

Nov 29th, 9:00 AM - Dec 1st, 5:00 PM

Becoming designers with Earth: propositions for design education

Wendy Fountain
The Open University

Stephanie Carleklev
Linnaeus University

Follow this and additional works at: <https://dl.designresearchsociety.org/learnxdesign>

Citation

Fountain, W., and Carleklev, S. (2023) Becoming designers with Earth: propositions for design education, in Derek Jones, Naz Borekci, Violeta Clemente, James Corazzo, Nicole Lotz, Liv Merete Nielsen, Lesley-Ann Noel (eds.), *The 7th International Conference for Design Education Researchers*, 29 November - 1 December 2023, London, United Kingdom. <https://doi.org/10.21606/drsld.2023.069>

This Event is brought to you for free and open access by the DRS Special Interest Groups at DRS Digital Library. It has been accepted for inclusion in Learn X Design Conference Series by an authorized administrator of DRS Digital Library. For more information, please contact dl@designresearchsociety.org.

Becoming designers with Earth: propositions for design education

Wendy FOUNTAIN

The Open University, United Kingdom

wendy.fountain@open.ac.uk

Stephanie CARLEKLEV

Linnaeus University, Sweden

stephanie.carleklev@lnu.se

doi.org/10.21606/drslxd.2024.069

Abstract: This paper is an account of a design inquiry grounded in teaching design processes with first year students in an international undergraduate design program. Guided by linked questions of how we foster consciousness of living and acting within planetary limits in the context of becoming designers, while shifting from modernist to planetary ways of being, the inquiry flows from critical engagement with a transdisciplinary scholar in the role of discussant. Three urgent propositions for design education emerge: 1) Live with, not on Earth; 2) Let go of being modern, and 3) Translate action with Earth. We discuss each proposition in the context of our co-teaching practice, potentially spurring critical reflection and seeding pedagogic strategies where fellow design educators find resonance. Equally, our propositions may well be challenged in reflection of pluriversal practices of design education as we experience intensifying Earth system destabilisation through the interlocking crises of the Anthropocene in diverse and increasingly unjust ways.

Keywords: *design education, planetary stewardship, Anthropocene, planetary health, bio-translation*

Introduction

We are living through tumultuous, volatile and threatened times, where a safe and liveable future hangs in the balance – and yet, unbelievably, most educational thinking, policy and practice takes little or no account of this greater reality. (Stephen Sterling, 2023, box 5)

This is an account of a design inquiry that questions the realities, remit and structuring of design education from within ecological and existential crises. Despite a multi-year co-teaching commitment to foster planetary stewardship in design education in response to anthropogenic climate change and linked biodiversity loss, we feel perpetually novice in this urgent challenge.

This is not for lack of scientific literature and discourse within design theory and philosophy, but a deep questioning of whether our practices in higher education are actually informed, aligned and effective. The design inquiry is driven by two linked questions:

1. How do we foster consciousness of living and acting within planetary limits in the context of becoming designers, and
2. How do we shift ourselves and our practice with learners from the pervasive modernist legacy that structures nearly all aspects of industrialised life, to explore and learn how to live as planetary stewards?



This work is licensed under a Creative Commons Attribution-NonCommercial-Share Alike 4.0 International License. <https://creativecommons.org/licenses/by-nc-sa/4.0/>

In delving critically into the realities in which design education is now located – its ontologies – and how with students we come to know these realities – our epistemologies – we acknowledge the subjectivities of our respective colonial settler and northern European backgrounds. In our own Eurocentric, growth-subservient design learning during the 1980s and 1990s the vexed and violent relationships between design, power and oppression rarely surfaced. The need we identify to work toward new consciousness, values and insight is in no way universal nor a position we seek to impose. This Earth-centred design inquiry is allied with pressing agendas to de-colonise design (e.g. Noel, 2022; Tunstall, nd.), for design justice (e.g. Costanza-Chock, 2020; Escobar, 2018), and to understand design, and design education, as emerging from pluriversal knowledge and practices for “... a world where many worlds fit; linked worlds of collective liberation and ecological sustainability” (Costanza-Chock, 2020, p. xvii). For design education and practice to be responsible agents in urgent whole system-scale transformations for planetary health, we see equality and collective liberation as inseparable from designing with Earth.

We first frame the design inquiry we undertook in partnership with a transdisciplinary scholar whose work spans human geography, the Anthropocene, planetary health and climate emergency studies. Planetary health describes an emerging field that focuses on understanding the dynamic interlinkages between human health and the effects of anthropogenic changes to Earth systems including climate change, biodiversity loss, resource scarcity, global pollution, and altered biogeochemical cycles (Planetary Health Alliance, 2021). As such, it relates to what a near-consensus of geological scientists are acknowledging by distinguishing between the Holocene and the Anthropocene. The latter marks rapid industrialisation and cross-scale human impacts on biogeochemical cycles and ecosystems which have taken the Earth system out of the state typical of the post-glaciation Holocene epoch (Subcommission on Quaternary Stratigraphy, nd.). In this destabilised context, we offer and elaborate three emergent propositions for design education: 1) Live with, not on Earth; 2) Let go of being modern, and 3) Translate action with Earth. We discuss each proposition in the context of our co-teaching practice in an international undergraduate design program, potentially spurring critical reflection and seeding pedagogic strategies where fellow design educators find resonance. Equally, our propositions may well be challenged in reflection of pluriversal practices of design education as we experience intensifying Earth system destabilisation in the Anthropocene in diverse and increasingly unjust ways.

