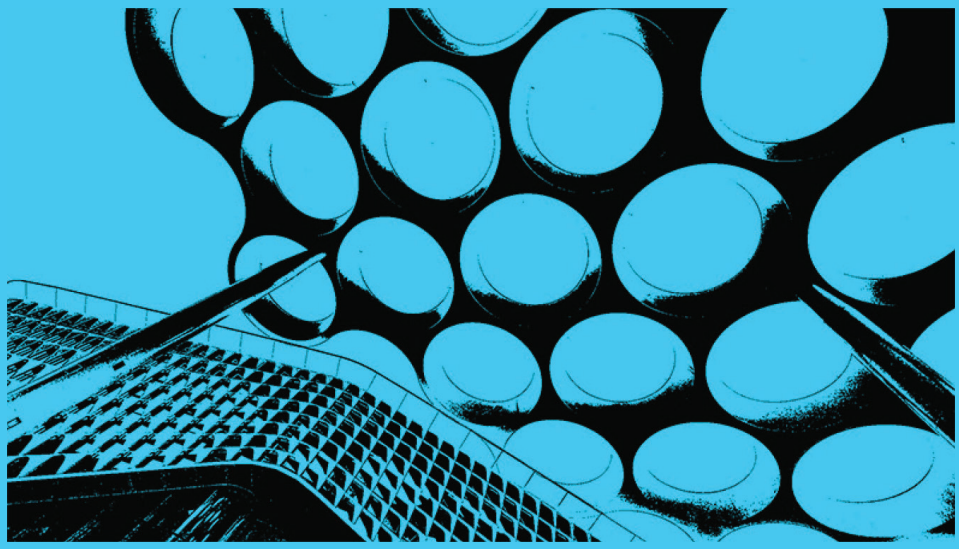
THE SPACE OF TECHNICITY

Theorising Social, Technical and Environmental Entanglements

Robert A. Gorny, Stavros Kousoulas, Dulmini Perera and Andrej Radman, editors



Ecologies of Architecture Book Series

TU Delft OPEN

JAP SAM BOOKS

Contents

Socio-Techno-Environmental Entanglements 10

Under the Dome: The Events of January 21

from the Pluriverse 32

Gentrification, Colonialism and Urban Echo Chambers 60

Practice of Architecture at the Site of Disaster 82

Gregory Bateson, Distributed Mind, and Cybernetic Ecology 104

Technosphere 126

A Metabolic Approach to Designing Space 156

of Images 180

Agropleasure in Demonic Grounds: On Resistance Across Gardens 202

Under the Dome: The Events of January 6 222

Technicity as the Montage Production of the Mundane 238

The Elbow Room of the Universe: Technicity, Diegesis, Force 262

The Space of Technicity

Theorising Social, Technical and Environmental Entanglements

Colophon
The Space of Technicity | Theorising Social, Technical and Environmental Entanglements

Open Book Series
Ecologies of Architecture

Series Editors
Stavros Kousoulas, Andrej Radman, Heidi Sohn
Department of Architecture, Faculty of Architecture and the Built Environment, TU Delft

Volume Editors
Robert A. Gorny
Stavros Kousoulas
Dulmini Perera
Andrej Radman

Copy Editor
Heleen Schröder
Layout Editor
Lena Galanopoulou
Text and Illustrations
Copyright © Authors, 2024
Cover photo
Marc Boumeester

Electronic version of this book is available at https://books.open.tudelft.nl/home/catalog/series/ecologies-of-architecture

The *Ecologies of Architecture* Book Series is published by TU Delft OPEN Publishing and Jap Sam Books in collaboration with the Architecture Philosophy and Theory Group, Faculty of Architecture and the Built Environment, TU Delft, PO Box 5043, 2600 GA Delft, The Netherlands
ecologiesofarchitecture@gmail.com

The digital version by TU Delft OPEN Publishing is licensed under Creative Commons Attribution 4.0 International License (CC BY 4.0), except otherwise stated.

