Fabulation as an Approach for Design Futuring

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ABSTRACT

Envisioning alternative futures and desirable worlds is a core element of design that must be cultivated, especially when a deep transition of practices, values, and power is necessary for vibrant and just future lifeworlds. In this paper, we contribute towards fabulation as an approach for design futuring that foregrounds feminist commitments and more-than-human concerns. Analyzing two fabulation case studies around biodata and bodily fluids, we offer three themes based on our process of developing these fabulations: how they engage materials, how they work to trouble temporalities, and how they cultivate imagination. We argue for the emerging potential of fabulation as an approach for open-ended, joyful design futuring, mobilizing speculative storytelling to foreground absent or neglected relations when imagining alternative lifeworlds.

CCS CONCEPTS

• **Human-centered computing → Interaction design process and methods**; *Interaction design theory, concepts and paradigms.*

KEYWORDS

Fabulation, Design Futuring, Critical Feminist Technoscience, Research through Design

1 INTRODUCTION

HCI shows increasing interest in design futuring, critical feminist technoscience, and more-than-human concerns. For instance, recent work calls for expanding approaches to design futuring [44], underscores the importance of feminist technoscience for imagining alternative futures with design [74], and expanding conceptions of bodies in HCI to include more-than-human concerns [42]. Design futuring, critical feminist technoscience, and more-than-human concerns garner increasing interest in part because they offer ways to both resist design solutionism and explore avenues for engaging highly complex, challenging societal problems such as inequality and unsustainability in relation to designing and living with novel technologies.

As feminist activists, researchers, designers, and technologists, we see it as urgent to create new forms of situated, plural and collective forms of design futuring. We contribute to this nascent space in HCI by drawing out fabulation as a mode of design futuring that uses speculative storytelling to foreground absent or neglected relations when imagining alternative lifeworlds. Interaction designers and HCI researchers have been initiating work to explore how the theoretical concept of fabulation and the practice of fabulating can contribute in design processes [40, 53, 61, 67, 81]. Fabulations have some origins in literary criticism [72] and are gaining traction in feminist Science & Technology Studies (STS) as a storytelling approach in response to the Anthropocene [33].

While we wish to avoid flattening a lively and divergent space of existing work, when we use the term "fabulation" in this paper we mean imagining and creating representations of alternative social relations: ways of designing, ways of knowing, and ways of living with or without technology. Fabulations place less emphasis on designing/imagining technology and more emphasis on social and cultural relations, political tensions, and power hierarchies among human, non-human, environmental and technology co-existence. We argue that fabulation—as both a process and outcome—is particularly interesting to further develop as an approach of future

making for a number of reasons. Firstly, fabulations combine thinking with making, i.e., in the form of visual, tangible or other material manifestations to communicate stories. Secondly, fabulating is a reciprocal practice that can be done in dialogue with others, such as researchers and practitioners from HCI, design and other disciplines, thus inviting for collaboratively developing and reflecting on imagined futures. Thirdly, fabulations trouble predefined categories, and instead propose new configurations of human and non-human actors, and include these more-than-human perspectives in the practice of worlding.

While we see potential in speculative fabulation methods, we see a need for a deepened articulation of fabulating as an approach that is relevant and generative for design research. In order to address this, in this paper we present and analyze two distinct processes of fabulating conducted by the authors. Each process is focused on a different research topic: on bodily fluids [40] and on biodata [81]. The fabulation outcomes of each process, in the form of images and collages, are presented in detail in two separate papers elsewhere [40, 81]. Here, we focus on the development processes rather than their outcomes. We outline each process and reflect on how they are both alike and different, teasing out, analyzing, and reflecting upon the subjectivities of each project. Bringing the two fabulating processes in dialogue with one another, the analysis surface three themes of what fabulating brings forth as an approach for design futuring. These themes include the materials of fabulations, the shifting temporalities of fabulating, and how fabulation aids in cultivating imagination. We see these as orientations that can guide researchers through a process of fabulating, and aid in articulating the value of fabulation for design practice. We end by discussing how fabulations can work as an ongoing and open-ended material for design, and invite others to fabulate.

2 RELATED WORK

2.1 Design as Futures-oriented

Design involves imagining contexts, actors, and interactions surrounding technological artifacts in the future, whether through sketching, scenarios, or prototyping. Fundamentally, traditional human-centered design approaches orient towards the future, attempting to move from existing to preferred situations [73]. Sketching and prototyping allow shape and form to be rehearsed in conversation with materials, in order to both imagine and create a shared understanding of future possibilities. Design scenarios tell stories of future interactions between personas and not-yet-realized technology designs [14]. Even functional prototypes are *proto*, indicating their status as first, early, or provisional [62]– a first, basic, or preliminary indicator or desire of what might come to be more fully realized in a/the future [49]. In these efforts toward a/the preferable future, material and social constraints are accommodated to strive for measurable impact.

This idea of the future has also been at the center of futures and foresight studies. By "forecasting" alternative futures, and representing them as scenarios, they can become a part of strategic planning, influencing how real-world decision-making processes can work toward implementing preferred futures as part of a "futures cone" [15]. Strategies here include imagining generic futures to help classify as well as generate and explore greater nuance in

ideas about the future [12, 16]. Futures studies in this vein can typically engage a community or organization with a Futures Visioning Process to help this group reach consensus on and move toward its preferred future [13, 47]. These approaches often frame the future as a field that contains actors with problems that can be solved by technology, as well as actors who may be directly or indirectly impacted by both problem and proposed solution. Futures here often operate as targets, ways of articulating how a problem might be addressed, and work to persuade those involved as to the relevance of the problem and the viability of the proposed solution(s) at hand.

2.2 Design Futuring

Diverging from more traditional design methods, design futuring approaches do not offer solutions or targets but rather aim to open up critique, discussion, debate, and questioning about alternative futures. We draw from Kozubaev et al. in using the term *design futuring* to refer to a loose ensemble of approaches that "leverage design to explore futures as a means to comment on—and potentially change—the present" [54, p. 2]. For example, the role of speculative design is "not to show how things will be, but to open up a space for discussion" [25] and the fictional storytelling nature of design fiction allows it to be "temporally disinhibited when compared to traditional design" [57, p. 243]. While design fictions have been described as objects from a possible future, the approach do not have unified theories and methods [8], but can best described as explorations of the future. Auger articulates that one of the key factors responsible for the engagement of a future vision, in his case via a speculative design, is a bridge between the audience's perception of their world and the fictional element of the presented concept. He calls this a perceptual bridge, rooting futures in objects that are familiar in the present [2]. Other design futuring approaches include critical design [7, 23, 24] speculative design [2, 25], discursive design [78], and others in this loose ensemble of HCI practices. In contrast to human-centered design, these approaches break away from solutionism and invite questioning or critiquing the status quo.

Though not always explicitly referred to by design futuring projects, sociotechnical imaginaries can work as a generative 'backdrop' to which design futuring approaches respond. Futures here operate as reflections of cultural and social understandings of technologies – for better or for worse. Sociotechnical imaginaries are "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology" [46, p. 4]. In a sense, sociotechnical imaginaries synthesize the cultural, societal, political, or institutional norms that design futuring often aims to question, amplify, resist, or subvert.

Overall, design futuring approaches work to question or critique the status quo and open up a space for discussion. As design futuring practitioners ourselves, we appreciate the strengths of these approaches, yet also acknowledge their limitations. One limitation we have encountered in our own design futuring work is that, by aiming to address an often societally held notion of 'status quo', design futuring approaches can risk embedding or reinforcing normative assumptions or viewpoints of dominant groups that have

defined or benefit from the status quo, even while attempting to critique and shift that status quo. A growing range of design futuring projects seek to mitigate or address this issue, several of which are highlighted in the next subsection.

2.2.1 Futures for Whom? There are growing calls for diversifying design futuring and challenging the privileged position of dominant speculative design [63]. For example, with decades of rich precedent works outside HCI, Afrofuturism and Afrofuturist feminism and Black feminism have recently been gaining recognition and prominence within HCI as canonical approach(es) to design futuring, with much of this work led by Harrington et al. [35]. Tran O'Leary et al. question who gets to future and point toward possibilities for more participatory futuring with racially diverse and socioeconomically marginalized communities, in their case Africatown in Seattle [79]. Bardzell calls for moving beyond the typical modernist telos of rationality toward imagining feminist utopias [6]. Søndergaard contributes 'collective imagining' as part of the approach for troubling design focused on women's health [74]. This draws from STS scholar Donna Haraway's advice to 'stay with the trouble' with both feminist and post-anthropocentric perspectives [33]. Howell et al. critique ways that the Futures Cone foregrounds a dominant perspective and call for a greater plurality of perspectives on design futuring [44]. These approaches show a need to continue to diversify and explore approaches to imagining alternative futures.

2.3 Fabulation

We explore fabulation as one way of imagining alternative futures that helps foreground critical feminist technoscience and post-anthropocentric lenses in HCI an design [51]. Here we highlight some related approaches to 'fabulations' to situate what we mean by fabulations and fabulating. Far from being an exhaustive list of approaches called 'fabulation', we hope that emphasizing a few related works on fabulation from outside HCI can serve to invite other researchers to extend our work on fabulation and continue to connect it to more approaches in fabulating and design futuring.

Fabulation in part stems from the narrative form of fables; stories involving speaking animals and with a strong moral lesson for human behavior [68]. For instance, we draw from Scholes' work on fabulation and adapt it for design research. Literary critic Scholes conceptualized in 1960s-70s fabulation as a new literary mode, that in response to realism turns away from seeking to depict reality, and towards "a more artistic kind of narrative" that stimulates our imaginative well-being through "ethically controlled fantasy" [72]. Important characteristics of fabulations according to Scholes are the qualities of art and joy; a pleasure in form ("extraordinary delight in design") that produces joy and peace, and exercises our imagination, thereby finding new ways of corresponding with reality through fiction, and new ways of re-imagining human life itself [71]. Curiously for our understanding of fabulation in HCI and design, Scholes describes the fabulator as a designer of the form of the story:

> "The fabulator is important to the extent that [they] can rejoice and refresh us. And [their] ability to produce joy and peace depends on the skill with which [they] fabulate. Delight in design, and its concurrent

emphasis on the art of the designer, will serve in part to distinguish the art of the fabulator from the work of the novelist or the satirist. Of all narrative forms, fabulation puts the highest premium on art and joy" [72, p. 10].

While Scholes' analysis of fabulation is meant to apply only to literature, the focus on characteristics of joy and art, evocative ideas and ideals, and the relationship between fiction and reality, moral, allegory and humor, are important aspects to consider in current constellations of fabulation in feminist STS and design practice. These aspects help characterize fabulations, and later our case studies tease out ways that our fabulating also foregrounds these aspects.

A key contemporary theory of fabulation is by Haraway through her figure of 'SF': string figures, science fact, science fiction, speculative fabulation, as demonstrated in the Camille Stories [33]. Haraway emphasizes fabulating as a making of fables, a place of "wild facts", a worlding which is "often full of animals and full of critters who maybe don't really exist. Full of children and animals and creatures of the imagination and impossible worlds. But also full of adults, full of the serious" [77]. Both Haraway [33] and Despret [21] have brought speculative fabulation to scientific discourse to experiment with new ways of understanding more-than-human world-makings.

