Reconfiguring the Soft Operation Field: Architecture of Collective Metabolisms

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How to Cite
Eda Yeyman and Ayse Sentürer, 'Reconfiguring the Soft Operation Field: Architecture of Collective Metabolisms', *Footprint* 36 (2025): 61–74 , https://doi.org/10.59490/footprint.19.1.7497

Submitted 31 March 2024
Revised 16 October 2025
Accepted 29 January 2025
Published 20 June 2025

Abstract

The evolution of architecture calls for a redefinition of materialism, urging a departure from deterministic systems towards non-linear causality and systems far from equilibrium. This entails recognising the dissolution of human-in-human boundaries and advocating for tactile and sensory bodies that initiate metabolic changes by penetrating environments. Isabelle Stengers critiques the tendency to frame thought within pre-existing planes, labelling it as stupidity, and advocates for an architecture that proliferates rather than condemns.

With this article, we propose to explore architecture's singular conditions through the concept of trans-scalability, akin to transitioning from micro-subatomic to macro scales. We look at what enables transitions between scales, agents, fields and the realms of theory and practice. Additionally, we scrutinise how spatial construction practices, influenced by non-cartographic scale considerations and engaged with micro-subatomic dimensions, can impact contemporary architectural practices. To illustrate this, we present an alternative approach to transscalability through the work of Rachel Armstrong. With this new material reading, our aim is to view architecture as an interface between the world's multiplicities and to explore how an architectural practice more attuned to the intersecting dynamics of various fluxes can be realised. With this approach, we aim to contribute to perceiving the world through its unstable and temporary material dimensions, thereby resisting stupidity.

Keywords
Micro-macro, transscalability, transitions, posthuman, experimental architecture

The dissolution of human-non-human boundaries, the transformation of time into a material process, and the awareness of architecture's capacity to intervene in the flows and metabolisms within it indicate the need to redefine the conditions of materialism for architecture. The understanding of matter as passive, silent, stable and unchangeable is now outdated, as it implies that matter can only be manipulated by the designer. This shift where 'matter is empowered not just as an aspiration but as a reality' alters the relationship between architecture and matter, allowing the 'agency of matter to speak'.[1]

Given that the material world is dynamic and changeable, it is better to think of its effects in systems that are far from equilibrium rather than deterministic systems. To establish such a relationship with materialism, it is essential to conceive of life as metastable too, as Andrej Radman suggests.[2] This 'metastable milieu' is constantly on the edge of equilibrium and disequilibrium and always on the verge of collapse.[3] In this context, the emphasis is not solely on architecture itself, but on the invisible forces that enable architecture, and the object of design is not only to create space in a Cartesian void, but also to be aware of all the physiological, biological, electromagnetic and chemical

ISSN: 1875-1504
p-1875-1490 e-1875-1504

layers that the space encompasses.[4] Rachel Armstrong takes this a step further and argues that 'today's architecture should consist of tactile and sensory bodies that penetrate, orbit, and seep from their environments.'[5] Therefore, Armstrong sees architecture as part of a 'broader metabolic series, even capable of initiating a new one, in which architecture not only alters its own bodily form but also changes its surroundings.'[6] This perspective on metabolism focuses on observing the micro-scale effects by dissolving the architectural object, and thus emerges as a way of thinking, imagining, and relating to both humans and non-humans, emphasising their interconnectedness. This interconnectedness also challenges the distinction between living and non-living, bringing architecture closer to living systems that continuously adapt to new configurations as their environment changes and resists equilibrium. Such an approach fosters the development of an alternative form of architectural practice, one that addresses the challenges of an unstable world not as a one-time solution, but as an ongoing process, integrating the parallel evolution of heterogeneous elements into design thinking. Two points become clear in this context: first, that it is inevitable for architecture to establish relationships beyond its own scale and connect with the wider world; and second, that architecture must embrace a constant state of flux, where every relationship formed is momentary and temporary.

Working with far-from-equilibrium systems or non-linear causality signifies the emergence of an architecture that can engage with the micro-subatomic dimension and establish interactions that span different scales. This situation signifies a jump to an entirely different scale, making the connection between microscopic bacteria and planets visible. This jump occurs because the spectrum of scale that architecture mediates is neither continuous nor holistic. Instead, as Reza Negarestani points out, 'when different scales converge, discontinuities arise, as the rules, functions, and modes of operation at each scale act independently.'[7] Thus, it is not possible to extend an idea or understanding from microscopic particles to the macro scale, since the behaviour of matter changes entirely. The inability to address scales through top-down or bottom-up reductionist approaches indicates that interscalar relationships must be approached differently. Andrés Jaque's view of transscalability is crucial here.[8] Jaque suggests that architecture is inherently trans-scalar. However, for Jaque, the transscalability of architecture centres on the idea of togetherness as being inherently plural, interscalar and multi-dimensional. Another important dimension of this togetherness is that it is not a matter of choice; it reflects the way existence is fundamentally composed, across various times, scales and forms of life.[9] When thinking about transscalability, building this sense of togetherness requires new approaches through which common ground between human and non-human, living and non-living, and micro and macro scales is created. More importantly, it necessitates thinking beyond these pre-given frameworks or categories. Similarly, Gilbert Simondon criticises the assumption that relations come after the formation of terms (subjects, individuals, objects, groups). According to him, these relations are established prior to and for any individuation. Contrary to the notion that the cosmos is pre-constructed from individuals at the macro, meso and micro scales, encompassing galaxies, planets, humans, animals, plants, technical objects, atoms and subatomic particles, Simondon focuses on the continuities within the relational ground that enable individuation. Here, there is no distinction of the individual; instead, there is an infinite variety and differentiation obtained through the thickening and thinning of potential fields.[10] In this way Simondon highlights that scales and human-non-human categories are not fixed, but rather emerge as the result of relationships formed through a process, and every relation within that process is momentary and temporary.

