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Shitty food-based world-making: Recasting human|microbiome relationships beyond shame and taboo

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ABSTRACT

Anticipation holds that imaginaries of future situations can provide orientation in decision making, despite the incalculability of outcomes. The *Shit!* project turns this premise towards the rift between humans and 'the rest of our nature'. The project uses experimental means to examine how anticipation—performed through moving, making and doing with food—might assist people to envision and then perform healthier relationships with their gut microbiome. The imaginary is human|microbiome harmony, pleasurably negotiated through what goes into our bodies, materially, sensorially, nutritionally, and emotionally, and what comes out—our *shit*. To anticipate from and towards this imaginary, we use autoethnographic inquiry to estrange researcher thinking, a 'kitchen research lab in the wild' to expose early ideas to public scrutiny, and a four-part workshop to estrange participant thinking. The workshop was conducted with people who struggle with serious gut disease, and close family members with ostensibly healthy guts. The activities reconfigure embodied design methods around, with and through food to engender a fertile space in which participants may address vulnerability and taboo, and embody anticipation of alternative relationships with their gut microbiome. The work introduces food and eating as anticipative actions for world-making, to support participant engagement with challenging subjects.

1. Introduction

In 2018, the Intergovernmental Panel on Climate Change gave us ten years to transform our material practices, heal the rift between humans and nature, and avoid catastrophic climate instability (IPCC, 2018). The IPCC Sixth Assessment Report (2021) shortened that time frame. The scale and scope of this challenge is almost beyond comprehension. In so-called 'developed' societies, we do not seem to know how to foster human|nature (re)connection in sufficiently profound and far-reaching ways to shift our current trajectory. According to eminent climate change scientist, Will Steffen (cited in Carvan, n.d.), the problem is neither scientific, nor technical. Rather, it relates to our socio-political values.

The *Shit!* project grapples with these intertwined issues of scale, scope and values, by turning attention to the troubled relationship many people hold with their gut microbiome—the rich and fecund multi-species nature found within our bodies. Otherwise known as our gut flora, the human gut microbiome is the collection of microorganisms that live inside our gastrointestinal tract: the part of our

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body that extends from our mouth to our anus. The gut microbiome has been declared 'our second brain' (Ochoa-Repáraz & Kasper, 2016); is said to shape our physical health; our emotional and mental well-being; our cravings, desires, moods and more (Carpenter, 2012). While a plethora of research brings focus to the gut, the system itself is incredibly complex and despite recent advances (MacDougall, 2012), it remains unclear what constitutes a healthy gut microbiome for an individual, at a specific moment in time. The makeup of an individual's microbiome depends on their health, history and circumstances, and can change quickly and radically. As Gilbert et al. explain, humans are multi-species events—composite by-products of collaboration (Gilbert, Sapp, & Tauber, 2012).

In addition to this challenge of idiosyncratic complexity, technology stumbles in its quest to make the gut knowable: cameras and other sensors inserted orally or anally, quite literally, only go so far due to constraints in size, scope, sensitivity… or length of cabling. Our gut thus remains a black-box system containing a hidden world of microbes, over which we have limited access, awareness or control. What we can access is what goes in (physically, as well as emotionally) and what comes out (in the form of fæces, urine, altered emotions and behaviours). When people's gut microbiome functions well—reliably pre-digests foods and sends healthy signals to the rest of our system, this lack of access is not a problem. However, as many as 21% of people worldwide suffer with Irritable Bowel Syndrome (IBS) at any time, and one in four will suffer a chronic gut issue in their lifetime (Chey, Kurlander, & Eswaran, 2015). These issues present challenges for the people who suffer the diseases and syndromes, as well as for those around them. The challenges are physiological and psychological, and include shame and discomfort around how the gut responds to food, how the body behaves in social situations, how it impacts intimate activities and sexual relations, as well as emotional behaviours that can distort experiences and disrupt interactions with others (Leenhardt et al., 2019). To complicate matters further, IBS is as much a medical placeholder, as a diagnosis; it acknowledges the seriousness of the symptoms, though provides little certainty around what might afford relief (Chey et al., 2015).

In response to this problematic, *Shit!* proposes a radical new approach to empowering people to engage with their gut microbiome, via an embodied anticipation process, conducted with and through food. The approach recognises that, as humans, we contain multitudes on whom we depend and who are, in turn, dependent on us (MacDougall, 2012; Yong, 2016); and that food, as well as *shit*, are the most fundamental material manifestations of this relationship. In this article, I describe the research actions that constitute the *Shit!* project: an autoethnographic experiment, a kitchen research lab in the wild, and two workshops conducted with members of the Danish Colitis and Crohns Patient Association—a support organisation for people who suffer from chronic gut diseases (Colitis-Crohn Foreningen, n.d.). Each of these activities leverages food as a foundational material relationship in more-than-human nature; acknowledges the need for radical action in this complex and challenging suite of issues; and proposes a transgressive and intimate, embodied approach to Anticipation to find new ways forward. Through their exposition, I seek to grasp potentially transformative moments in the process of engagement *between* participants and *with* materials. To this end, the essay takes the form of an 'annotated portfolio' (Gaver & Bowers, 2012), wherein the text constitutes annotations for photo-collages. The essay thus aims to "simultaneously respect the particularity and multidimensionality" of the design intervention (Gaver & Bowers, 2012, p. 43), as it brings focus to the pictures' capacity to depict the situated unfolding of change and anticipation, amidst heterogeneous concerns. These concerns are at once embodied in, and emerge from, the practical staging of the experiments.

2. Embodying anticipation

The objective of *Shit!* is to invite people to individually and collectively anticipate healthy relationships between themselves and their gut microbiomes. The imaginary of the future in this scenario is one of human|microbiome relational harmony, negotiated through what goes into our bodies, materially and emotionally, and what comes out: our *shit*. To move from this *as-if* world to desirable, alternative 'now's, *Shit!* stages tangential inquiries into more-than-human practices. These inquiries reconfigure embodied design methods around, with and through food, to engender a fertile space in which participants may move through vulnerability and taboo to rehearse alternate possibilities. The work thus uses food and eating as anticipative actions for world-making; supporting participant engagement with challenging subjects.

2.1. Anticipating alternatives

As a research field, Anticipation holds that imaginaries of future situations can provide orientation in decision making, despite the incalculability of outcomes (Beckert, 2013). This stance recognises and involves individual felt experience and phenomenologically grounded expertise. It enables actors to flatten heirarchies, and transform top-down systems and structures from within (Wilde, 2020:182). *Shit!* engages with these possibilities, using experimental means to empower participants. Through embodied engagement and estrangement, the project seeks to transform a relationship that is typically approached from an anthropocentric viewpoint, into a more democratic and agonistic, balanced and holistically relational system. The objective is to transform the human|gut microbiome relationship from top-down (as perceived by people, with guts, inhabited by a microbiome), to fundamentally relational. To bring

focus to what Stacy Alaimo describes as our 'porousness'. To recognise "the literal contact zone between human and more-than-human nature" as a "mobile space" where "the often unpredictable and unwanted actions of human bodies, nonhuman creatures, ecological systems, chemical agents and other actors" play out (Alaimo, 2010:2).

