

Collective Wondering: Enabling Productive Uncertainty in Agroecological Codesign

Markus Wernli

School of Design, The Hong Kong Polytechnic University, Hong Kong SAR

mswernli@gmail.com

Markus Wernli is a research assistant professor at the Urban Environments Lab focussing on probiotic agency, citizen science pedagogies and eco-mobilising design.

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This paper explores the transformative relations of unknowable possibility in three urban communities which upcycle human waste. Working with communities – human and nonhuman – is approached by applying the dynamic model of collective wondering conceived as (i) provisional proposition, (ii) responsiveness to difference, and (iii) affirmation in/of uncertainty. The communities act in concert with people, microbes, and earthworms to address unsustainable food systems. Their profoundly self-implicating engagement on the material, social and cultural level stems from a pendulation between actionable immersion (wondering at) and perspectival detachment (wondering about). Community – understood as togetherness in wondering – becomes a conduit for imaginative, counter-intuitive thinking, and doing that can diversify existent, dominant, and hegemonic perspectives. Three agroecological cases illustrate how cultivating a rich, interactive context for exchanging or moving positions give birth to a plurality of perspectives, human and nonhuman, on the world. Since physical, social, and cultural positions in people and groups are never fully determined, codesign that provides ample possibility for repositioning – including unsettling bathroom routines, group debates, compost care, and agroecological tinkering – is crucial for opening perspectives and influencing how people act in close relation with unknowable otherness.

Keywords: agroecological exploration, community, ferment, human waste, Situational Analysis, social creativity.

1. Introduction and related work

What does it mean to work on transformational change with communities when designers abandon the logics of crisis response or efficiency? What are the implications for collaboration when design accepts its complicity in climatic and social volatility that now prevail? Confronting this complexity, how can a diversity of positions be invited for generating unforeseeable perspectives as the premise for creative action? These questions are considered by examining what spaces of reflexivity emerge when perspectives, human or not, are placed in direct dialogue whereby the situation unfolds as inherently multiple and open to change. This article argues that attention to possibilities unfolding from a deepening understanding of and tangible engagement

with ordinary experience expands communities' capability for more-than-human empathy and collective action. Such social learning processes from within the given situation is described as collective wondering. Despite offering ever-present, creative opportunities, collective wondering often goes unnoticed or is omitted from reporting in design. This article is motivated to contribute to the understanding of wonder-instilling dimensions in participatory practice at a time when less privileged design positions, including non-human voices, need to be fully counted in for restoring futures together.

This article resonates with research that conceives designing together as an emergent reality formation with interdependent people, places, practices, and structures. Arranging social life by design is considered through the lenses of phenomenology, self-organization, complexity, and activist research. Phenomenology, with its emphasis on placemaking, describes the durable investment in a place—not only as sensual quality but also as a precondition for building trust, solidarity, and collective action that transcend disparate notions of space (Pink 2011; Agnew 2011; Mang and Reed 2012). Self-organizing or 'infrastructuring' in codesign is concerned with stabilizing socio-technical arrangements that reproduce relevant knowledge and make dedicating time worthwhile (Ehn and Sjögren 1992; Karasti, Baker, and Millerand 2010; Storni 2013; Huybrechts et al. 2018). Complexity and emergence consider social transformation in entrenched arrangements as a matter of contingent relating and relearning in the process of mutually recreating experiences, intentions, and identities (Said Moslef and Larsen 2020; Akama and Light 2020). Finally, activist research and poststructuralism pay attention to the evolving nature of the community's particular narratives, desires, and concerns that enable collective imagination yet rebuff formulaic design approaches (DiSalvo, Clement and Pipek 2012; Lobenstine, Bailey and Maruyama 2021). Such discussions on designing with communities point to the susceptibility in people to be mutually affected and highlight the importance of sensing, relating, and making in shaping collaboration and agendas.

Although previous research, particularly debates in 'infrastructuring,' have noted the importance of engaging the messiness of social entanglements, recognizing uncertainty and incompleteness as catalytic encounter and creative opportunity in communities are largely missing. In their observation, Mosleh and Larsen (2020, 15) state that 'there is a lack of research that engages the temporal, social, complex and

power relations of participation.’ In other words, the close examination of emotional investment and ambiguity tolerance in the co-created experience, process, and outcome evades reporting. Likely this is due to a legacy of positivist research that narrowly defines personal attributes and behavioural indicators thus cannot holistically encompass their complexity. In response, this article foregrounds activist communities and ordinary people as designers and knowledge producers in their own right. Their experiences are not replicable yet may inspire others to wonder about.

This article intentionally focuses on experiential dimensions in participation to provoke reflection about the mental models underpinning reality formation since it can radically ground, liberate or hamper the thriving of communities. Discussion about the importance of iteratively re-examining the instructive relationships with the world is emerging in participatory design (Akama 2015; Luján Escalante 2019; Smitheran and Joseph 2020). The argument is that the mode of design needs to change—from the impartial, design-centric projecting onto and correcting of the world to becoming an ‘equipment for social learning’ (Bonnet et al. 2020) for how to live and relate to the contingencies inside the damaged biosphere (Hennon and Monnin 2020). This paper proposes that participatory design can only be transformative when it helps humans reinterpret their place at experiential, communal, and species level inside a constantly coevolving world. Deliberately questioning, unsettle, and reconstructing our interpersonal relations by design can make social change imaginable and, thus, ultimately achievable. It requires exploring and evaluating practices aimed at generative inconsistencies – collective wondering – for asking what such emotive accounts can contribute to discourses in participatory design. For this, the article presents three communal journeys conducive to wondering, then evaluates related observations with a causal framework, and concludes with overarching implications.

2. Designing for productive uncertainty

In the Global South, design engages with productive uncertainty for restoring local food systems, reviving communitarian links in the city, and defending alternative ways of inhabiting the world. Arturo Escobar (2016) describes Indigenous Peoples’ creative struggles in Latin America who reconstruct ‘territories of life’ by seeking differences, valuing diversity, and approaching environmental interactions as circularity.

