural area, rural farmers, folklore, craft—all these elements present a real challenge to our Western idea of innovation. Innovation and the avant-garde are often situated in opposition to a preceding order or movement. It's a series of ruptures: Pop art against Abstract Expressionism, Abstract Expressionism against new realism. It's always how the next generation fights the previous generation. But there is an alternative way of telling this story: Hammad Nasar speaks about focusing on continuity, not ruptures. And the rural often allows for innovation not through individualism, but through the collective. The rural is always anonymous: you don't know who farmed your potatoes. You know the names of artists who painted certain paintings, but you don't know the names of artists who stitched your tapestry. **...** We almost never offer alcohol at our openings **...** in Warsaw we filled the gallery with this very pungent smell. The idea was to serve another kind of fermentation that is nonalcoholic. And also to complicate the gallery space, which is supposed to be clean, antiseptic, even scientific in some sense.

ET: Ha, so, you exchanged the potato for the cucumber.

KC: Your idea of politicizing fermentation reminds me of Roberto Esposito's reflection on the word munus, which means both a gift and a debt, and is the root of immunization and communization. Pickling as a political project consists basically of a disapproval of immunization—a rejection of the Cartesian subject isolated from the evil bacteria.

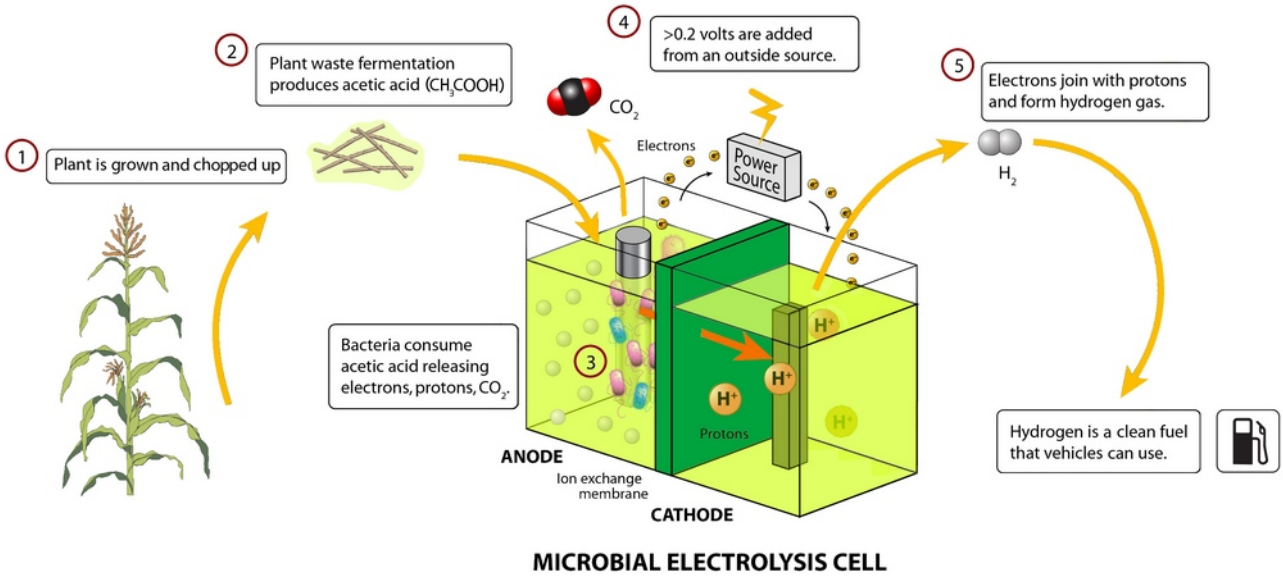
ET: Towarzystwo Szubrawców's sense of humor has been used in the aesthetics of Slavs and Tatars since always! For example, the cucumber as a breast.

S&T: If you look at the language of political parties of the present and the past, the government is often portrayed as maternal or paternal, nurturing you. So instead of giving you milk, it's giving us sour milk, kefir from the breasts of power. And what comes from power is a certain kind of substance, but it's not the sweet one (in English, there's the expression of the milk and honey of government). In this case, it is a sour substance, a rotten substance.