Another key theorist of fabulation is Saidiya Hartman, scholar in African-American literature and cultural history. Hartman's concept *critical fabulation* [36] critically engages archival records of Atlantic slavery that record violence enacted against enslaved people while leaving no trace of the stories of the enslaved people themselves. Reflecting on the desire to retell their stories coupled with the impossibility of doing so, Hartman's critical fabulation offers an approach to engaging with histories of violent erasure: "The necessity of trying to represent what we cannot, rather than leading to pessimism or despair must be embraced as the impossibility that conditions our knowledge of the past and animates our desire for a liberated future" [36, p. 13]. While the case studies of fabulation that we present in this paper do not directly connect to these lost histories, our fabulations desire and attempt to imagine more equitable futures. Hartman's approach of combining critical theory and fiction in critical fabulation is crucial for such endeavours.

In feminist STS, Kenney [50] draws from Hartman and Haraway in doing a critical fabulation comparing the crustacean *Daphnia* to their namesake Daphne in Greek myth. Through this, the paper critiques problematic assumptions in epigenetic biology that treat female heterosexual reproduction as an unquestioned good and offers an alternative reimagining of adaptive biological transformation in response to threats. Another example from race and gender studies, is Huerta's "Magical Habits" where autoethnography, archive studies and fiction are intermingled to contend with racial capitalism and history [45]. These are examples of how fabulation can look to the past, from family archives to mythology, to critically rework both past and present narratives.

2.3.1 Fabulation in Design and HCI. Design and HCI researchers have recently started drawing on and contributing to fabulation. Design researchers Forlano et al. have been drawn to speculative fabulations as a more politically-minded and norm-critical addition

to critical and speculative design [26]. Here feminist speculative fabulations have been considered to "offer alternative approaches through attention to core feminist arguments around corporeality, materiality, embodiment, affectivity and experientiality" [26]. Their perspective on fabulation seeks to offer new perspectives to design for both speculating on futures and re-imagining the past, through participatory prototyping practices. Jönnson et al. have for instance been inspired by fabulation and the combining of facts and speculations in their participatory design practice, drawing on feminist technoscience, to tell stories and anticipate futures of biodiversity loss [48]. In a recent conference workshop, Wilde et al. have drawn on design fabulations as "unconstrained futures" that designers can backcast from, to realize social transformation today [84]. Here fabulations are connected to magical, fantastical and multi-species futures, imagined to create just and sustainable change. Such a commitment to sustainability is also present in earlier design approaches of fabulation, such as Mazé's futures visions of sustainable energy [60]. In digital civics, speculative fabulation has been used in conjunction with participatory methods to foster embodied and material forms of more than human imaginaries with different communities [61]. In ethnography, speculative fabulation have been used to help with communicating, engaging, and connecting research materials (e.g., texts, field observations, interview data) with audiences, mobilizing materials in compelling and affectively rich ways to offer new perspectives around intractable matters of concern such as climate change [69]. These examples point to how fabulations can foreground embodied, material, and affective imaginaries. From the existing approaches on fabulating presented above, we can understand that fabulations are a form of social fiction. It is about imagining alternative social relations, and alternative ways of designing. Thus, the goal with fabulating is not so much to imagine technology, but to imagine social relations and foreground political tensions, absent imaginaries, and power hierarchies.

Fabulation does not have to focus on the future. Rather fabulation holds a commitment to world-making otherwise including "a historical reimagining", where naturalized pasts or presents could be re-imagined [66]. For example by picking up on forgotten or ignored world-making practices, or non-dominant (e.g. non-western) knowledge practices, as extensive practiced and theorized by Daniela Rosner [65]. Drawing on Hartman, Rosner articulates fabulations as "ways of storytelling that rework how things that we design come into being and what they do in the world. They deconstruct design methods to open different understandings of the past that reconfigure the present, creating new opportunities for a just future. Derived from the practice of telling fables or stories, the term fabulation orients design towards narrative potentials" [67, p. 17]. Klumbytė et al. [53] have integrated critical fabulation, from Black critical theoretical thought and critical and speculative design, into their work with intersectional feminist concepts in machine learning. Critical fabulation, they argue, "entails speculative thought and imagination but it positions those activities against the absent imaginaries and loci of power hierarchies" [53, p. 1530].

By bringing together these emerging understanding of fabulation, we further explore what fabulation offers to design practice. Speculative fabulation, inspired by Haraway, can be said to have particular onto-ethico-epistemic commitments, such as a commitment

to hybrid figurations and troubling established ways of knowing. Fabulations are not merely scenarios, design fictions or sci-fi futures. They might not have a plot, but can include ethnographic writing. Whereas design fiction can be instrumental and product-driven, fabulations have a key connection to and with theory, and fabulations can be a way of understanding, working with, and making theory. We build on these expanding and diverse approaches of fabulations, and offer our own contribution to fabulations in design futuring practices through presenting and discussing two processes of using fabulations as a means to open up design spaces.

3 PROCESS: REFLECTING ON FABULATING

This paper emerges as a collaboration aiming to better understand the process of fabulating. With the increasing interest in and reference to fabulation in the design community, we seek to articulate fabulating as an approach in design futuring. We ask what fabulation brings to design of futures, and how design futuring practice itself offers a unique medium for fabulating. By articulating fabulating as an approach, we seek to aid other researchers, practitioners and students in imagining alternative futures.

The authors came together as two groups of design researchers that had already separately created fabulations, where each group's process lasted several months. Our approach of analyzing our own past of design research projects as case studies draws from first-person approaches in HCI [19], where the focus is on the experiences and reflections of designers themselves. In our case, we reviewed old meeting notes and intermediary design process representations, and iteratively commented on and discussed our reflections, adapting these retrospective analysis techniques from Desjardins and Key's work examining their own past design processes [18] and Sanches' et al.'s work analyzing the concept of *agential realism* in their past design research projects [70]. Through this, we articulated our processes of fabulating, the messy and often emergent [28] designerly work, in our case of fabulating, that led to the 'output' of the fabulations.

As a way to reflect on the commonalities among our processes but also as a way to tease out and reflect upon the subjectivities of each project, we hosted 14 meetings over the course of 8 months, and developed a dynamic collection of notes and collaborative text documents. After an initial kickoff meeting, we each contributed a first round of written personal reflections on our role in the respective design project and the personal context in which it took place, as a way to inquire about the meaning these fabulations made in the context of each person's broader design research practice and personal circumstances. We responded to the following prompts: What were key aspects of the process? What do we find generative in our fabulations? What is powerful and why? How do you imagine others using them? This first round of reflection from the seven authors resulted in about 7000 words in a shared document. We then met to discuss our reflections, followed by asynchronously commenting on each other's reflections, and replying to each others' comments in dialogue.

Aiming to further reflect and start synthesizing by reacting to each others' reflections, we wrote a second round of individual reflections comprising about 3300 words. We continued using the

collaborative document for asynchronous discussion. We met to discuss these round two reflections and synthesize about 30 extremely rough 'themes' or aspects describing our processes of fabulation. In future meetings, we gradually narrowed to the themes of the discussion section, iteratively writing, re-writing and adapting one another's drafts of different sections of the paper as a means of refining our thoughts. Through this process, we tease out some possible ways of doing fabulation. We characterize it as an approach, since we do not wish to prescribe a systematic method for fabulating; rather, we aim to offer possible avenues, characteristics and elements of fabulating alongside reflections on what fabulating can bring to design research.

Responding to calls for greater reflexivity on the part of the designers for design futuring (e.g., [54]), we reflect on our positionality. We are all positioned within academia as PhD students, postdocs, or faculty at universities in Europe and the US. We are white, cis, hetero, non-disabled women and men from various regions and countries in northern and southern Europe and the US. Several of us have moved to another country for work, where we are not fluent in the local primary language. By fabulating from positions of relative privilege in the global West and North, we acknowledge the limits of our perspectives. Yet, we also aim to leverage this privilege to critique and shift problematic frames in technology development through presenting our fabulations to HCI audiences in academia and industry as well as to our students, many of whom go on to become industry practitioners.

In the next two sections, we provide brief overview of a selection of fabulations developed through two design processes: *Scaling bodily fluids for utopian fabulation* and *Biodata futures for living and knowing together*. Detailed descriptions of all fabulations, in both written and visual form, can be found in [40, 81]. Here, we provide short excerpts of the narratives aiming to transmit the essence of each developed story, followed by reflections on the process of creating them. Afterwards, in later sections, we analyze and re-tell the overlapping aspects of these processes, the designers' thinking and reflections, and the similarities and differences of the final visual and textual outcomes.

4 CASE STUDY 1: SCALING BODILY FLUIDS

The fabulations resulting from this process are narratives in the form of fables to think with for the present, instead of futures to strive for or against. In that way, the authors consider them as potentially being situated in a future, or a parallel now, towards other ways of designing and radically being in the world as and with more-than-human bodies. We present two fabulations of text and images (see Fig. 1).

4.0.1 Magical discharge rituals: Spiritual bleeding and careful witchcraft.

"Human and canine menstruators commune in a garden whereby locally grown herbs are used to brew tea particular to a menstrual cycle. In this ritual of care, participants begin their human-food interaction by contributing biodata from a vessel of menstrual blood, a basal thermometer, or a petri dish of saliva. Tools of collection are provided or brought as part of an ecology of menstrual experiences that accommodates and encourages 'touching'. Biodata can be

publicly gathered at the table, or privately prepared in advance and then brought. From the biodata, a lunar analyzer draws upon the current phase of the moon to interpret menstrual cycle desires for the personalized crafting of tea..."

Through this fabulation that imagines radically different utopias of gatherings and rituals of human and canine menstruators, the authors pose the following questions, among others: What are the bodily fluids? Those that are collected or those that are concocted? And what bodies do these bodily fluids belong to? Those that touch or those that are touched?

4.0.2 Bodily fluid infrastructures: Visible tubes for traveling nourishment.

"Exposed industrial pipes ebb and flow along a block of modular housing. They pulse in red, yellow, and cream as menstrual blood, urine, and human milk are transported within and from different domestic containers. The colors of the moving fluids are also in motion as they shift in hue, saturation, and opacity as a dynamic palette of pipes. From this deliberate exposure, change and variation are visible and noticeable. (...) In one scene, a menstrual cup is emptied. The blood and menses are diluted with water for plant nourishment inside another home while also floating upwards to fertilize a community rooftop garden. In another scene, a catheter of urine freely couples with the structural tubing, which distributes the effervescent liquid to sustain vertical gardens and cleanse clothes in a washing machine. Human milk is generously collected in another scene to carefully nurture a kitten and lavishly refresh a man..."

Through this fabulation that imagines a network of pipes inside which multiple bodily fluids float in abundance for interspecies nourishment, the authors pose the following questions: Where else do bodily fluids travel? What other scenes are out of sight? What other scenes are ways of knowing? What else does this fluid infrastructure challenge and maintain? What else challenges and maintains this fluid infrastructure?