The hard copies, back issues and subscriptions are published and arranged by Jap Sam Books at www.japsambooks.nl
Copyright clearance made by the TU Delft Library copyright team

Book Abstract
Desperate times demand optimistic transdisciplinary measures. This volume unites a select group of thinkers who courageously traverse disciplinary boundaries. What brings them together iWs the least stratified 'component': a shared problem. It is a widely recognised that a problem gets the solution it merits. However, only a few acknowledge that a problem seldom neatly fits within a single discipline, nor does it conform to the principle of general equivalence. Handling its irreducibility and non-entailment is a skill possessed by very few. Even fewer take the quasi-causal capacity of what we term the 'space of technicity' seriously.

The space of technicity, the shared problem of this volume, is a consequence of immanence. Each configuration of surfaces comprising the built environment produces an intangible effect, acting as a quasi-cause. It can be referred to as downward causation or the timely rediscovery of (neo)finalism.

In this volume it is approached it from the perspective of axiology. The space of technicity allows us to evade techno-determinism without adopting an anything-goes attitude. That which has become manifest could have individuated differently. However, the potential of a body cannot be discerned before intervening in the causal fabric of agential reality to extract the singular points that make certain outcomes more likely than others, surpassing mere probability.

Series Abstract
The *Ecologies of Architecture* Book Series promotes a transdisciplinary approach to architectural thinking and doing by extending its interest to topics that bring together the three ecological registers, namely the environment, the social and the individual. Such an approach accounts for what the built environment will come to be, and speculates about who will become alongside it. The series focuses not only on the why, what and how of architecture, but also on the who, who with and for whom.

Disclaimer
Every attempt has been made to ensure the correct source of images and other potentially copyrighted material was ascertained, and that all materials included in this book have been attributed and used according to their license. If you believe that a portion of the material infringes someone else's copyright, please contact ecologiesofarchitecture@gmail.com

DOI: https://doi.org/10.59490/mg.95
ISBN: 978-94-93329-14-0 paper version
www.japsambooks.nl

The Space of Technicity

Theorising Social, Technical and Environmental Entanglements

Table of Contents

Introduction:
Socio-Techno-Environmental Entanglements 1
Robert A. Gorny, Stavros Kousoulas, Dulmini Perera and Andrej Radman

One: Dis/Empowering Technicities

Ode to Chaos: Neotropical Entanglements and Other Narrative Fictions from the Pluriverse 23
Heidi Sohn

Gentrification, Colonialism and Urban Echo Chambers 51
Lila Athanasiadou

Ghosts of the Rio Doce: Tracing the Ethical Grounds for a Hauntological Practice of Architecture at the Site of Disaster 73
Alina Paias

Two: In/Formational Technicities

Gregory Bateson, Distributed Mind, and Cybernetic Ecology 95
Gökhan Kodalak

Gaian Technics: Lynn Margulis, Natural Technicity, and the Technosphere 117
Bruce Clarke

A Metabolic Approach to Designing Space 147
Sha Xin Wei

Annotate This! Semiotization, Automation and the Recursive Causality of Images 171
Stavros Kousoulas and Andrej Radman

Three: Onto/Genetic Technicities

Agropleasure in Demonic Grounds: On Resistance Across Gardens 193
Agnieszka Anna Wołodźko

Under the Dome: The Events of January 6 213
John Protevi

Technicity as the Montage Production of the Mundane 229
Marc Boumeester

Afterword:
The Elbow Room of the Universe: Technicity, Diegesis, Force 253
Gregory Seigworth and Barbara Prezelj