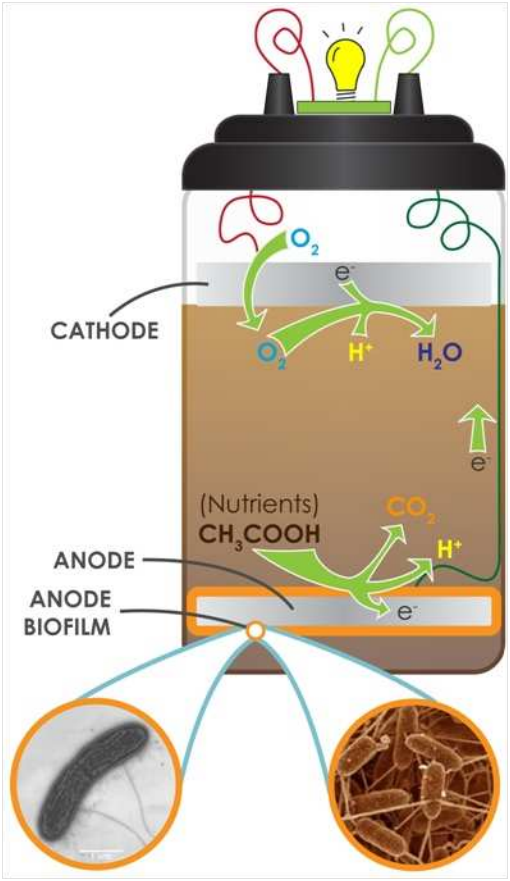
ET: In Polish the homeland is not feminine. In Poland we are nurtured by the father—you say the "fatherland" and the "father tongue"—which is kind of perverse, but unconsciously recognized, as if the nurturing orifice periodically exploded and spilled out its crappy contents for us to feed on, yet it's never explicitly invoked in the discourse around nationalism. It's choked up.

KC: And this image is both ridiculous and bitter, or sour. It reminds me of the battle around breast-feeding that took place during the French Revolution. The campaign to make higher-class women breast-feed their children (instead of giving them to wet nurses) turned out to be a way to keep women away from politics. An idea that was supposed to obliterate class divisions became a tool for strengthening gender division.

S&T: I would love to read more about that.



A schematic of a microbial electrolysis cell (MFC)
Instructions on making a MFC can be found here.
auteur: 22 avril 2010, Zina Deretsky, National Science Foundation (NSF), User:KVDP, source



A soil-based MFC
by MFCGuy2010 - Own work, CC BY-SA 3.0, link

Pile à bactéries

(extrait de wikipedia, 15 mai 2022)

Une **pile microbienne** (ou **biopile** ou **pile à bactérie**) est une pile basée sur le principe des piles à combustible1: la cathode est alimentée en oxygène (en général par l'air) et l'anode est constituée d'une électrode placée au sein d'une chambre contenant un biofilm de bactéries et de quoi les nourrir.
Elles sont également désignées par l'acronyme **MFC** provenant de la dénomination anglo-saxonne : **microbial fuel cell** (littéralement : *Pile à combustible microbienne*).

Principe

Les molécules carbonées produites par les êtres vivants le sont sous des formes réduites qui peuvent être oxydées sous l'action du dioxygène de l'air. La chaîne respiratoire des êtres vivants est d'ailleurs basée sur ce principe.
Il est donc possible de produire de l'énergie à partir de molécules carbonées. Il existe des piles fonctionnant sans bactéries, basée sur l'oxydation spontanée du glucose. Mais la bactérie grâce à son cycle catalytique, peut spectaculairement augmenter la cinétique de la réaction, et fournir des intensités surfaciques supérieures au $mA.cm^{-2}$2. Elle joue un rôle de biocatalyseur en échangeant des électrons avec le matériau d'une électrode, en utilisant des réactions issues de son métabolisme. Les bactéries qui ont ces capacités sont dites « électrochimiquement actives » ou « électroactives ».

Électrode

Elle est constituée de carbone, graphite, inox, platine ou carbone vitreux réticulé peut avoir diverses formes (ex : fil, grille, feuille (chiffonnée), plaque, structure conductrice en éponge ou feutre voire en granules, etc ; L'objectif est d'avoir une aire de contact avec le biofilm aussi vaste que possible.