Shit! literally seeks to move participants "beyond inherited thought patterns and categories by bringing them into an as-if world in which given reality is surpassed and a different one considered" (Bronk, 2009). The project thus makes use of two necessary but distinct components of anticipation: "a forward-looking attitude and the use of the former's results for action" (Poli, 2017). It combines anticipation with design's world-making capacities to introduce new practices that give rise to new imaginaries. The resulting imaginaries are personally meaningful, contextually relevant, and ecologically impactful. They build capacity for new kinds of relationships and suggest opportunities—embedded and embodied in the moment—to not only practice but lay the foundations for change.

2.2. Embodying experience

Fundamental to this process, is a participatory approach to research-through-design, enacted with, through and around food (Dolejšová, Wilde, et al., 2020; Wilde, 2020: 184–187). This stance opens up new ways of thinking, and enables all of a person's senses to be leveraged in an emergent design space. Participatory research-through-design is an embodied approach that draws on phenomenology (Heidegger, 1996; Merleau-Ponty, 1996) and related theoretical frameworks such as pragmatist aesthetics (Dewey, 2005; Shusterman, 2000), embodied cognition (Varela, Thompson, & Rosch, 1993) and embodied, embedded and enacted minds (Clark, 1998, 2010; Gallagher, 2012, 2016; Gallagher & Zahavi, 2012; Kiverstein & Clark, 2009). It leverages performative traditions to extend these theoretical understandings into practice, and draws on design researchers' and participants' first-person experiences (Wilde, Vallgårda, & Tomico, 2017). This stance affords enriched opportunities for knowledge generation and experience creation, by relying on *estrangement* to enliven the ideation process and bring into being new ways of designing, imagining and rehearsing—or practicing—new ways of living.

2.3. Estrangement

The concept of estrangement is centred on the idea that the act of experiencing something occurs in the moment of perception and that the further you confuse or otherwise prolong the moment of arriving at an understanding, the deeper or more detailed that understanding will be. Estrangement has been used as a basic strategy in artistic expression, ethnography and design throughout the twentieth century (Bell, Blythe, & Sengers, 2005; Danto, 1981). It is epitomised in the surrealist slogan "making the ordinary extra ordinary" (Lefebvre (1988)), and can be understood as what Russian Formalist Art critic, Viktor Shklovsky, describes as the "artistic-poetic power of defamiliarization" (Shklovsky (1965)). As a strategy, estrangement is used to destabilise existing thought patterns and practices, and prompt participants to 're-learn' how to look at the world. Harding (1991) argues that making strange, thus, is the beginning of any scientific enquiry as something made strange demands attention and brings forth questions. Sheets-Johnstone's theories about making strange extend this idea by bringing focus to and through the moving body to leverage the knowledge that can be generated through embodied engagement (Sheets-Johnstone, 2011). *Shit!* builds on this rich phenomenological foundation. It places participants into situations that turn the familiar upside-down to enable reflection on the intimate and the tacit, and open up for new imaginaries (Bell et al., 2005; Koefoed Hansen & Kozel, 2007; Wilde, 2015; Wilde & Underwood, 2018).

3. Methodology

Shit! is built on the hypothesis that bringing together food, shit and embodiment might afford radical new ways of grappling with our gut, and from there, human-nature interrelations. Through a series of critically-engaged, participatory research-through-design actions, the *Shit!* project invites participants to anticipate the possibility of human|microbiome harmony, pleasurably negotiated through what goes into their bodies, materially, sensorially, nutritionally, and emotionally, and what comes out—their *shit*. The research begins with an autoethnographic inquiry, followed by a kitchen research lab in the wild.

Autoethnography recognises that personal experience unfolds within political and cultural norms and expectations (Ellis, Adams, & Bochner, 2011). These norms marginalise the experience of people with gut disease, even if 20–25% of the population at any time has a problem with their gut. To better understand the experience of intense scrutiny of one's gut, and begin to discern how to invite others to engage with their gut, as a researcher, I began with my own. I documented my gut in action and observed my emotional journey as I did so. Following Ellis, Adams, and Bochner, I "use[d] personal experience to illustrate facets of cultural experience, and, in so doing, make characteristics of a culture familiar for insiders and outsiders." (2011: 276). The subsequent kitchen research lab in the wild extends this autoethnographic work by testing out partial ideas in the public realm. Research Labs in the Wild have been used in

exploratory textiles research to speculate through new materialist theory (Wilde & Underwood, 2018), and in embodied design that delves into yet-to-be imagined technologies (Wilde, 2015). It has also been used within speculative DIY Biology research (Aleksejeva et al., 2019). In these cases, a number of ideas are trialed at different resolutions of completion, in the public realm. The purpose is not to find answers, but to gauge participant responses, so that the work might be adjusted or reoriented to more successfully invite people into the inquiry. Sitting in complement, the autoethnographic inquiry and the kitchen research lab in the wild afford a reflexive interrogation into what might facilitate an embodied inquiry with the gut. They give rise to strong concepts: "generative intermediate level knowledge … that plays a direct role in the creation of new designs" (Höök & Löwgren, 2012).

From this foundation, with researchers and student researchers-in-training, we designed and tested a range of performative approaches that leverage *thinking through moving, making and doing* with food, to construct a four-part workshop. Thinking phenomenologically, through more-than-human things, forms the foundation of participatory Research through Design (Wilde, 2020) and has been leveraged in workshops by the author and others, using food as a 'thing' to think with (e.g.: Dolejšová, Wilde, et al., 2020; Wilde, Dolejšová, et al., 2021). The resulting workshop actions (detailed below) recognise the interspecies entanglement of humans and microorganisms and the challenge of relating—in intimately meaningful ways—to this entanglement. By using design research methods as a form of collective inquiry, in a quest to find new ways of *anticipating* more interdependently beneficial relationships between humans and their gut microbiome, the project troubles the idea that science, medicine and technology are preferred means of addressing complex challenges. Through these experiments, *Shit!* seeks to understand how individuals and communities might foster alternatives to the dominant human-gut-microbiome relationship model, and consider deeply more complex, harmonious and agonistic, multi-species, relational understandings of human|nature. Critically, the human gut microbiome is the locus of this inquiry.

4. A 'shitty' series of practices

In this section, I lay out a series of defamiliarising activities: the autoethnographic inquiry conducted to estrange researcher thinking; the kitchen research lab in the wild that served to expose early research ideas to public scrutiny; and the four-part workshop, designed to estrange participant thinking, give rise to new imaginaries, and lay the foundation for anticipating desirable alternatives. The autoethnographic inquiry shown here was undertaken by the author—a senior researcher who has IBS. The kitchen research lab in the wild unfolded at a public event during Danish National Research Week (Forskningens Døgn), attended by approximately 100 people. The workshop was designed for the Danish Colitis and Crohn's Patient Association (CCF) (Colitis-Crohn Foreningen, 2021), for people who struggle with serious gut disease and close family members who have ostensibly healthy guts. We performed the workshop two times. The first involved 32 adult participants (26 years and over), including 16 sick people, each accompanied by a healthy family member, who participated alongside them. The second, involved 16 young adults (aged 19–30), all of whom are ill. The workshops were conducted as part of the CCF annual 'colony', a residential four-day weekend that has as its focus social activities that serve to bring the community together in a safe space, where the constraints of their illnesses are understood. The participants in both workshops all knew each other. Many of them had not seen each other since the previous year's colony. One member of the adult group had died since the previous year. This loss highlights the vulnerability of the participants, and the need for this colony to serve as a safe space. The preparatory process was thus critically important, as was the process undertaken with the members of the CCF. We were invited into this safe space the evening before the workshop, to have dinner, sleep over and have breakfast and lunch together with the participants, as well as to conduct the workshops.

