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DESIGNING FERTILITY OTHERWISE: OF HUMAN, ANIMAL AND SOIL RELATIONS

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ABSTRACT

This exploratory paper unpacks the design space of fertility sensing, reflecting on current meanings and designs for fertility in humans, animals, and soil. Attending to the curious relations between these, we explore how fertility technologies share histories across patriarchal and capitalist visions of bodies and land. We provide a critical feminist analysis of fertility sensing and begin to unpack how design might approach this space otherwise, by means of exploratory prompts and opportunities that we call ‘design seeds’. We accompany the design seeds with four evocative images, engaging practically and materially with these opportunities, opening up for critical yet hopeful engagements with human, animal, and soil fertility. We invite designers to notice these entanglements and extend to more-than-human perspectives in designing fertility tracking and sensing technologies.

INTRODUCTION

Fertility is the ability of humans, animals, or plants to conceive offspring, to produce (to be productive), or to

reproduce (to replicate, to create a copy), as well as a quality of a seed or an egg, or the soil or land. Western notions of fertility are situated within long-standing and ongoing histories of patriarchy and colonialism, where patriarchy expands beyond the exploitation of women, but is also an attitude of domination over nature and land (Escobar, 2018). Patriarchy reduces the meaning of fertility and fertile bodies to one capitalistic goal, to produce. Bodies and land are swayed to produce offspring or yield a harvest to achieve value within society, striving for an ideal reproductive body or ideal profitable land. Those who do not meet these goals are deemed less capable, cast aside, and “othered”. Such patriarchal and capitalist logics of fertility have not only harmed women’s bodies by exercising control of bodily autonomy but have also contributed to animal violence in farming industries and to the depletion of soil (Mies et al., 1993).

These perspectives are imbued in designs for fertility and fertility technologies: “design designs” the meaning of fertility (Escobar, 2018). Here we, as design researchers working with human reproductive health, see an opportunity for design to challenge patriarchal and capitalist logics, reimagining meanings of fertility through a feminist and posthuman lens, by paying attention to the neglected relations between the fertile bodies of our world: humans, animals, and soil. As we will show, these relations are not inexistent or empty, they are curious, fantastic, yet often unknown or unacknowledged. By attending to the *blank spaces* and *in-betweens* of fertilities, we urge designers working with human health to care for these more-than-human



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relations, and to join recent calls to de-center the human in design (Forlano, 2017; Wakkary, 2021; Ávila, 2022).

FERTILITIES IN DESIGN

We begin by providing brief critical accounts on how fertilities are sensed, the ethical implications arising, and the scales to which they extend. We focus on fertility *tracking* and *sensing*, that is, the practice of collecting data, or sensemaking of the biological phenomenon or experiences of a fertile (human or animal) body or fertile soil through technologies.

HUMAN FERTILITY

Sensing: Fertility is often understood by observing, collecting, and making sense of diverse health indicators or emotional and physiological symptoms of the menstrual cycle (Costa Figueiredo et al., 2017; Schneider et al., 2019). Some speculate that the earliest forms of fertility tracking date back 20,000 years ago, to exemplars of etched bones and rocks marking every day of the cycle. Since then, fertility awareness methods have enabled women to document their menstrual cycle through pen, paper, or digital spreadsheets. Nowadays, with the prevalence of smartphones and embedded sensors, there are a plethora of apps and services designed for fertility self-tracking, marketed as FemTech (technologies focusing on the female body). These technologies predominantly measure basal body temperature; levels of the luteinizing hormone in urine; crystallization of saliva (also called *ferning*); progesterone levels in saliva; cervical mucus texture, color, and conductivity; breath; and heart rate.

Ethics: Although feminist approaches to fertility are flourishing (Reime et al., 2022), the majority of FemTech devices perpetuate societal norms. Many fertility tracking technologies come with a disclaimer informing of their unsuitability for people with irregular cycles, polycystic ovarian syndrome, endometriosis, or reaching menopause, since their precision is maintained by presuming a person has a regular menstrual cycle (Costa Figueiredo et al., 2017). Additionally, fertility tracking through temperature cannot yield trustworthy results in cases of deviating or non-routinized lifestyles including sicknesses, hangovers, or different sleeping conditions. In many cases, these irregularities become the equivalence of illness or disease and failure to conceive, which further increases anxiety and stigma of non-normative bodies (Sharma & Mishra, 2018). Furthermore, the notion of human fertility has been formulated in a deeply gendered and heterosexual context, often excluding people that have no partner, a partner that cannot get them pregnant, multiple partners, or an infertile partner. Most FemTech technologies are designed for one-person use, further increasing the emotional and social burden of fertility tracking put on menstruating bodies (Homewood et al., 2019).