Framing the inquiry

Our approach over the past five years in first year design education has tried to foster social-ecological system understanding and to locate design as human activity within the frame of planetary stewardship. In this, we work with the “care - knowledge - agency” stewardship framework of the Stockholm Resilience Centre (2018), an international research centre for transdisciplinary research on resilience and sustainability science. This is ambitious within a modernist-legacy higher education institution still largely geared to extraction, perpetual growth, consumption and nation state citizenship (Latour, 2018; Sterling, Dawson & Warwick, 2018; Gren, 2023). Despite working within a progressive educational setting that advocates for sustainable change through design and co-creative pedagogies with diverse, engaged, international student groups, social structures dominate students’ and teachers’ worldviews. This is unsurprising as we struggle to uncover the ecological precedence supporting all life and co-evolving thereafter to become social, cultural, political, economic and technological in human terms.

Weighted by ecological and climate crises, many students and educators now approach design as fundamentally about solving these immense inherited problems. If we continue to demarcate these as problems to be solved in turn, our collective efforts may be misdirected:

Climate change is not something we will ever really solve. We will be managing stocks and flows of carbon in the atmosphere, ocean, land, and life for the rest of humanity's time on Earth, at least as an industrialized civilization. This is the new responsibility of our species in the Anthropocene (Rockström & Gaffney, 2021, ch. 10, para. 1).

The Intergovernmental Panel on Climate Change (IPCC) reports are now a key way we know of our status in relation to the climate. But our knowledge is increasingly first-hand and diverse as we experience climatic extremes, ecological collapse and social disruption now underway across global regions (IPCC, 2022). The central question is no longer whether climate change is happening, but how we are experiencing and anticipating its intensification, and how we exercise our species’ responsibility through our actions. The underlying root causes of the multiple, interlocking crises unfolding across global regions are often lost in the focus on symptoms: inequalities and conflicts entrenched for

centuries by colonisation and dispossession, for example, are frequently obscured by more recent climate-related events.

As teachers of design, our mid-life consciousness of deep-rooted, interlocking crises has jolted us into forming new relational worldviews of Earth system destabilisation. From this position we try to practise without reifying notions of “sustainable development” and “sustainable futures” as assured destinations (Sterling, 2016) when meeting our young adult students who share strong awareness and anxieties of living within multiple crises, with uncertain futures. Students’ affective experiences cannot be left outside the learning space for the false comfort of all present; the space must welcome whole person learning and development. To date, our strategies at the module level have centred on teaching introductory design processes as:

- Urgent, creative and adaptive action in our social-ecological systems, including identifying and relating system components and leverage points, guided by Meadows (2008)
- Practical exploration inside the systems students inhabit, starting local and increasing in scale and complexity from the individual to community to region to Earth system, and
- Experimenting with being co-citizens and planetary stewards via the challenge of a student-led design lab, to seed system changes students can carry through Years 2 and 3 as they grow their agency (see Fountain, Carleklev & Hruza (2019) and Carleklev & Fountain (2021) for elaboration on this learning design).

We are active among a growing number of designers and educators advocating systemic and relational approaches to design learning and practice (e.g. Sevaldson, 2022; Jones, 2017; Nelson & Stolterman, 2012; Ichioka & Pawlyn, 2021). These approaches reflect multiple motivations including working with complexity, cross-navigating knowledge domains, and pressing, to understand our destabilised Earth system and the need for human activity to re-organise for the survivability of living systems (Rockström, Steffen, Noone, Persson, Chapin et al., 2009; Rockström & Gaffney, 2021). As educators we are challenged to devise holistic pedagogical strategies that enable us as (typically) non-scientists to translate design processes and outcomes through to their biogeophysical effects. This refers to the complex interactions between ecosystems, the layered geologies of the lithosphere, water in all its forms in the hydrosphere and cryosphere, and the atmosphere – together comprising the relatively thin biosphere in which we live (Folke, Polasky, Rockström, Galaz, Westley et al., 2021). This is ultimately where we practise design; not within discrete parts of societies, cities or industries.

A key mission for design education, we suggest, is becoming conscious of acting within planetary limits while dismantling the modernist, life-limiting trajectories of design that have favoured progress, growth, order and reason above all else (Till, 2020). From a Western or Eurocentric perspective, there appears to be new momentum in wider design practice across traditional and emergent fields toward “life-centred” design (e.g. Lutz, 2022; Mau, 2020) and regenerative design (e.g. Ichioka & Pawlyn, 2021; Wahl, 2016). These articulations of practice often draw on the earlier cradle to cradle principles of Braungart and McDonough (2002) and biomimetic design of Benyus (1997); all advocate reconnection with nature and close engagement with living systems and cycles. Often unacknowledged, however, are their roots in enduring traditional and Indigenous worldviews and knowledge. Windows into such culturally-practised, often embodied knowledge are generously shared through the textual accounts of Indigenous scholars including Robin Wall Kimmerer (2013) in North America and Tyson Yunkaporta (2019) in Australia. While we have attempted at small-scale to foster immersive, place-based experiences through which students can engage with co-existing knowledge systems, we are growing alert to how borrowing, appropriating and re-colonising of traditional, folk and Indigenous knowledge and wisdom can persist in seemingly new articulations of design paradigms that we reference and assimilate with students.