In this context, where categories are not fixed and relationships are temporary, architecture that penetrates its environment should be focused not on reducing the scales and agents it mediates to a unified, homogenised whole, but on embracing the differences and multiplicity of scales, agents and entities. Moreover, for Armstrong an architecture that includes this multiplicity (scale, agency and so on) does not work with organised constellations of parts. Instead, it uncovers a series of transformations, jumps, deviations and transitions – characterised by partial goals, phase shifts and temporary structures.[11] An architectural practice that homogenises and reduces categories misses the opportunity to produce a difference each time by not engaging with the spatial-temporal plane upon which architecture builds its design thinking. Stengers advocates for an architecture which that does not belittle, condemn or eliminate actors and agents, but aims only for their proliferation. She refers to cosmopolitics, an approach that acknowledges the involvement of various entities and perspectives intertwining in the construction of knowledge and the shaping of the world. This approach considers the plurality and diversity of voices as both forms of existence and knowing.[12] Stengers criticises the tendency to frame a thought not as a contrast but as a contradiction by grounding it in pre-existing distinctions, thereby 'failing to see multiplicities'. [13] She labels this attitude 'stupidity'.

Stengers argues that stupidity should not be seen as a 'temporary unconsciousness or a psychological state; it should not be reduced to a state of drowsiness, passivity, or the mind being asleep'.[14] Stupidity is primarily characterised by a certain admiration for false problems, 'hellish

alternatives'; it is a kind of laziness or mental fatigue that manifests itself as 'natural' in every situation. Moreover, stupidity is described by a continuous confusion between the trivial, the ordinary, and the singular, an inability to understand what is important, a condition of homogenisation.[15] Stengers emphasises the irrelevance of questions about knowing the world beyond human experience, critiquing the 'bifurcation of nature' as rooted in false problems. These false problems arise because the issues remain as problems of planes that were previously separated and constructed, but whose modes of construction are no longer questioned. In this situation, despite being presented as 'real', the separation between two imagined planes leads thought into a completely abstract space where all practical considerations are lost. Then, the thought, lost within its own constructions, oscillates between a reality that is merely the virtual image of its own abstraction and a subjective experience devoid of any essence.[16] Thus, one cannot select what is important among thoughts that establish two separate planes, missing the multiplicity. The problem here is that contradictions turn into oppositions and eliminate each other. Stengers likens this situation to 'Platonic philosophy, which labelled all modern practices – scientific, medical, political, technological, psychoanalytic, pedagogical – that disqualified others as charlatans, populists, ideologists, astrologers, magicians, and hypnotists.'[17]

Stengers refers to the lack of creativity that arises from thinking within existing frameworks as 'stupidity', which corresponds to two separate yet intertwined situations in this article: the failure to recognise a heterogeneous mode of production by separating agents into human and non-human, and the tendency to view scale as an outcome independent of the process by interpreting interscale situations through fixed scale frameworks. Accordingly, based on the idea that different frameworks are only temporarily stabilised, in this article we focus on constructing transitions between them rather than isolating and separating them. From this perspective, translation serves as the means to establish communication between systems, aiming to identify the conditions for the most inclusive interaction possible.[18] Translation here refers not to interpreting or explaining the implicit, but to maintaining the continuity of a state of transformation – in other words, embracing ongoing movement. According to Stengers, this also means keeping thought in motion and avoiding its transformation into a fixed endpoint or final recognition. She suggests that creating transitions between theory and practice can prevent holistic and hylomorphic tendencies.[19] The question that needs to be addressed, as Stengers suggests through the concept of creating 'relays', is how these transitions can be achieved.[20] In this regard, Radman argues that Stengers's proposal is similar to Gilles Deleuze and Félix Guattari's concept of 'generalized chromaticism'.[21] According to this concept, every element is constantly subjected to variation, resulting in the emergence of new distinctions, none of which are ultimately fixed or predetermined.[22]

Building on Stengers' discussion of stupidity, in this article we explore transitions between scales, agents, fields, theory and practice through the concept of transscalability. We focus on new design thinking that enables architecture to encompass scales ranging from the micro-subatomic to the planetary. The aim here is to understand how an architecture that starts with micro-scale configurations and incorporates interscalar jumps can influence spatial practices, and to explore how an architectural practice more attuned to the intersecting dynamics of various fluxes can be realised. We argue that an architecture capable of facilitating communication between various fluxes and systems can only be achieved through an alternative mode of making and design thinking. We consider Rachel Armstrong's worlding practice particularly relevant to this context. 'Worlding' refers to 'protocols for choreographing spacetime through experimental practices, inviting alternative modes of inhabitation and ways of being in the world.'[23] It also serves as a 'practice-led method for prototyping and exploring parallel worlds, synthesising ideas and discoveries, fostering responsive relationships with matter.'[24] In this framework, we present an alternative approach to transscalability through two works by Rachel Armstrong that employ worlding practices. The goal is to explore the possibilities of discovering a new way of reading through the material forms themselves. Choosing the filters for this new material reading is crucial, because these filters are expected to inspire new ways of architectural thinking and making.

Unfolding the transitions

Lars Spuybroek describes the process of matter formation in terms of softness, 'where what we seek in all processes – whether through hands or tools – is the degree of softness, or the discovery of an already existing one.'[25] For Spuybroek, 'softness goes beyond the usual preparatory phase before solidifying', revealing previously unnoticed permeability and porosity.[26] He explains how this softness operates through a spatial analogy, using the term *poché*, borrowed from Beaux-Arts tradition.[27] *Poché*, etymologically related to 'pocket' and 'purse', refers in architecture to the space between walls. It has a dual structure: 'pockets where people play hide-and-seek, but where the dead come after us; spaces where people dress, while ghosts seep from attics and monsters enter from the sewers, all while providing comfort to the house's inhabitants.'[28] In this way, *poché* retains its technical function, yet also becomes the zone where spirits, ghosts, and monsters infiltrate

the home. However, what gives *poché* its meaning is the presence of living spaces and homeowners, whose adjacency allows this hidden layer of technical spaces to exist. Spuybroek argues that technical spaces are transformed into spaces of imagination through their closeness with living spaces, and that creativity emerges from the gaps in this relationship.[29] What is important for our purpose is not that *poché* represents a physical space, but rather to recognise that the potential for new formations arises from the juxtaposition or togetherness of human and non-human. Creativity and new formations emerge through the discovery of softness in various domains.

The question that needs to be addressed is how to establish human-non-human interactions that foster creativity and enable the formation of something new. In other words, what kind of architecture can increase the amount of *poché* that remains between the walls? What is needed in architecture today is a heterogeneous mode of making that, by not maintaining a stable state of agency, promotes togetherness and facilitates transitions between fields, agents and scales – filters proposed for the new material reading. In this sense, such a reading aligns with Simondon's concept of heterogeneous modes of production.