‘Sentipensar con la tierra,’ the *feel-thinking* with soils and land (Escobar 2014), plays a

fundamental role in indigenous communities since it embodies, all at once, enduring health, food sovereignty, relational situatedness, and intergenerational wisdom.

This passion for enacting social change in the face of an ever-deepening civilisatory crisis and inescapable techno-economic mediation of the world also mobilizes communities in the Global North (Lobenstine, Bailey, and Maruyama 2021) to practice the ‘autonomous design of themselves’ (Escobar 2018, 5). Communities thus revolve around the environmental context they intend to transform while codesigning their capacity for plurality of social life they truly want. This section introduces three cases where codesigning for *feel-thinking* with the soil and disrupting deep-seated urban unsustainability implies that communities formed around bringing their excrements to fruition in the city. The cases brought strangers together who collectively wonder how to cohabit territories with their human waste. By seeking accountability to soil, skill, and collective ecologies, the cases exemplify imaginative ways of seeing and doing in the ordinary of eating and excreting by restructuring both. The organizers of these three cases, including the author, are designers who met each other through mutual affiliation in eco-sanitation networks. What galvanizes the organizers is designing working alliances for radically open possibilities in the socio-environmental contexts they call home.

Environmentally activist communities emerge to pose critical questions, make people think critically, and enact substantiated changes (Berglund and Kohtala 2020). It marks a shift from earlier codesign focused on workplace and technological adaption towards engagement with broader, socially relevant matters and a move to involve communities in their everyday context, rather than unilaterally addressing users, clients or consumers (Subrahmanian, Reich, and Krishnan 2020). Increasingly, codesigning citizens and scientists wonder how future generations will grow sufficient food on a drastically smaller ecological footprint. Humus-rich, healthy soil ecologies are critical here since they provide vital storage capacities for water, nutrients, and carbon dioxide (Schneider and McMichael 2010). If soil care becomes a societal concern, if recovered nutrients instead of synthetic fertilizers are to replenish the land, if home-cooked food is to replace readymade meals, if adept producers are to emerge from inept consumers, then codesign is about engaging much larger parts of the population in a ‘deep commitment’ (Carolan 2016, 143) to the animate world that feeds it.

The communities presented are upcycling human waste in Brussels, Hong Kong, and Berlin. The author selected the cases because they run counter to the prevailing

assumption that involving people in their sanitation is solely a concern for lesser privileged parts of the world. Advocating composting toilets in cities with flush toilets and sewers can seem frivolous and unnecessary. Yet, the author wonders how designers can promote composting toilets for populations abroad when the same technologies are not implemented at home. It is a disparity that causes frustration (at dry toilet conferences) since people overseas are expected to adopt predetermined modes of ‘resource conservation’ while the convenient modes at home remain uncontested. Next to fulfilling a need for diversifying the metabolic territory in the global north, the cases also bring together a focal complementarity as they present varied sociocultural contexts.

2.1. Brussels: L’Usine du Trésor Noir

In the Belgian capital, human waste upcycling gravitates around architects and artists affiliated as Collective Disaster. The group formed in response to a call in 2014 by the Belgian Ministry of Environment to revitalize a derelict downtown park (Amaya 2016). In the ensuing collaboration with two dozen neighbours, over the summer of 2015, Collective Disaster realized a community-run, ecological public toilet facility (Figure 1). Unique to this community was how the respective composting processes dictated the spatial and organizational arrangement of the placemaking initiative. The onsite treatment of excrement as responsive, publicly accessible process triggered wondering what could be encountered, experienced, and learned. The community consolidated the insights gained into a comprehensive, open-source manual for designers, neighbours, and visitors alike to carry out the maintenance involved.

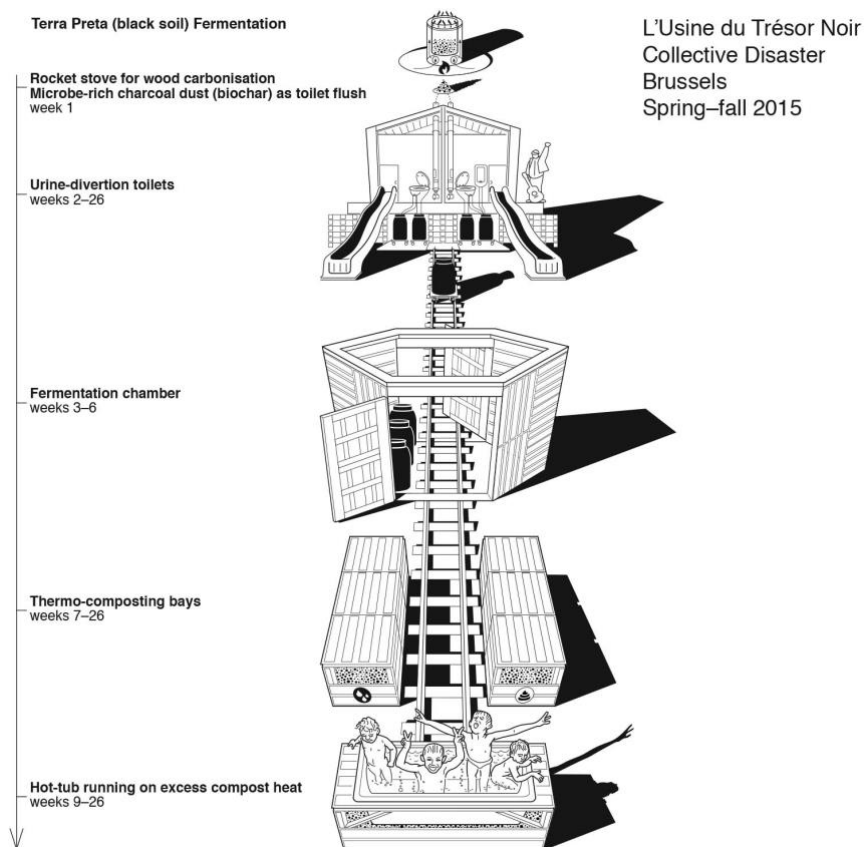


Figure 1. Architecturally and socially arranged composting experience.