Our design inquiry

We have been iterating and adapting our pedagogic practice in design processes since 2019, while being involved in wider institutional responses to climate crisis across two universities on different continents. Once emerging from the pandemic we could take stock, creatively diverge from our established learning design, and proactively shape curriculum directions. Positive student feedback expressed via formal evaluations, progression interviews (between individual students and the program coordinator) and end-of-module reflective writing since 2019 suggested that if we could open up our practice, it could possibly make a contribution to wider design education. During summer 2022 we each wrote and exchanged a critical reflection on our co-teaching to date and then workshopped potential directions for our ongoing design research. We questioned the kinds of knowledge, skills and experiences we were

actually fostering with students, and what we could expect of the projects and/or the design processes in the face of the complexity and precarity of global conditions. This invited an inquiry more wide-ranging and open-ended than the enclosed space of a case study approach; by contrast our methodology needed to bridge sense-making and critical scrutiny of current practice as well as offer discovery and insight for future practice.

To this end, we partnered with transdisciplinary scholar Martin Gren who has been involved at the Masters level in the design program for the past seven years and agreed to fulfil the role of discussant in our inquiry. A professor of human geography, he has published a body of academic work on the Anthropocene (e.g. Gren, 2017; Gren & Huijbens, 2016) and new Earthly climatic regime. A key thread through this work is critical questioning and challenging of the dominant worldviews, spatial concepts and language that Gren’s original discipline of geography has propagated to the Earth’s detriment. Gren is also a white, European male in mid-life which makes his position one of considerable privilege. Through him we gained proxy access to emergent fields beyond our own (e.g. planetary health, climate emergency studies) and to higher level institutional and public debates in which he was active. He had just authored a discussion paper (Gren, 2023) for a project led by the second author (Carleklev) which explored the implications of the climate crisis on research, education, and societal collaboration in the Faculty of Arts and Humanities at Linnaeus University. We both experienced the discussion paper as ontologically challenging – ideal therefore for activating our inquiry with a highly relevant and timely provocation. We also judged Gren to be an opportune discussant given his affinity with the design program and its change- and justice-seeking ethos. From this initial provocation paper we devised the design inquiry in Figure 1, noting that we understand and enact our co-teaching in design as design research embedded in pedagogic practice.

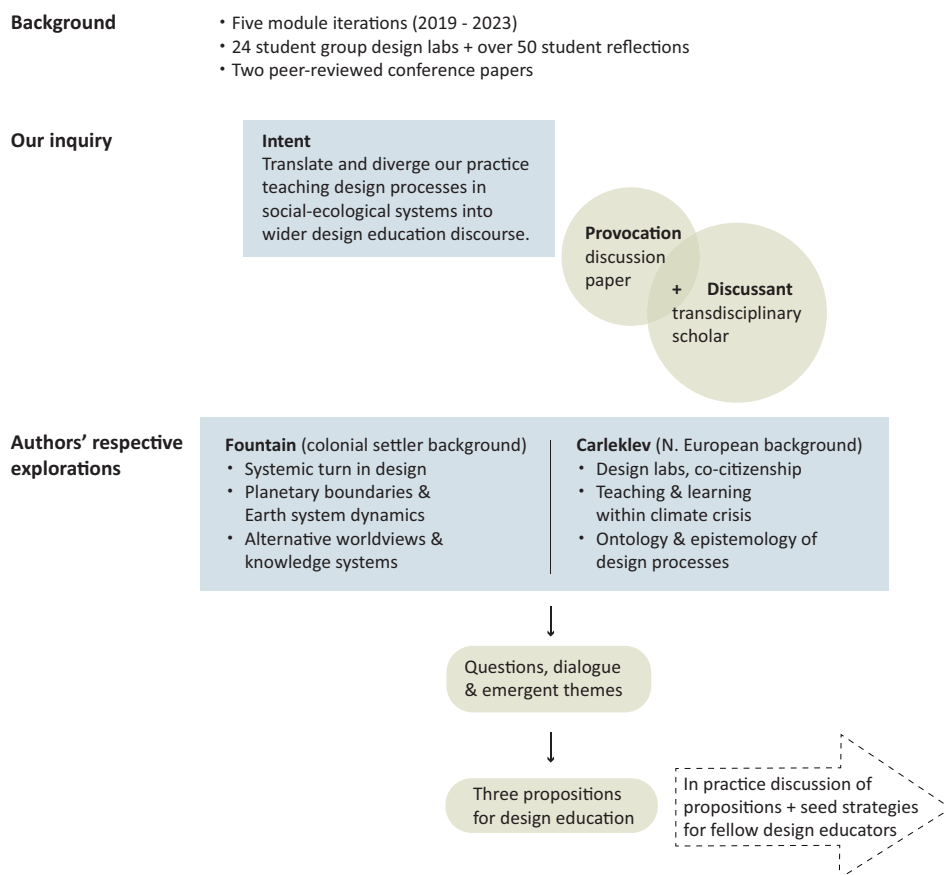


Figure 1. A visual overview of our design inquiry

In response to reading the discussion paper in early 2023, we (the authors) each identified three resonant topics we were personally inspired to explore more deeply and then synthesise into new insights for our design co-teaching.

These spanned direct aspects of our practice – systemic design, co-citizenship and design labs for example – and scaled out to larger ontological and epistemic questions arising from living within climate and planetary emergency. We then re-read the provocation paper and reviewed our collective insights (using the Miro collaboration platform) to draft five questions to pose to our discussant prior to a semi-structured, two-hour recorded discussion via Zoom.