Gilbert Simondon was a French philosopher known for his significant criticisms of hylomorphism. His critique is that it views the individual as static, emerging before any process of formation.[30] He describes a hylomorphic schema as 'a process described by a free person and carried out by a slave', placing architectural production within a hierarchical system.[31] Simondon suggests looking at the relationship between form and matter differently, without prioritising one over the other. He exemplifies the matter-form pair through moulding. In a hylomorphic schema, moulding consists of passive matter (clay) affected by the ideal form (mould). Simondon considers this mode of making abstract because, in his view, neither the clay nor the mould is passive and static; both possess capacities for affect. This perspective neglects the real qualities of both the clay and the mould, because it doesn't describe how both need to be prepared for their mutual but non-reciprocal uses. To enable the clay to take on the mould's shape, the clay's microphysical structure must align with the mould's macrophysical forces. Thus, both the clay and the mould must undergo preparatory processes. According to Simondon, there's not a one-time but a 'continuous temporal moulding process' between the clay and the mould.[32] The relationship between form and matter, as exemplified by Simondon, applies to any situation of individuation where categories are not fixed but emerge through relationships formed in a process. Since human and non-human categories are also established through individuation, this process is continuous, not a one-time event. Consequently, the goal is to consider the ongoing process and design transitions between agents without attempting to regulate any fixed state of agency.

In addition to transitions between agents, it is essential to discuss transitions between knowledge fields or disciplines in the context of complexity theory, particularly thermodynamics, and their influence on architectural theory. Mariam Fraser, Celia Kember, and Sarah Lury suggest that due to developments in various disciplines over the past two decades and the effects of neo-vitalism, there has been a shift from reductionist analyses to towards systems at the edge of chaos within an order.[33] There is an opportunity for architecture within the theory of complexity, related to the effects of a system capable of generating far-from-equilibrium states and multiplicities over time along a line of individuation. Peter Kugler and Robert Shaw argue that when a snapshot is taken of the system at the moment of individuation, it is possible to see effects at different scales, not just at a singular scale.[34] Similarly, the work of Ilya Prigogine and Stengers suggests that the microscopic properties of matter, such as its essence, particles and molecules, behave independently at different equilibrium levels but act together under non-equilibrium conditions at the macroscopic levels.[35] Although the system may not function together at every scale, the idea that it can work together to represent a whole implies that the macroscopic and microscopic conditions of a system may differ, or a newly configured arrangement at the subatomic level may have a more widespread impact. Thermodynamic principles or non-equilibrium conditions suggest the idea that different scales may need to be comprehended to intervene in a system. In other words, it is evident that changes at a singular scale alone are insufficient for observing and understanding the holistic complexity of a system.

It can be said that thermodynamic principles offer not only a nourishing perspective on the understanding of how different fields interacts with each other, but also transitions between the scales. Zachary Horton argues that 'disciplines are bound by the resolution of specific scales – each discipline selecting a particular scale as its focus'.[36] If disciplines indeed partition the world into scales and generate knowledge at these boundaries, any transition between disciplines inherently involves a shift in scale, accompanied by discontinuities and jumps, even if it doesn't correspond to distinct dimensions of the scale itself.[37] This perspective on disciplines and their knowledge production blurs the boundaries between scales. Here, conceiving of architecture as transscalar involves more than approaching and engaging with resolutions at various scales, but more profoundly, the convergence of previously unconsidered scales within one another. Karen Barad describes this intrinsic connectedness of the universe not as a pre-existing interwoven

connection between 'nested scales', but as the entanglement, 'the interpenetration of different scales through one another as agents.'[38]

As seen in this section, the filters proposed for the new material reading create slippery areas within themselves, where the reason for constructing a transition is interconnected with others.

Methodology: Rachel Armstrong's collective metabolisms

Rachel Armstrong sees the potential in living systems as building materials. Along with her research group, she develops architectural systems that are adaptive and responsive to their environment, effectively demonstrating the relevance of dynamic chemical, microbial, and biological systems to architectural design.[39] Her research explores how the properties of living systems can be harnessed and scaled to create environmental solutions within architecture.[40] Armstrong advocates for designing conditions of change for all living beings and systems, believing that collective behaviour will positively affect the planet and increase its efficiency. She examines the metabolisms of microorganisms to explore the possibilities for shared and ongoing survival. According to Armstrong, 'we are all *worlders* now; there is no other choice.'[41]

Armstrong suggests that living systems, through their metabolisms, can regulate energy usage and develop strategies to survive over a lifetime by continuously optimising raw material use and adapting chemical strategies to changing environments. She emphasises that living systems resist 'decaying into equilibrium' and escaping death, constantly 'optimizing processes and adapting to new configurations as their environment changes'.[42] Chemical processes such as energy uptake and waste disposal occur through metabolism in living organisms, allowing them to 'distribute materials used for metabolism' in various ways over time and space.[43] According to Larry Moran, Armstrong's 'living systems' exhibit some qualities of fully alive agents, such as growth, movement or sensitivity, but may not be fully classified as 'alive'. Yet, they share the same chemical language as the biological world, allowing organisms and their environments to ultimately 'co-evolve'.[44] Therefore, Armstrong investigates the material conditions for mutual thriving through a 'deep relationship with materiality that promotes cooperation, openness, synthesis', and the connection between life and death.[45] She believes that for this to occur, materials should be meaningfully structured at the molecular level, utilising natural energy flows within their components. Consequently, she aims to develop materials using a 'bottom-up approach', viewing this as a departure from the traditional hylomorphic order imposed on systems.[46]

Drawing on the properties of living systems, Armstrong develops a toolkit that addresses uncertainty by replacing deterministic concepts with probabilities in her experimental practice. This toolkit comprises both conceptual and practical approaches to generating new types of architecture, involving the construction of architectural prototypes and models based on data from scientific experiments.[47] This approach not only validates the experimenter's assumptions but also reveals new possibilities, shifting from a world of command and control to a dialogue between the experimenter and the experiment.[48] Armstrong states that she is not 'proposing to construct a particular architecture, but rather to identify a new technological platform based on interactions among lively, material assemblages that may increase the range of architectural species.'[49]