The resurrection of excrements through materially performative structures and novel social constellations became known as L'Usine du Trésor Noir. To overcome resentment and gain support, the collective involved neighbours in planning, building, and operating facilities that incorporated spacious, urine-separating toilets and a heat-capturing compost system for powering public hot-tubs. This closed-circuit between waste and leisure in the open public was unprecedented and entailed unknown possibilities and risks. It required from all involved a healthy dose of trust and responsiveness to difference.

The pyramid-like toilet facilities operated over six months and were built on top of an elevated platform with spacious front stairs that doubled as a stage for performances. On the backside, visitors exited the toilets on large slides, one for females, one for males. The platform's interior stored the sealed collection barrels to separate urine from solids and preprocess them with microbially activated charcoal dust. Using the Terra Preta method, the multi-stage fermentation process eliminates pathogens, retains nutrients, and makes human waste into veritable fertilizer within one year. From the collection chamber, narrow-gauge tracks connected to the adjoined

composting site for swiftly transferring full barrels on trolleys for harnessing the excess heat. The park-enlivening public toilet garnered several awards and international acclaim. In its downtown setting the Trésor Noir community exemplifies empathetic exploration of the possible and unknown based on imaginative and material repositioning of issues like public tolerance, land access, and urban resourcefulness. It brought together soil experts, authorities, and concern groups to reconceive, at least temporarily, operational infrastructures for sanitation, composting, and recreation crossing divides between resource conservation and social capabilities.

2.2. Hong Kong: Anthroponix (人類水培)

The university-endorsed community of urine-upcycling citizens in Hong Kong responded to mounting food safety and environmental health concerns. The community evolved gradually around the Zero-Organic-Waste-Home initiative instigated by the author to engage the interested public in the skilful exploration of untapped agricultural opportunities. The collectivized composting praxis, located on a rooftop inside a densely populated urban district between 2015-8 relied on the good rapport with its neighbours. Emerging from this praxis was the Anthroponix urine upcycling initiative to enable urbanites deprived of balconies and land access to grow plants indoors (Figure 2). Following a public call in 2017, the organisers invited 22 households of diverse sociocultural backgrounds into this Urban Ecology Adventure to ferment their urine – with the addition of sauerkraut brine – into a fertilizer substrate to grow edible plants. The simple material relationship between participants' urine and the environment constituted a provisional ecological proposition since the possibility of the fertilized plants was interlinked with the person feeding it.

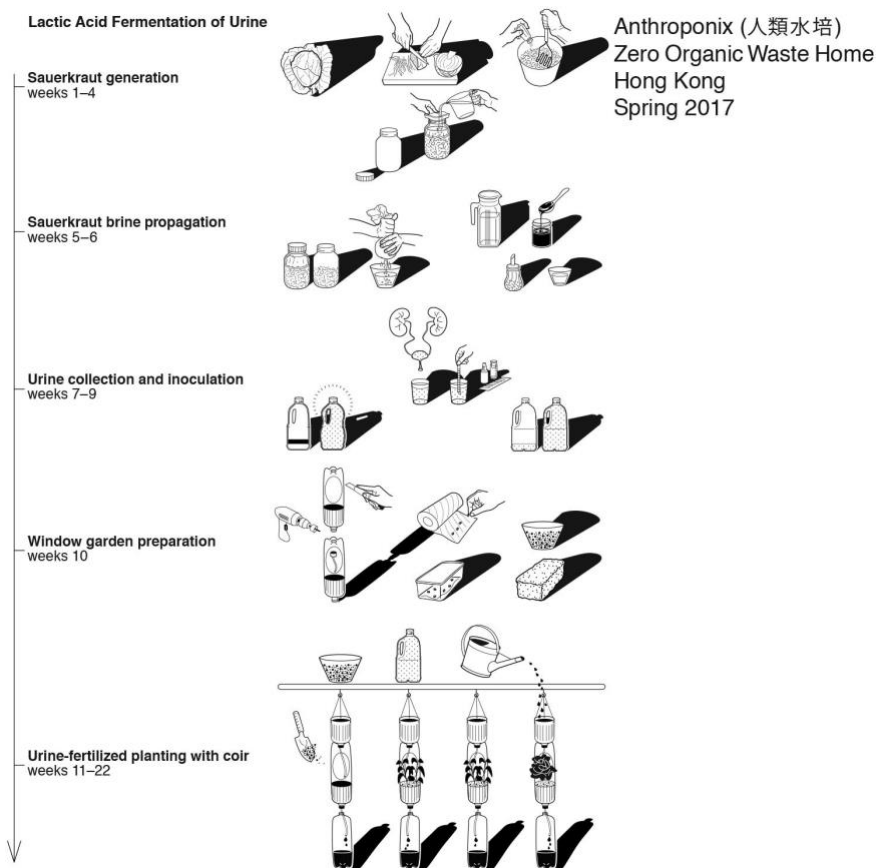


Figure 2. Fermenting urine inside collective food pedagogy.

Each fermenting urine specimen became part of an annotated self-examination passage that involved medical dipstick testers, diet monitoring, and botanical tracking. Participants consolidated all data into an intricate Mutual Thrivability journal. The community spearheaded an untested closed-loop resource system that required participants to jointly overcome technical and affective ambiguities. The imperfect technical setup invited tinkering, instructive failing, and social curiosity—all forms of excitement stemming from responding to unsettling relationships that ignited unifying purpose, social engagement, thus captivating participants’ inventiveness for over three months. The empathetic exploration led many to continue their fermentation experiments or join garden groups long after the project ended.

The agroecological experiment reframed human waste as a responsibility-triggering agent (Wernli 2019). It countered visions of the urban as an inevitable nutrients’ sink, instead reimagined the household as a resource hub between human and environmental circulations.

2.3. Berlin: DYCLE (*Obst aus Babywindeln*)

In response to soil degradation and water shortages in the German capital region, an aspirational, artist-led human waste reuse program has evolved in recent years. Under the name DYCLE, a communal start-up pioneers the eco-friendly transformation of baby nappies into fertile soil for fruit orchards since 2014 (Figure 3). The proposition is to cultivate fruit tree orchards along the city's outskirts led by diaper-upcycling families. Building on revenue from tree adoptions rather than the sale of diapers, the DYCLE social enterprise entails custom production of biodegradable diaper inlays and communal composting into Terra Preta black soils, like the Brussels example, to grow heirloom fruit trees. The engaged families meet weekly at a central processing point to exchange soiled inlays with fresh ones (Debatty and Matsuzaka 2019).