Membrane séparatrice échangeuse de protons

Elle évite le mélange de l'anolyte et du catholyte (s'ils sont différents) et empêche les produits de réaction d'une électrode de s'acheminer vers l'autre électrode.

Les membranes Nafion et Ultrex sont parmi les plus utilisées dans les piles microbiennes.

Transfert d'électron

Trois mécanismes de transfert d'électrons de la bactéries aux électrodes sont connus :

1. transfert direct, il s'agit du contact physique entre la membrane cellulaire de la bactérie et l'électrode. L'électron est transporté par des complexes transporteurs d'électrons liés à la membrane bactérienne (ex : cytochromes) 3, 4;
2. transfert indirect, via des médiateurs exogènes tels que du rouge neutre5 ou des médiateurs endogènes propres à la bactérie (ex : phénazines6;
3. transfert via des pili aussi dits « *nanowires* » qui font un pont conducteur entre l'électrode (ou d'autres cellules bactériennes) et la bactérie7.

Utilisations possibles

Cette réaction, qui pourrait - éventuellement dans le cadre d'un processus de chimie verte - permettre de produire de l'énergie à partir de déchets organiques10,11,12,13,14,15, d'eaux sales ou d'autres substrats pollués ou riches en bactérie, suscite de l'intérêt16.

Microbial Fuel Cell

(extracted and paraphrased from wikipedia, May 15, 2022)

A **microbial fuel cell (MFC)** is a type of bioelectrochemical fuel cell [1] that generates electricity from microbial action

History

The idea of using microbes to produce electricity was conceived in the early twentieth century. Michael Cressé Potter initiated the subject in 1911.[5] Potter managed to generate electricity from *Saccharomyces cerevisiae*, but the work received little coverage. In 1931, Barnett Cohen created microbial half fuel cells that, when connected in series, were capable of producing over 35 volts with only a current of 2 milliamps.[6]

A study by DelDuca et al. used hydrogen produced by the fermentation of glucose by *Clostridium butyricum* as the reactant at the anode of a hydrogen and air fuel cell. Though the cell functioned, it was unreliable owing to the unstable nature of hydrogen production by the micro-organisms.[7] This issue was resolved by Suzuki et al. in 1976,[8] who produced a successful MFC design a year later.[9]

In the late 1970s, little was understood about how microbial fuel cells functioned. The concept was studied by Robin M. Allen and later by H. Peter Bennetto. People saw the fuel cell as a possible method for the generation of electricity for developing countries. Bennetto's work, starting in the early 1980s, helped build an understanding of how fuel cells operate and he was seen by many[*who?*] as the topic's foremost authority.

In May 2007, the University of Queensland, Australia completed a prototype MFC as a cooperative effort with Foster's Brewing. The prototype, a 10 L design, converted brewery wastewater into carbon dioxide, clean water and electricity. The group had plans to create a pilot-scale model for an upcoming international bio-energy conference.[10]

Definition

A microbial fuel cell (MFC) is a device that converts chemical energy to electrical energy by the action of microorganisms.[11] These electrochemical cells are constructed using either a bioanode and/or a biocathode. Most MFCs contain a membrane to separate the compartments of the anode (where oxidation takes place) and the cathode (where reduction takes place).

Soil-based

Soil-based microbial fuel cells adhere to the basic MFC principles, whereby soil acts as the nutrient-rich anodic media, the inoculum and the proton exchange membrane (PEM). The anode is placed at a particular depth within the soil, while the cathode rests on top the soil and is exposed to air.

Soils naturally teem with diverse microbes, including electrogenic bacteria needed for MFCs, and are full of complex sugars and other nutrients that have accumulated from plant and animal material decay. Moreover, the aerobic (oxygen consuming) microbes present in the soil act as an oxygen filter, much like the expensive PEM materials used in laboratory MFC systems, which cause the redox potential of the soil to decrease with greater depth. Soil-based MFCs are becoming popular educational tools for science classrooms.[32]

Sediment microbial fuel cells (SMFCs) have been applied for wastewater treatment. Simple SMFCs can generate energy while decontaminating wastewater. Most such SMFCs contain plants to mimic constructed wetlands.