Thus, Armstrong produces experimental prototypes that explore life, ecology and planetary systems through a practice of worlding, which she calls Soft Living Architectures. Emerging from agile prototypes at various developmental stages, these architectures are 'highly heterogeneous and metabolically active – being neither fully alive nor inert.'[50] Soft living architectures consist of 'dynamic materials in far-from-equilibrium states', which are typically 'soft' (at least initially) as they facilitate liquid systems that supply nutrients and remove waste. This platform has the potential to expand the range of architectural species and generate new forms of aliveness while fostering new relationships through infrastructures that enable this aliveness to coexist with air, water, and soil.[51] It serves as the 'foundation for a range of dynamic materials coordinated using natural computing techniques' and proposes an alternative portfolio of tools for producing architectural spaces, including ecological apparatuses such as dynamic droplets. [52]

With this framework, we will examine two examples of Armstrong and her collaborators' Soft Living Architectures, focusing on how micro-subatomic configurations relate to the establishment of architecture: 1) Philip Beesley's Hylozoic Ground installation, in collaboration with Hayley Isaacs, Eric Bury, Jonathan Tyrrell, Rob Gorbet (Gorbet lab) and Rachel Armstrong (Experimental Architecture Group) and 2) the Living Architecture project, in collaboration with experts from the universities of Newcastle, the West of England (UWE Bristol), Trento, the Spanish National Research Council, LIQUIFER Systems Group, and Explora.[53]

The first example of Soft Living Architecture is The Hylozoic Ground installation, exhibited at the Canada Pavilion during the twelfth Venice Architecture Biennale in 2010. This installation is part of a series of collaborative installations developed over four years. The first iteration of the Hylozoic series was exhibited in Montreal (2007–08), Madrid (2008–09) and Linz (2009), while the expanded

version of the series was showcased in New Orleans (2009), Quebec City (2010) and Mexico City (2010). It is a 'semi-living architectural work incorporating chemical organs capable of perceiving carbon dioxide and generating brightly colored microsculptures'.[54] The project operates as a synthetic soil at an architectural scale, responding to changes in the environment and human behaviour, whereby space begins to form in response to these stimuli.[55] According to Armstrong, the chemistry of Hylozoic Ground serves as an evolving platform where material and technological systems interconnect, allowing matter to react at the molecular scale.[56] In fact, this project fits into the soft living architectural portfolio because it is based on the synthetic capacities of minerals and the potential programmability of matter through prepared matrices such as soils and clays.[57] The microsculptures consist of dynamic droplets and gel plates that trigger chemical changes within the system. These elements explore how liquids with metabolic properties can be used in prototypes and interconnected within a 'neural network, influencing one another'.[58] The system includes thousands of lightweight components integrated with microprocessors, microcontrollers and sensors, forming an artificial forest of interactive leaves that oscillate between a cybernetic framework, the environment and visitors.[59] Armstrong notes that groups of these structures may attract each other and, after initial interaction, produce 'skins' almost simultaneously, suggesting a basic form of chemical communication between them.[60] This is because the installation possesses intelligence, through liquid chemistries that react to carbon dioxide triggered by human presence, performing breathing, stroking and swallowing movements, which are characteristic of living systems.[61] [Fig. 1]

The second example of soft living architecture is the Living Architecture project, a modular bioreactor wall based on microbial fuel cell technology and synthetic microbial consortia.[62] These bioreactors can be programmed to harvest resources from sunlight, wastewater and air, using them to create biomass, proteins and oxygen. The bioreactors are designed as standardised building segments, or 'bricks', with the goal of increasing domestic resource efficiency.[63] These bricks, consisting of a microbial fuel cell, an algae bioreactor and a genetically modified processor provide infrastructure within a building while creating space for specific microorganisms.[64] The microorganisms can generate electricity, clean nitrogen gases, extract valuable inorganic components from waste and purify greywater. To perform these functions, the environments to which microorganisms are exposed are simulated and recreated within the bricks, activating the microorganisms. Therefore the Living Architecture project acts as a 'regulation system' that creates mutually beneficial exchanges between electrical, physical and chemical interfaces resembling a metabolic trading system, which is open to human interaction. Feedback loops within the system encourage a thriving ecosystem, where human microbiota become integral to the flows of food, water and waste, uniting people in a holistic 'living' system.[65] This project not only transforms living spaces from inert habitats into environmentally sensitive and productive sites but also raises the possibility of a more active relationship between humans and natural processes. In this relationship, humans could 'speak' with the living world through 'chemical, physical, biological, mechanical, and even digital means'.[66] Living Architecture has the potential to alter our perspective on resource management and sustainability in the near future, demonstrating that soft living architecture can catalyse radical social and cultural change. [Fig. 2]

Although these two examples of Soft Living Architecture vary in scale, sphere of influence and practice, we consider it more meaningful in this article to examine the continuity of Armstrong's architectural philosophy and the limitations of the discourse through both projects, rather than evaluating them individually. Therefore, we ask: What happens when architecture is considered on such a micro-subatomic scale? With this question, clues are sought about how ideas at the micro level can be realised on a macro scale, fostering a transscalar architecture. We use the idea of transition mentioned above as a filter for reading the projects; we examine them in terms of a) transitions between fields, b) transitions between agents, c) transitions between scales, d) resolution and e) shortcomings.

a) Transitions between fields. Rachel Armstrong utilises chemicals such as iron and calcium salt-based structures at the oil-water interface in both of her projects. Her aim is to engage with and intervene in the metabolisms of microorganisms and the environmental fluxes. To achieve this, she creates 'communication corridors' between chemistry and architecture, facilitating transitions not only between different disciplines but also across various agents within the project.[67]

Armstrong defines protocells as dynamic droplets that work with chemicals, and she employs them in the Hylozoic Ground Project. According to Armstrong 'protocells are simple chemical systems that exhibit behaviours similar to living organisms.'[68] While their mechanism of action is complex and not easily defined, they appear to create an environment where a semipermeable barrier separates one set of chemical reactions from another, generating an energy gradient between the two systems.[69] Armstrong explains that 'protocell technology enables the chemical programming of various surfaces and microstructures with shapes reminiscent of biological structures' by adjusting both the medium they operate in and their internal metabolism.[70]

Fig 1: The Hylozoic Ground series. Left: Hylozoic Soil, Festival de Mexico, 2010; centre: sensor lash assemblies, Montreal Museum of Fine Arts, 2007; right: protocell detail, Festival de Mexico, 2010. Images: Philip Beesley Architect Inc. (PBAI).

Fig 2: The Living Architecture Project. Left: Living bricks, Tallinn Architecture Biennale, 2017; right: Living Architecture installation, 2019. Photos: Rachel Armstrong, courtesy of the Living Architecture consortium.