Therefore, there is a tension between empowering people with the knowledge of their fertility and the growing responsibility, surveillance, and control over women's lives, making it more and more challenging for women to willingly track intimate data.

Scales: Human fertility expands beyond the individual body and is not only entangled with the bodies of others, but with society, the state, and the environment at large. Pollution and the use of plastics highly impact fertility (Clancy, 2021), and we are just beginning to understand how epidemics (like COVID-19) impact it as well. Due to these uncertain reproductive futures and the decline in Western population, social anxieties encouraged by capitalist platforms reconfigure fertility as precious and vulnerable, encouraging women to track their cycles and be aware of their ovarian reserve (Roberts & Waldby, 2021).

ANIMAL FERTILITY

Sensing: There are a plethora of ways that farmers determine if, e.g., a cow is in heat (optimal time for artificial insemination) via temperature sensors, monitoring the herd's behaviors and movements, or measuring the ferning or conductivity of cervical mucus. Many of these "ovulation detectors" are marketed toward pig, cow, sheep, and dog breeders. Curiously, although these mammals and humans have very different fertile cycles, the methods are very similar to the ones used in FemTech. In fact, much of the early biomedical work searching for answers about human fertility cites studies done on cows, e.g. Cohen et al. (1952). Little research exists which unpacks the tensions that arise when equating the two species' fertility. Have FemTech technologies been inspired by agricultural fertility sensing techniques? And if so, deliberately pointing out the shared oppressions between women and cows does not come without its baggage of moral tensions (Adams, 1990).

Ethics: From facial recognition for managing pig farming, to virtual reality headsets for increasing cow comfort, the use of technology to enhance agricultural re/production is anything but problematic. Environmental activists argue for a drastic reduction in meat and dairy production and consumption, as it accounts for a large impact on the climate crisis. These massified industries also prove to be detrimental to human health, where meat and dairy farms are making residents sick (Levitt, 2019). Many ethical problems arise when thinking about design's role in this agricultural panorama: designing for increasing animal fertility might be equally problematic as designing for decreasing and controlling it.

Scales: Away from large-scale industrial farming practices, we find a more hopeful growing body of design projects focused on small-scale agriculture as well as designs fostering close attention and care for

pets and urban animals (Jönsson & Lenskjold, 2014), pollinators (Jönsson et al., 2021), birds (Biggs et al., 2021) or co-habiting with pests (Ávila & Ernstson, 2019). Many of these approaches are situated within more-than-human and posthuman design, thinking with Haraway's *companion species* (2008). Fertility is further troubled by notions of cross-species reproduction, as in Ai Hasegawa's (2011) artistic speculation of a human giving birth to an endangered species of dolphin. These perspectives blur the boundaries between human and non-human animals and discuss the complexities of multispecies care.

SOIL FERTILITY


Sensing: Soil fertility is often understood through the macro-nutrients nitrogen, phosphorus, and potassium, also referred to as NPK values in common fertilizers. However, organism activity is also a critical factor in soil fertility, such as the fungi, worms and insects inhabiting the soil; the organisms which degrade organic matter and sustain healthy microbial activity in the soil. Humans can also use their embodied senses to sense soil fertility. Leah Penniman (2018) describes how indigenous ways of touching, squeezing, smelling, and even tasting soil can be useful in determining the fertility of soil. Western industrial tools for sensing and tracking soil fertility include digital sensors, such as pH and conductivity sensors, and chemical tests which measure the NPK values in a diluted soil sample.

Ethics: Living soil is the basis of all terrestrial life and a condition for human and non-human survival. However, the liveliness of soil is drastically influenced by toxicities like environmental pollution. Soil fertility is under threat from microplastic pollution and anti-microbial resistance, and it is more important than ever to care for biodiversity in soil and the ability of soil to grow nutrient-rich food. Soil fertility impacts the quality of the food we consume, yet with industrialized food production, the great distance between the soil in which the food is grown and the supermarket where the food is sold, banishes soil out of sight and out of mind. In urban contexts, it can be hard to even access soil itself, not to mention access to understanding the importance of soil and knowing its fertility.

Scales: In the design community, there has been a rise in explorations of soil fertility. Soil chromatography has been used to support urban farmers in understanding their soil samples in urban community gardens, where fertility is interpreted visually through circular imprints (Poikolainen Rosén, 2022). Design work has explored wearables for sensing the soil where mushrooms grow (Liu et al., 2018), soil microbial activities and potentials of co-healing with soil (Tarkhanian, 2023), and several projects use human urine or menstrual blood as a way to fertilize soil (Wernli, 2021; Campo Woytuk & Søndergaard, 2022; Helms et al., 2021). These works

exemplify the role design can play in reimagining humans' relationship with soil and demonstrate how soil fertility is a complex aggregate of many elements, not just one entity that can be quantified easily.