4.1 Developing the Fabulation

As the subset of authors who created this fabulation (Karey, Nadia, Marie Louise), our collaboration began with shared research interests on human bodily fluids (e.g. urine [37], menstrual blood [11, 76], cervical mucus and breast milk [38]), from which we aimed to create visual narratives that could shift social perceptions and values of them. Bodily fluids are essential to human flourishing, yet often excluded from body-centric design methods as they often carry stigma and taboos, and are difficult to categorize as part of the human body or as not part of it. Our conceptual starting point was around notions of queer uses of scales [1], multispecies community practices and collaborative survival [58], and intimacy in relation to human bodily fluids. Bodily fluids are particularly generative for these themes since they trouble the boundaries of the body, they move beyond the individual human scale, and cross paths

Figure 1: Left image: Magical discharge rituals: Spiritual bleeding and careful witchcraft. Right image: Bodily fluid infrastructures: Visible tubes for traveling nourishment.

with others' bodies and fluids, by means of our intimate individual or community practices (such as managing menstrual care, or breastfeeding), societal norms (whether or not a fluid has a stigma attached, and to what extent we are willing to share or hide these fluids), infrastructures (public toilets, waste management systems) or ecosystems (local ecologies) [29, 41, 83].

4.1.1 Collaboration and Alignment. Prior to our design process, we defined how we wanted to work together. This was important within a shared understanding that we each brought intimate personal experiences and unique empirical knowledge that we wanted to build upon, and also explore interconnections across interests and how those might scale beyond bodily fluids as often associated with a bounded human body. In this way, the practicalities of our collaboration aligned with our conceptual goals. This resulted in outlining the responsibilities of image making, the encouraged leaking of visual aesthetics, and the fluidity of individual versus group work through collaborative critiques. We also agreed that a key alignment was a desire for our images to be utopian: we intended for them to be interpreted as visual stories for positive change and to counter dystopian narratives that often aim to critique societal values by portraying bleak future scenarios. Striving for utopianism was a direct response to the challenges we had faced in doing critical work with bodily fluids, including stigma, ethics [39], emotion work [3], and institutional resistance; from which we needed a space of joyful allyship and optimism. Thus, we aimed to approach bodily fluids as valuable and abundant, within which we could recognize their particular qualities and potentials in contributing to multispecies flourishing.

4.1.2 Visual Exploration. For the first meeting, or design critique, we each brought a collection of aesthetic inspiration and a minimum of five visual explorations (See Fig. 2). We printed them out and put them together. Within this first step, we encouraged the sharing of our personal experiences in designing, researching, and living with human bodily fluids, which primarily focused around menstrual

blood, milk, and urine. We did not separate types of lived knowledge, and instead we intended to gather that of which was professionally and personally present. Although we had determined that each collaborator would eventually take the lead on crafting at least one image, in discussing our material we sought to highlight visual and conceptual relations to continue in the visual worlding. For example, Marie Louise brought watercolors of building facades with tubes of menstrual blood and urine down and across them. Karey brought a sketch of pipes connecting various rooms, through which discarded milk could flow from a kitchen to a bathroom sink to a scientific laboratory. From the watercolors and sketch, we saw an exciting opportunity to foreground nourishment within bodily fluids through making visible how they might travel and be shared within a local community. This cross-pollination of ideas grounded the final fabulation Bodily Fluid Infrastructures: Visible Tubes for Traveling Nourishment (See Fig. 1).

4.1.3 Visual Narratives. During subsequent critiques, we oriented our conversations around the overarching narrative composition and specific visual details in our images. We considered how a reader might visually navigate the story (e.g. as a literary progression from left to right, or through multiple prompts and threads) and what details already do or might convey the narrative direction (e.g. atmosphere and context to moments of interaction between humans and nonhumans). For example, one of the fabulations that started to take shape, called Spilled Breast Milk, was intended to be read from left to right with a floating milk bank traveling away from climate disaster to a lush paradise, while Bodily Fluid Infrastructures was intended for a reader to begin from any room and follow the associated pipes to another room(s). In considering the visual elements, we deliberately juxtaposed visual scales to disorient perceptions of human bodily fluids as often associated with a singular human body. This was not simply a scaling-up of bodily fluids, but rather making the material itself visible (as patriarchal societies push bodily fluids out of sight) and making relations with
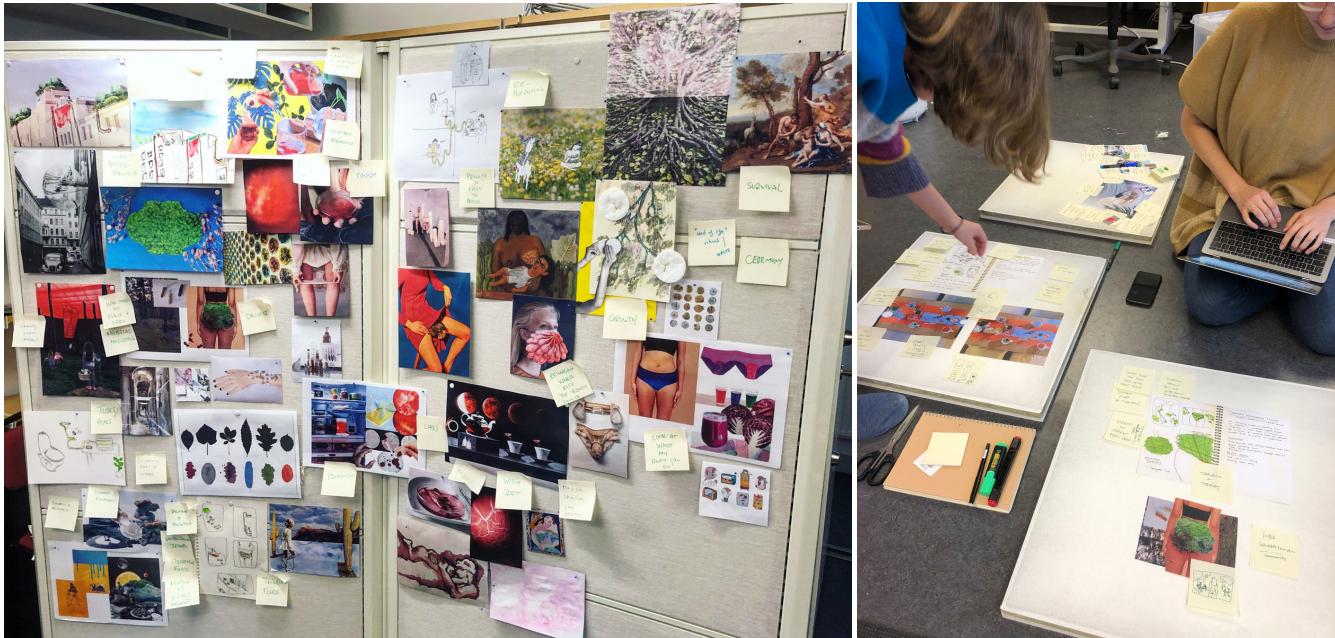
Figure 2: Left image: For the first critique session, we brought and printed out images as inspiration for the fabulations. We pinned them up on a board, annotated them and made connections between them. Right image: For the second critique session, we each prepared a first idea for a fabulation, which we had sketched out or made an initial collage of. We annotated and further developed them together.

where fluids go. This created tensions between macro and micro perspectives of bodily fluids to connect more-than-human material qualities, such as microbial composition, to cross-species and infrastructural pathways of collaborative survival.

4.1.4 Material Encounters. As we iterated and decided on four key narratives, we refined each image collage further by using own photographic material and drawings, rather than stock imagery. This led us to both search our personal archives of photos and use pictures of our friends, family, loved ones and places and objects known to us, but also to generate new photographs of the material that might be missing. We posed and took pictures of each other and of people around us, took new pictures of objects, environments and materials. The material encounters were abundant throughout this process. We brought materials that had soft cotton pads and embroidery/stitching, and we used watercolors, pen sketches, photographs from home of fluids or associated people and objects, digital inspiration, acetone reliefs, and mixed media.

In one specific instance, Nadia and Marie Louise went into a forest near Nadia's home with a basket, ready to collect and photograph moss, since one of the collages would focus on a wearable moss-underwear garment for collecting menstrual blood, and the practice of making and unmaking it. We touched and identified different mosses, and collected a variety of damp samples to bring back home and photograph. At home, we arranged the mosses and intertwined them with tubes, taking photographs along the way. We also photographed a set of petri dishes, teas, glass containers and other recipients for visualizing another fabulation that was slowly taking shape, that of Magical Discharge Rituals (See Fig.

1). At one point, Nadia remembered she had saved some of her menstrual blood in a jar in her cupboard in order to take pictures of it or do something with it for this project. She asked Marie Louise about it and they both thought it might look good in photos, but quickly realized it must have been rotting somehow, because it smelled horrible, and was immediately washed down the drain. Nadia reflects, *somehow, this moment stuck with me, feeling slightly ashamed and embarrassed I had shown my friend something that might be "disgusting", while we fight so hard to de-stigmatize this in our work. I hadn't really reflected upon this until now, but the unusual material encounter with this bodily fluid must have pushed our thinking in new directions, because later on we continued fabulating beyond this project, about ways of storing or saving menstrual blood.* The resulting images was brought together and digitally edited into the final collages.

4.1.5 Textual Narratives. Finally, Karey crafted text to accompany the collages. The crafting of the textual narratives drew upon notes taken in a shared document documenting the critique sessions. The texts included two descriptions for each image that aligned with the previously mentioned focus on narrative and details. In composing our notes into textual narratives, we aimed for a writing style that would be clearly descriptive of each scene as a story, yet also playful and poetic with words and sentences to express tensions and possible dual meanings to open for a multiplicity of interpretations. We also referenced our more general notes that were not specific to particular images, such as "what happens off the page?", and reflected upon our frequent discussion in designing the fabulations as interconnected or "known" events. This prompted the ending

of each textual narrative with a series of open-ended questions to seek possibilities beyond what we might know or expect, and to invite unknowable responses and further speculations.

4.1.6   Becoming Fabulations. Our utopian commitment influenced how we positioned the resulting images and subsequent textual narratives as fabulations. During our process we decided that we did not want or intend for them to reflect a predetermined timeframe. Instead, we desired for them to be a "mode of attention, a theory of history and a practice of worlding" [33]. Marie Louise reflects: *They are not design fictions or speculative designs, but they more curiously work with a material, (other)worldly, spiritual storytelling process in which humans, critters, plants and technologies tell stories about themselves, each other, and their past-present-future becomings. Some of the collages and corresponding texts can be read as linear narrative, with a clear storyline, but each of them also has various starting points for other stories to be told. Multiple stories and multiple temporalities co-exist.*

4.1.7   Performative Presentations. With the final crafted images and texts together forming a collection of fabulations, we had reflections on how to present and possibly perform them. As Karey reflects: *I started to think about the first presentation we gave about these fabulations, how reductive it would have been to just "show" and "describe" them, but rather, they needed to be performed. This called for thinking about how and when within the presentation to read them aloud, and the importance of the visual interplay - to make the images dynamic and lively (we used "bubbles" to highlight aspects being read about to direct the audience through the images).* In this regard, the outcomes of this fabulating process are not "just" text and images. Their materiality and existence shifts depending upon the audience, medium, and storying intent.

5   CASE STUDY 2: BIODATA FABULATIONS

The second case study imagines biodata as being tightly entangled with more-than-human bodies, including computers as embodied actors, referred to generically as silicon-based agents, as well as non-human critters. In this way, the authors de-center the conception of "biodata" as something calculated only from human bodies, shifting towards collaborative co-creation of biodata values between humans and other bodies. Put differently, only-human biodata is not enough to understand the true meaning and diversity of "bio". We present two fabulations of text and images (See Fig. 3).