Notably, protocells appear capable of both interacting and collaborating on a population scale, as well as undergoing changes at the individual level.

Spiller and Armstrong emphasise that protocells are associated with more 'primitive regulatory forces', interacting with physical and chemical processes rather than biological ones.[71] They describe protocells as having the ability to spontaneously organise themselves chemically through the process of emergence, where new properties arise from the molecular-level interactions of simpler systems. Even though they could resemble 'a bottom-up form of synthetic biology', they 'differ fundamentally from biology in that they have not been produced through the regulatory system of DNA'.[72] Armstrong regards protocells as 'material computers', with the ability to process information through alternative sets of instructions and regulatory pathways, distinct from those controlled by DNA.[73]

Moreover, in all types of protocell technology, Armstrong notes that species and dynamic interactions occur at an interface. In other words, the interface serves as a point of contact between the two systems, knowledge fields. As a result of this relationship, sophisticated structures are formed that distribute inert elements across space and time.[74] Within this framework, transitions between different fields – chemistry and architecture – are facilitated by interfaces that create communication corridors between them. In fact, because the interface facilitates communication and translation between two fields, it also enables transitions between agents, allowing for heterogeneous modes of making in Armstrong's practice.

b) Transitions between agents. In both the Hylozoic Ground and Living Architecture projects, the transitions between agents rely on interfaces that make the structure of microorganisms visible and allow for external intervention. Therefore, their emergence and development cannot be explained solely by human effort. Armstrong emphasises that the 'chemistries in the Hylozoic Ground act as co-designers rather than merely materials of the installation.'[75] Also in the Living Architecture project, Armstrong works with a collaborative team of architects, chemists, and systems designers who 'programme' microbial populations by modifying and spatially organising them through a metabolic interface that transforms substances based on their inputs. The role of the designers is to determine the rules of their own software and initiating the configuration and activation of units, which are the microorganisms that perform the actual work of metabolism. While the microorganisms carry out the metabolic processes, humans are responsible for 'feeding' them according to the system's readable values.[76] In this case, the interface enables access to microorganisms by ensuring that the data is readable and comprehensible to humans. When Armstrong assigns responsibility to humans, she requires them to learn the interface and let it guide them, as this is the only way humans can communicate with the organism's metabolic reactions.[77] Therefore, Armstrong includes people in the process by assigning responsibility in the Living Architecture project. What is significant here is that Armstrong does not distinguish between experts and non-experts; instead, she distributes responsibility equally for a collective effect. As a result, the heterogeneous mode of making between microorganisms and humans extends beyond just two different agents; it also encompasses the transitions between experts and non-experts.

What enables humans and microorganisms to work in shifts is the 'soft' design process, which allows for human intervention from time to time. Armstrong incorporates a 'margin of uncertainty' that opens up space for matter to act independently, influenced by the varying speeds of chemical reactions.[78] She views this process – characterised by 'uncertainty, creativity, and surprise' – as being guided through modes of soft control.[79] Armstrong argues that the results of this kind of agency can be modified and interacted with through non-traditional computing methods that engage with spatial programs and concepts of 'soft control'.[80] This mode of control – both in Hylozoic Ground and Living Architecture projects – expresses itself through unresolved material phenomena like ectoplasms, ghosts and monsters inhabiting transitional spaces, while still preserving their radical potency. Interwoven with their frameworks, they have the potential to evolve into a type of embryology: 'not as morphological aesthetic, but as an evolving materiality that differentiates, grows and becomes increasingly autonomous.'[81]

As a result, rather than being deterministic agents, 'the chemistries in the Hylozoic Ground exhibit a degree of unpredictability that is determined by the particular site and context in which they function.'[82] Therefore Armstrong calls this uncertain, evolving materiality 'lively matter', and explain this as follows:

> for example, when hydrogen and oxygen gases are combined under terrestrial conditions, they produce a liquid, water, the properties of which are unpredictable based solely on the knowledge of the original reactants. Matter becomes especially unpredictable when it is far from equilibrium, as it is highly responsive to environmental conditions, dynamic, and exhibits a form of inherent "intelligence" – the ability to make "decisions" during transitional states.[83]

Here Armstrong recognises the ability to respond to the temporal and spatial context as 'making decisions' and she uses this phrase as a metaphor to emphasise the change in role of the designer: the designer is 'decentred' in this

heterogeneous mode of practice.[84] However, for Armstrong, 'because living architecture focuses on the structural frameworks that enable "living" materials to persist, their design practices are as crucial as those in object-making design cultures'.[85] In other words, 'the hard geometries, inert materials, and fossil fuel energy sources that characterise the industrial modes of making in modern architecture are being replaced by strategies that prioritise maintaining flow, adjusting system balances, coupling disparate elements, and integrating catabolism and anabolism.'[86] These approaches prioritise synthesis and decay over traditional drivers like 'form and function' in the design process.[87]

Both the presence of the interface and its operation with a soft control mode and uncertainty facilitate transitions between agents. This shifts the role of the architect and the traditional drivers of architecture, fostering a more interconnected relationship with the world.

c) Transitions between scales. In both of these projects, the microorganisms themselves are regarded as the starting point. Protocells and dynamic droplets have the capacity to encompass many scales, including both human and non-human elements such as biofilms, bricks, walls, cities, weather, oceans and soils. However, the transitions between scales, particularly evident in the Living Architecture project, encompasses a perspective on resource consumption and efficiency on a global scale. Armstrong articulates this vision as follows:

> Bricks in our homes could transform into materials that sustain us, reshaping our homes, economies, and cities. Thus, living architecture permeating daily rituals not only manages material flows within a home but also embodies systemic change potential inherent in the material, showcasing alternative paradigms for home economies. Through our interaction with microorganisms, a world is envisioned where everyday human activities contribute to planetary revitalization.[88]

In this project Armstrong, proposes to reconstruct the architectural toolkit and redefine architectural space using the previously mentioned critical practice of worlding. She aims to (re)civilise the world, transforming how we think, work and live together, and proposes to recall a form of construction similar to the Tower of Babel by reassigning responsibility to humans.[89] Armstrong integrates her living bricks and the walls constructed from these bricks into existing spaces, thereby not only intervening in active metabolisms but also addressing ecological concerns in architectural design. She seeks to observe the effects of her system incrementally, starting from basic components to 'niche, infrastructure, and space', and progressing towards a cosmological narrative by gradually increasing the scale.[90] This awareness evolves over time through shared knowledge and know-how among participants, creating a collective memory based on previous contributions. Armstrong's practice fosters interdisciplinary and inter-encounter involvement through the transfer of practical knowledge and know-how, collaborating with a diverse range of lively actors rather than merely transferring theoretical concepts.