The questions posed to the discussant reflect our searching knowledge gaps: how can we become Anthropocene citizens (and/or planetary stewards) within design? How might we progress design within a “geoversity” or Earth system university? These are terms coined by our discussant (Gren, 2023) to challenge the entrenched modern university, and to offer concepts beyond disciplines that pitch sciences against humanities. We also probed obstacles: questioning the logical limits of our current language and concepts such as hope (which Head (2016) argues is only useful if practised rather than felt); and asking whether all formal education is inherently modern i.e. reductive, future-focused and progress-seeking? Throughout, we were also alert to emergent openings to expand our thinking and conceptual territory.

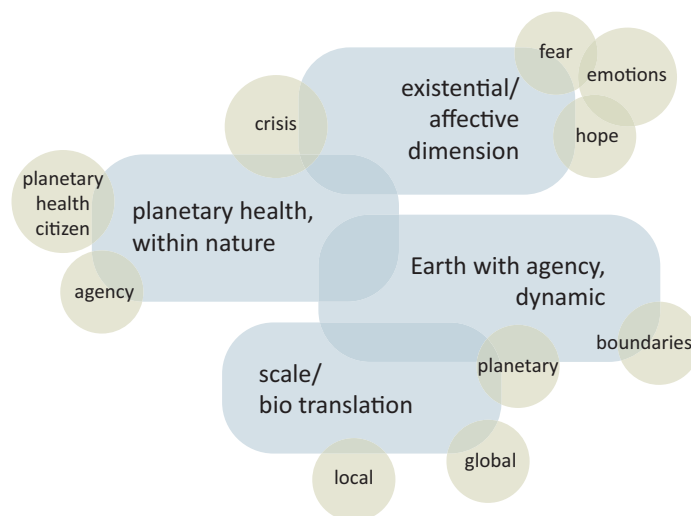


Figure 2. Four key themes and sub-themes emerging from our dialogue with discussant

Emerging from this rich discussion we identified four key themes and sub-themes, arranged in Figure 2, that we subsequently unpacked in dialogue with relevant literature and artefacts of our reflective practice (our writing, collected practice examples and conceptual mapping on Miro). These thematic analyses formed the basis of propositions that we iterated and re-ordered into three urgent propositions for design education, as set out in the next section. We elaborate each proposition with reference to the sub-themes in our context of co-teaching introductory design processes within social-ecological systems. Each proposition includes a practice focus in which we suggest how our pedagogical strategies have played out, or might be evolved as seed strategies – bridging our current and future practice with students.

Proposition 1 – Live with, not on Earth

The first of the three propositions for design education is to work toward a dramatic shift in perception that moves us from a common but misleading understanding that we live on an earth as a solid body of matter or a stable backdrop (Gren, 2023), to experiencing that we are living with and within an earth system. In order to apprehend the dynamism and agency of this now destabilised earth, Latour urges big “e” Earth, a proper noun, which “gathers together all existing beings” ... [and] “comprises all the agents - what biologists call ‘living organisms’ - as well as the effect of their actions” (Latour, 2021, p. 25).

The concept of the Anthropocene is increasingly used to signal our current, post-Holocene geologic epoch and the global-scale effects of human actions. It is at the same time contested, not least for blithely attributing its anthropogenic causes to all global peoples, irrespective of their vastly unequal impacts on Earth. The concept is arguably still useful for making clear that our actions – individual and collective – are intertwined with the Earth

systems that make all life possible (Folke et al., 2021, p. 838). Our futures are inseparable from that of Earth, and prepositions matter: we live with, not on.

Unpacking our being and interconnectedness with Earth is a priority for design education. Narratives of “sustainable futures”, “taking care of the environment”, or even attempting “to solve the climate crisis” are pervasive in design programs in our experience. As well-meaning as these are, they obscure the scale and complexity of Earth system destabilisation in which climate change and biodiversity loss are only the headline symptoms (Rockström & Gaffney, 2021). They also obscure that we are inescapably part of the living biosphere and increasingly subject to unpredictable Earth system dynamics which beg entirely new ontologies in design. In these, we need to move well beyond taken-for-granted and fragmented concepts such as “environment”, “resources” or “waste” under human command.

In our practice: live with, not on Earth

Living with Earth is a challenging concept in our design teaching. While we have woven in more engagement with Earth system science (via Stockholm Resilience Centre resources and guest experts) since 2019, it is always a challenge to make visible bio- and geophysical dynamics at scales tangible to students. To date we have tried to support immersive experience of, and mapping students’ own social-ecological systems with attention to cross-scale and human-nature relations. Food systems have proven particularly powerful in exemplifying the interwovenness of culture and nature. While we stress a need for biogeochemical translation in design in Proposition 3, we recognise that being with Earth needs to be explored holistically. In Lesley Head’s characterisation of becoming conscious inhabitants of the Anthropocene, we “... understand the many ways we are embedded in the earth – materially, ontologically, historically, biogeochemically – in the processes of the earth” (Head, 2016, p. 215). But our inquiry made clear that changing the narrative of our separation from nature (Wahl, 2016) will be a continuous exploration in which we can encourage a wider diversity of student design labs reflective of students’ own diversity and connections to place (noting the need to be sensitive to some students’ refugee and oppressive regime backgrounds).