5.0.1   Diffracting Selves.

"When we started growing gardens as a metaphor for design, and attending to ways we are all entangled with one another, we started by manipulating things we could see with our naked eye. We started by designing different, kinder relationships with the critters around us, such as spiders. But by building collaborations with others, we also have had to know ourselves differently. What we leave of ourselves in the world as we move through it — a combination of silicon and carbon space — are data doubles, partial, contingents, and not always representative of a body in the real world. By spinning stories, weaving different threads around the web, we imagine bodies

as having control of their traces, leaving wakes that are crafted to wash over records. (...) First, as with the tattoos of the past, some of us dared to wear the silicon agents on our skins. (...) They are organic and silicon-based and move with our bodies, pulsating with our veins, inflating and deflating with our lungs, twisting, turning in tandem with our own rhythms. (...) (Such) implants also cause interference with us and others around us. We are as much affected by our own implants as by the implants of those around us, by the wind as it caresses our skin, or the loud horn of a car passing nearby. Each rhythm, each wave, diffracts with one another, affecting us while we affect everything around us. It's impossible to know what anyone is "truly" feeling, not when we are constantly affected by the waves of those around us."

This fabulation resists the prevalent push to 'discover' the 'truth', whether scientific or internal and subjective, of bodies through biodata. Rather than inner or outer truth, there is only interference and diffraction [4, 5]. It poses the questions: What are the bodies being sensed? Is a "body" a material body or an accumulation of its data traces? How many bodies or data doubles exist out there? Can data doubles help in forging alliances with other bodies, both human and non-human?

5.0.2   Collective Affect.

"This carpet is composed of thousands of semi-alive filaments that are able to collect tears, resonate with the excitement of new love or stomps of anger, and senses the disquieting, somber reminiscence of those who sit, contemplate and struggle to let it all out. With every laugh, commemoration, or moment of sorrow, the multitudes of filaments hum, resembling a cat's purr that grows deeper and more complex. When they are first planted, the filaments are small and still, but as they collect the traces of grief of many, they respond to it through vibration and humming, growing in height and activity over days, weeks, years or however long the grief is felt..."

This fabulation questions the scale of biodata across multiple dimensions, both in terms of individual bodies as well as how those bodies relate to one another, as a thread that weaves together human and non-human bodies as members of a biodata public. A biodata public imagines biodata that participates in and attends to community-level issues. Through this fabulation, we pose the questions: How can biodata, being always political, support communities of shared practices and policy? How can we expand the notion of biodata to understand a healthy community as a biome for living with?

5.1   Developing the Fabulation

In this case study, fabulations became a way of engaging with research findings. This process took a distinct form from the previous case study, and unfolded almost a year later. It began as a follow-up step of a workshop focused on identifying challenges and opportunities when designing with biodata, described in [80]. From this

Figure 3: Left image: Diffracting Selves. Right image: Collective Affect.

workshop, we (Vasiliki, Noura, Tom and Pedro), the authors involved in this fabulation process, identified emerging themes for biodata design future research: pushing the boundaries of what counts as biodata and bodies, attending to a greater diversity of human bodies and experiences, and scaffolding biodata collaborations between human and Other (non-human) bodies. These themes emerged from the analysis of the workshop material, as well as further discussions and reflections on the future of biodata design research that continued for about a year after the workshop. As a next step, we wanted to continue exploring and reflecting on how biodata have biopolitical implications and how we can imagine alternative biodata design futures, using ideas of scale, collaboration and crafting different measures, presented in the published paper including the fabulations on Scaling bodily fluids (i.e., "Case Study 1"). The three themes of biodata design research that we used as a starting point had already a theoretical commitment to feminist perspectives and post-anthropocentrism, so we engaged in this topic and process thinking through and with human and non-human bodies.

5.1.1 Telling Biodata Stories. Two authors (Tom and Vasiliki) met in the beginning of Autumn 2021. We drew directly from the fabulation approach of Scaling bodily fluids as a starting point. For us *scale*, *collaboration* and *crafting different measures*, became lenses on our own work. As Tom describes, *"The findings and themes* [from the workshop] *were compelling to me, but they seemed like they needed a way to make them become compelling to others. Using them as the launching pad for stories to tell about the possibilities of biodata seemed like a reasonable next step–we could think about how the themes could be focused by different lenses related to our own*

research. How could biodata be made precious? Be shared in a community? Become an object of reflection? Imagining worlds that the biodata could build and telling stories of new arrangements and forms that biodata could take seemed like a way to help the ideas travel." Because we were operating partially remotely and internationally, we used Miro to on the three themes from the workshops (See Fig. 4): *pushing the boundaries of what counts as biodata*, *encountering a plurality of bodies*, and *more-than-human biodata*) from a perspective of broadening in each what counts as "bio," "data" and "bodies", since these themes were troubling each of these, in different ways. By mapping out different concepts and words that came to mind, three design spaces started to take form: 1) Nurturing biodata for collaborative survival, 2) Diffractive data doubles, 3) Cohabiting in biodata publics. These encompassed aspects of scale, collaboration and human-non/human relations, while also drawing on our own backgrounds, research trajectories, and interests.

Tom and Vasiliki gathered images from online resources that resonated with these design spaces. They started combining and connecting images to each concept, while writing short stories about these worlds with a focus on biodata futures. What is bio, what is body, what is collaboration there? What entanglements and relationships exist between humans and non-humans? How can biodata contribute to new ways of knowing and cohabiting instead of prioritizing human knowledge, well-being and existence? Short snippets of stories were written for each design concept in Miro, under preliminary images combined and annotated with a few words. Presenting, to the other researchers involved in co-organizing the initial biodata workshop, this exploratory direction of moving from the themes to developing stories, we all agreed that a way for new collaborators (Pedro, Laurens, and Noura) to
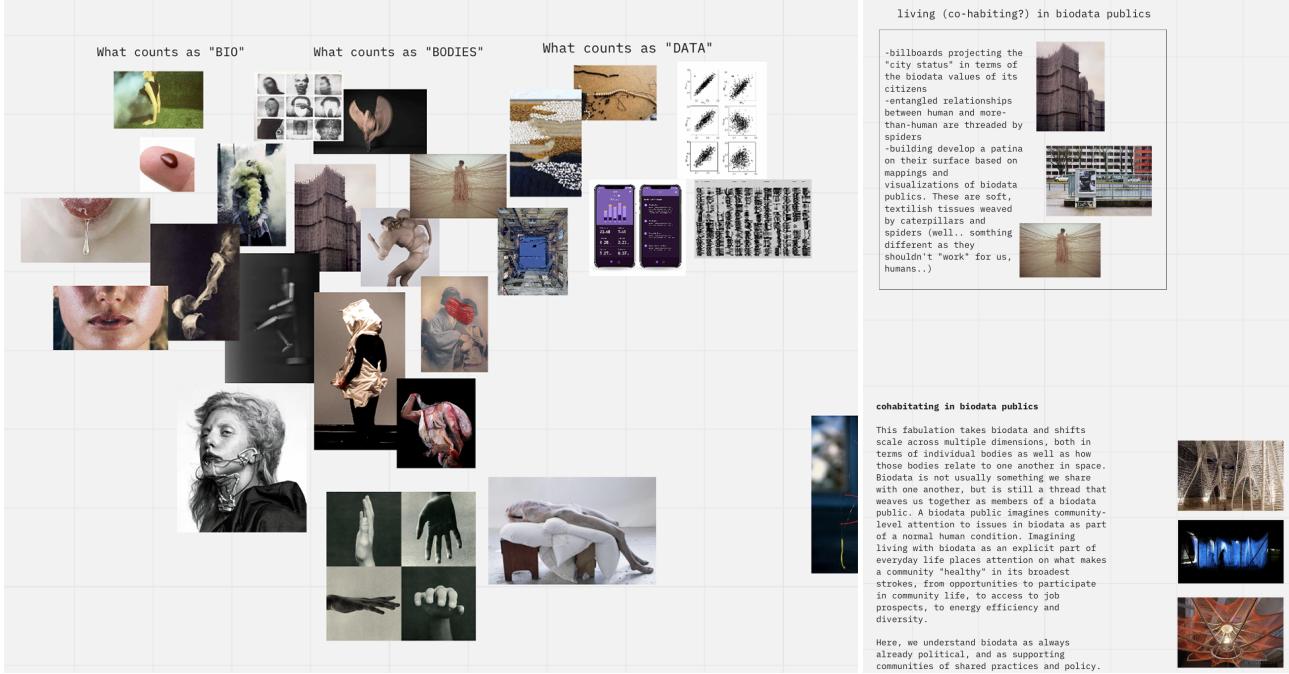
Figure 4: Left image: A Miro board became home to an iterative process of idea refinement and generation. Here we show an initial step where the three themes were interpreted through gathering and collating inspirational images. Later, this board was expanded with notes and short stories. Right image: Detail on the initial prompt and first drafting of a fabulation story.

enter this process would be to respond to and continue developing these preliminary stories. They began by annotating the stories in Miro, based on what thoughts, feelings or new concepts the stories evoked to them.

5.1.2 Developing a Broader Vision. As a continuation to this process, all researchers/authors involved in this case study began by finding current media stories, scientific articles and a variety of imagery that related to the snippets of text and stories that had been developed. For example, articles about how spiders (i.e., non-human bodies) sense the world and how sensitive they are to human disturbances, the symbolism of spiders across different cultures, how computation can be made from natural materials, how fungi can be woven into burial suits to facilitate decomposition, or how patterns of laser diffraction can create strong aesthetic experiences. These materials gave rise to new text snippets that remixed themes of the older ones with both current events and mythologies. The intention was to create a rich and complex world that could be related to and perceived as "just around the corner". As Pedro reflects: " *"This process continued over the course of weeks and months, as each new person commented and added to the fabulations, connecting them to new stories. Some of these new stories were scientific studies, while others were science fiction, resulting on re-writing the fabulations to incorporate the new stories and points-of-view. The whole process was really string figuring. It was a step by step un-making and re-making what was there, by making new figures out of the old ones. And the current stage of the fabulation is just that: their current stage. To me, this process is far from being complete."*

In this version we took inspiration from Rosner's critical fabulations, where it is advised that we take into consideration lost and forgotten modes of production and labour for computation [67]. Searching for these, we reflected on what is biodata replacing as a mode of knowledge production, of understanding ourselves and the world. This research was influenced by current readings in the intersections of botany and indigenous knowledge [52], as well as science fiction that explored the notion of communicating across species with only partial understanding [59]. These influences gave rise to the idea that biodata could be conceived as any form of inscription in the world, not to be decoded as information, but to be aesthetically appreciated both among humans and between species. In search for a metaphor for designing, we found that permaculture and gardening, which are active doings of different species, and require from humans some knowledge of the ecological entanglements between different species, could be a fruitful form of thinking about biodata design.

We wrote a prologue to capture these aspects of how a way of knowing life and the more-than-human world could be made from hybridizing traditional knowledge and new technologies, describing a new actor called "silicon-agents"–figurations of biodata communication devices for more-than-human worlds. These think beyond artificial intelligence, which is centered on individual technologies, towards more-than-human intelligence, centered on emerging properties of a broader ecology. The second version of the fabulations was written, figuring these machines and ways that they could be hybridized and woven into collaborations in the more-than-human biological world.