The concept of fostering interconnected life and observing the effects of a single behaviour within the system is present in the Hylozoic Ground project. Unlike Living Architecture, this project does not aim for planetary impact. Here, the liquid structure of one protocell affects others, influencing the system's collective behaviour. The design aligns with its elements' behaviour and immediately adapts to environmental changes and human movements. While both projects encompass various scales, effects in Living Architecture appear over a longer period, while Hylozoic Ground shows more immediate reactions.

d) Resolution. In her practice, Armstrong establishes a relationship between the internal structure of liquids and spatial configurations in two ways: first, using design as the site of translation, and second, through intermediary objects.

The first method is applied in the Living Architecture project, where microorganisms with diverse functions are activated by recreating their natural environments within the bricks. This redesigned brick allows organisms to collaborate within a single structure, housing anodic compartments for bacteria, cathodic compartments for algae, and spaces for genetically modified organisms.[91] A key achievement of the project is that it enables diverse microorganisms to collaborate in performing complex biological functions that no single microorganism could do alone.

The second method, used in the Hylozoic Ground installation, involves altering the liquid's structure through additions and removals. Two types of droplets are employed: modified Bütschli droplets, which react to carbon dioxide by creating luminous structures, and fat droplets that form pearl-like clusters recording carbon dioxide levels.[92] Both types of droplets interact with environmental changes, their responses visible in the liquid structure and in the changing behaviour of the system. The key difference between the projects lies in the use of protocells. In Hylozoic Ground, protocells serve as intermediary objects between acrylic elements and liquid, with metabolic processes occurring within them, while in Living Architecture, the design itself acts as the site of translation. Additionally, while Hylozoic Ground, as an interior installation, links changes in liquid structure to physical design, in Living Architecture, the liquid structure changes, but the brick unit remains unchanged.

Moreover, by integrating physical and digital elements, both projects become repositories of knowledge that can be documented and transferred. Philip Beesley's concept

of ‘soft architectural details’ encapsulates this idea.[93] He explains that the knowledge generated in these installations can be applied to other projects, as the data within the liquid inside the protocells can be ‘homogenised’, even if the installations are located in different places. In this case, the only aspect that changes, is the physical dimension of the work.

e) Shortcomings. Despite the shortcomings outlined below, these projects make a significant contribution to architectural practice by exploring how architecture can become more attuned to the intersecting dynamics of various fluxes, metabolisms and how transscalar architecture can be achieved by starting with micro-scale configurations.

The Living Architecture project, rather than envisioning a new space, focuses on altering a component of an existing space, which is why living systems remain confined within existing architectural elements. Even as a ‘living’ brick wall, it maintains the same spatial relationship. This raises questions about the limited design scale and the production of prototypes using living matter. Although cybernetic systems create complex environments and interact with a broader technological ‘ecosystem’, the architectural design scale has been overlooked, reducing this project to the design of a mere architectural component (the brick). Despite numerous exhibitions, Living Architecture has never been installed indoors. In this sense, it evokes the utopias of the 1960s, where space was envisioned as obsolete, despite aiming for impact at a planetary scale. Similarly, the Hylozoic Ground project was installed within an existing interior space with controlled environmental conditions. This suggests that the scale of projects capable of transitioning across fields, agents and scales must go beyond conventional architectural scales, requiring a redefinition of architecture’s spatial concepts. What is significant here is that design at the component level proposes an alternative way of making, establishing a collective practice where human and non-human agents collaborate.

The Living Architecture project faces criticisms similar to those directed at biotechnology in the late 1990s. While the wall functions as infrastructure reflecting domestic systems, there is little distinction between the singular and the plural. Although a plurality may encompass more types and functions, the critique focuses on the inability of multiplicity to transform a system. This issue relates to the system’s responsiveness. Since the spatial experience remains unchanged, the expansion of the system’s impact is primarily visible through resource use and infrastructure on a global scale, and it will take time for its effects to become noticeable. Armstrong emphasises a different approach in this project. She says that ‘in architecture, flow and structure are typically seen as distinct and rival systems – flow being temporary and structure permanent’.[94] The Living Architecture project uses organisms’ metabolisms to create a sequence of modular blocks, or ‘living’ bricks, to reconcile this paradox within living systems. Specifically, ‘it develops building elements that integrate structure and flow in response to the dynamic aspects of the living environment.’[95] Thus, the expression of multiplicity is realised through flows, rather than through structure.

With the Living Architecture project, Armstrong aims to create a new language, drawing on a method reminiscent of the Tower of Babel. However, the project becomes inaccessible because it neither explains nor establishes a common language beyond materiality. Since the living conditions of microorganisms are simulated, humans seem almost absent from the system. The goal, however, is to challenge the belief that humans can create an autonomous ecosystem separate from the rest of the biosphere, and instead, to create togetherness that foster a deeper relationship with the world.

Reconfigurating the soft operation field

The new material reading of the Hylozoic Ground and Living Architecture projects conducted in this article with the suggested filters does not aim to test the projects by dividing it into separate categories, but rather to show that the ways these transitions occur are similar. These categories alone are insufficient to explain the whole; the project operates between all of them. Therefore, *poché* is approached as a method of reading to focus on what it achieves beyond categorical distinctions.

In this regard, these two examples of Armstrong’s work, which involve far-from-equilibrium systems and rely on repetitive processes and new material configurations based on metabolic models of minerals, bacteria and microorganisms, illustrate an intention to proliferate rather than eliminate agents within architectural practice. These projects transcend existing frameworks by creating transitions between agents, scales and fields, aiming for a transscalar architecture. This approach makes clear that such an outcome is only possible through an alternative, heterogeneous mode of making – embodying the softness in Soft Living Architecture.

These examples show that discovering softness not only facilitates transitions between agents, fields, and scales but also creates ‘soft’ areas within the design process to manage these transitions. Armstrong’s proposal goes beyond collective practices by aiming to make the design process more transparent – understanding and interpreting it, including all its breakdowns and reasons, as well as the relationships between its parts. In other words, creating a soft operational field means the design process remains open to uncertainties and surprises, accommodating repeated processes and new material configurations.