As noted above, the experiments are presented here as an annotated portfolio, in an effort to open up the transformative moments in the process of engagement *between* participants and *with* materials; to "simultaneously respect the particularity and multidimensionality" of the design intervention (Gaver & Bowers, 2012: 43), and depict the situated unfolding of change and anticipation, amidst heterogeneous concerns. I unfold them in chronological order to provide access to the cumulative impact on the thinking process, and design of the participatory aspects of the study.

4.1. A 'shitty' autoethnographic exploration of 'the taboo of poo'

Excrement, shit, poo, the act of defecation and the use of toilets are steeped in social norms and taboos—especially in modern Western societies (Laporte, 2002; Lea, 2001). Defecation is a necessary and recurring activity. However, unlike eating, defecation is governed by strict conventions of privacy and intimacy, and is severed from public discourse outside of medical situations and jokes. To inquire into our relations with the gut, therefore requires that we transgress the apparent intangibility of our subject matter.

We began by framing our research as a 'cause-and-effect' study and attempted to document causality through a rigorous autoethnographic photo registration of food consumption and excretion (e.g. Fig. 1). Our experiment lasted several months and did not reveal any causal relations. However, it proved significant in two ways. First, it provided a method for relating personal experiences;

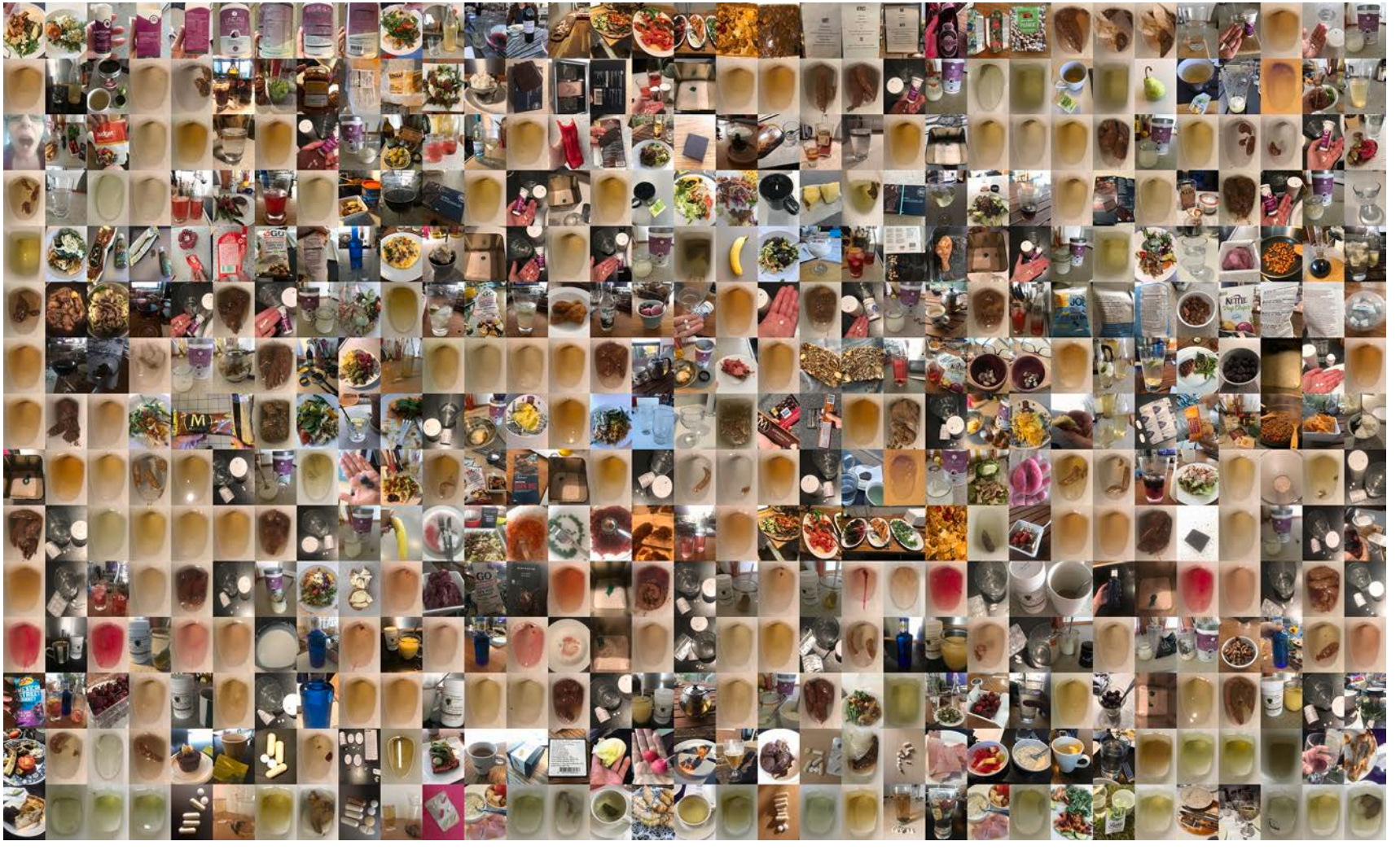

Fig. 1. Autoethnographic wayfinding: a visual autoethnography of what went into and came out of the author's body. (Consecutive images catalogued by the author).
Alt-text: *A 33×15 grid of images, shot consecutively, showing the contents of toilets, plates, menus, packaging, foods, vitamins, snacks and other things that the author ingested or excreted.*

the experimental approach took us beyond an initial queasiness and embarrassment about sharing intimate details. Second, it pointed us towards working *asymptotically* towards our relationship with the gut microbiome. As we examined the nature-culture assemblages outside our bodies: the outer ecosystem and social entanglements that effect and in turn are affected by the gut microbiome. The key takeaways from this visual autoethnographic process were that feelings of shame and embarrassment can shift with the familiarity that comes from direct engagement.

I provide a first-person perspective:

I have Irritable Bowel Syndrome (IBS). It's a placeholder that means there is nothing that the Western medical system can, or is willing to, do for me. Curiously (for me), my gut challenges were not foremost in my mind as I photographed what I ate and what my body expelled over the course of this experiment. Rather, my feelings of exposure were related to a) possible judgements that might be brought to bear on what I was choosing to do, in conducting this experiment, b) possible judgements that might be brought to bear on what I was choosing to consume, and c) horror that the experiment I had devised would result in my blood, piss and fæces being shown by me to others—first to my collaborators, then to strangers as I reported the research.