5.1.3 Keeping a Critical Perspective. This version of stories was then iterated with other co-authors. In particular, Noura tried to make sure that future readers of these fabulations would interpret them in ways that challenged their dominant perception of biodata. As she reflects: *I tried to add greater criticality, holding space for difference without flattening difference. I did this through minor textual edits and comments. I tried to imagine how others might read the fabulations, interpret them, and imagine ways of knowing with biodata from these fabulations. Sometimes readers' interpretations diverge from authors' intentions. I tried to make sure that future readers of these fabulations couldn't go away defaulting to old patterns of exclusion that too easily get embedded in working with biodata."*

Aiming to keep a critical lens, we focused on alternative priorities and values and amplifying those ideas. For example, in the first fabulation developed, *Weaving Alongside*, we worked during the design process with questions such as "how can spiders coexist with their webs alongside humans, but without centering the humans and human interests or hiding spiders away in 'cocoons?'" Questions like these were permeated with Latimer's notion of "being alongside" [56]. In the second fabulation, *Diffracting Selves*, we focused on the concept of 'data doubles'. With this concept came questions about the social performativity of the representations, and the possibility for supporting or resisting surveillance with them, hereby bringing in two critical interests in biodata around social performativity and oppressive surveillance. Finally, with the third fabulation, *Collective Affect*, the concept was pushed beyond playful and reflective uses toward more radical and emancipatory ideas of community solidarity, assisting collective grief and rage as well as softer, gentler, or more pleasant emotions.

5.1.4 Illustrating the Fabulations. After this process, the fabulation stories were textually very rich. But there were also materially dense, meaning that they were accompanied by a form of imagery that evoked sensory qualities of the stories–their feelings, colours, textures, and movements. The text of the stories evoked sensory qualities, suggesting a variety of visual interpretations. When we developed our stories, we aimed for the fabulations to be materially rich. We also discussed how to further develop them visually, creating imagery to accompany each story that would be suggestive of the content. We thought about developing collages—different parts of things being combined and intertwined. We did not want these visual parts of the fabulations to be too literal and prescriptive of the worlds we imagined, as we felt that they should both complement the stories and remain open to being interpreted in new ways, adapted and reimagined by others.

Vasiliki has a friend who is an illustrator and animator, and her work has an atmosphere that fits the biodata world we were imagining well. This illustrator read the stories we had written, and gathered textures and photos of physical things and materials that she could use for the illustrations. We highlighted key terms and phrases in the stories that seemed to reflect the essence of the ideas, and gave these to her to work with. Vasiliki met twice with the illustrator to explain the context of our collaboration and to make sure that she understood the fabulations. We also had a series of meetings with the entire group, where she showed preliminary collage ideas for further development and refining based on our discussions and feedback.

These illustrations created new layers in the fabulations, and brought a new understanding and interpretation of the stories that complement the written text. In our discussions and analysis of the fabulations, we focused on how they can be further materialized into intricate and polyvocal narratives. In doing so, we have also delved deeper into particular elements of each story, questioning why they are as they are, or how they might have been different. Some examples here include the element of "dancing" as a mutual relationship between humans and critters (in particular spiders), or a decision to eliminate the black colour in the affect carpet, since we wanted all kinds of emotions being communicated and shared in this context. The details of the illustrations point to details of the stories. One is invited to spend time reading the stories and viewing the illustrations, and speculate on how the elements living in those worlds are entangled together.

After we were done, we felt that this process of fabulation added something meaningful to our design experience, creating visions that others could build upon as we had. Vasiliki describes the process and goals like this: *"Developing the fabulations collaboratively was a very powerful process. It was not only that the fabulations were aimed at addressing scale, collaboration and crafting different measures, but it was also the process of developing the fabulations itself that moved across these. We brought together our theoretical commitments, things we have read that inspired us, and ways that we think about the world and this particular context we were focusing on. And we weaved all these collaboratively into fabulations that have some aspects of all of us, as individuals, but which share our common worries, desires, concerns and future hopes."*

6 QUALITIES OF FABULATION

Analyzing and reflecting on the two processes of fabulating, we have drawn out some broad characteristics or qualities that fabulations have, both as a process of creating worlds (i.e., fabulating) and as an outcome of those processes (i.e., the fabulations themselves). These include the materials of fabulations, the shifting temporalities of fabulating, and how fabulations aid in cultivating imaginations. We see these as generative orientations that can guide designers and researchers through a process of fabulating, and as analytical qualities that can be used to interpret fabulations.

6.1 The Materials and Making of Fabulations

In each case study, we began our processes by sharing lived experiences in designing and researching bodies, biosensors, and bodily fluids in workshops as well as ongoing meetings. Both cases also started with the authors collecting images, photos, and illustrations that served as aesthetic inspiration for the fabulations. However, after this step in the process, the two cases diverged.

The bodily fluids case study departed from visual explorations towards visual narratives, depicting different visual scales to disorient perceptions and create tensions. This process relied on using craft materials (paper, threads, painting, textile, collage, cutting) to portray future worlds, including what products, practices, and built environments might exist. After a few iterations of crafting the visual fabulations, we decided on the final versions, and only after this step, the accompanying text was crafted. In this case, working with these materials was an emergent process that led

to particular ways of reimagining engagements with bodily fluids. The combination of these materials evolved into writing the texts and producing the images. For the biodata case study, while visual material informed discussion, the process of developing the fabulations was more textual. The practice of developing the stories and editing texts was taken on by each of the authors in turn, adding their own sensibility and sense of meaning into them. Only after the stories were refined to say what we believed we meant, were illustrations produced. These brought new depth to thinking and served to create a richer representation of the fabulations.

What shape could fabulations have? In both cases, we present them as a combination of text and images, meant to be read and experienced simultaneously. With the bodily fluids case study, the production of visual images came before writing the text, whereas for the biodata case study writing the text came before producing the images. While our fabulations are all combinations of text and image, we see that the order of producing these are of less importance–they can be produced in parallel and will inevitably influence each other in the process. The bodily fluids fabulations have been presented performatively and poetically during talks. There can be other ways to present them, and as such fabulations can be seen as unfinished, prone to being adapted and communicated to different audiences. They could be exhibited like a painting in a gallery, without a lengthy description, without the text, and be left purposely ambiguous and up for interpretation, or they can be accompanied by the author's storytelling by performing them: presenting them in an engaging way, asking audience to attend to specific details, reciting the narratives, and allowing time for the audience to read them on their own.

Both cases engaged with more-than-human and relational ways of knowing and foregrounded absent imaginaries of bodies and technology. While both cases engage with scale, they do not consider scaling (up) as an inherent good and recognize the harm that capitalist logics of scaling and growth can bring to social justice [55, 82], where the expansion of storytelling itself can be problematic [30]. For instance while Spilled Breast Milk scales up breast milk, Community Menstruation Practices Practices is scaling down compared with industrial menstrual hygiene product systems. By working with "conflicting scales that might be disorienting, or queer scales" [40], the cases demonstrate how fabulations can craft different measures in fantastical worlds that foreground certain aspects while minimizing others; thinking beyond the singular human body and human exceptionalism but embracing our more-than-human relationality and locality.

6.1.1   Joy in Fabulating. According to Scholes, there is an extraordinary delight and pleasure in the form and design of fabulations [71]. We experienced this delight and pleasure in writing the narratives and producing the images, and aimed to transfer this joy in text and image to an audience. In the case of bodily fluids, the authors chose a utopian and joyful attitude to the often stigmatized subject of bodily fluids, and they also found a cathartic joy in the collaboration itself. Likewise, for the biodata fabulations there was satisfaction in producing the representations that could help to make research ideas material in provocative ways. We reflect on the sustenance offered by joy. As women working against the stigmatization of menses and breast milk in traditional STEM contexts, there is a toll

of emotional labor [3]. The rise of dehumanizing, criminalizing bio-data surveillance can at times seem overwhelming large, powerful, and difficult to resist. The fabulations intentionally contrast this discouragement to sustain hope in imagining alternatives. Both of these cases are examples of why joy is needed in keeping up the energy to keep doing work that resists and challenges the dominant, and we argue fabulation as an approach aids in this joy.

In the making of imaginative worlds in the form of texts and visual imagery, this joy of fabulating can become accentuated in the connections between materiality and imagination. Playing with unrealistic scales and ambiguous abstractions in the images, and with poetic narratives in the text, allowed for a more imaginary approach to world-making, where the constant tension between the familiar/mundane and the spectacular/fantastical prompted us to radically reimagine what could be. Materials for fabulation can come from any number of media, and text and images can be a starting point for further material explorations. But what is important for an approach of fabulating in interaction design and HCI is the material aspect beyond written narratives themselves: highlighting designers' and creative practitioners' ability to imagine how things (technologies, artefacts, systems) have concrete material impact in possible future worlds, using their designerly skills to make, craft and materialise these fabulations into some perceivable or a sensory medium.

6.1.2   Materiality as Part of a Critical Method. Just as science facts and archival data can form the basis of fabulating, so can first-person [20], lived experiences become material in a fabulation process. As a form of storytelling, speculative fabulations, have been used in other related disciplines and practices (Section 2.3) to offer novel ontological, epistemological and ethical perspectives. In both of the cases presented in this paper, the process of fabulating stems from a deep engagement with how bodies have been approached in our own design practice, from first-person perspectives, as datafied (biodata) and stigmatized (bodily fluids). These reflexive first-person engagements integrated experiences and materials from the authors' lives into the fabulations.

These understandings of the values surrounding bodies in design—and how we want to challenge them—stems not only from engaging with materials such as different technologies, but also with design research literature, feminist new materialism, queer theory, and STS literature that offer conceptual and theoretical pathways to critically re-imagine norms and assumptions towards alternative ways for these materials to be integrated into everyday life, helping them to be designed otherwise. The fabulations that we produced are crafted specifically to combine critical perspectives with material knowledge: drawing from our past expertise working with bodily fluids and biodata, we shaped plausible but alternative worlds to imagine how to engage with biodata and bodily fluids differently. This combination of theory and making distinguishes itself from other approaches by focusing not on objects and gadgets, but on world-making involving future perspectives.

6.2   Shifting Temporalities of Pasts, Presents, Futures

Engaging in a process of fabulating can be a way to reflect on temporalities pertaining to a specific research topic. Similar to

other methods of futuring that shift the focus from the present to a projected future, such as speculative design or design fiction, fabulations invite both the makers of the fables and the audience engaging with those to reflect on aspects of time. Unlike these other design futuring methods, however, fabulations as not intended to exist only in the future. The alternative imagined lifeworlds they offer could be located in a past, present, or future; at all these times simultaneously; or moving in between them. For instance, Rosner's fabulations bring untold pasts into the present [67], and Wilde et al. use fabulations as futures that are backcasted into the present [84]. In our cases, the time in which the biodata-focused fabulations take place is not concretely-defined. They can be imagined as existing in the past, present and future; or as extending from the past to the present and then into the future. Fabulations as narratives are also not necessarily linear: for instance, "Community Menstruation Practices" describes intergenerational cycles of gathering and redistributing moss, while "Magical Discharge Rituals" describes a regular social meeting of drinking tea and sharing discharge samples.