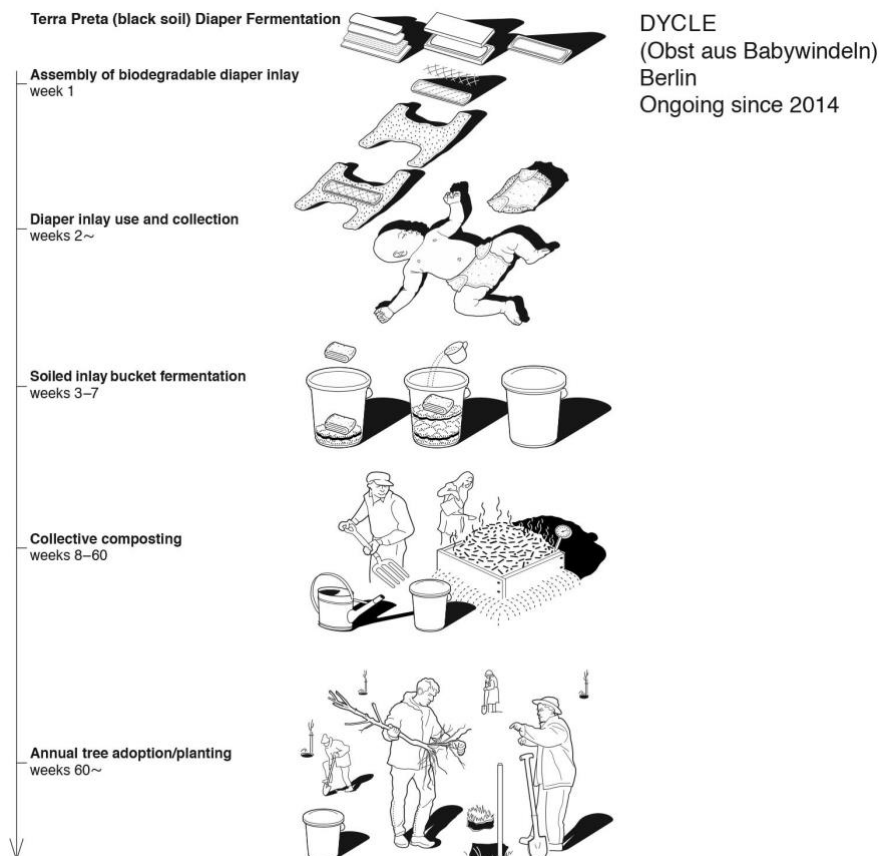


Figure 3. Revenue from tree adoptions supports the social enterprise.

DYCLE established a value-creating local economy that spans community, soil care, food forests, and employment. Advancing this biosocial proposition required that all elements and procedures be custom-configured to fit together and serve the larger

purpose. It took the DYCLE team six years of trial and error to develop diaper inlays that would satisfy both the needs of the baby and the soil. Several hackathons and maker occasions provided gradual breakthroughs for incorporating local plant fibres into appropriate diaper inlays. The sense of wonder in these community-led environmental interactions overcame initial aversion towards excrements and stirred latent aspirations for enacting more fulfilling, ecologically contributing lifestyles. While the community around DYCLE's core team fluctuates, its empathetic exploration inspires increasingly communities beyond Berlin to adopt the diaper-to-orchard economy. Generations growing up with diaper-fertilized orchards help normalize the agroecological use of human waste and affirm humanity's role in Earth's shared metabolism.

All three excrement upcycling communities demonstrate, in their respective context, how advancing commitment, practices, and capabilities prompted collective wondering about the human function in replenishing the biophysical foundation. With this disposition, the author wished to probe further the value of productive uncertainty in communal experimentation by diverse citizens inside their daily lives. The following section introduces how the research was conducted with these actors and communities.

3. Methods

The study comprises three cases of eco-toilet communities to evaluate the dynamics conducive to collaboration and enjoyment under uncertainty. How can organizers of such cases understand and stimulate these self-enabling processes? The research responds to the need to justify humanure experiments, find ways to sustain them, and tailor follow-up interventions. The author wanted to examine the characteristic features and frames of reference in communities that equip people with agency to self-manage place-bound and collectivized arrangements.

3.1 Gathering research material

To generate qualitative and quantitative data, the study integrated participant observation, content review, and interviews in a multiform analysis. Based in Hong Kong, the author knew the organizers of the cases in Brussels and Berlin from eco-sanitation networks but was neither involved in planning these projects nor implementing them. The research material was collected by the organizers of each case

and compiled by the author. It consists of field notes from participant observation and document review over the respective project period; internal documentation; audio transcripts from workshops and participant interviews; communication material; participants' self-reflective documentation; and email exchanges with key organiser. In the Hong Kong case, 54 interviews ranging from 45 to 120 minutes were conducted. All field notes highlighted the position, role, possible influence, and reflections of the respective note-taking organizers and the author. In Hong Kong, drafts of the manuscript were subjected to the validation of respondents (Lincoln and Guba 1985, 35) by sharing them with participants.

3.2 Analyzing situational sensitivities

To evaluate the data, the author drew on Adele Clarke's (2015) Situational Analysis that advances Strauss and Corbin's (1998) Grounded Theory aimed at accounting for the complexity of social processes and the role of investigators. Situational Analysis aligns with the Situational Sensitivity framework (Glăveanu 2020:148) in psychosociological research that understands productive uncertainty as transitions inside person, perspective, group, reality, and norms when facing unknown otherness (Graber and Brooks 1996). Situational Sensitivity pays attention to relational processes, interaction quality, and reality formation that encourage trust amidst uncertainty by excluding preconceived ideas in favour of human or nonhuman otherness and collective action. A central analytical task is to identify the imaginative turning points in the design process and examine the triggers, insights gained, and implications of those transitions: who authenticates sensitivities; how are unexpected instabilities negotiated; what dynamics of commitment emerge; how actors seek to justify their actions (Clarke, Friese, and Washburn 2015).