At the beginning of the autoethographic process, I felt acutely embarrassed to photograph the contents of the unflushed toilet. As the documentation process unfolded, the feelings of shame slowly transformed into more banal emotions, such as indifference and boredom. As part of this transformation process, I would occasionally find what I was doing terribly funny and want to talk about it to others, then realise mid-sentence that speaking about my most intimate acts in this way was radically transgressive, and perhaps not at all funny for the people I was speaking to. At these moments, I would sometimes stop, mid-sentence, unsure if I was meant to feel ashamed. At other times, I would forget to photograph what I ate, suddenly realise, then find ways to capture it—by photographing food in my open mouth, the remains of a meal on a plate, or an empty plate and a menu item, to indicate what had passed. Sometimes, my curiosity as a scientist took over, and I became quite fascinated by what I was doing. At other times I became bored by the effort. And, as boredom kicked in, I was able to recognise that the emotional sharpness of shame and humility were no longer anywhere to be found. These shifts surprised me, and over time have become more pronounced as I show the images in presentations, conferences, workshops and public events. I had not really considered what it might mean to present the work live, but I find that doing so enables me to be vulnerable—honest and raw—and that this in turn makes something happen.

The first time I showed the images was in the kitchen research lab in the wild [described below]. *Showing the images was not easy. It was emotional and confronting. However, the power of doing so was that others were able to speak about their shame in turn, knowing that they will not be judged. Many people came to me afterwards and confessed that they have gut issues that they have never told anyone about; that they can see themselves in the work; that they feel liberated, seeing and hearing me talk about it; seeing that my shit is not more or less weird than theirs. Their comments suggest that speaking openly about our fæces might have benefits far beyond the individuals involved.*

The takeaways from this experience were that:

- Engaging directly with our excretions, could temper the acuteness of associated shame.
- By exposing our intimate acts somehow to others, two things might unfold at once: 1) the shared vulnerability could open a space where shame might be transformed, potentially through curiosity and laughter, into something different; 2) the distinct lack of direct causality between gut issues and the idiosyncracies of excretions could be made visible beyond the individual, and open up new ways of *being with* our *shit*, not only as people who are sick and vulnerable, but as humans who are part of nature.

These takeaways assisted us researchers in thinking about the kitchen research lab in the wild, and informed how we designed the subsequent workshop.

4.2. A 'shitty' kitchen research lab in the wild

The first public experiment was undertaken at the University of Southern Denmark (SDU) in Kolding, during the annual National Research Week (*Forskningens Døgn*). This event brought around a hundred people to the SDU Kolding campus for lightning Pecha Kucha talks and exhibitions of research posters. We took advantage of this event to create our first experiment, a kitchen research lab in the wild—a participatory event that is both exhibition and research in progress, used to expose early ideas to public scrutiny, and expose researcher bias (Wilde & Underwood, 2018). The aims of this process were to explore how willing people are to engage in participatory actions that converge food, fæces and multi-species concerns; determine how feasible people find the idea of communicating with their gut microbiome; and understand what issues might arise as a result of either subject matter or methodology. To begin, I gave a lightning talk, as part of a Pecha Kucha, at the end of which, I invited people to join the inquiry. We had two research stations and a video screen, running a looped exposition about the human gut microbiome. The first research station gave away foods created by, or in collaboration with, non-human organisms—sourdough bread, kimchee, sauerkraut, local honey, and butter made on the spot by shaking up cream. Guests were also invited to draw their gut anatomy, using food-based paints. At the second station, we used designerly means—identical foods (in terms of ingredients and taste) presented with either highly refined aesthetics, or looking

literally like fæces—to ascertain people's interest in the research topic, and their willingness to eat something and/or have its taste influenced through non-taste-based aesthetics.

We thus engaged people with our inquiry, and gained a more nuanced sense of their willingness to transgress taboo. While tasting the foods, painting, or viewing the video, many shared their personal experiences fermenting foods, gathering honey, choosing what they eat to align with the nature that surrounds us. A significant number shared their struggles with gut disease, IBS and ongoing or intermittent gut discomfort, experienced by themselves, their family members and intimate partners. Overall, the activities—no matter how strange—were received enthusiastically, even when people could not bear to eat the food.

The takeaways from this event were that:

- Many people are curious about how to engage with the microbial nature that exists around and within us, and are excited to share methods for doing so through food.
- Many are curious and willing to engage in experiments where food might look disgusting but smell and (potentially) taste delicious. Though not all are willing to eat such food.
- All participants and observers seemed drawn to consider and discuss the topic of human|nature, and the challenge of gut microbiome relatedness, even when they expressed disgust in response to the research object and experimental materials.

These findings suggest that the estrangement process was successful in bringing people to a taboo topic. We therefore leveraged them as we designed the CCF workshop.

4.3. Leveling the playing field

Following the kitchen research lab in the wild, we worked with chefs to ensure we addressed important, if often overlooked aspects of food. For instance, in the kitchen research lab in the wild, we found that mouth-feel not only impacts taste, but participants' willingness to suspend their hesitation and eat unusual things. To better afford a balanced playing field for the meeting between participants and their gut microbiome, we modified cakes to be bacteria friendly, replacing egg with flax seeds, and wheat flour with chick-pea flour. Flax seeds and chickpeas are rich in inulin, which is known to promote growth of beneficial bacteria (Ramirez-Farias et al., 2008). In this way, our cakes contained prebiotics (in the form of inulin)—to feed the probiotics (the bacteria), and polyphonols (in the form of cacao)—for the gustatory pleasure of the people, and to enable us to communicate directly with the microbiota. Polyphenols are plant compounds that have long been investigated as most likely capable of protecting against chronic diet-associated disease. As discussed by Marchesi, Adams, and Fava, 2016: 332):

> *The gut microbiota plays a critical role in transforming dietary polyphenols into absorbable biologically active species, acting on the estimated* 95% *of dietary polyphenols which reach the colon* [citing Clifford, 2004]. *Recent studies show that dietary intervention with polyphenol extracts, most notably de-alcoholised red wine polyphenol extract and cocoa-derived flavanols, modulate the human gut microbiota towards a more 'health-promoting profile' by increasing the relative abundance of bifidobacteria and lactobacilli.*

Our modified cake recipes thus intended to simultaneously feed the participants, their gut microbiota, and to assist in making conscious the communication process between these two actors. Alongside the previous two experiments, this work was fundamental to preparing the 'shitty' workshops, presented at the CCF annual colonies, described below.

4.4. Two very shitty workshops

The two CCF *Shit!* workshops took place during the Danish Colitis-Crohn's Association's annual long-weekend meetups. The first involved 32 adults, including 16 CCF members with chronic gut disease and 16 healthy family members; the second, held the following weekend, involved 16 members of the association's youth group, aged 19 – 30. In both cases, the research team arrived at the venue on the Saturday evening, had dinner with the CCF members, spent the evening in residence and conducted the workshop the following day, beginning with each team member explaining their personal experience with gut diseases and disorders.[1] In this way, we were perceived as coming from within, somewhat, rather than simply being outsiders who arrived, conducted an experiment and left again. Each workshop consisted of carefully scripted procedures of self-experimentation: four 45 min activities, with a break for coffee or lunch in between. Each activity reconfigures embodied design methods around, with and through food to engender a fertile space in which participants can find ways to address vulnerability and taboo, and thereby embody anticipation. The participants built system models, ate, tasted, felt and smelt their way to future imaginaries of human|gut microbiota harmony. The aim was to spur a genuine interest in our otherwise taboo-ridden social discourse on shit and the food system, develop new imaginaries, and thence new practices or positions. The following photo-montages combine images from both events (Figs. 2, 3, 4 and 5).