Beyond troubling the linearity of time and the multiple temporalities during which a fabulation can take place, our fabulating processes have also prompted reflection on how one could de-center human perception of time through storytelling. This is an aspect that is less prevalent in the presentation of our fabulations, but which was nevertheless part of the discussions taking place throughout the processes of developing the fabulations by both of the two groups. The timescales in our designed fabulations are not necessarily human. They range from a few moments' duration to describing a general societal transition in "Entangled Biodata World". Additionally, the narrative structures of our fabulations often do not feature specific human characters, personas, or protagonists. Rather they tend to describe social rituals (e.g., "Magical Discharge Rituals") or public practices (e.g., "Collective Affect"). Similarly, in the "Weaving Alongside" fabulation, where spiders co-exist with humans, temporalities and time can be reflected through the spider's perspective; questioning how this story might change from a spider's experience of time?

Beyond troubling temporalities and time through the fabulations themselves, the actual process of fabulating was a process of entangled temporalities. Both processes presented highlighted aspects of re-mixing or string-figuring [31], where one researcher was picking up a thread of another one, and then adding something to it. This was a non-linear experience of creating the fabulations, which did not have a clear beginning and a clear end. Further, we consider the developed fabulations as not "finished" or "done" but we rather as open-ended narratives that can continue to be evolved by us, or by others who want to pick them up and continue developing these worlds, creating e.g., illustrations, short films, models, or prototypes. Our experience of making these fabulations is more in line with a process of working with multiple threads that connect, unravel, and re-connect. As a process, developing the fabulations also took time. The work was slow and reflective, individual but also collaborative. We gave the fabulations time to marinate, iteratively developing concepts, bringing in inspiration, and engaging in embodied activities.

Overall, we see fabulation as offering an approach for both engaging with, as well as troubling, notions of time and temporality

in relation to technological developments making openings to acknowledge different forms of knowledge e.g., Indigenous knowledge. It does this by working with cyclical concepts of time, such as phenology, or with long-term thinking, such as intergenerational living. By weaving together multiple timespans and temporalities into a fabulation, we are invited to make our own temporal connections among elements of a story as we read the story and visuals that accompany it. This is in line with Kozubaev et al.'s [54] invitation to engage with temporal representations as a reflective mode in design futuring. Similarly, when fabulating, one can engage with various temporal questions: "how does the fabulation represent time, and why?", "Who is included in this time representation and timespan, and who is excluded?". We do not suggest that fabulation must follow these tendencies in terms of engaging with temporality and time. But these choices on how to present imagined lifeworlds through fabulation affect what social, cultural practices and rhythms are foregrounded. In fabulation, temporalities are often left under-specified, rather than representing a particular point in the future, and describe practices that can happen repeatedly like social rituals or gatherings or commonplace encounters in public space. We see this as an opportunity to attend to both human and non-human, individual and collective, multilayered and entangled temporalities of pasts, presents and futures, in a non-linear and open-ended format.

While previous work on fabulations in design and HCI has emphasised reimagining *pasts* (histories) [67], the reason why we still emphasise fabulation as an approach that orient towards *futures*, is, firstly, that we consider fabulation as providing a criticality urgently needed for other design futuring work, such as speculative design, design fiction and strategic foresight, and secondly, that challenges of climate crisis and social injustices require long-term thinking and sometimes an imaginative leap that the space of the future can provide. That said, fabulations is not only about the future, and there are indeed limitations to working with the future, as it can oversimplify the present and invisibilize current issues and lived realities faced by certain communities [64]. As an approach in design futuring, we argue that fabulation offers a shift in temporalities across pasts, presents and futures, by troubling linear narratives and a human temporal stance.

6.3 Cultivating Imagination: Honing in on Fabulation

Reflecting on our own processes of fabulating, we recall how fabulating helped cultivate our imaginations individually and as a team to sustain a sense of critical hope, abundance, and joy, even as our work was motivated by deep critiques of our domains. For example, in the case of the biodata fabulations, we started from rather broad ideas of how we can engage Others in processes of making interpretations of biodata readings, or how to think about biodata futures from a broader scope that would contribute to cultivating ecological sensibilities. Through slowly developing stories—both individually and collectively—and through connecting threads of one another's stories, our imaginations gradually opened up. Slowly, we started considering and including details in the fabulations that we would not have thought of when we had initially entered this

process. For example we started engaging more deeply with spiders as Others and considered how a relationship of fear between humans and spiders could be turned into a mutual relationship of care and collaboration, supported by empathic knowledge gained from the spiders' and the humans' biodata readings.

As design researchers, we utilize many techniques for generating ideas and broadening our imaginations, ranging from brainstorming and bodystorming techniques, to other speculative or critical methods that more explicitly aim to invite people to open up their imagination and correspondingly, a design space. Our case studies illustrate that fabulation can contribute to cultivating imagination for design researchers. Typical design processes can tend toward techno-solutionist and short-term aims that seek to fit within and incrementally shift the world as it is now. When surrounded by this kind of work, it can be challenging to carve out space—space in time, headspace, physical space, and priority—for imagining far into the future with radically alternative social norms and rituals. When aiming to resist the stigmatization of bodily fluids and the oppressive regulation of bodies, incl. women, non-binary and trans folks, it can be challenging to imagine hopeful alternative possibilities. When aiming to resist and reconfigure biodata, it can be challenging to imagine hopeful possibilities outside legacies of neoliberal self-improvement and oppressive surveillance. Our processes of fabulating helped us do design work based in our commitment to critical feminist technoscience, resisting the issues of our respective domains, while at the same time imagine hopeful critical alternatives. Fabulating here is a crucial driver for resisting and critiquing the defuturing of technology [27], and continuing advocating for and practicing the important life-sustaining collective force of our imagination. Fabulations are not blunt of their own wickedness and at times strange (im)possibilities. Fabulation as a design futuring approach brings an alternative to other speculative work which have been adapted and appropriated into foresight, trendspotting and strategy, where predictability and probability are valued higher than the expansive space of the possible. We argue that in critical times where our futures are uncertain, it is increasingly important that designers cultivate and train their imagination. As an aspiring approach in need for development, fabulation offers radical new ways of ideating and conceptualizing futures, where the fictitious and fabulous space of more-than-human worldings are deeply connected with a feminist commitment to challenge social structures and power hierarchies among human, more-than-human and technological co-existence.

7 DISCUSSION AND FUTURE(S) WORK

7.1 Fabulations as an Ongoing and Open-ended Material for Design

Fabulations can be useful both as the creative process of imagining and as the materialisation or form-giving of imaginings. After initial research into a domain or topic has been conducted, fabulations work to open up and extrapolate the design space, revisiting values and questioning initial assumptions of research and corresponding design directions. Fabulations can work as ends in themselves, as objects of reflections and debate, as with the case studies in this paper. Yet they can also function as future visions for further design work to continue and build on the fabulations. For instance, two

of the authors continued their fabulations of Scaling Bodily Fluids into the research-through-design project Biomenstrual [10, 75]. We highlight opportunities for designers to take up fabulations created by themselves or others, and further explore and develop the fabulations through other design research methods such as creating concrete artefacts, interactive systems, or technologies portrayed in the fabulations.

Reflecting on the ongoing-ness of and open-endedness of fabulation, we consider fabulation as an approach that embraces *emergence* in design research practice, drawing from Gaver et al. [28]. While the outputs of the fabulations can set intentions for future work, we also observe how our processes of fabulating embraced accidental occurrences as pivotal sources of inspiration. For example, when one author working on the Scaling Bodily Fluids fabulations felt embarrassed to discover that the menses she had saved for use as a design material had unexpectedly turned rotten, this became fertile conceptual material for reflection on the stigmatization of bodily fluids–an emergence strategy to "consider anomalies to be inspirations" [28, p. 522]. In narrating our processes of fabulating in this paper, we avoid defining a strict method for fabulation because we want to "present design research as a journey, not a quest" [28, p. 523] to support the emergence of diverse and unexpected reimaginings through fabulating. In this way of presenting design research, we articulate a nuanced and sometimes messy retelling of process that responds to calls to tell richer, less glossy stories of design research processes [43].

7.2 Inviting Others to Fabulate

The fabulations presented in this paper were created by academic design/HCI practitioners through a first-person approach without direct feedback from an audience, users or in collaboration with a community. To broadening perspectives in/on fabulating, there is a need to explore how we can invite others to fabulate, acknowledge the ways people are already fabulating; and questioning fabulations for whom? Such invitations could include design pedagogy with students [66], participatory design with end-users, or with practitioners in workshops and broader design projects that have industrial and societal impact. This is not only to understand how more people in practice can collaborate on fabulating. More important for this collaborative approach would be to ensure that fabulation does not become an academic-only practice, and also that diversity and plurality are built into fabulating practice. For this, there is a need to understand how participatory and inclusive practices can be stimulated by fabulation, engaging with marginalized experiences, forgotten pasts, and neglected or absent realities. At the same time, we acknowledge that particular materials and activities (e.g., collage in our case) and sometimes playful, utopian, or joyful tone of our particular fabulations could be an inappropriate way of engaging particular audiences, especially for participatory engagements with communities reckoning with systemic oppression and trauma [34]. Harrington et al. describe these risks in offering considerations for more equitable and participatory design engagements [34]. Fabulating may not always be the right choice of approach, and it must be adopted and adapted carefully to set an appropriate, respectful emotional tone with participants and audiences.

While we have been inspired by other disciplines' work on fabulation, including the literary genre [71], futures studies and STS [33], we find that emerging practices of fabulation in design and HCI offer creative and tangible approaches of engaging with speculative fabulations in ways that are sensitive and critical to the roles technology (could) play. We invite for further interdisciplinary collaborations on fabulation, deepening the literary and narrative potentials of design fabulation (similar to [9, 17]), and exploring how fabulation may work alongside other sense-making and imagination tools in futures studies, such as the futures wheel and the 2x2 scenario matrix. Additionally, we see fertile potential for further uptake and adaptation of fabulations in design industry, beyond academia and theory-driven disciplines such as HCI, the humanities, and social science. Taking caution from Wong and Khovanskaya's analysis of speculative design's rhetorical engagement with industry over the past few decades [85], future work on fabulation can explore how fabulations might work toward, as Wong and Khovanskaya call for, a criticality based in "advanc[ing] agendas that challenge dominant practices in technology design" [85, 175]. How might fabulations engage, shift, and resist industry rhetoric, through fabulations' emphasis on thriving lifeworlds and diverse perspectives? We see potential for fabulation to work alongside other critical futures-oriented approaches in design industry, such as design fiction [8], adding onto the role that objects and diagetic prototypes play in envisioning futures, to incorporate wider fabulating world-building activities that foreground absent imaginaries. Building on how speculative fabulations intermingle science fact and science fiction [32], we invite for future work that explore how fabulation can be used in public dissemination of science and for heightening public engagement with science projects.