3.3 Coding, charting, and themes

Research materials were summarised in text descriptions and analysed inductively using open coding to give voice to the diverse actors and permit themes to emerge from the data. Coding analysis focused on how organizers and participants validated their experiences of unpacking, reimagining, and redoing when prompted with contradictory situations. In extension, situational charts and uncertainty-tolerance maps were used to render visible the connections among human and non-human actors, material practices, emergent perspectives, cultural context, and symbolic discourses. All this served to

articulate the sites of collective commitment under adversity or ambiguity. Guided by Collective Sensitivity criteria (Clarke, Friese, and Washburn 2015; Glăveanu 2020) and respondents' validation the author arrived at the initial listing of codes: (i) how did the situation play out? (ii) what was exploratory about it? (iii) what perspectives emerged thereof? (iv) how did the actors' positions shift? (v) what was learned in the process? In the subsequent round of coding the author established three lines of noteworthy catalytic tensions: (1) acquiring knowledge is a transitional and incomplete property meant to stimulate further inquiry into the existential understanding of self and the world; (2) social creativity as a process that extends the meaning of codesign beyond technology and artifact towards an emergent perspective for becoming aware of, being excited about, and exploring ways of thriving on uncertainty over time; (3) community understood as trustworthy space for daring to be openminded as the basis for subjecting ordinary experience to what initially might have been unthinkable. The following section discusses the results by correlating the pluralisation of perspectives with durational commitment and productive uncertainty.

4. Results: Dynamic of community-endorsing wondering

Several catalytic tensions are arising in the situational sensitivities among the communities analysed. Initially, excitation spurs the groups when participants wonder about the feasibility of using human waste in the urban context. Intermittently, tension arrives when participants wonder about the mode of joint learning to advance their experimentation in ecological living. Eventually, pondering lingers beyond the project when participants wonder how these excrement-sanctioning communities imbue personal distinction, fulfilment, and future trajectory.

Participation that outlasts the initial project is described in design related to Science and Technology Studies in terms of 'infrastructure time' (Karasti, Baker, and Millerand 2010). Here inconsistent timelines of wants and needs among people is approached with the concept of 'scripting' (Storni 2013) to solve problems efficiently and deliver product innovation. These scripted scenarios or personas likely reduce people's lives to abstract representations and static opinions and impose the views of designers – who define agendas and outcomes and normatively influence what is possible or not (Huybrechts et al. 2018). Recently, the lack of imagination and confinement to short-term accomplishments when working on real-life concerns is

addressed with ‘scripting for the future’ that employs the theatrical metaphor for more enduring ‘democratic experimentation’ (Binder et al. 2015, 11) whereby citizens rehearse engagement with issues of concern. Thus, projects are seen as a stage for citizens to temporarily explore with designers how to organize themselves through a three-fold process of (i) *personal scripts*, to denote individual perspectives on issues, thereby creating community and their own stage without the designers; (ii) *community scripts* suggesting pluralistic views of the collective; and (iii) *action scripts* that guide participation over time and propose how the community may unfold (Huybrechts et al. 2018).

Assessing the plurality of perspectives towards productive uncertainty, the catalytic tensions emerging in this study manifest how adaptive humans can tolerate ambiguity, contradictions, and unpredictable nonhumans: they thrive on them with curiosity, contemplation, marvelling, and tinkering. All constitute processes that Vlad Glăveanu (2020) describes as ‘collective wondering’. In connecting the literature above with the analysis of relational processes emerging between diverse actors and contexts of the presented cases, this study complements the indicative ‘scripts for the future’ with the contingent model of collective wondering as follows:

- (1) **Wondering as provisional proposition:** the assembly of self-investment in the issue of concern for its own sake (via biosocial protocol) raises awareness how one’s knowledge is incomplete, more is to be learned, and one is surrounded by previously unknowable possibility;
- (2) **Wondering as responsiveness to difference:** the activation of these possibilities from defamiliarization vis-à-vis otherness (via distributed material responsibility) triggers excitement essential for moving from awareness of the possible to its exploration and back to awareness;
- (3) **Wondering as affirmation in/of uncertainty:** the enactment of empathetic explorations of the possible (via emergent synergies) that involve repositioning oneself physically and imaginatively, leading to experiences of not knowing while also being energized.

Collective wondering is elemental to instilling contingency thinking and commitment to the unknown. While empirical research often considers wondering an unhelpful irritant (Rubenstein 2008), the communities manifest how participants enter a cycle of awareness, excitement, and exploration of the possible in codesigning the reuse of

human waste. The next section reflects further on the three-fold model of collective wondering in dialogue with debates on productive uncertainty and participants' voices.

5. Discussion: The initially unthinkable as implicating co-emergence

The accounts from the excrement-transforming communities are testimony for multiple catalytic tensions. First, they facilitated a situational sensitivity that made participants realize that what they usually do about their excretions is no longer suitable and prompted among participants in Brussels this question: *“How much waste of resources could be prevented if we brought nutrients cycling and food cultivation back into local communities?”* The insight that wastefulness necessitates locally specific approaches also triggered questions among participants in Berlin on how else local food systems could be organized: *“Because growing heirloom fruit trees requires our bodies and time, do we have enough people committed to producing food?”* Communities become inquisitive by acting in a world that is simultaneously physical, social, and symbolic, thus conducive to catalytic thinking that Glăveanu (2020, 62) refers to as ‘what else’ and ‘how else’ thinking. Born out of social activities, like tending to compost or tinkering with urine ferment, confronts with surprising otherness as described by a Hong Kong participant: *“Not only did we learn about the respiration in plant roots, we also used our mouth and breath to keep our seedlings alive.”* What participants explore is not tied to an object as such but instead to its associated possibilities. The experientially embedded ‘what else/how else’ thinking prompts multiple perspective-taking and meta-positions (Glăveanu 2020) conducive to social creativity. It can be relevant to designers looking for ways to cultivate wondering in their practices or communities.