DESIGN SEEDS


Through analyzing and (dis)entangling practices and meanings in human, animal and soil fertilities, we bring forth opportunities in the form of 'design seeds' (

SLOW, JOYFUL, QUEER

There is a tendency toward finding the most optimal and precise method to measure fertility quantitatively. Although discrete levels of the chemical/hormonal components in soil/bodily fluids or binary outputs displaying "fertile/not fertile" are helpful to obtain quick and simplified knowledge, this approach is not always what communities strive for, as exemplified by pregnancy test "tweaking" (Clements & Nixon, 2022). Furthermore, binaries reduce the complexities and experiences of fertility to the act of being designated as standard or not, which risks excluding non-normative bodies (human, animal or soil).

Technologies also prioritize and optimize for just the right moment to become pregnant or for artificial insemination. However, fertility can be interesting beyond the act of reproducing. E.g. there is already an existing will and curiosity to learn about the menstruating body beyond its involvement in pregnancy (Campo Woytuk et al., 2020).

In addition, western perspectives on women's reproduction and sexuality have always been geared towards becoming pregnant, not towards pleasure and joy. Fertility is thus unsexualized, medicalized, and associated with feelings of discomfort. There is also a tension present when mixing sexuality and pleasure with medical and clinical experiences, which stems from the fear of being involuntarily sexualized in these environments. However, experiences of fertility can and should be joyful and positive without having to equate them to sexual experience.

: We seek to imagine the purpose and meaning of fertility to be made through everyone's own experience, whether it is about having a baby, knowing your body, claiming space, or planting seeds in the soil. By

allowing for alternative paths towards this meaning-making, we open up for unexpected and queer meanings which could even take place across species. For example, for some, fertility might mean the ability of menstrual blood to fertilize soil, as exemplified in the design project Biomenstrual (Campo Woytuk & Søndergaard, 2022).

Making meanings *otherwise* takes time, and fertility might not be able to be sensed immediately, therefore it might not work in efficiency-driven paradigms. Perhaps it is enjoyable to take your time, build up a long-term relationship with fertility, and engage with uncertain and qualitative sensing (Homewood et al., 2019), nurturing curiosity and joy?

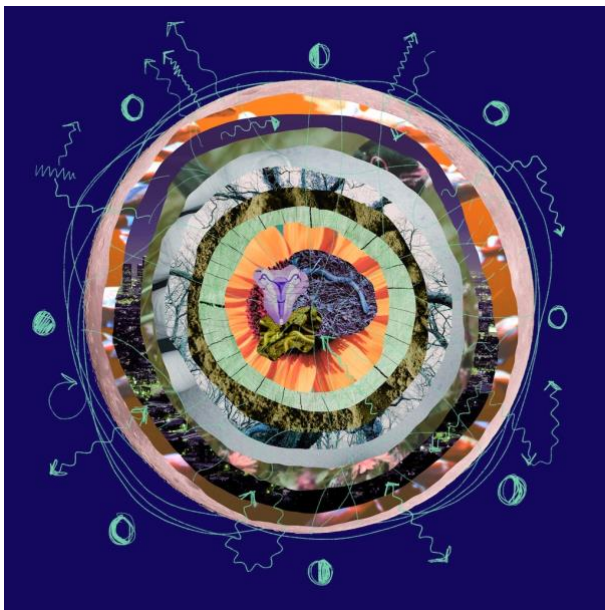


Figure 1: Slowing down, breaking up, and layering the temporalities of human-animal-soil fertility create new curious meanings and joyful deviations from the reproductive path.

FROM HARD TO SOFT AESTHETICS

Through our explorations of human, animal, and soil fertility technologies, we found troubling aesthetic trends across them. Sensors built with metal probes, poking with spikes and sharp edges, for easily stabbing the soil. Phallic forms are predominant, and many objects meant to be inserted vaginally are metallic, hard, rigid, and cold, similar to gynecological tools (Sundbom et al., 2013). Strips, sticks, and dipsticks permeate home fertility tests. For animals, the medical and industrial aesthetics are exaggerated (instruments, detectors, examinations...) and sometimes violent (insemination ‘guns’). Searching for images of “fertility sensors” on search engines results in a mix of sensors for women, soil, and animals alike, sometimes difficult to even tell them apart. In contrast, for digital products, the usual feminine, pink, infantile, and innocent aesthetic choices are found across menstrual tracking, pregnancy, and ovulation-tracking apps (Epstein et al., 2017). Gender

norms are also very present in colors and forms of soil fertility sensors and apps, where dark green, camouflage patterns and raw exposed electronics indicate a preference towards a stereotypically masculine hobby.