Author Bios 263

Introduction: Socio-Techno-Environmental Entanglements

Robert A. Gorny, Stavros Kousoulas, Dulmini Perera and Andrej Radman, editors

Our present condition urges those critically and creatively engaged with it, to address the transformative potentials that are brought about by a highly intertwined triad of changes. As the posthuman philosopher Rosi Braidotti notes, these three changes can no longer be addressed in isolation or in the context of singular disciplines. At an environmental level, we are entangled within deteriorating ecological systems, global changes in climate that affect areas and populations in vastly divergent ways, and massive species extinction that disrupts a variety of symbiotic relationships. At a social level, we are entangled in increasing structural injustices brought about by economic and political systems going increasingly haywire. Finally, at a technological level, we are entangled in new techno-logical developments mostly related to developments in cybernetic-informational systems redefining the human and life in general, (design) intelligence, and related systems of bio- and necro-political governance and control, that accelerate in their longstanding dehumanizing and disindividuating logics and effects.[1] Given its urgent multi-layered social, psychological, and environmental dimensions, this latter technological condition in particular cannot be answered through technology alone. It requires a compound view that ought to be not just multi-, cross-, or inter-disciplinary, but fundamentally trans-disciplinary, in order to address issues in a transversal manner.

This book is an attempt to cut across some of the multifarious relations between the three – environmentally, socially, and technologically – changing dimensions of reality with the aim of opening such a transversal path. Its ambition is to re-think these changes relationally as "analytically reducible" but "ontologically

inseparable" relata that co-emerge from primary relationships. We are not just entangled in the fields of forces and powers, but the very entanglements make us who we are and determine what we can do. Such a radical relational theorization of socio-techno-environmental entanglements presents itself as an urgent endeavor, to the extent that the Western threefold binaries between nature/culture, culture/technology, and technology/nature can be said to have contributed to many of the present predicaments by having reduced these relationships to different things. *The Space of Technicity* is therefore positioned within a wider ongoing endeavor across the natural sciences, humanities, and arts to re-theorize them as aspects of co-constitutive dynamics in order to mitigate the pernicious problem of binary thinking. In their entailment of related form/matter, structure/agency or subject/object divides, these binaries have fostered discriminations based on hierarchical ontologies, speciesism, anthropocentrism, and human exceptionalism, all of which have been reiterated (and are being reiterated as we write) through discursive and disciplinary divisions.

Due to long-lingering container conceptions of space, both theoretical and designerly, spatial discourses have discussed the environmental, the social, and the technological rather reductively. Space is commonly thought of as something external or extensive, meaning as a background material environment, which is made up of inanimate and passive objects or formations that space contains, and in which living and active bodies and forms of life act. In this figure/ground dialectics only humans supposedly have a special status thanks to the wider role of technologies that distinguish them in their capacity of transforming the world into objects. In the case of architecture, history, and spatial sociology, social space is more specifically understood as a construct: a *product* of social and spatial practices.[2] In this formulation architecture is but one of many other relational ecologies, economies, and technologies of creative practices.[3] Thus any question of the production of space or place cannot be addressed in isolation, as it located at the intersection of social, technical, and environmental realities, including the many displacements and forms of othering that characterize the present. Spatial production must be studied in conjunction with the multiple ecologies of social production and technical knowledge systems that are *middling* with it in the first place.

Regarding this middling, neo-materialist scholars such as Braidotti have radically rethought space in intensive terms as an embodied, embedded, relational and affective milieu from which living systems emerge. In contrast to simple Darwinian ideas of evolution, space enables and shapes certain forms of life that do more than passively adapt to ecological niches, which they inhabit in more or less mutual relationships. Rather, most life-forms actively adapt and re-shape their environments through niche construction processes, which fundamentally

change evolutionary dynamics to the point where forms of life – like humans – mutually adapt to their own adaptations and artificial conditions of adaptation in a recursive loop.[4] Machines everywhere; assemblages all the way down. This recursive notion of feedback and systemic operations is not only relevant to understand the ongoing formations between architecture, cybernetics, and ecology.[5] It also lies at the core of a wider endeavor across many fields – from quantum field theory to evolutionary biology to cognitive sciences – to underscore the technical functions that material environments bear as enabling constraints within processes of self-organization – from ontogenesis to path-dependent evolutions – in which certain lifeforms arise among (and at the expense of) other possible ones.[6]