Evaluating the ‘what else/how else’ thinking on the level of person, community, and action, the catalytic tensions of wondering manifested in the presented communities on the three levels of (5.1) provisional proposition from awareness, (5.2) responsiveness to difference from excitement, and (5.3) affirmation in uncertainty from exploration described in Glăveanu’s (2020, 62) model of wondering. *Provisional proposition* stems from wondering about the suitability of one’s body wastes for growing crops since food additives and pharmaceuticals compromise its ecological use-value. Thus, reusing human waste is a never-completed, consistently revelatory endeavor. *Responsiveness to difference* is inevitable when participants practically explore the proposition and are

compelled to abandon preconceived ideas about the function of excretions in a metabolically intertwined world. The ensuing dialog on becoming a better metabolic provider invites (nonhuman) otherness and makes possible probiotic upcycling alternatives. *Affirmation in uncertainty* stems from the capacity of the community to engage all involved with the possibility of the given situation (Dewey 1934, 256). Participants wondered ‘what if’ confrontations of current resource-squandering arrangements could enable ‘how else’ communities for shaping more resourceful balances of self and other, certainty and uncertainty.

5.1. Wondering as provisional proposition

Designing for ‘what if/how else’ instilled the desire to counter a profound lack of wonder about humanity’s biosocial prospects as denoted by participants in Hong Kong: *“The project gives us a strong sense of contributing, in small part, to our living future.”* The communities revolved around ‘biosocial protocols’ (Galloway 2004) that stipulated a renewed purpose for human waste, bringing people together and advancing in close relation to reveal previously unknowable possibility surrounding them. In Brussels, a neighbour of Trésor Noir explains: *“The project demonstrates how human faeces can be composted on the spot in an overcrowded city, which is brilliant.”* In Hong Kong, urine recyclers monitored their conjoined human/plant health that could be self-disclosing: *“The project helped me observe myself, how I make myself too busy and no longer enjoy life.”* In Berlin, young parents acknowledge their biodegradable diapers as regenerative both in trees and babies: *“Disposable diapers can cause allergic reactions to the baby’s genitals, so I want this healthier alternative when my second child is born.”*

By seeking to improve their metabolic relations, the communities rely on generosity—the appreciation of self that incorporates others (LaCaze 2002, 13) as a Hong Kong participant describes: *“I catch myself ingesting junk food while collecting my urine, and wrangle if my negligence has any influence on the plants sprouting out of it.”* Generosity is the precondition for ‘what if/what else’ thinking rather than reasoning. When generosity guides a person to eat healthier food to produce better quality excrement-to-be-fertilizer, the person exists to the extent of wondering, not just participation and reaction. Collective wondering stipulates a range of socio-

psychological processes like counterfactual thinking, pondering, foresight, and anticipation that invite complexity and open possibility.

Protocols that uphold composting for placemaking, fermenting for interspecies health, and intergenerational tree planting, pull people into the social position of caregivers. Here perspectives of the self, coincide with the other in the reflective dialog of wondering that unlocks unforeseeable developmental opportunities (Mead 1934, 135). Positioned inside the demands and responses of lively compost and unruly ferment, people reveal themselves as members of a species working together with other species, as knowledge-holders drawing from experience or intuition, as problem-causers burdening ecosystems, and as solution-holders exemplified by a urine recycler in Hong Kong: *“Every time I went for a pee, I felt like it’s a shame to let most of it down the drain when we treat this lucky batch like royalty: fermenting, testing, and replenishing plants.”*

Reorganizing domestic life depends on context-sensitive coordination and delicate biological timelines. It requires new forms of attention, connection, and dedication wherein the familiar and the self are made unfamiliar. When urbanites collect their urine for interspecies diagnosis, when parents recover soiled nappies for future orchards, when neighbours compost for the funpark, then things and persons lose their conventional identity, turn into something else – something to be excited, discovered, and explored further – something to wonder about summarised by another urine-cycling participant: *“What I liked most was to witness how, besides me, there are people in Hong Kong excited about fermenting their urine, because I thought it was impossible.”*

Defamiliarizing the ordinary as social activity (Cohen 2000, 97) justifies involving people in what conventionally is relegated to ‘sanitation’: it reveals to them the intimate linkage between production and destruction and lends urgency to bring those two spheres together. For people who recycle their excrements, societal change starts from an experience of doubt about how the world is arranged and questioning one’s role in it. An organizer in Brussels illustrates: *“Our toilet facility championed a viable economic model for implementing compost toilets in public parks against a world that does not want to change.”* The opening of wondering to the political imagination combined with material engagement, challenges the wonderer to reckon with the situation and demand the extraordinary from the ordinary. Negotiating with peers and nonhuman actors, the person moves between multiple positions in the world, both physically and socially (Gillespie and Martin 2014), encouraging ‘openness to

difference’ as creative response (Glăveanu and Beghetto 2017), which is less about personal traits than about emergent characteristics within interactions.

The communities constituted rich, emergent settings friendly to including unexpected otherness as exposed by an incident in Hong Kong: *“After I told my four-year-old nephew that my fermented urine is no longer wee-wee, he started sipping it, asserting that it tasted like apple juice... I just smiled and rinsed him off!”* When people, actions, and things do not perform as planned, the ordinary is increasingly scrutinized, questioned, and wondered-about. The provisional proposition implies that human control over biosocial environments is never absolute and prompts designers to consider the fragility of the status quo as an organizer in Berlin articulates: *“People best collaborate in ambiguity when they are not just moved by gestures but touched by their shortfalls.”* The gateway to this provisional proposition is to be caught by wonderment so that one stands by the external demands and by others for giving a personal response (Hansen 2015, 218). In a culture focused on weakness and strength, defense and attack, acknowledging one’s shortfalls is challenging. Yet, in communities with agential vulnerability, members witness each other as existentially porous humans who can yield to the unknowns. It makes them listen, learn, and decide the next steps in more integrative ways (Contessa and Hiles 2018, 261).