🌱: For this design seed, we offer an opportunity to rethink the aesthetics of fertility. Might we move from harsh shapes, forms, and materials, to softer, less medical, and industrial choices? And how might we avoid conforming to gendered stereotypes through these aesthetic choices, moving towards norm-critical aesthetics of fertility sensing (Ehrnberger et al., 2012)?



Figure 2: The morphing of shapes, colors, and materials of human-animal-soil fertility sensors suggest a new soft norm-critical aesthetics.

EMBODIED, INTIMATE AND PLEASURABLE SENSING

Many fertility sensing technologies and techniques create detachment between “the sensor” and “the sensed”: inserting probes into the vagina or soil but then reading the measurements on a digital device; bracelets and rings that automatically collect data; or collecting and shipping off a soil or blood sample to a lab. Although these forms of sensing may be empowering or imperative for diagnostic approaches, we wonder what embodied ways of sensing fertility might bring to the table. For instance, multisensory approaches can be exciting and pleasurable. Touching, smelling, or listening to soil, flesh, or bodily fluids, and getting hands dirty and sticky, creates more material, emotional, and intimate ways of engaging with data, and contributes to broadening what data means. This might require designing with the uncertainties of fertility, which already exist for people with irregular menstrual cycles (Chopra et al., 2021) and in the complex composition of soil.

🌱: How might we design more embodied fertility sensing with sensory engagements, bringing close “the sensor” and “the sensed”? With this, we imagine an orientation towards more pleasurable and enjoyable interactions with fertility, while staying with the critical question of “who is deserving of this pleasure?”

For this, design needs to work beyond the normative body, adopting intersectional feminist positionalities, considering how gender, race, class, ability, and sexuality have determined who gets to have pleasurable experiences. Furthermore, despite finding ourselves in an anthropocentric position we might not be able to fully avoid, designing for fertility could look beyond human exceptionalism and attend to more-than-human needs and experiences, who are also deserving of pleasure. For example, in how Ece Tan (2022) explores how to design for cows’ dignity and pleasure during artificial insemination, or how artists and philosophers Annie Sprinkle and Beth Stephens explore what it means to become lover with the Earth in their ecosexual positionality (Sprinkle et al., 2021).



Figure 3: Connecting the senses of more-than-human species to stimulate pleasurable fertility sensing through touching, tasting, seeing, and listening.

FROM INDIVIDUAL CONCERN TO COLLECTIVE RESPONSIBILITY TO PLANETARY CARE

Fertility does not just involve fertile bodies but is a societal concern. Fertility can be a shared experience with non-fertile bodies and others, where partners, parents, and loved ones might be invited into fertility tracking, pregnancy, contraception, and beyond. Loved ones might be involved in caring for children, in deciding and influencing the environment in which a child is raised. Fertility is a collective responsibility, like reproduction, it is “the struggle for the collective conditions for sustaining life and persisting over time

amid life-negating structural forces, and not just the right to have or not have children” (Murphy, 2017).

Furthermore, more and more people decide not to have children due to the climate crisis. Human fertility is thus drastically entangled with the environment. The very toxicities of pollution, pesticides, and plastics accelerating the climate crisis are not just detrimental to the land and the soil but have proven to have long-lasting impacts on human endocrine systems, causing increased menstrual irregularities (Clancy, 2021).

Contaminated and depleted soil further entangles human experience through food consumption: the soil becomes us through what we eat. There is also a long and tense history of blending human, animal and soil fertility, present across the globe in ritualistic traditions and folklore imbued with magical beliefs such as fertility rites or sacrifices enacted by a community in order to stimulate both soil and human fertility (Saha, 2022).

🌱: In this design seed, we ask: how can we invite *others* into fertility? How can we expand the responsibility and care of fertility from individual to collective to planetary? How can we design for one fertility in a way that prospers and cares for other species’ fertility? And how can we do this by maintaining bodily autonomy and acknowledging that not all fertile bodies (have) receive(d) the same reproductive rights?



Figure 4: Like layers in soil, micro to macro, fertilities bleed and leak from individual concerns to collective responsibilities, to planetary care.

CONCLUDING REMARKS

By inquiring about histories of human, animal, and soil fertility, we have traced how they relate and differ, how some beings are regarded as deserving more than others; how these different fertilities and species are “not one

and the same, but all in this together” (Braidotti, 2022). If reproduction means to “support some things and not others” (Murphy, 2017), supporting and nurturing connections across human, animal and soil fertilities is also a way to support and center the bodies that have been excluded and oppressed. We hope these design seeds inspire feminist and posthuman design for reproductive health and stimulate conversations with the already flourishing body of design work exploring more-than-human entanglements.

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