Based on this radical critique of container conceptions of space, the title of this book is not to be understood as looking for a "space *for* technology," nor does it aim to offer answers on how to use space as some technophilic instrument for or against something according to some dictum like Cedric Price's "if technology is the answer, then what was the question?" Instead, it begs the question what space actually does in its "produced yet further productive" nature as a transformative material environment.[7] It problematizes how architecture and environmental design in the widest sense engender and operate by means of technicities. Yet, problems never sit neatly within a single discipline, nor do they lend themselves to principles of general equivalence. This anthology recognizes the general reluctance to tackle the irreducibility and non-entailment that comes with this dispositional dimension. The disposition of problematization has always been to open up new (and better) questions by reframing the problem. This book project revolves (and has evolved) around a shared problem of how to make sense of ongoing environmental, social, and technological developments. One *ecological* way, we suggest, lies in a new apprehension of the space of technicity.

When Technicities are not Technological

Technicity is not technology. Coined in the ground-breaking work of French historian and philosopher of technology Gilbert Simondon, the ontogenetic notion of technicity has been used to move beyond the study of mere technical objects and instead approach their genesis in terms of "modes of relation" between beings and their world;[8] be it humans and technical objects, or ensembles, or living and non-living systems in general. In this account, technicity describes an emergent aspect in the formation and organization of assemblages. It concerns the moment where these transform at the point where the workings of certain objects that are constitutive for these assemblages, having initially remained in a "magical" mode, become part of a new form of technical consciousness with which these workings come to be tooled for certain ends.[9] Francophone scholars have tended to distinguished *technics* from *technology* as a certain scientific logic or progressivist

rationale for using technics. Overshadowed by the modern understanding of technology, Simondon reserved the notion technology for the critical study (*logos*) of how technics operate. This way, technologists (or "mechanologists" as Simondon called them), more than psychologists, can help cultivate a new awareness of the working of all sorts of machines and how they affect self-organization processes and evolving systems. In the case of architectural technicities, this calls for a new philosophy of architecture that intuits the space of technicity in a non-reductive manner,[10] and thereby comes to terms with – and makes sense of – the wickedness and messiness of the workings of such systems.[11]

In this mechanological aim, *The Space of Technicity* investigates how or where the space of technicity arises from generative environmental, social, and technical relationships, how they come to be environmentally constructed and embodied, how they might be employed for engendering transformative becomings, and all in ways that are not readily reducible to the relata these relations establish, such as humans interacting with technology. This is effectively an exercise in revaluating space. In deconstructing the res extensa relation, technicity inverts the underlying logic to one of intensity and immanence. It suggests that certain things, life-forms, and life-worlds come to be, "become-together-with," and co-evolve through systemic relationalities and constitutive entanglements to emerging technicities.[12] They "crystallize" (to use Simondon's vocabulary) into particular socio-techno-environmental formations, and "concretize" into technical objects and larger ensembles that configure these processes further and dispose in particular directions.

To revisit this emergent aspect of technicity in its configurative dimension, the target of this conceptual inversion lies in the second aspect: space, as a problematic and yet often mysterious "black box," but whose production, and productive and configurative nature, is the shared individuating knowledge par excellence of many contributors to this book. Configuring or organizing space is precisely what architecture supposedly does. Therein it presents an interface lying at the intersection of three ecologies (environmental, social, and psychological) described by Félix Guattari;[13] one of the many "ghost writers" of this book. Through Simondon and more recently Stiegler, Yuk Hui, and Karen Barad's work, among many others, especially the dimension of subjectivation and psycho-social becomings has since been much de-psychologized to help start from the process of individuation and not from already constituted individuals as products. In the same vein, Foucault long suggested that architecture ought to be subsumed to an aspect of technics.[14] This us helps reconsider the processes of individuation architecture engenders in much more machinic terms how the "what" (technicity) determines the "who" (subjectivity). Concerning this "how", technicity avoids "mono-technological thought" and calls instead for a multi-logic of worlding

practices, in accounting for the different metaphysical spaces that are recursively created by means of cultural techniques or cosmotechnics.[15]