Sometimes, or perhaps too often, futures extrapolate dominant sociotechnical imaginaries toward either utopian or dystopian extremes, often inspired by Western science fiction [22]. While this can provoke reflection and debate, it can also reinforce an existing dominant techno-narrative as an inevitable, inexorable premise or starting point from which to extrapolate. Yet, as recent work in design futuring increasingly acknowledges, there is no singular point in the present from which we can point a 'futures cone' outward [44]. Rather, imagining futures must seek to break way from tired old patterns of capitalism, anthropocentrism, colonialism, and other frameworks of oppression. Fabulation foregrounds feminist commitments when imagining futures; either through re-imagining pasts and inviting for diverse fabulation "across a geographically diverse set of communities" [66], and/or by "align[ing] with intersectional feminist, anti-racist, postcolonial, and overall power-critical concerns" [53]. Building on feminist fabulation, our practice and articulation of fabulation also intersect with more-than-human concerns. With HCI's turn to posthumanism and more-than-human design, we see fabulation, with its focus on multispecies storytelling and non-human temporalities, as a promising feminist unsettling of human-centered HCI methodologies [51]. It is our humble yet urgent hope that fabulation can offer some partial approaches for imaginings that break the mold by foregrounding diverse flourishings.

8 CONCLUSION

In this paper we have reflected on our design practices involving speculative fabulation, to contribute towards the emerging potentials of fabulating as an open-ended and joyful approach in design futuring. Fabulations invite researchers and designers to mobilize storytelling to foreground absent or neglected relations when imagining alternative lifewords. As a design approach, fabulation aligns with current calls for design and HCI to adopt feminist theories to catalyze social change, and incorporate more-than-human concerns to respond to climate crisis. With a focus on materiality, shifting temporalities and the cultivation of imagination, design is in a unique position to gain from the critical delights of fabulation, and contribute towards other disciplines that leverage fabulation, such as STS and environmental humanities. With this paper, we wish to draw attention to these potentials and open up and further stimulate emerging research and practice of fabulation in design.

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REFERENCES

[1] Sara Ahmed. 2019. *What's the Use?: On the Uses of Use* (illustrated edition ed.). Duke University Press Books, Durham.
[2] James Auger. 2013. Speculative design: crafting the speculation. *Digital Creativity* 24, 1 (March 2013), 11–35. https://doi.org/10.1080/14626268.2013.767276 Publisher: Routledge _eprint: https://doi.org/10.1080/14626268.2013.767276.
[3] Madeline Balaam, Rob Comber, Rachel E. Clarke, Charles Windlin, Anna St\a ahl, Kristina Höök, and Geraldine Fitzpatrick. 2019. Emotion Work in Experience-Centered Design. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*. ACM, New York, NY, USA, 602:1–602:12. https://doi.org/10.1145/3290605.3300832 event-place: Glasgow, Scotland Uk.
[4] Karen Barad. 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (second printing edition ed.). Duke University Press Books, Durham.
[5] Karen Barad. 2014. Diffracting Diffraction: Cutting Together-Apart. *Parallax* 20, 3 (July 2014), 168–187. https://doi.org/10.1080/13534645.2014.927623
[6] Shaowen Bardzell. 2018. Utopias of Participation: Feminism, Design, and the Futures. *ACM Transactions on Computer-Human Interaction* 25, 1 (Feb. 2018), 6:1–6:24. https://doi.org/10.1145/3127359
[7] Shaowen Bardzell, Jeffrey Bardzell, Jodi Forlizzi, John Zimmerman, and John Antanitis. 2012. Critical Design and Critical Theory: The Challenge of Designing for Provocation. In *Proceedings of the Designing Interactive Systems Conference (DIS '12)*. ACM, New York, NY, USA, 288–297. https://doi.org/10.1145/2317956.2318001
[8] Julian Bleecker, Nick Foster, Fabien Girardin, and Nicolas Nova. 2022. *The Manual of Design Fiction: A Practical Guide to Exploring the Near Future.* Near Future Laboratory. Google-Books-ID: W_c7zwEACAAJ.
[9] Mark Blythe. 2014. Research through design fiction: narrative in real and imaginary abstracts. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. Association for Computing Machinery, New York, NY, USA, 703–712. https://doi.org/10.1145/2556288.2557098
[10] Nadia Campo Woytuk and Marie Louise Juul Søndergaard. 2022. Biomenstrual: More-than-Human Design of Menstrual Care Practices. *Temes de Disseny* 38 (July 2022), 116–131. https://doi.org/10.46467/TdD38.2022.116-131 Number: 38.
[11] Nadia Campo Woytuk, Marie Louise Juul Søndergaard, Marianela Ciolfi Felice, and Madeline Balaam. 2020. Touching and Being in Touch with the Menstruating Body. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing*

Systems (CHI '20). Association for Computing Machinery, New York, NY, USA, 1–14. https://doi.org/10.1145/3313831.3376471

[12] Stuart Candy. 2010. *The Futures of Everyday Life: Politics and the Design of Experiential Scenarios*. Ph. D. Dissertation. https://doi.org/10.13140/RG.2.1.1840.0248

[13] Stuart Candy and Kelly Kornet. 2019. Turning Foresight Inside Out: An Introduction to Ethnographic Experiential Futures. *Journal of Futures Studies* 23 (March 2019), 3–22. https://doi.org/10.6531/JFS.201903_23(3).0002

[14] John M. M. Carroll. 2003. *Making Use: Scenario-Based Design of Human-Computer Interactions* (1st paperback edition ed.). The MIT Press, Cambridge, Mass.

[15] James Dator. 1996. Futures studies as applied knowledge. In *New Thinking for a New Millennium*. Routledge. Num Pages: 11.

[16] Jim Dator. 2009. Alternative futures at the Manoa School. *Journal of Futures Studies* 14, 2 (Nov. 2009), 1–18. https://jfsdigital.org/articles-and-essays/2009-2/vol-14-no-2-november/articles/futuristsalternative-futures-at-the-manoa-school/ Publisher: Springer.

[17] Audrey Desjardins and Heidi R. Biggs. 2021. Data Epics: Embarking on Literary Journeys of Home Internet of Things Data. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21)*. Association for Computing Machinery, New York, NY, USA, 1–17. https://doi.org/10.1145/3411764.3445241

[18] Audrey Desjardins and Cayla Key. 2020. Parallels, Tangents, and Loops: Reflections on the 'Through' Part of RtD. In *Designing Interactive Systems*. https://doi.org/10.1145/3357236.3395586

[19] Audrey Desjardins, Oscar Tomico, Andrés Lucero, Marta E. Cecchinato, and Carman Neustaedter. 2021. Introduction to the Special Issue on First-Person Methods in HCI. *ACM Transactions on Computer-Human Interaction* 28, 6 (Dec. 2021), 1–12. https://doi.org/10.1145/3492342

[20] Audrey Desjardins, Oscar Tomico, Andrés Lucero, Marta E. Cecchinato, and Carman Neustaedter. 2021. Introduction to the Special Issue on First-Person Methods in HCI. *ACM Transactions on Computer-Human Interaction* 28, 6 (Dec. 2021), 37:1–37:12. https://doi.org/10.1145/3492342

[21] Vinciane Despret. 2016. *What Would Animals Say If We Asked the Right Questions?* (1st edition ed.). Univ Of Minnesota Press, Minneapolis.

[22] Paul Dourish and Genevieve Bell. 2014. "Resistance is Futile": Reading Science Fiction Alongside Ubiquitous Computing. *Personal Ubiquitous Comput.* 18, 4 (April 2014), 769–778. https://doi.org/10.1007/s00779-013-0678-7

[23] Anthony Dunne. 2005. *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*. The MIT Press, Cambridge, Mass.; London.

[24] Anthony Dunne and Fiona Raby. 2001. *Design Noir: The Secret Life of Electronic Objects* (1 edition ed.). Birkhauser, London; Basel.

[25] Anthony Dunne and Fiona Raby. 2013. *Speculative Everything: Design, Fiction, and Social Dreaming*. MIT Press, Cambridge, Massachusetts ; London.

[26] Laura Forlano, Åsa Ståhl, Kristina Lindström, Li Jönsson, and Ramia Mazé. 2016. Making, Mending and Growing in Feminist Speculative Fabulations: Design's Unfaithful Daughters. In *DRS2016 Conversations*. University of Brighton; DesignResearchSociety; Imperial College London, Royal College of Art, PHDBYDESIGN, Brighton, UK. http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-131321

[27] Tony Fry. 2008. *Design Futuring: Sustainability, Ethics and New Practice* (english ed edition ed.). Berg Publishers, Oxford ; New York.

[28] William Gaver, Peter Gall Krogh, Andy Boucher, and David Chatting. 2022. Emergence as a feature of practice-based design research. In *Designing Interactive Systems Conference*. 517–526.

[29] Gerd Geleff Nielsen and Teresa Almeida. 2021. Designing with the Immune System: The Abject, Bodily Fluids, and Micro(be) Interactions. In *10th International Conference on Digital and Interactive Arts (ARTECH 2021)*. Association for Computing Machinery, New York, NY, USA, 1–4. https://doi.org/10.1145/3483529.3483726

[30] Brett A. Halperin, Gary Hsieh, Erin McElroy, James Pierce, and Daniela K. Rosner. 2023. Probing a Community-Based Conversational Storytelling Agent to Document Digital Stories of Housing Insecurity. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23)*. Association for Computing Machinery, New York, NY, USA, 1–18. https://doi.org/10.1145/3544548.3581109

[31] Donna Jeanne Haraway. 1994. A Game of Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies. *Configurations* 2, 1 (Jan. 1994), 59–71. https://doi.org/10.1353/con.1994.0009

[32] Donna J Haraway. 2013. SF: Science fiction, speculative fabulation, string figures, so far. (2013). Publisher: Fembot Collective.

[33] Donna J. Haraway. 2016. *Staying with the Trouble: Making Kin in the Chthulucene*. Duke University Press Books, Durham.

[34] Christina Harrington, Sheena Erete, and Anne Marie Piper. 2019. Deconstructing Community-Based Collaborative Design: Towards More Equitable Participatory Design Engagements. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (Nov. 2019), 1–25. https://doi.org/10.1145/3359318

[35] Christina N. Harrington, Shamika Klassen, and Yolanda A. Rankin. 2022. “All that You Touch, You Change”: Expanding the Canon of Speculative Design Towards Black Futuring. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, USA, 1–10. https://doi.org/10.1145/3491102.3502118

[36] Saidiya Hartman. 2008. Venus in Two Acts. *Small Axe* 12, 2 (2008), 1–14. https://muse.jhu.edu/pub/3/article/241115 Publisher: Duke University Press.

[37] Karey Helms. 2019. Do You Have to Pee? A Design Space for Intimate and Somatic Data. In *Proceedings of the 2019 on Designing Interactive Systems Conference (DIS '19)*. Association for Computing Machinery, New York, NY, USA, 1209–1222. https://doi.org/10.1145/3322276.3322290

[38] Karey Helms. 2021. Entangled Reflections on Designing with Leaky Breastfeeding Bodies. In *Designing Interactive Systems Conference 2021 (DIS '21)*. Association for Computing Machinery, New York, NY, USA, 1998–2012. https://doi.org/10.1145/3461778.3462048

[39] Karey Helms. 2022. A Speculative Ethics for Designing with Bodily Fluids. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems (CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, 1–11. https://doi.org/10.1145/3491101.3516395

[40] Karey Helms, Marie Louise Juul Søndergaard, and Nadia Campo Woytuk. 2021. Scaling Bodily Fluids for Utopian Fabulations. In *Proceedings of the 9th Nordic Design Research Conference*. DRS Digital Library, Kolding, Denmark, 5.