[1] Among the research team was one person with ulcerative colitis and other gut issues, who spent 100 days in hospital one year; another with three children, one of whom can eat anything and one almost nothing without getting an upset stomach; another with a background in physical therapies and extensive experience with gut diseases and disorders; and myself, a person with IBS.

Fig. 2. Draw your Gut (workshop activity no. 1). Working alone, but together—side by side—workshop participants drew their gut anatomy from memory using food-based paints (spirulina, cacao, turmeric mixed with water, beetroot juice). In the adult group, half the participants have chronic gut diseases; the other half are healthy family members. In the activity, we did not distinguish between who was sick and who was healthy. However, the participants asked for this information. On analysis, the health of each participant was not discernible from their portrait. This outcome surprised sick and healthy alike.

Alt-text: *Three images of people sitting at a long table wearing labcoates. The table is covered in brown paper and has jars of food-based paints and paint brushes available for use. In the first image the people have research consent forms on the table in front of them and they are laughing very strongly. In the second image people are looking at each other and painting their understandings of their gut anatomy onto the brown paper. In the third image, we look over the shoulder of a woman painting her gut on the table.*

Fig. 3. Build your gut (workshop activity no. 2). Participants, working in four groups, performed the mechanics of their gut: i) mouth to stomach; ii) stomach; iii) small intestine; iv) large intestine and rectum, using food-based elements to play the roles of food and biological processes (e.g. apple cider vinegar stood in for stomach acid, and juice for digestive juices). *Top*: workshop 1: a passing manœuver from group (i) mouth to stomach, to group (ii) stomach; *Bottom, left*: workshop 1: the large intestine of a person with ulcerative colitis (the beetroot juice on the stockings indicates blood on the intestinal walls); *Bottom right*: workshop 2: preparing food for the mouth.

Alt-text: *Three images. In the top image, six people are standing at a table wearing disposable labcoats and blue surgical gloves. One has their hands in a plastic bucket that represents the mouth; three are passing food from the bucket to a large plastic bag that represents the stomach; two more (the intestines) look on. In the bottom-left image, a man wearing a lab coat and surgical gloves is seated, stretching a stocking from the table to above his head. the stocking has a funnel inserted at the top, and dark marks where beetroot and other foods have left traces as the were funnelled down. In the bottom-right image, a young man wearing a lab coat and surgical gloves stands peeling a banana over a plastic tub, while another young man, seated, looks on smiling.*

Fig. 4. Shitty cakes (workshop activity no. 3). The primary task in this activity was to model your fæces. The materials used were organic chocolate cake (made from pre-biotics, pro-biotics and polyphenols), various 'superfoods' and spices (bee pollen, açai berry, dried and powdered sea buckthorn, freeze-dried raspberries, chili flakes, cacao nibs; edible gold powder). *Top, left*: workshop 1: beginning the task; *Top, right*: a poo-cake; *Bottom, left*: workshop 2: a participant compares their model stool with the Bristol Stool Chart, a standardised model used by doctors in Western medical contexts to discuss stool characteristics with patients; *Centre right*: workshop 1: a participant eats their poo-cake; *Bottom right*: the table set-up, with 'superfoods' in the foreground.

Alt-text: *Five images. Top left: participants seated at the table of cakes and spices, putting on gloves and preparing to begin. Top right image: a white plate with a shitty cake—a chocolate model of fæces decorated with beetroot juice. Bottom left: two youths from the second workshop sit with their shitty cakes while one of them, holding the Bristol Stool Chart, presents their cakes to the table. Centre right: A woman is about to eat one of the shitty cakes. Two others, sitting beside her, look on with bemusement and disgust. Bottom-right: the table set-up, with several kinds of chocolate cake and petri dishes of superfoods and spices arranged in a line along the centre of the table.*

Fig. 5. Collective reflection (workshop activity no. 4). Guided reflective conversation. *"We talked about how this is a taboo to us, only inside of us, but today we learned to hang our taboo on the wall." Left:* workshop 2: group discussion; *Top, centre*: participant gut drawing, with medical status post-it note; *Top, right:* a partly eaten poo-cake; *Bottom, right*: workshop 1: participants note their medical status on their gut drawings.

Alt-text: *Four images. Left: people at tables with their cakes in front of them talking about what they experienced. Top Centre: a close up of a gut drawing. Top right: a plate with fork and bits of shitty cake. Bottom right: People standing in front of their drawings, which have been hung on the wall. Some are annotating their drawings, others look to the camera or the drawings.*

4.5. Reflections: 'hanging our taboo on the wall'

A person with a chronic gut disease will typically only speak openly about their illnesses with their doctor or a close family member. The *Shit!* workshop activities challenge this norm.

To understand *the individual's* journey through the workshop, we analyse the experience of two young male members of the CCF, both of whom have gut disease. Over the four phases of workshop 2, we observed clear development in their understanding of personal vulnerability, and a willingness to break the surrounding taboo. In stage 3 and 4, in particular, they began to open up. One created an edible sculpture titled '7 days': a plate of 7 different stools that represented how ulcerative colitis affects his gut system over the course of a week. This presentation served as a turning point for the other participants at his table. They began discussing intimate stool issues and experiences. They expressed how important it is to break down the taboos that they hide behind. One of our two young males admitted that he was never himself in his own house, particularly when with friends.[2]

> *When my friends come around, we always laugh when someone farts, but I will never fart in front of them because I'm too ashamed of my illness. I see now that it is me, making that shame, not my friends, and it has to change.*

Through the workshop activities, he and many other participants seemed to find the strength to push through stigma and imagine freeing themselves. In workshop 1, a participant who had been working with a close family member expressed a collective change of attitude:

> *We talked about how this is a taboo to us, only inside of us, but today we learned to hang our taboo on the wall.*

This assessment of the collective inquiry reflects how anticipation can serve as a lever for shifting imaginaries, and assist people in pushing towards a more resilient future-facing stance in dealing with their life situation. The metaphorical depiction of 'hanging our taboos on the wall' is indicative of the kind of anticipation developed and accumulated in these workshops. There is nothing spectacular or enticing, as in the visual and material future scenarios of speculative and critical design (Dunne & Raby, 2013). Nor does this methodology provide a heuristic, method or rehearsal of ways to achieve future change (Halse, Brandt, Clark, & Binder, 2010). What this anticipation does, is provide a radical opening in the here and now of shared experiences. It empowers participants to dare articulate a *what if* scenario of a different way to live with gut disease in the future. Herein lies a powerful gestalt of hope.

Other participants stressed that:

> *This work is important. You need to be working with the medical community. With the doctors and hospitals.*

One participant wanted to adopt the method:

> *Will you share the recipes for the cakes? I'd like to do the shitty workshop at home with my family.* [email communication, one week after the workshop].