This way, *The Space of Technicity* introduces the strange machinic ecologies of architecture as a crucial interface between environmental and social arrangements and the forms of knowledge that reciprocally shape their production. From this machinic angle, the configurative aspect of architecture as a *dispositif* must not to be sought in its actual form or plan. Rather, its generative forces and potentials reside in virtual intensive relations that are better thought of as a phase space diagram. Within emergent systems, differential relations like intensity and proximity are key drivers in the production and actualization of particular relationships to the exclusion of other possible ones. Beyond the still extrinsic conception of a production of specific socio-techno-environmental assemblages with their heterogeneous and spatialized constituents, technicity arises from (and is thus intrinsically connected to) the production of a more abstract space of possibilities generated by and associated with different assemblages and how they work.[16] It implies that any evolving system has, within its constitutive constraints, a built-in transformative elbow room for things to unfold. This is no actual space, but a virtual one; a space of immanent forces and powers, of intensities. It is a product of immanence. Once understood, this elbow room can be tapped into and manipulated.

This is where the question of "design" kicks in; not just problematizing who is charged with creating and modifying spaces of possibility, but addressing the question in reverse by asking who is created by it.[17] What subjectivities, collectivities, and assemblages are created by the *how* of modulating what is related to what? For example, elevating a portion of the ground by eighty-odd centimeters will have profound ethological and hence ethical consequences. Labelling it a table merely amounts to pigeonholing a number of generative relationships that work their magic in affording certain actions. Next time you enter into such an assemblage, please pay attention to the actual arrangement and its virtual effect-cum-cause; focus on the production of sense, which is never given, but always made. An oval table is very different from an elongated orthogonal one, not simply in dimensional, but in technological terms. One could argue that the oval table fashions a different social body than the rectangular one. Any table assemblage is more or less sit-around-able, more or less lean-against-able, more or less hide-underneath-able, more or less own-able, more or less jump-on-able, more or less knock-down-able, and so on. The emphasis on the "more or less" – as indeterminate yet capable of determination through activity – is crucial. And this activity is, on the most elementary level, motivated by value. As a spatial assemblage, it affords different possibilities that depend on the actual relations that it enables and individuates. Yet such spaces of possibilities for future evolutions are

always themselves "designed" depending on the system's past evolution. As such, any spatial formation can be understood as an enabling constraint opening up auto-affective systems to emerge in path-dependent ways.

Locating both the elbow room that enables change and the constraining concatenations through which systems stabilize and regularize themselves and their constitutive dynamics, helps us see individuation in a richer way: as a transindividuation in which technical individuation is deeply entangled with psycho-social individuation. The social and mental dimensions of individuation are dependent on a kind of spatialization: a spatial or built arrangement of a tertiary layer that couples the becomings of individuals and groups into a particular co-constitutive relation.[18] We argue that situating knowledge production at the very production sites of transindividuation, by mapping out and diagramming such couplings, facilitates ongoing efforts of intuiting the mechanisms for bringing forth other futures and worlds, literally breaking open limited possibilities.[19] Crucially, this approach avoids techno-determinism without replacing it with the relativist anything-goes attitude. The truth of the relative, which is not to be confused with the relativity of truth; for one cannot know what a body can do before intervening into the causal fabric of reality. Enabling action becomes ethical.