Through this softness, these projects explore the possibilities of the process rather than seeking total control. With this perspective, it becomes crucial to understand how both the design process and the final design achieve these transitions and where softness manifests within the process. This requires identifying where translations occur within the design process. In Armstrong's examples, the space of translation – where two different systems encounter each other – becomes the designed space itself, raising the question of whether today's architecture functions as a translation space that brings together different systems. Viewed through this lens, the role of the architect shifts to that of a translator of the world's diverse voices, navigating different vocabularies to facilitate communication between various disciplines.

Architecture capable of translating these voices can engage with disciplines such as philosophy, mathematics, media, cybernetics, ecology, biology and computation, moving away from a central position to negotiate with other fields. In every negotiation, the boundaries of architecture are also transformed. As the discipline adapts and becomes more relevant and fluid, new operational areas and collaborations will emerge. As seen in Armstrong's examples, creating an experimental field paves the way for a transscalar architecture by producing new bodies and materialities, demonstrating that such architecture can encompass diverse fields of knowledge and various scales through its broad relationships. Furthermore, they suggest that for architecture to have an impact at a planetary scale, it should scale down rather than up. The micro-scale offers potential because it works with molecular flows, enabling close interaction with materiality that fosters collaboration, openness, synthesis and the interplay between life and death by exploiting the inherent energy flows in its constituent parts. At this far-from-equilibrium scale, architecture remains open to new configurations, unrestricted by predetermined frameworks between living and non-living or human and non-human, fostering creativity. Thus, rather than emphasising a transscalar architecture, we propose an architecture that integrates into the world's metabolic flows by starting the design process with micro-subatomic configurations.

Explained this way, architecture can encompass multiple scales, from micro to macro, offering the potential to reshape spatial construction practices and serve as an interface between the world's multiplicities, shifting architectural practice to be more attuned to the intersecting dynamics of various fluxes. This architecture does not aim to solve the problems of the time but instead offers approaches for addressing them, recognising that all elements are constantly undergoing change. This leads to the creation of new distinctions that are neither fixed nor predetermined. Exploring this 'softness' contributes to perceiving the world through its unstable and temporary material dimensions, thereby resisting stupidity.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

Notes

This article is based on ongoing PhD research titled 'Architecture as an Open Field of Interactions' conducted under the supervision of the thesis advisor Prof. Dr. Ayşe Şentürer in the Architectural Design PhD Programme in the graduate school at Istanbul Technical University.

1. Rachel Armstrong, *Experimental Architecture: Designing the Unknown* (London: Routledge, 2019), 45.
2. Andrej Radman, *Ecologies of Architecture* (London: Bloomsbury, 2022), 6.
3. Ibid.
4. Peg Rawes, ed., *Relational Architectural Ecologies: Architecture, Nature and Subjectivity* (London: Routledge, 2013), 3–11.
5. Rachel Armstrong, *Soft Living Architecture: An Alternative View of Bio-Informed Practice* (London: Bloomsbury, 2020), 67.
6. Ibid.
7. Reza Negarestani, 'Frontiers of Manipulation', in *Speculations on Anonymous Materials,* ed. Susanne Pfeffer (Berlin: Sternberg Press, 2014), 201–14.
8. Andrés Jaque, 'The Dissident Architect: Reflections on Multimedia, Transscalar, and Transspecies Architecture', *KoozArch*, 19 November 2022, https://koozarch.com/interviews/the-dissident-architect-andres-jaque-reflections-on-multimedia-transscalar-and-transspecies-architecture
9. Ibid.
10. Gilbert Simondon, *Individuation in Light of Notions of Form and Information*, trans. Taylor Adkins (Minneapolis: University of Minnesota Press, 2020 [1964]).
11. Armstrong, *Experimental Architecture,* 45.
12. Isabelle Stengers, *Cosmopolitics* (Vol. 1) (Minneapolis: University of Minnesota Press, 2010).
13. Isabelle Stengers et al., In *Catastrophic Times: Resisting the Coming Barbarism* (London: Open Humanities Press, 2015), 98.
14. Stengers, *In Catastrophic Times*, 117.
15. Ibid.
16. Ibid.
17. Stengers, *Cosmopolitics*, 29–30.