Being with Earth clearly involves interwoven social dimensions for which we have grounded students’ learning of design processes in the concept of co-citizenship. We borrow the term from the works of Johan Rockström, while expanding its scope to encourage students to extend their design concerns to all living organisms. We can now build on these values with guidance from the Planetary Health Education Framework (Planetary Health Alliance, 2021), the goal of which is to nurture the development of planetary health citizens – painting a very different kind of human than a “health worker”. The Planetary Health Education Framework (Figure 3) embeds humans within nature and integrates diverse knowledge beyond disciplines; modern health disciplines are subsumed yet interwoven within a bigger set of concepts and urgent imperatives. This planetary health exemplar suggests various pathways for how diverse students might become planetary health citizens without a single, dominant prescription – which is allied with what Redström (2020) describes as the ever-expanding territory and ongoing practices of designing design. In the module space we can frame students’ inquiries within design processes in a new way, as Wahl (2016, p. 29) suggests: “... to shift our attitude and goal to our appropriate participation in these systems, as subjective, co-creative agents”.

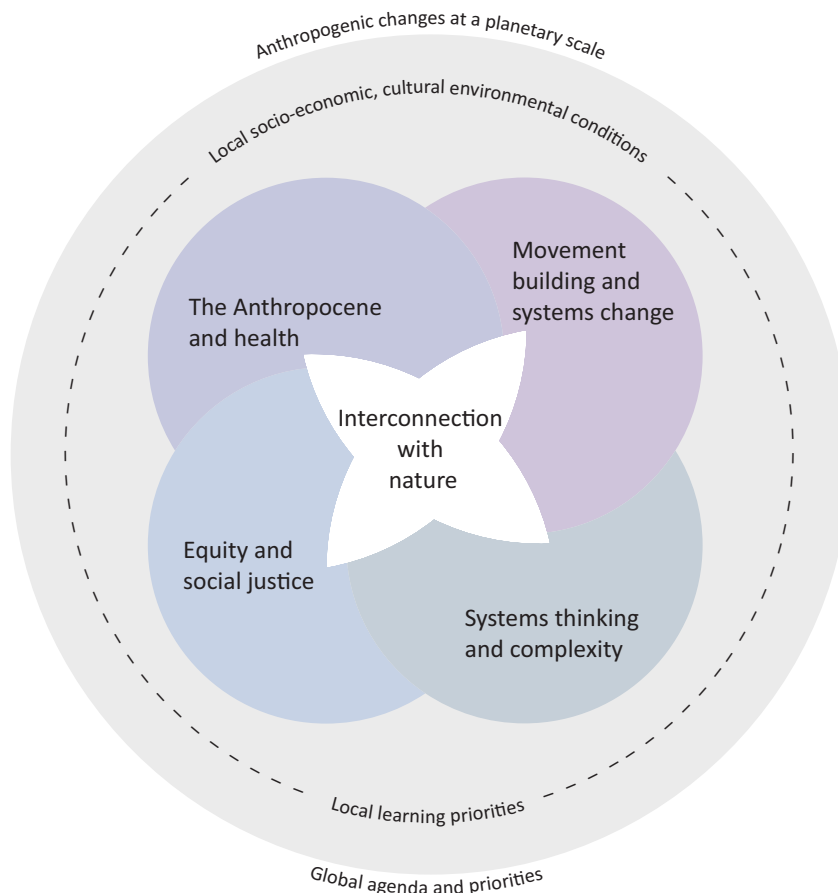


Figure 3. Redrawn after Planetary Health Education Framework (2021). An intertwined cross-section, based on the wound structure of rope, that illustrates the interdependent and interconnected domains.

Proposition 2 – Let go of being modern

Our second proposition questions the validity of the Eurocentric, modernist legacy in higher education that continues to prepare students to be actors in society and the economy with Earth as a backdrop (Gren, 2023). If we become conscious to our interwovenness with Earth (Folke et al., 2021; Latour, 2021; Planetary Health Alliance, 2021; Head, 2016) and anticipate the projections of the IPCC (2022) or worse, we must ask what is education now for, and design education therein? If design is now in need of new ontologies as we suggest, what and how we are to know in design learning can be alive to pluriversal re-thinking and restructuring. In dominant techno-modernist worldviews, epistemologies of design are finetuned toward goals that still fail to heed Earth-bound limits. As Till reminds, design has not just been a servant to the modern project, but still shares much of its deterministic logic including progress and growth (Till, 2020, p. 4). This accelerates daily, for example, via the global technology giants who are determining our futures with disproportionate, non-democratic power.

In design education we need to let go of logics deriving from the relatively stable Holocene, that are now destructively unjust and life-limiting in our current contexts. The planetary health field highlights that particular aspects of the modern era, such as medical science and improved global health outcomes, can be carried and restructured into new ontologies. A being with Earth perspective makes clearer that the outcomes of most design practices directly and indirectly impact the social and ecological determinants of human health, which are nested within planetary health (Planetary Health Alliance, 2021) and need to be recognised as such. In practice, this could mean being tactical regarding our agency as educators, investing our energy in evolving design towards relational and responsible practices that act outwardly for planetary health and equality from inside the still-modern academy. Letting go of being modern also means being committedly reflexive: alert to stubborn mental models that embolden us to think our design agency can even tackle powerful structures of this magnitude.

In our practice: let go of being modern

We will continue to work in a generative way with the question posed by Head (2016): what does it mean to inhabit the Anthropocene? In our case, we ask: what might it mean to practise design within the Anthropocene? As Anthropoceneans, Head urges, we need to address the emotional work demanded, live with uncertainty, practise relational not linear concepts of progress and causation (in design) and live with multiple temporalities and concepts of time (Head, 2016, pp. 167-172). These concerns do not feature often in the outcomes-based curricula of higher education in service to industry demands and graduate employability.