[41] Sarah Homewood, Harvey Bewley, and Laurens Boer. 2019. Ovum: Designing for Fertility Tracking as a Shared and Domestic Experience. In *Proceedings of the 2019 on Designing Interactive Systems Conference (DIS '19)*. Association for Computing Machinery, San Diego, CA, USA, 553–565. https://doi.org/10.1145/3322276.3323692

[42] Sarah Homewood, Marika Hedemyr, Maja Fagerberg Ranten, and Susan Kozel. 2021. Tracing Conceptions of the Body in HCI: From User to More-Than-Human. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21)*. Association for Computing Machinery, New York, NY, USA, 1–12. https://doi.org/10.1145/3411764.3445656

[43] Noura Howell, Audrey Desjardins, and Sarah Fox. 2021. Cracks in the Success Narrative: Rethinking Failure in Design Research through a Retrospective Trioethnography. *ACM Transactions on Computer-Human Interaction* 28, 6 (Nov. 2021), 42:1–42:31. https://doi.org/10.1145/3462447

[44] Noura Howell, Britta F. Schulte, Amy Twigger Holroyd, Rocío Fatás Arana, Sumita Sharma, and Grace Eden. 2021. Calling for a Plurality of Perspectives on Design Futuring: An Un-Manifesto. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems (CHI EA '21)*. Association for Computing Machinery, New York, NY, USA, 1–10. https://doi.org/10.1145/3411763.3450364

[45] Monica Huerta. 2021. *Magical Habits*. Duke University Press Books, Durham.

[46] Sheila Jasanoff and Sang-Hyun Kim (Eds.). 2015. *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (1 edition ed.). University of Chicago Press, Chicago ; London.

[47] Tom Jenkins, Laurens Boer, Juliane Brigitta Busboom, and Ivar Østby Simonsen. 2020. The Future Supermarket: A Case Study of Ethnographic Experiential Futures. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society (NordiCHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3419249.3420130

[48] Li Jönsson, Kristina Lindström, and Åsa Ståhl. 2021. The thickening of futures. *Futures* 134 (Dec. 2021), 102850. https://doi.org/10.1016/j.futures.2021.102850

[49] Gopinaath Kannabiran and Susanne Bødker. 2020. Prototypes as Objects of Desire. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference (DIS '20)*. Association for Computing Machinery, New York, NY, USA, 1619–1631. https://doi.org/10.1145/3357236.3395487

[50] Martha Kenney. 2022. Daphnia and Apollo: An Epigenetic Fable. *Catalyst: Feminism, Theory, Technoscience* 8, 2 (Nov. 2022). https://doi.org/10.28968/cftt.v8i2.36728 Number: 2.

[51] Cayla Key, Cally Gatehouse, and Nick Taylor. 2022. Feminist Care in the Anthropocene: Packing and Unpacking Tensions in Posthumanist HCI. In *Designing Interactive Systems Conference (DIS '22)*. Association for Computing Machinery, New York, NY, USA, 677–692. https://doi.org/10.1145/3532106.3533540

[52] Robin Wall Kimmerer. 2015. *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants* (first paperback edition ed.). Milkweed Editions, Minneapolis, Minn.

[53] Goda Klumbytė, Claude Draude, and Alex S. Taylor. 2022. Critical Tools for Machine Learning: Working with Intersectional Critical Concepts in Machine Learning Systems Design. In *2022 ACM Conference on Fairness, Accountability, and Transparency (FAccT '22)*. Association for Computing Machinery, New York, NY, USA, 1528–1541. https://doi.org/10.1145/3531146.3533207

[54] Sandjar Kozubaev, Chris Elsden, Noura Howell, Marie Louise Juul Søndergaard, Nick Merrill, Britta Schulte, and Richmond Y. Wong. 2020. Expanding Modes of Reflection in Design Futuring. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–15. https://doi.org/10.1145/3313831.3376526

[55] Ida Larsen-Ledet, Ann Light, Airi Lampinen, Joanna Saad-Sulonen, Katie Berns, Negar Khojasteh, and Chiara Rossitto. 2022. (Un) scaling computing. *Interactions* 29, 5 (Aug. 2022), 72–77. https://doi.org/10.1145/3554926

[56] Joanna Latimer. 2013. Being Alongside: Rethinking Relations amongst Different Kinds. *Theory, Culture and Society* 30, 7-8 (Dec. 2013), 77–104. https://doi.org/10.1177/0263276413500078

[57] Joseph Lindley, Dhruv Sharma, and Robert Potts. 2014. Anticipatory Ethnography: Design Fiction as an Input to Design Ethnography, Vol. 2014. https://doi.org/10.1111/1559-8918.01030

[58] Jen Liu, Daragh Byrne, and Laura Devendorf. 2018. Design for Collaborative Survival: An Inquiry into Human-Fungi Relationships. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3173574.3173614

[59] Ken Liu. 2016. *The Paper Menagerie and Other Stories* (reprint edition ed.). Saga Press, London ; Sydney ; New York.

[60] Ramia Mazé. 2017. Visions of the Future: Critical practices of design fabulation. Jyväskylä, Finland. https://www.jyu.fi/en/congress/sptpaivat2017/english/

[61] Greg Nijs, Giulietta Laki, Rafaella Houlstan, Guillaume Slizewicz, and Thomas Laureyssens. 2020. Fostering More-than-Human Imaginaries: Introducing DIY Speculative Fabulation in Civic HCI. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society (NordiCHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–12. https://doi.org/10.1145/3419249.3420147

[62] William Odom, Ron Wakkary, Youn-kyung Lim, Audrey Desjardins, Bart Hengeveld, and Richard Banks. 2016. From Research Prototype to Research Product. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. Association for Computing Machinery, New York, NY, USA, 2549–2561. https://doi.org/10.1145/2858036.2858447

[63] Luiza Prado de O. Martins. 2014. Privilege and Oppression: Towards a Feminist Speculative Design. In *Proceedings of Design Research Society*.

[64] Larissa Pschetz. 2021. No futures: Design for a renewed focus on the present. In *Working with Time in Qualitative Research*. Routledge. Num Pages: 14.

[65] Daniela Rosner. 2019. Whose stories underpin design? reworking our methods with design fabulations. *Interactions* 26, 5 (Aug. 2019), 20–21. https://doi.org/10.1145/3349703

[66] Daniela Rosner. 2023. Fabulating Otherwise. *Interactions* 30, 2 (Feb. 2023), 34. https://doi.org/10.1145/3582194

[67] Daniela K. Rosner. 2018. *Critical Fabulations: Reworking the Methods and Margins of Design*. The MIT Press.

[68] Gillian Russell, Frederik Lesage, and Craig Badke. 2022. Fables for imagining: Critical storymaking and digital literacies. In *Proceedings of Design Research Society*. DRS Digital Library, Bilbao, Spain. https://www.conftool.pro/drs2022/index.php?page=browseSessions&form_session=29&presentations=show

[69] Juan Francisco Salazar. 2017. Speculative fabulation: Researching worlds to come in Antarctica. In *Anthropologies and Futures*. Routledge. Num Pages: 20.

[70] Pedro Sanches, Noura Howell, Vasiliki Tsaknaki, Tom Jenkins, and Karey Helms. 2022. Diffraction-in-action: Designerly Explorations of Agential Realism Through Lived Data. In *CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, USA, 1–18. https://doi.org/10.1145/3491102.3502029

[71] Robert Scholes. 1979. *Fabulation and Metafiction* (new ed edition ed.). University of Illinois Press.

[72] Robert E. Scholes. 1967. *The fabulators* (0 edition ed.). Oxford University Press.

[73] Herbert A. Simon. 1969. *The Sciences of the Artificial - 3rd Edition* (3rd edition ed.). The MIT Press, Cambridge, Mass.

[74] Marie Louise Juul Søndergaard. 2020. Troubling Design: A Design Program for Designing with Women's Health. *ACM Transactions on Computer-Human Interaction* 27, 4 (Aug. 2020), 24:1–24:36. https://doi.org/10.1145/3397199

[75] Marie Louise Juul Søndergaard and Nadia Campo Woytuk. 2023. Feminist Posthumanist Design of Menstrual Care for More-than-Human Bodies. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23)*. Association for Computing Machinery, New York, NY, USA, 1–18. https://doi.org/10.1145/3544548.3581083

[76] Marie Louise Juul Søndergaard and Lone Koefoed Hansen. 2016. PeriodShare: A Bloody Design Fiction. In *Proceedings of the 9th Nordic Conference on Human-Computer Interaction (NordiCHI '16)*. Association for Computing Machinery, New York, NY, USA, 1–6. https://doi.org/10.1145/2971485.2996748

[77] Fabrizio Terranova. 2016. Donna Haraway: Story Telling for Earthly Survival. IMDb ID: tt5581080 event-location: Belgium, France, Spain.

[78] Bruce M. Tharp and Stephanie M. Tharp. 2019. *Discursive Design: Critical, Speculative, and Alternative Things* (annotated edition ed.). The MIT Press, Cambridge, MA.

[79] Jasper Tran O'Leary, Sara Zewde, Jennifer Mankoff, and Daniela K. Rosner. 2019. Who Gets to Future?: Race, Representation, and Design Methods in Africatown. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*. ACM, New York, NY, USA, 561:1–561:13. https://doi.org/10.1145/3290605.3300791 event-place: Glasgow, Scotland Uk.

[80] Vasiliki Tsaknaki, Tom Jenkins, Laurens Boer, Sarah Homewood, Noura Howell, and Pedro Sanches. 2020. Challenges and Opportunities for Designing with Biodata as Material. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society (NordiCHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–3. https://doi.org/10.1145/3419249.3420063

[81] Vasiliki Tsaknaki, Pedro Sanches, Tom Jenkins, Noura Howell, Laurens Boer, and Afroditi Bitzouni. 2022. Fabulating Biodata Futures for Living and Knowing Together. In *Designing Interactive Systems Conference (DIS '22)*. Association for Computing Machinery, New York, NY, USA, 1878–1892. https://doi.org/10.1145/3532106.3533477

[82] Anna Lowenhaupt Tsing. 2015. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (edition unstated ed.). Princeton University Press, Princeton.

[83] Anupriya Tuli, Shaan Chopra, Pushpendra Singh, and Neha Kumar. 2020. Menstrual (Im)Mobilities and Safe Spaces. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*. Association for Computing Machinery, Honolulu, HI, USA, 1–15. https://doi.org/10.1145/3313831.3376653

[84] Danielle Wilde, Sjef van Gaalen, Markéta Dolejšová, Paul Graham Raven, Maria Karyda, and Sarah Trahan. 2021. Backcasting [Better] Futures. In *Proceedings of the 9th Nordic Design Research Conference*. DRS Digital Library, Kolding, Denmark.

[85] Richmond Y. Wong and Vera Khovanskaya. 2018. Speculative Design in HCI: From Corporate Imaginations to Critical Orientations. In *New Directions in Third Wave Human-Computer Interaction: Volume 2 - Methodologies*. Springer, Cham, 175–202. https://doi.org/10.1007/978-3-319-73374-6_10