18. Serres advocates for the parallel development of scientific, philosophical, and literary fields, challenging the prevalent notion of two separate cultures – scientific and humanist – that are thought to be incapable of communicating. Instead, he seeks to establish corridors of communication between these domains. His goal is not to create direct relationships between different fields, mix philosophical and scientific content, or discover analogies, but rather to explore conditions that enable the most inclusive communication possible through a series of interventions and transformations. Michel Serres, *Hermes: Literature, Science, Philosophy*, various translators, ed. Josué V. Harari and David F. Bell (Baltimore: The Johns Hopkins University Press, 1982).
19. Isabelle Stengers, 'Thinking Life: The Problem Has Changed', in *Posthumous Life: Theorizing Beyond the Posthuman*, ed. Claire Colebrook (New York: Columbia University Press, 2017), 325–38.
20. Ibid.
21. Andrej Radman, 'Generalised Chromaticism: The Ecologisation of Architecture', *The Journal of Architecture* 27, no. 4 (2022): 520, https://doi.org/10.1080/13602365.2022.2122070.
22. Gilles Deleuze and Félix Guattari, *A Thousand Plateaus,* trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987), 97.
23. Rachel Armstrong, 'Living Architecture', *Interalia Magazine*, July 2017, https://www.interaliamag.org/interviews/rachel-armstrong-living-architecture/.
24. Armstrong, *Soft Living Architecture*, 18.
25. Lars Spuybroek, 'Matter and Image: The Pharmacology of Architecture', *Architectural Intelligence* 2, no. 1 (2023), 2.
26. Ibid., 3.
27. Ibid.
28. Ibid.
29. Ibid., 12.
30. Simondon, *Individuation in Light*.
31. Gilbert Simondon, *On the Mode of Existence of Technical Objects*, trans. Cecile Malaspina and John Rogove (Minneapolis, MN: Univocal, 2017), 248.
32. Ibid., 249.
33. Mariam Fraser, Celia Lury, and Sarah Kember, *Inventive Life: Approaches to the New Vitalism* (London: Routledge, 2006), 1–14.
34. Peter N. Kugler and Robert E. Shaw, 'Symmetry and Symmetry-Breaking in Thermodynamic and Epistemic Engines: A Coupling of First and Second Laws', in *Synergetics of Cognition: Proceedings of the International Symposium at Schloß Elmau, Bavaria, June 4–8, 1989* (Berlin: Springer Berlin Heidelberg, 1990), 296–331.
35. Ilya Prigogine and Isabelle Stengers, *Order Out of Chaos,* trans. Sheridan Flavin (New York: Bantam Books, 1984).
36. Zachary Horton, *The Cosmic Zoom: Scale, Knowledge, and Mediation* (Chicago: University of Chicago Press, 2021), 12–13.
37. Ibid.
38. Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter* (Durham, NC: Duke University Press, 2007), 245.
39. Armstrong works with Experimental Architecture Group (EAG), 'which is introduced as a research practice capable of developing alternative architectural paradigms by redefining the materials, tools and limits of the field. The specific approach of the … EAG is also outlined as a research practice that sets out to enable the transition from an industrial towards an ecological era, by developing a set of approaches capable of addressing "wicked" challenges'. Armstrong, *Experimental Architecture,* 39.
40. Armstrong, 'Living Architecture'.
41. Armstrong, *Soft Living Architecture*, 90.
42. Rachel Armstrong, 'How Protocells Can Make "Stuff" Much More Interesting', *Architectural Design* 81, no. 2 (2011): 72.
43. Ibid.
44. Larry A. Moran, 'Good Science Writers: Richard Lewontin', *Sandwalk* blog, 3 July 2008, http://sandwalk.blogspot.co.uk/2008/07/good-science-writersrichard-lewontin.html, cited in Rachel Armstrong, *Vibrant Architecture: Matter as a Codesigner of Living Structures* (Berlin: De Gruyter Open, 2015), 77.
45. Armstrong, 'Living Architecture'.
46. Armstrong, 'How Protocells Can Make "Stuff" Much More Interesting', 72.
47. Rachel Armstrong and Robert Hughes, *The Art of Experiment: Post-pandemic Knowledge Practices for 21st Century Architecture and Design* (London: Taylor & Francis, 2020), 1–5.
48. Rachel Armstrong, Robert Hughes and Stefano Ferracina, 'Monstering: A Transdisciplinary Method for an Unstable World', *Palgrave Communications* 6, no. 1 (2020): 1–7.
49. Rachel Armstrong, *Vibrant Architecture*, 5.
50. Armstrong, *Soft Living Architecture*, 43.
51. Ibid., 25.
52. Ibid., 23; Armstrong, *Experimental Architecture,* 49.
53. 'Partner Profiles', *Living Architecture* website, https://livingarchitecture-h2020.eu/partner-profiles/.
54. Philip Beesley and Rachel Armstrong, 'Soil and Protoplasm: The Hylozoic Ground Project', *Architectural Design* 81, no. 2 (2011): 78–89.
55. Ibid.
56. Armstrong, *Vibrant Architecture*, 182.
57. Armstrong, *Soft Living Architecture*, 25.
58. Armstrong, *Experimental Architecture,* 33.
59. Beesley and Armstrong, 'Soil and Protoplasm', 78–89.
60. Armstrong, 'How Protocells Can Make "Stuff" Much More Interesting', 73.
61. Beesley and Armstrong, 'Soil and Protoplasm', 83.
62. 'Objective', *Living Architecture* website, https://livingarchitecture-h2020.eu/objective/.
63. Armstrong, *Soft Living Architecture*, 137–39.

64. Ibid.
65. ‘Objective’, *Living Architecture* website.
66. Armstrong, *Experimental Architecture,* 57.
67. Serres, *Hermes.*
68. Armstrong, ‘How Protocells Can Make “Stuff” Much More Interesting’, 73.
69. Ibid.
70. Ibid.
71. Neil Spiller and Rachel Armstrong, eds., *Protocell Architecture* (Hoboken, NJ: John Wiley & Sons, 2011), 21.
72. Armstrong, ‘How Protocells Can Make “Stuff” Much More Interesting’, 73.
73. Ibid.,72.
74. Ibid.,73.
75. Armstrong, *Vibrant Architecture*, 196.
76. *Living Architecture* website.
77. Armstrong, *Experimental Architecture,* 56.
78. Simondon’s concept of technicity encompasses the ‘margins of indeterminacy’. Simondon suggests that we see buildings and machines not as predetermined operations but as constructions that should not be perceived as closed systems, emphasising the need to see their workings beyond automation. While technicity pertains to the relationship between technology and humans, Simondon extends this to architecture, arguing for the construction of open structures (machines) that include this indeterminacy. Gökhan Kodalak and Stavros Kousoulas, ‘Simondoniana: Essays by Kodalak and Kousoulas, with Mutual Responses’, *Footprint* 30 (2022): 3–21.
79. Armstrong, *Soft Living Architecture*, 25.
80. Armstrong, *Vibrant Architecture*, 183.
81. Armstrong, *Soft Living Architecture*, 25.
82. Armstrong, *Vibrant Architecture*, 183.
83. Armstrong, *Soft Living Architecture*, 7.
84. Armstrong, ‘Living Architecture’.
85. Ibid.
86. Ibid.
87. Ibid.
88. Armstrong, *Soft Living Architecture*, 2.
89. Ibid., 37.
90. Armstrong, *Experimental Architecture,* 63.
91. Ibid., 56.
92. Armstrong, ‘How Protocells Can Make “Stuff” Much More Interesting’.
93. Armstrong, *Experimental Architecture,* 33.
94. Armstrong, *Soft Living Architecture*, 137.
95. Ibid.

Biography

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Ayse Sentürer is a professor of architecture at the Istanbul Technical University. She teaches architectural design studios and diploma projects at the undergraduate school and gives courses and supervises theses at the architectural design graduate programme. She conducts research at the intersection of architectural theory, design and criticism, including representation and aesthetics. She has participated in numerous conferences, panels, exhibitions and received awards. Apart from ITU, she has run architectural design studios and participated in juries in various countries such as the US, the UK, Germany, France, Hong Kong and Portugal, as well as at schools including Harvard GSD, New School: Parsons School of Design, the AA, Brandenburg TU-Cottbus, and RMIT (Royal Melbourne Institute of Technology). She has written articles on architecture, architectural, urban and rural design, and education.