Many agreed that the disruptive nature of the work was ground-breaking for them:

> *I never thought I could do something like this, but it was fun, and I learnt a lot, a lot about myself.*

In a survey conducted three months after the workshops, participants shared their recollections. Overall, they expressed that the workshop experience was funny, challenging and created a sense of community. When asked what they remember best:

> *The funniest thing was the cakes; The dirtiest thing was with the whole intestinal system; The thing that gave the most thought was the drawings.* [65110990]

> *I remember best the little movie we made where many participants worked with each part of the intestinal system from mouth to bottom. It was so funny. Then I remember the "cake" we had to make and taste (with disgust).* [65112037]

> *We grinned so much when we had to create our fæces with the cakes and then show it to the others.* [65125335]

> *Now I think* [about my illness] *with humour. I have a better understanding of myself. And I just have to laugh every time I get served chocolate cake; it will never be the same.* [65125335]

The CCF annual colonies do not normally bring focus to the members' illness. However, following the workshop, participants expressed feeling more confident in their illness, in relating to others, and less alone in their journey.

> *I think of my illness from a less lonely place.* [65125335]

> *I remember the other students' experiences and Danielle's* [the author's] *own IBS experience. … It was very touching.* [65121521]

[2] All participant quotes translated from Danish.

> *Everyone was in the same boat, no one failed, because we were in it together.* [65103049]

> *Seeing how the others painted their gut was in a way like seeing my own. The way we all think it looked and felt. That you are not alone in those thoughts. We can all say that we are doing super well on current medicine, but still feel that it looks like something that is a lie inside. It was uplifting, somehow* [to see myself in the others]. [65110376]

They gained insight into their gut:

> *I often think of the digestive system now the way that we did it, physically in a long chain. It now makes more sense to me when something, for example, is running sluggishly.* [65125335]

> *I have become more aware of my illness and how it affects my life; I have gained more insight into my own digestive system.* [65121521]

And how they think about food:

> *I have thought a lot about the fact that many of the others described the mouth as the best due to the taste of the food, and I do not feel that way at all. I think a lot now about maybe eating to live more than for the taste.* [65110990]

And repositioned themselves in relation to their illness:

> *It made me remember that I am not only my disease and that I am still me from before I got sick.* [65198878]

And in relation to others:

> *I think how important it is to be aware that the disease cannot be seen from the outside. One has to open one's mouth for others to know.* [65125335]

These quotes suggest an opening towards other possibilities moving forward. Possibilities that the participants might now anticipate, having been exposed to them.

4.6. Fostering anticipatory moments

Critically, this work does not seek to judge human-gut relations, nor develop guidelines for best practice. Instead, it aims to foster what we call 'anticipatory moments'. To open up new ways of relating and responding to our gut microbiomes, ourselves and others. The workshops are staged as an embodied invitation for radical, collective inquiry. The structure builds a steady progression of confidence and trust. As evident in many of the images, this experiment design enables participants to share very private information and to have fun while doing so. In the reflection session (Fig. 5, above), participants voiced often-fraught relationships with doctors and expressed an inability or reluctance to engage with issues beyond the medical domain. They spoke similarly of the challenge of communicating their illness with relatives, including those who were present. The majority expressed a change in attitude towards their future lives with gut disease as a direct result of their participation, and reiterated this change in a follow-up written survey. The workshop activities and subsequent dialogue helped them to breach the communicative status quo and open up about the intimate struggles of their daily experience. It enabled them to share highly personal, material details about their *shit*, and discover they are perhaps not so different from others—healthy and sick.

Methodologically, these world-making activities stem directly from experimental design research. They are embodied and performative, and therein lies their potency (Wilde, 2020)—through these means they open up new ways of thinking about how to enact anticipation that are at once tentative and very powerful.

4.7. Conclusion

The *Shit!* project brings focus to the nature within us. It opens an intimate space for embodied reflection on human|nature reconnection, and proposes new ways of acting *with* our inner nature, through radical intimacy and the transgression of taboo. The work seeks to achieve these aims using experimental autoethnography and critical participatory research through design, thereby inviting people to craft new forms of connection with their gut microbiome. *Shit!* uses the human digestive system as the context for action, and food as both bio-design material and trigger for reflection. The processes used are designed to empower people to look to their inner ecologies; eat, make and imagine their way to more enduring, interdependent, more-than-human well-being. At the same time, *Shit!* looks outwards—to examine how our symbiotic relationship with our gut flora is affected by deep-seated socio-cultural norms and taboos that govern our discourse and practices around defecation and *shit*.

Through experimental means, the research uses food as aesthetically charged materiality so that alternative practices can become imaginable. To begin, we use autoethnographic mappings of food consumption and excretion to destabilise ourselves as researchers. We expose our early ideas to a broad public, then invite a close group of sick and healthy people to pictorialise and build the mechanics of their gut; to emulate their fæces through means of edible foodstuff. This performative engagement radically estranges the use of everyday materials, as it confronts participants with the social stigma of their malfunctioning gut. In a move towards more robust futures, the process empowers participants to imagine alternative futures, wherein they, their gut, and their gut microbiome live in

agonistic harmony.

In *The democratic paradox*, Chantal Mouffe (2000) positions 'agonistic struggle' at the core of a vibrant democracy. This notion presupposes a polyphony of voices and mutually vigorous but tolerant disputes among groups united by passionate engagement; a background where hegemony is potentially challenged, public spaces are pluralistic, and different perspectives continually confront each other. The goal of agonistic harmony is to empower a multiplicity of voices in the struggle for hegemony, to move from conflict between enemies to constructive controversies among adversaries who have opposing matters of concern but also accept other views as legitimate. The resulting activities may be full of passion, imagination and engagement. As such, they are more like creative innovations than rational decision-making processes (Björgvinsson, Ehn, & Hillgren, 2012; Björgvinsson, Ehn, & Hillgren, 2012; Mouffe, 2000).

In the *Shit!* project, we achieve this transformation through meticulously crafted interventions: 'shitty' collaborative inquiries as anticipative actions for world-making. We explore the speculative and practical possibilities of people tending to their gut microbiome the way they might tend a garden; treating our gut as a black-box system containing a hidden world over which we have little awareness or control. While it is true that the alliances people enjoy with their gut microbiome go largely unnoticed unless they encounter digestive problems, the gut microbiome plays a crucial role in health and well-being (Wang, Yao, Lv, Ling, & Li, 2017). As many as 20% of people, worldwide, suffer from serious, chronic gut issues (Chey et al., 2015). "Befriending" our gut thus seems not only wise but suggests a new pathway for reconfiguring relationships with the complex natural ecologies of which we are a part and on which we depend.

Beyond the workshops, *Shit!* brings together a wide array of stakeholders. These include chefs, fermenters, gastroenterologists, human and non-human eaters, medical philosophers and design researchers. These stakeholders come together in different ways to consider two key questions: 1) How might we cultivate meaningful relationships with our gut microbiome? And 2) What kinds of changes might be wrought in our food and material practices to support newly emerging human|gut microbiome, and human|nature imaginaries? We use a range of design research methods to examine these questions—toolkits, food lab tools, foodstuff and carefully scripted procedures of self-experimentation. The purpose is to find new ways to engage participants with digestion processes; to build system models; to eat, taste, feel and smell our way to future imaginaries. The driving objective is to spur a genuine interest in our otherwise taboo-ridden social discourse on *shit* and the food system. To develop new imaginaries, and recast our interspecies relationships. The approach combines social imaginaries—collective beliefs about how society functions, that can enable or disable societal transformation and are critical to its realisation (Jasanoff & Kim, 2015)—with daily practices, to understand, imagine and support transformative change.