Despite all the Anthropocene is yet to demand of us, as Keri Facer reminds, we are also living in times that are “... equally characterised by ingenuity and exploration, by invention and reinvention of old ideas” (Facer, 2019, p. 1). We will continue to question the validity of the Eurocentric, modernist legacy in design and the forms of design learning needed for ingenuity and exploration. We have already taken steps in our co-teaching practice towards plurality in ways of knowing, seeing and doing, and have de-focused design artefacts in favour of facilitating design processes as inquiry, systems and interventions, as well as encouraging cooperation and collaboration both among students and the systems they inhabit.

There is more we can do, however, in these systems we inhabit with students. We need to host more diverse design learning spaces “... where hope and trust might be developed not as an escape from the admittedly violent times we are living in, but in and through an awareness of the other qualities that our times also have – generosity, love, anger, fear, friendship, collegiality and care – built through the collective encounter with the complexities of the present” (Facer, 2019, p. 13). In the learning spaces typical to design education, our discussant also pointed us to the invisible rules we invoke that can be open to challenge if made visible. Why, for example, are design projects presented in the manner they typically are? Is it because we are dutifully emulating industry practices of pitching and persuasion that serve imaginary clients’ interests? Can we instead embrace the incompleteness of our knowledge, and the need for ongoing inquiry, instead of pretending that a design project outcome represents an answer or solution for interests that often remain unspoken? With students we will make more space for exploring alternatives to our default problem solving mindsets, and as suggested by Wahl (2016, p.19), favouring questions and lived inquiry over answers.

There are more questions for us to ask regarding skills, knowledge and attitudes that might co-determine how we practise design in the Anthropocene, and for identifying those modernist legacy mindsets and skillsets that work counter to planetary health. While starting to address these questions would extend the possibilities of this paper, we will not answer them from a narrow, professional point of view but with an understanding that the educational question goes way beyond preparing students for being actors in society and the economy. It is according to Gert Biesta (2021) the question of the “I” – not the “I” only interested in itself, but the “I” existing in-and-with the world, or in being with Earth.

Proposition 3 – Translate action with Earth

This proposition recognises that all human activities, design included, have complex interactions with and will sooner or later land within the biosphere. If we aspire to live as planetary stewards, it is no longer only the responsibility of scientists to translate human impacts through to their likely biogeochemical effects at the scale of the biosphere. We need to co-develop with students and colleagues new biosphere intelligence by partnering across knowledge domains to test and iterate methods of “bio-translation” – coined by Gren (2023) and the short form of biospheric translation. Integral to all design processes, this would involve working with the scales used in ecological and Earth system sciences to evaluate the impacts of our design decisions. New partnerships would hinge on bridging or boundary actors working with ongoing scientific translation as ecological and social systems co-develop (Folke et al., 2021), and by respecting cultural knowledge holders whose ways of being fit neither category neatly (Kimmerer, 2013).

There is still so much to be made possible by design processes. No less than six global systems need to be entirely transformed within the decade, according to Rockström and Gaffney (2021, ch. 9, para. 18) for any chance of slowing Earth system destabilisation: energy, food, inequality, cities, population and health, and technology. To this we add a cross-cutting seventh system – education – as signalled in the opening quote by Stephen Sterling (2023). Design action at the scale of localised projects remains critically important in bio-translation, however, as entry points and potential levers of larger scale system transformation. Localised scales are where we often have agency as designers – whether student, professional or otherwise – and where we can begin to evaluate our appropriate participation.

In our practice: translate action with Earth

Our students' design labs have originated in their local social, cultural and ecological concerns centred on campus. Their explorations and action to date have spanned power relations in change making, cultural inclusivity, gender, stress and wellbeing, consumption, disaster readiness, food, waste, recycling and energy. To suggest bio-translation more tangibly in design processes, we can sketch an example in which students propose to design a local system that connects their campus-related organic food growing (a real current activity) with existing food security initiatives in the region. An integrative framework could be applied for ideation, iteration and evaluation, such as the Wayfinder model that nests a safe and just space for humanity within the nine planetary boundaries (see Enfors-Kautsky, Järnberg, Quinlan & Ryan, 2018). Working cross-scale, the soil health and microbial life would be traced through to the nitrogen and phosphorus boundary, carbon capture potential to the climate boundary, water cycling to the local and regional hydrology and out to the water boundary. Decisions around transporting and distributing food, for example, might be most guided by the social dimensions of the safe and just model, while still being evaluated integral to the planetary boundaries. Any such attempt would need to be in collaboration with bridging members of the teaching team from relevant fields of science and regional actors.

In experimenting with bio-translation we risk becoming overly focused on our considerable scientific knowledge gaps and losing grasp of our holistic values. We can however proceed to trial approaches that are fundamentally guided by transformative pedagogies (e.g. Sterling et al., 2018). Connecting to Proposition 2, we can start problematising, for example, the staple format of project-based learning in design, as urged by our discussant. We can question the assumptions baked into its typical sequence: a design process leads to an outcome (artefact, system, environment, performative event etc.) which is evaluated by teachers and peers. Upended, we could facilitate experimental design action first in order to set off processes of bio-translation as the "project". Students might collectively determine which bio-positive design propositions should proceed depending how their effects land in the biosphere as the "outcome". At module level, we could alternatively begin with bio-translation of the previous module's design outcomes to steadily grow a culture of continuous bio-translation competence akin to lifelong learning.