In 2015 researchers announced an SMFC application that extracts energy and charges a battery. Salts dissociate into positively and negatively charged ions in water and move and adhere to the respective negative and positive electrodes, charging the battery and making it possible to remove the salt effecting *microbial capacitive desalination*. The microbes produce more energy than is required for the desalination process.[53] In 2020, a European research project achieved the treatment of seawater into fresh water for human consumption with an 85% reduction in current energy consumption with respect state of the art desalination technologies. Furthermore, the biological process from which the energy is obtained simultaneously purifies residual water for its discharge in the environment or reuse in agricultural/industrial uses.

Ceramic membrane

PEM membranes can be replaced with ceramic materials. Ceramic membrane costs can be as low as $5.66/m^2. The macroporous structure of ceramic membranes allows for good transport of ionic species.[61]

The materials that have been successfully employed in ceramic MFCs are earthenware, alumina, mullite, pyrophyllite, and terracotta.[61][62][63]

Effects of music waves on fermentation characteristics and viability of starter cultures in probiotic yogurt

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It has been proved that sonic waves energy and especially the 'green music' waves affect the metabolism and growth of some plants and vegetables as well as enhance milking yield in cows. Green music normally encompasses a classic music base along with some natural sounds such as those of birds, insects, water and wind. In this research, the effects of green music waves on fermentation characteristics and viability of starter cultures in probiotic yogurt was investigated. Milk inoculated with yogurt bacteria (mixed culture of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus*) or probiotic culture (mixed culture of *L. acidophilus* LA-5 and *Bifidobacterium lactis* BB-12) plus yogurt bacteria was exposed to the green music (sound intensity of 75±5 dB and frequency range of 30-18000 Hz) during fermentation until final pH of 4.5±0.02 was reached. Changes in pH decrease, titrable acidity increase and redox potential increase during fermentation as well as their decrease/increase rates at the end of fermentation were monitored. The viability of probiotics and yogurt bacteria was assessed immediately after fermentation. The green music waves significantly increased the fermentation/acidification rate of aforementioned starters whilst significantly decreased viability of either yogurt bacteria or probiotics as well as incubation time.

1. Introduction

Probiotics are special types of live and healthful bacteria or yeast which possess favourable impacts on animal and human host mainly via maintaining and/or improving microbial balance between harmful and beneficial microflora, especially in the intestine (1, 5, 11). These microorganisms are common to be ingested through dairy products, mainly fermented milk products (5, 11). *Bifidobacterium* spp. and *Lactobacillus acidophilus* are by far the most important probiotics regularly added to the fermented milks (8). Probiotics should be alive to an adequate number in order to exert their positive effects on the health of the host. This attribute is known as 'viability'; namely, the adequate number of live probiotic cells in a food product at the time of consumption (5).

Sound waves are produced from oscillation of elastic materials and as a result, induced vibration of air molecules. When sounds are integrated into rhythm patterns, music (in its special meaning) is emerged. Music might contain either regular vibrating sound waves (tones) or irregular ones (noises) (7). Apart from the advanced and complex physical-mental-spiritual impacts of music on humans, it has been proved that sonic waves and 'green music' (which normally comprises a classic music base along with some natural sounds such as those of birds, insects, water and wind) affects the metabolism and growth of some plants and vegetables (10) as well as enhances daily milking yield in cows (12). Music waves have been also applied for attracting livestock to move along a laneway (2-4). However, to the authors' best knowledge, no data was present regarding the influence of green music waves or other types of sonic waves on the acidification rate and viability of fermenting microorganisms and probiotics during fermentation. Therefore, the aim of this study was to investigate the effects of green music waves on fermentation characteristics and viability of starter cultures in probiotic yogurt.

4. Conclusion

This study demonstrated that the green music waves significantly increase the cell activity and acidification rate of yogurt and probiotic bacteria whilst significantly reduce the viable counts of mentioned microorganisms at the end of fermentation as well as the incubation time. Further works could be focused on deep consideration of different music styles on viability of different microorganism strains with investigating the mechanisms of impacts and qualitative and quantitative monitoring of the produced metabolites during fermentation.