5.2. Wondering as responsiveness to difference

Designing for wondering is not just about directing attention. It also requires the manifestation of excitement and contention. Making sauerkraut starter culture, tinkering with diaper inlays, or toilet construction with salvaged pallets may be temporary, not providing solutions, or fail at present. Yet, these substantiations are vital expressions of excitement, including delight, hope, and frustration, about how the world could function. An organizer in Brussels reports how naming the project entailed consensus-building amid controversy: *“For Muslim neighbours, our initial name ‘Temple of Holy Shit’ was so insulting that they threatened to burn down our structure—yet when they realized that we are willing to adapt, they became indispensable supporters.”* Getting invested in greening window sills or food forests also meant that the reward for the growing efforts is deferred for a generation as a Berlin participant explains: *“Planting trees is our initiation for learning to be patient, an almost lost virtue these days.”*

All communities paired material experience with reflection. Urine recyclers recorded an interspecies food journal to track person/plant fluctuations and sharing

insights with the group. The diaper collecting families meet at the compost station to survey wellbeing in community and soil. The process between individual and group, activity and debriefing requires roles to be exchanged, as actors move between immersion and detachment and realize how their position looks to others (Glăveanu and Beghetto 2017). John Dewey (1934, 69) notes how wondering in the collective raises the issue of consequences over intentions. Responding to a common cause or threat becomes a matter of addressing the situation in self-implicating ways rather than pursuing blame as a Hong Kong participant explains: *“When the urine tubes exploded in my bathroom, I connected with others, and we decided to keep the agitating lactobacilli in check by taping down the lids—we cleaned up the mess and it was no big deal.”*

Participants also realized that scientific monitoring of biological processes cannot account for the wondrous complexity associated with stewarding compost, germinating seeds, or diagnosing urine: *“Often the results of the Urinalysis test strips seemed out of context, so I better relied on my senses and peer exchange.”* In wondering together, people realize how otherness, including urine, lactobacilli, earthworms, or peers, are not mysteries to be cracked. Instead, in and of themselves, they are subjects of wonder to be rediscovered, puzzled-over, never to be known completely, so that future change remains viable and not negated (Kearns 2015, 99). Thus, responsiveness to difference requires more than respect or openness. It involves a deep sense of responsibility to share wonder with others in surprise, dialogue, or tinkering.

While inconsistent behaviour in ferment, soil, and social ecologies ignited wonder in the three communities, commonly it triggers inconvenience, fear, or repulsion since it evades easy appropriation. Dirt-expelling, mortal human bodies do not conform to ideals of purity or eternal youth. It is easier to avoid the ramification attached to human waste altogether, as a toilet patron in Brussels reveals: *“Engaging with my defecation via the compost toilet made me aware how my body breaks down, drop by drop, for unhuman life forms to go on living from its excess.”* Reconnecting to the dirt-expelling body is not about trading purity ideals for messy existence. Instead, it embraces both aspects simultaneously by learning to wonder about and relate to impure otherness that enables humans to live (Caslav Covino 2004). By elevating urine to an environmental health device, incorporating diapers in intergenerational conservation, and turning eco-toilets into a funpark, designers created what escapes standard

categorization and judgment, as an organizer in Brussels points out: *“I was amazed how many people were not disgusted, how teachers wanted compost toilets in their schools because they hoped their kids learn how soil can be regenerated.”*

The cases formed communities from strangers who collaboratively wondered in response to a basic need (defecation), a threat (human wastefulness), a desire (belonging), or pure curiosity (novelty). It authenticates the joint purpose for the individual where people come together to realize what they are missing and, in turn, wonder who they want to become as a Hong Kong participant illustrates: *“Already before I joined the urine cycling project, I was sure the result would disappoint, but I was eager to witness what would happen in the process.”* While Anthroponix and Trésor Noir were temporary communities, most members went on to pursue horticultural experiments in their own right or became advocates for urban resourcefulness.

Reimagining community starts from experiencing serious doubt about the current world, feel excited about how it could be transformed, and desire that it will manifest that way. Readiness for societal experimentation is the reward of wondering together. As part of wondering constellations, the person becomes better equipped to counteract inertia with creativity and uncertainty with affirmation. It highlights for design the importance of creating holding spaces for provoking questions and coordinating actions based on uncertainty. Accepting the unknown – intrinsic to most of life – is the best place to explore the known and open future opportunity. It means that single-focused solution approaches miss the point when there are manifold ways forward highlighting the critical importance of intuition, indigenous, and abandoned knowledge. Creating those incubation spaces where myriad ways can take hold and thrive is the task of codesign (Berglund and Kohtala 2020).

5.3. Wondering as affirmation in/of uncertainty

All communities revolve around the social infrastructure of fermentation for sensibly reintegrating putrescible urine, excrements, and diapers. Fermentation embraces open-ended partnerships across life forms. It prompts wondering about when substrates are fermented or rotten and apprehension for who needs water, food, salt, or air. It requires a readiness to be ‘collaboratively contaminated’ (Tsing 2015, 27) since the process leaves no one unchanged as a diaper fermenter in Berlin attests: *“I love the connective simplicity and aesthetics when we’re returning last year’s nutrients to the soil.”*

However, diaper or urine ferments can go awry. As social infrastructure for responsible transformation, fermentation comprises both possibility and its own limits clarified by an organizer in Brussels: *“I find it important to experiment with big infrastructures on smaller scales so that we get a practical understanding for how they work for then construct them differently.”* The fermenter and wonderer are simultaneously exposed to the technique’s evolutionary benefits and risks since they can notice them, reflect, learn, and make amends.

Stinky compost begs for turning, putrid urine demands soil-drenching, which calls on a congeniality recognized by a participant in Berlin: *“We have much more fun touching the soil and experiencing like we’re part of it, rather than studying everything about carbon dioxide emissions.”* Wonder and ferment renew environmentally entangled, emotional thinking – ‘sentipensar con la tierra’ (Escobar 2014) – without attaining single-right consensus or final knowledge. Rather, they maintain possibility by emphasizing a slower process, allowing unexpected outcomes to affect how people make sense and come to know as a Hong Kong participant discloses: *“When I saw how many peers got a kick out of experimenting with seeds and ferments, it made me realize the interesting bits I previously had missed and try again.”* Building attuned knowledge and possibility is neither centred on knowledge-provider nor knowledge-recipient. It manifests in practice, dialogue, and joint inquiry, where learning is about how to live well when surprises are taken on, let linger and wondered about. It highlights the continual, fluid evolution in person and group conducive to a situational sensitivity that encourages trusting and meeting (non)human others, as absolutely new (Montuori 2012, 66). This fruitful interplay between traditional divides and actors, ideas and phenomena, awareness and exploration, certainty and uncertainty, calls for ‘togetherness in wondering’ (Glăveanu 2020, 149), as indicated in Table 1.