Methodologically, the *Shit!* project develops food-oriented embodied encounter methods. It does this by remodelling existing methods that leverage embodied engagement, estrangement and enchantment to respond to a complex impasse (Bell et al., 2005; Danto, 1981; Wilde et al., 2017) to surface new imaginaries in new ways of thinking. The aim is to investigate how the development of new imaginaries might assist us to achieve real-world change, in simple everyday actions and feelings of empowerment. With others, we propose that these new methods offer a new form of infrastructuring that invigorates democracy, sustains participation and design-for-future-use at community and societal scales; and will assist us in moving from ideas to action and realise real-world change (Björgvinsson et al., 2012a; Björgvinsson et al., 2012b; Clement, McPhail, Smith, & Ferenbok, 2012; Ehn, 2008; Le Dantec & DiSalvo, 2013).

Everybody eats and has expertise around eating. We eat for nutrition, socialisation *and* degustation (Douglas, 1972; Ochs & Shohet, 2006; Warde & Martens, 2000). Food consumption and defecation are caught up in rich cultural arrangements saturated with social norms, rituals and taboos. Food is personally, socially, culturally, politically and ecologically potent, making it an appropriate and timely vector to reconnect humans with nature and respond to ecological breakdown. Opening our intimate engagements with food and *shit* is radical.

In a radical series of moves, *Shit!* thus brings together human and non-human stakeholders, leveraging embodied material interactions with food and *shit* to craft new relationships between people and their gut microbiome. The research actions reorient more-than-human stakeholders towards personally and ecologically enriching encounters. This approach productively unsettles current medical models for engaging with gut health issues—through inclusion, and an inside-out | outside-in reconfiguration of embodied experience—to ensure transformative outcomes. The research thus brings meaning, value, responsibility and purpose to bear on questions of human and environmental well-being (Bergthaller et al., 2014; Rose et al., 2012). It shifts the scale of the ecological crisis to the intimately familiar scale of the physical human body, making it personal, material, sensual and relatable. The intention is that societal actors from all walks of life can envision new futures and act.

As researchers, we initially directed our inquiry towards all humans with gut flora. The problematic of IBS and other chronic gut diseases enables us to work with 'extreme users'—participants with something powerful at stake in the human|gut microbiome relationship. Our work together creates unusual circumstances for engaged analysis, and provides powerful insights into how we might move our inquiry forward.

Finally, this research investigates how embodied design, using food and eating as anticipatory actions for future world-making, might assist us in breaking the ecological impasse in which we find ourselves. It contributes to Anticipation Studies with new methods, new imaginaries and robust moves towards new practices. It does this in an attempt to dissolve ontological and ethical divides between human beings and other life-forms (Buller, 2015; Haraway, 2008), so that alternative practices might become imaginable (Binder et al., 2011; Stengers, 2005, 2016). The objective, ultimately, is to 'enrich the (…) public discourse about an Earth whose long-term future we are now making day-by-day' (Castree, 2014), and to do so in ways that are intimately relatable.

Declaration of Competing Interest

The author reports no declaration competing of interest.

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References

Alaimo, S. (2010). *Bodily natures: Science, environment and the material self*. Bloomington: Indiana University Press.
Aleksejeva, J., Biedermann, P., Gavriliuc, I., Orlovate, O., & Wilde, D. (2019). Crafting bioplastics: Materially reconfiguring everyday food practices. *RTD2019 Research Through Design Conference*. Article 23. 16pp.
Beckert, J. (2013). Capitalism as a system of expectations: Toward a sociological microfoundation of political economy. *Politics & Society, 41*(3), 323–350. https://doi.org/10.1177/0032329213493750
Bell, G., Blythe, M., & Sengers, P. (2005). Making by making strange: Defamiliarization and the design of domestic technologies. *ACM Transactions on Computer-Human Interaction, 12*(2), 149–173.
Bergthaller, H., Emmett, R., Johns-Putra, A., Kneitz, A., Lidström, S., McCorristine, S., et al. (2014). Mapping common ground: Ecocriticism, environmental history, and the environmental humanities. *Environmental Humanities, 5*(1), 261–276.
Binder, T., Michelis, G. D., Ehn, P., Linde, P., Jacucci, G., & Wagner, I. (2011). *Design things*. MIT Press.
Björgvinsson, E., Ehn, P., & Hillgren, P. A. (2012a). Design things and design thinking: Contemporary participatory design challenges. *Design Issues, 28*(3), 101–116. https://doi.org/10.1162/DESI_a_00165
Björgvinsson, E., Ehn, P., & Hillgren, P. A. (2012b). Agonistic participatory design: Working with marginalised social movements. *CoDesign, 8*(2–3), 127–144.
Bronk, R. (2009). *The romantic economist: Imagination in economics*. Cambridge University Press.
Buller, H. (2015). Animal geographies III: Ethics. *Prog. Hum. Geogr.*, 1–9. https://doi.org/10.1177/0309132515580489
Carpenter, S. (2012). That gut feeling. *Monitor on Psychology, 43*(8), 50.
Carvan, T. (2019). *How do we go on?*. Available at: ANU Science, Health & Medicine https://science.anu.edu.au/news-events/news/how-do-we-go.
Castree, N. (2014). The Anthropocene and the environmental humanities: Extending the conversation. *Environmental Humanities, 5*(1), 233–260.
Chey, W. D., Kurlander, J., & Eswaran, S. (2015). Irritable bowel syndrome: A clinical review. *JAMA, 313*(9), 949. https://doi.org/10.1001/jama.2015.0954
Clark, A. (1998). *Being there: Putting brain, body and world together again*. MIT Press.
Clark, A. (2010). *Supersizing the mind embodiment, action, and cognitive extension (Philosophy of mind)*. Oxford University Press.
Clement, A., McPhail, B., Smith, K. L., & Ferenbok, J. (2012). Probing, mocking and prototyping: Participatory approaches to identity infrastructuring. In *12th Participatory Design Conference: Research Papers, 1* pp. 21–30).
Clifford, M. N. (2004). Diet-derived phenols in plasma and tissues and their implications for health. *Planta Medica, 70*(12), 1103–1114.
Colitis-Crohn Foreningen. (n.d.). Retrieved 24 November 2019, from https://ccf.dk/.
Danto, A. C. (1981). *The transfiguration of the commonplace: A philosophy of art*. Harvard University Press.
Dewey, J. (2005). *Art as experience*, 1934. New York, N.Y: Perigee (Penguin, Berkley).
Dolejšová*, M., Wilde*, D., Altarriba Bertran, F., & Davis, H. (2020). Disrupting (more-than-) human-food interaction: Experimental design, tangibles and food-tech futures. In *Designing Interactive Systems* (pp. 993–1004). * joint first authors.
Douglas, M. (1972). Deciphering a meal. *Daedalus*, 61–81.
Dunne, A., & Raby, F. (2013). *Speculative everything: Design, fiction, and social dreaming*. MIT press.
Ehn, P. (2008). Participation in design things. *The 10th Anniversary Conference on Participatory Design 2008*, 92–101.
Ellis, C., Adams, T. E., & Bochner, A. P. (2011). Autoethnography: An overview. *Historical Social Research/Historische Sozialforschung, 36*(4 (138)), 273–290.
Gallagher, S. (2012). *Phenomenology*. Palgrave Macmillan.
Gallagher, S. (2016). *How the body shapes the mind*. Oxford University Press, 2006.
Gallagher, S., & Zahavi, D. (2012). *The phenomenological mind* (2nd edition). Routledge.
Gaver, B., & Bowers, J. (2012). Annotated portfolios. *Interactions, 19*(4), 40. https://doi.org/10.1145/2212877.2212889
Gilbert, S. F., Sapp, J., & Tauber, A. I. (2012). A symbiotic view of life: We have never been individuals. *The Quarterly Review of Biology, 87*(4), 325–341.
Halse, J., Brandt, E., Clark, B., & Binder, T. (2010). *Rehearsing the future*. The Danish Design School Press, 2010.
Haraway, D. (2008). *When species meet*. Minneapolis, London: University Of Minnesota Press.
Harding, S. (1991). *Whose science? Whose knowledge?* Ithaca, NY: Cornell University Press.
Heidegger, M. (1996). *Being and time*. Trans. Joan Stambaugh. Albany: State University of New York Press.
Höök, K., & Löwgren, J. (2012). Strong concepts: Intermediate-level knowledge in interaction design research. *ACM Transactions on Computer-Human Interaction (TOCHI), 19*(3), 1–18.
IPCC. (2018). *Global Warming of 1.5°C, an IPCC, Intergovernmental Panel on Climate Change, special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. http://www.ipcc.ch/report/sr15/.
IPCC, 2021: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B. R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press. https://www.ipcc.ch/report/ar6/wg1/.
Jasanoff, S., & Kim, S. H. (2015). *Dreamscapes of modernity: Sociotechnical imaginaries and the fabrication of power*. University of Chicago Press.
Kiverstein, J. and Clark, A. Introduction: Mind on Human Factors in Computing Systems (CHI' 16). ACM, New York, NY, USA, 6014-6027. Paul Marshall, Alissa Antle, Elise Van Den Hoven, and Yvonne Rogers (eds.). Embodied, Embedded, Enacted: One church or many? *Topoi* 28.1 (2009): 1–7.
Koefoed Hansen, L., & Kozel, S. (2007). Embodied imagination: A hybrid method of designing for intimacy. *Digital Creativity, 18*(4), 207–220.
Laporte, D. (2002). *History of shit*. MIT Press.
Le Dantec, C. A., & DiSalvo, C. (2013). Infrastructuring and the formation of publics in participatory design. *Social Studies of Science, 43*(2), 241–264.
Lea, R. (2001). *The performance of control and the control of performance: Towards a social anthropology of defecation* (PhD Diss., Brunel, UK).
Leenhardt, R., Rivière, P., Papazian, P., Nion-Larmurier, I., Girard, G., Laharie, D., et al. (2019). Sexual health and fertility for individuals with inflammatory bowel disease. *World Journal of Gastroenterology, 25*(36), 5423–5433.
Lefebvre, H. (1988). Towards a leftist cultural politics: Remarks occasioned by the centenary of Marx's death. In C. Nelson, & L. Grossberg (Eds.), *Marxism and the interpretation of culture* (pp. 75–88). Urbana and Chicago: University of Chicago Press, 1991.