Viewing transdisciplinary practice as a survival mode, our design teaching should be flexibly team-based as sketched above and soundly representative of ecological and social systems knowledge so that Earth system knowledge also co-develops side by side with students. While we agitate for such formations to become normalised, we can more immediately self-audit the knowledge domains we unwittingly privilege in our design teaching. We need to be especially alert to those inevitably simplified models, causal diagrams and heuristics of Eurocentric, modernist lineage that could undermine our first forays into the humbling complexity of bio-translation in design processes.

Summing up the openings

Design education – in which crucial roles for design in the Anthropocene include bio-translation for planetary health and making possible urgent transformations – can be active within at least seven whole system transitions: energy, food, inequality, cities, population and health, technology and education cross-cutting all. We have offered three propositions – not prescriptions – for the direction of design education in this mission that may contribute useful provocations for evolving design learning within readers' contexts: live with, not on Earth; let go of being modern; and translate action with Earth. The propositions flow from both committed reflective practice and engagement with a particular discussant. We recognise that engagement with other scholars would have led to different insights; this is arguably true of all design inquiries which set off subjective, emergent dynamics between multiple actors in particular ecological, social and temporal contexts.

Consistent with design inquiry, we need to project forward with anticipation and evaluate the implications of the three propositions and the seed strategies we offer from different perspectives. Doing so exhaustively would take us beyond the scope of the paper, but we can venture initial perspectives relating to students, colleagues and curriculum focusing on bio-translation in the first instance for its potential to also nest the first and second propositions. Our students are typically motivated and impatient to learn how to "do sustainability" and make informed, justice-seeking decisions for action. Hands-on and well-supported bio-translation design labs would likely be welcomed by students for making tangible the cross-scale connections between Earth system concepts such as the planetary boundaries, "with Earth" mindsets and local, place-based ecological learning. To make this a reality we would need to assemble a willing bridging team with colleagues from the sciences to co-create the design labs. Not all colleagues would be willing, nor comfortable to work outside their disciplinary and research cultures without incentive. Scaling out such social-ecological bridging teams would of course be extremely challenging and disruptive to the way institutions organise their human labour and expertise. Design curriculum conventions would also be challenged and disrupted,

notably those learning outcomes favouring resolved projects and presentations as solutions over evaluating skills of inquiry and exercising judgement as to enacting design as bio-translation and appropriate participation. As system design practitioners, however, there is clearly a case for seeking out the system leverage points within our institutions. These initial perspectives signal potential next steps for our design research: experimenting with bio-translation design labs at the localised scale of co-teaching introductory design processes with first year students.

In the many Western, industrialised contexts where design education remains in service to perpetual growth and “progress” contingent on exploitation, educators have varying scope for critically confronting the limits of destructive techno-modernist constructs and the arrogance of problem solving by humans-in-command. Earth systems are de-stabilising at pace and our disciplinary knowledge canons are proving incomplete and rooted in past logics. The planetary health field offers a beacon in this respect and demonstrates that long-established disciplines and scholars can collectivise and reorganise ontologically and epistemologically – though likely not without ruptures and conflicts. To evolve our designing with Earth thinking, we have much to learn from engaging our research further with planetary health practitioners and also fellow designers already active in these spaces.

The efficacy of the seed strategies we have set out, grounded in our particular practice, will depend on us continuing to upend our deeply-structured mental models, leveraging the systems we inhabit and carefully exercising our relative agency – which we recognise is miniscule relative to Earth’s agency. A key part of proceeding with crucial humility is connecting, engaging and learning with diverse wisdom as we commit to designing with destabilised Earth.

Acknowledgements: We extend deep gratitude to our discussant Martin Gren who has helped provoke shifts in our perception and understanding. We thank the scholars who have helped transform our shared grief into generative practice, and the students and colleagues who have shared this journey to date. Grateful thanks too to the anonymous reviewers who generously provided their constructive feedback.