<i>Approach</i>	Togetherness in Wondering (Glăveanu, 2020)		Scripting for Participation (Binder 2015; Huybrechts et al. 2018)	
<i>Elements</i>	PERFORMATIVITY	PRACTICES	INTERVENTION	MEASURES
<i>Ways of being</i>	Phenomena-affirming	Awareness	Personal scripts	Self-reflection

<i>Ways of knowing</i>	Perspective-taking	Dialogue	Scripts for action	Planning
<i>Social arena</i>	Position-exchanging	Exploration	Community scripts	Facilitation
<i>Designer's role</i>	Interlocutor		Facilitator	
<i>Reality formation</i>	Cultivation of possibility in-between actors		Anticipation of possibility within actors	

Table 1. Comparing wondering and scripting for working with communities.

The communities of fermenting urban residents involved parents, public servants, farmers, scientists, and educators who unpacked taken-for-granted assumptions, probed viable responses, generated underexplored knowledge, opened the political imagination, thus expanded the repertoire of resistance as participants in Brussels expressed: “[*The project*] activated our social body, one that seeks harmony with its physical foundation, against the backdrop of financial abstraction with its effect on greed, despair, indifference.” Wondering, on the experiential level, how handling our waste streams today will affect future generations also evoked participants in Brussels to wonder about the underpinnings of wastefulness: “*In our culture that wastes not only urine or faces, but also human lives, transforming excrements becomes a precursor for disrupting the vicious cycles of exclusion, domineering, and desperation.*”

Socially invigorating learning with and of wonder is ultimately an act of genuineness. The organizers, including the author, had to humbly realize that their understanding is partial or mistaken, that there is more to learn for then reconnecting the experiential and the unforeseeable with the world of ideas (Glăveanu 2020, 173) as an organizer in Hong Kong attests: “*When on the first day most fermenting urine tubes exploded in 22 bathrooms, I had to openly admit my own deficiencies which made room for participants’ creativity and enthusiasm.*” Candidly wondering about prerogatives is also at the core of Orlando Fals Borda’s (2006, 27–37) ethics of Participatory Action Research. It assigns designers the role of interlocutors who remain receptive to counter-sentiment for recovering situational potential and diffuse insights acquired in an accessible and genuine manner.

Collective wondering and fermenting are about designing practices that actualize sensory modes for holding together short and long-term relationships across life forms. Community substantiates as interspecies concurrence beyond the here-and-now illustrated by the participant in Berlin worn out from tree planting: “*Aside from meeting*

compassionate people, fruitful encounters are taking place between human and nonhuman needs, city and countryside, present and unborn generations.” Designing such ‘sensuous futures’ (Pink, 2021) marks the end of the designer as a steadfast solution broker. Instead, designers are challenged to establish self-implicating processes and harm-aware measures toward other life forms that can never be fully known. It highlights the interspecies function of admitting joy as well as misery arising from empathetic explorations of wondering and fermenting. From the vantage of crisis defense and clinical optimization, people cannot build more-than-human bridges since affirming fulfillment and discontent shapes the terms of their relations and decisions. Collective wondering then shapes environmentally attuned subjectivities for empathetically scrutinising the interrelationships of designed and natural for acting accordingly on ecological loss and biodiverse futures.

6. Conclusion: Possibilities in-between actors (not inside of them)

This article extends the concept of scripting (Binder et al. 2015) by introducing the dynamic model of wondering (Glăveanu 2020) as a design approach that supports creative actors in opening novel spaces of possibility and commitment for themselves, (nonhuman) others, and society. It explored how person, community, and action (Huybrechts et al. 2018) can better accommodate uncertainty, inconsistency, and otherness through collective processes that are at once material, social and psychological. The study demonstrates that collectively wondering can help communities relate to what is absent in their experience of the ordinary, to enlarge and ultimately transform it.

Wondering in community denotes experiential encounters where the possible emerges through being envisioned, anticipated, tinkered with, and contemplated. In collective wondering, the designer’s role is to cultivate a dialogical context rich in catalytic tensions that entails three aspects: (i) *defamiliarize fixated positions* by employing purpose-aligning and self-implicating strategies like ‘biosocial protocols’ whereas people abandon conventional identities and reasoning; (ii) *mobilize unthinkable perspectives* by alternating actionable immersion with reflexivity upon for provoking inquisitiveness and conduct in concert with (nonhuman) communities that constitute in uncertainty; and (iii) *explore possibilities existentially* whereas environmentally sound subjectivity and decision-making is the result of admitting empathy inside lived,

authenticated relationships. Collective wondering points to the interspecies purpose of sensoriality and fulfilment for thriving and biodiverse communities.

The cultivation of wondering – not as exodus, but as profoundly social and physical engagement with the ordinary – aims at developing multiple perspectives on the world, including oneself, by inhabiting and exchanging embodied and (agri)cultural positions. In collective wondering, possibility is not just inherent in the actors themselves but found by acting in and on the world, by transforming oneself, communities, and the environment. A collective wondering approach to codesign is about planting possibilities in the spaces between actors and building commitment to productive uncertainty. The creative possibility in the presented communities derives from the fact that human waste can be used – and reimagined – in many different ways; as health guide, worm food, soil replenisher, intergenerational arc, ecological membership, civic resistance, etc. Developing inventive perspectives on human waste (or any other sidelined matter) is about becoming aware of, excited about, and exploring this profound openness for shaping emergent, unsettling, and surprising relationships with differences, perspectives, positions, and dialogues. The task of designers as interlocutors in this perspectival dialogue is not only to include the perspectives of unwanted otherness. Collective wondering also problematizes the lack of recognition for difference and the diminished creative potential of the marginalized – human or nonhuman – that ultimately hampers the advancement of communities and humankind overall.

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