MacDougall, R. (2012). *NIH Human Microbiome Project defines normal bacterial makeup of the body*. Website: https://www.nih.gov/news-events/news-releases/nih-human-microbiome-project-defines-normal-bacterial-makeup-body.
Marchesi, J. R., Adams, D. H., Fava, F., et al. (2016). The gut microbiota and host health: A new clinical frontier. *Gut, 65*(2), 330–339.
Merleau-Ponty, M. (1996). *Phenomenology of perception*. trans. Colin Smith. Motilal Banarsidas.
Mouffe, C. (2000). *The democratic paradox*. London: Verso.
Ochoa-Repáraz, J., & Kasper, L. H. (2016). The second brain: Is the gut microbiota a link between obesity and central nervous system disorders? *Current Obesity Reports, 5*(1), 51–64.
Ochs, E., & Shohet, M. (2006). The cultural structuring of mealtime socialization. *New Directions for Child and Adolescent Development, 2006*(111), 35–49.
Poli, R. (2017). Introducing anticipation. In R. Poli (Ed.), *Handbook of anticipation* (pp. 1–14). Cham, Switzerland: Springer International Publishing. https://doi.org/10.1007/978-3-319-31737-3_1-1.
Ramirez-Farias, C., Slezak, K., Fuller, Z., Duncan, A., Holtrop, G., & Louis, P. (2008). Effect of inulin on the human gut microbiota: Stimulation of Bifidobacterium adolescentis and Faecalibacterium prausnitzii. *British Journal of Nutrition, 101*(4), 541–550.
Rose, D. B., van Dooren, T., Chrulew, M., Cooke, S., Kearnes, M., & O'Gorman, E. (2012). Thinking through the environment, unsettling the humanities. *Environmental Humanities, 1*(1), 1–5.
Sheets-Johnstone, M. (2011). *The primacy of movement*. John Benjamins Publishing.
Shklovsky, V. (1965). Art as technique. *Russian formalist criticism: Four essays*. Lincoln: University of Nebraska Press (1917). Translated by L. Lemon and M. Reis.
Shusterman, R. (2000). *Pragmatist aesthetics: Living beauty, rethinking art* (second edition). Lanham, Maryland: Rowman and Littlefield.
Stengers, I. (2005). The cosmopolitical proposal. In B. Latour, & P. Weibel (Eds.), *Making things public: Atmospheres of democracy* (pp. 994–1003). MIT Press: ZKM/Center for Art and Media in Karlsruhe.
Stengers, I. (2016). *In catastrophic times: Resisting the coming barbarism*. Open Humanities Press.
Varela, F. J., Thompson, E., & Rosch, E. (1993). *The embodied mind: Cognitive science and human experience*. MIT Press.
Wang, B., Yao, M., Lv, L., Ling, Z., & Li, L. (2017). The human microbiota in health and disease. *Engineering, 3*(1), 71–82. https://doi.org/10.1016/J.ENG.2017.01.008
Warde, A., & Martens, L. (2000). *Eating out: Social differentiation, consumption and pleasure*. Cambridge University Press.
Wilde, D. (2015). Embodying material ideation. *Proc. Participatory Innovation Conference*, 386–397.
Wilde, D. (2020). Design research education and global concerns. *She Ji Journal of Design, Economics and Innovation, 6*(2), 2020. Summer 2020. pp. 170–212 2019.
Wilde*, D., Dolejšová*, M., van Gaalen, S., Altarriba Bertran, F., Davis, H., & Raven, P. G. (2021). Troubling the Impact of Future Food Imaginaries. In *Nordes 2021* (pp. 115–124). * joint first authors.
Wilde, D., & Underwood, J. (2018). Designing towards the unknown: Engaging with material and aesthetic uncertainty. *Informatics, 5*(1), 1. https://doi.org/10.3390/informatics5010001
Wilde, D., Vallgårda, A., & Tomico, O. (2017). Embodied design ideation methods: Analysing the power of estrangement. *Proc. ACM Human Factors in Computing (CHI'17)*, 5158–5170.
Yong, E. (2016). *I contain multitudes: The microbes within us and a grander view of life*. Random House.