References

- Biesta, G. (2021). *What's the point of education?* Keynote address, Konstfack Research Week, 27 January 2021.
- Benyus, J. (1997). *Biomimicry: innovation inspired by nature*. William Morrow.
- Braungart, M. & McDonough, W. (2002). *Cradle to cradle: re-making the way we make things*. North Point.
- Carleklev, S. & Fountain, W. (2021). Co-citizen design labs in resilience making. In E. Brandt, T. Markussen, E. Berglund, G. Julier & P. Linde (Eds.), *Proceedings of NORDES 2021, Matters of Scale: Proceedings of the 9th Nordic Design Research Conference*, Kolding, Denmark (pp. 318-327).
- Costanza-Chock, S. (2020). *Design justice: community-led practices to build the worlds we need*. MIT Press.
- Enfors-Kautsky, E., Järnberg, L., Quinlan, A. & Ryan, P. (2018). *Sustainable development in the 21st century*. Retrieved June 2, 2023, from <https://wayfinder.earth/the-wayfinder-guide/introduction/why-wayfinder-is-needed>
- Escobar, A. (2018). *Designs for the pluriverse: radical interdependence, autonomy and the making of worlds*. Duke University Press.
- Facer, K. (2019). Storytelling in troubled times: what is the role for educators in the deep crises of the 21st century? *Literacy*, 53: 3-13. DOI:10.1111/lit.12176
- Folke, C., Polasky, S., Rockström, J., Galaz, V., Westley, F. ... Walker, B. (2021). Our future in the Anthropocene biosphere. *Ambio* 2021, 50, 834-869. DOI:10.1007/s13280-021-01544-8
- Fountain, W., Carleklev, S. & Hruza, S. (2019). Making resilience through design doing. In J. Häkkinen, M. Pakanen, E. Luiro, E. Mikkonen & S. Miettinen (Eds.), *Proceedings of Cumulus Conference Proceedings Rovaniemi 2019: Around the Campfire – Resilience and Intelligence* (pp. 83-91).
- Gren, M. (2023). *Från klimatkris till civilisationskris* [From climate crisis to civilisation's crisis]. Climate Crisis Report: Appendix, Faculty of Arts and Humanities, Linnaeus University, Sweden.
- Gren, M. (2017). Mayday – a letter from the Earth. In M. Nieuwenhuis & D. Crouch (Eds.), *The question of space: interrogating the spatial turn between disciplines*, pp. 167-179. Rowman & Littlefield.
- Gren, M. & Huijbens, E. (Eds.). (2016). *Tourism and the Anthropocene*. Routledge.
- Head, L. (2016). *Hope and grief in the Anthropocene: re-conceptualising human-nature relations*. Routledge.
- Ichioka, S. & Pawlyn, M. (2021). *Flourish: design paradigms for our planetary emergency*. Triarchy.
- Intergovernmental Panel on Climate Change (IPCC). (2022). IPCC Sixth Assessment Report: Impacts, Adaptation and Vulnerability, Fact Sheets. Retrieved March 13, 2023, from <https://www.ipcc.ch/report/ar6/wg2/about/factsheets/>
- Jones, P. (2017). The systemic turn: leveraging for world changing. *she ji: The Journal of Design, Economics, and Innovation* 3(3), Autumn 2017, 157-163. DOI:10.1016/j.sheji.2017.11.001
- Kimmerer, R.W. (2013). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge and the teachings of plants*. Penguin.
- Latour, B. (2018). *Down to Earth: politics in the new climatic regime* (C. Porter, Trans.). Polity.
- Latour, B. (2021). *After lockdown: a metamorphosis* (J. Rose, Trans.). Polity.
- Lutz, D. (2022). *Life-centred design*. Retrieved May 22, 2023, from <https://uxdesign.cc/life-centred-design-96965acdcbf4>
- Mau, B. (2020). *MC24: 24 principles for designing massive change in your life and work*. Phaidon.
- Meadows, D. (2008). *Thinking in systems*. Chelsea Green.
- Nelson, H.G. & Stolterman, E. (2012). *The design way: intentional change in an unpredictable world* (2nd ed.). MIT Press.
- Noel, L-A. (2022). Designing new futures for design education. *Design and Culture* 14(3), 277-291. DOI: 10.1080/17547075.2022.210524
- Planetary Health Alliance (2021). *Planetary Health Education Framework*. Retrieved May 8, 2023, from <https://drive.google.com/file/d/1wg2zJnKj-wlGN5qK8EXCOY2lqUwMUQNV/view>
- Redström, J. (2020). Certain uncertainties and the design of design education. *she ji: The Journal of Design, Economics and Innovation* 6(1), Spring 2020, 83-100. DOI:10.1016/j.sheji.2020.02.001
- Rockström, J. & Gaffney, O. (2021). *Breaking boundaries: the science of our planet*. Dorling Kindersley.
- Rockström, J., Steffen, W., Noone, K., Persson, Å. ... Foley, J.A. (2009). A safe operating space for humanity. *Nature* 461, 472-475. DOI:10.1038/461472a
- Sevaldson, B. (2022). *Designing complexity: the methodology and practice of systems oriented design*. Common Ground.
- Sterling, S. (2016). Commentary on education and sustainable development goals. *Journal of Education for Sustainable Development* 10(2), 208-213. DOI:10.1177/0973408216661886

- Sterling, S., Dawson, J. & Warwick, P. (2018). Transforming sustainability education at the creative edges of the mainstream: a case study of Schumacher College. *Journal of Transformative Education* 16(4), 323-343. DOI: 10.1177/1541344618784375
- Sterling, S. (2023). *Key ideas: bite-sized Sterling*. Retrieved May 29, 2023, from <https://www.sustainableeducation.co.uk/key-ideas/>
- Stockholm Resilience Centre. (2018). *Stewardship: a user's manual*. Retrieved May 20, 2023, from <https://www.stockholmresilience.org/research/research-news/2018-09-18-stewardship-a-users-manual.html>
- Subcommission on Quaternary Stratigraphy. (nd.). Working Group on the 'Anthropocene'. Retrieved October 20, 2023, from <http://quaternary.stratigraphy.org/working-groups/anthropocene/>
- Till, J. (2020). *Design after design* [lecture transcript, September 23, 2020]. Retrieved May 20, 2023, from <http://www.jeremytill.net/read/131/design-after-design>
- Tunstall, E. (nd.). *Elizabeth (Dori) Tunstall on designing for respect*. Retrieved May 29, 2023, from <https://www.deemjournal.com/stories/dori-tunstall>
- Wahl, D.C. (2016). *Designing regenerative cultures*. Triarchy.
- Yunkaporta, T. (2019). *Sand talk: how Indigenous thinking can save the world*. Text.

About the Authors

Wendy Fountain is a designer, researcher and educator working with regenerative practices including formal and informal learning ecologies. She holds a PhD in Urban Design from the University of Tasmania and is currently involved in co-developing new design education in the UK.

Stephanie Carleklev is a Senior Lecturer in Design. She holds an MFA in Design from the University of Gothenburg and has developed a broad, holistic and relational design research practice. As a scholar and designer she is committed to re-imagining the design of design education, and higher education more broadly.