As such *The Space of Technicity* is a critical and creative intervention that cuts across a wider turn in contemporary theories. The book cross-connects a set of ongoing socio-environmental debates in posthuman and neo-materialist discourses that use heavy doses of monism and affect theory in their assemblage-theoretic and (counter)cartographic approaches. Further on, the book links such discussions with socio-technological questions addressed in parallel by many scholars that engage with the increasing social effects and decoherence fostered by environmental and technological changes, as well as a series of social and technological considerations in the expanded field of spatial/environmental design.

Structure of the book

This anthology brings together a small cohort of thinkers who dare to traverse and transgress disciplinary boundaries. What brings them together, in a joint deterritorialisation, is the shared problem concerning the various technicities involved in making spaces. Instead of giving facile answers on what those technicities are, their writing makes space for conversation about different perspectives of overlapping and complementary planes of analysis that create new starting points for theorizing the social, technical, and environmental entanglements from which technicity arises. The argument cuts three ways in inquiring what technicity could mean from three co-constitutive perspectives. More than absolute categories, we like to think of these three layers as navigational tools, as they cluster around

several concepts and lines of further investigation, while moving the reader through and across to the other levels.

Part One sets out from the question of "Dis/Empowering Technicities." In an initial move from the social, through technical and to environmental registers, the three chapters in this vector explore ways to decolonize the space of possibilities. On a formal-methodological level, this part is made up of three expository case studies (see Protevi in this volume), which outline various cartographies of cumulative worlding processes.

The first contribution is by architecture theorist Heidi Sohn, whose work attends to how political economy affects territorial, spatial, and material phenomena, and promotes related posthuman and neo-materialist theoretical and philosophical lenses to revisit architectural culture.[20] In Chapter 1, "Ode to Chaos: Neotropical Entanglements and Other Narrative Fictions from the Pluriverse," Sohn takes us to the *Mayab*, the intoxicating universe of Maya culture, where she investigates and interweaves several sites and storylines in an onto-cartographic account of the viscous liquids honey and crude oil, contested sites of extraction, competing human political agendas and quite literally nonhuman, otherworldly desires or intentions of specific naturalist deities. A line of inquiry binding the many stories traces the complex cosmological and symbiotic relations between the indigenous Maya and an endemic honeybee, and the collapse of these relations after the introduction of European honeybees and sugar cane plantations as models that paved the way for the assemblage of modern agribusinesses fuelled by oil and high technologies. Addressing the nested scales of these assemblages, and what kind of world they promote, the chapter critically places this process within a framework of a "world of many worlds." Sohn's pluriversal inquiry is one that seeks to engage chaos, the realms of *Xa'ak',* that in the Mayan universe has less to do with absurdity and disorder, but rather indicates a cosmic source prior to all life that engenders creation and destruction, but carries potential within it. Using the very entanglements between the bees, humans, forests, honey and crude oil, and their potential for ordering and disordering that brings the reader closer to the realms of *Xa'ak',* Sohn's cartography raises the question of ontological design and world-making technicities. The chapter is an invitation to reframe the ongoing environmental collapse as the collapse of an impossible one-world world model, so as to engage in its urgent transformation towards ontologically manifold models.

The processes of colonial transmutation that recursively return in the history of designed systems, are further explored by Lila Athanasiadou, a writer and researcher with an interest in understanding architecture and urbanism – and the increasing use of digital tools within its production – as a complex instrument of subjectification.[21] Chapter 2, her contribution, titled "Gentrification, Colonialism,

and Urban Echo Chambers," offers a fervent and lucid critique (a counter-cartography) of somewhat naturalized conceptions of (and discourses about) gentrification as a ubiquitous force shaping urban life. Through the work of postcolonial critics like Brena Bhandar and Frantz Fanon, Athanasiadou exposes the broader processes of gentrification as a socio-political construct fundamentally shaped by (settler) colonial, racial, and commodity logics, and by capitalist ideologies. This exposition begins with a concise review of the longer history of those ideologies, long hidden behind legal questions concerning property, ownership, territory, or land value, and modernist narratives of "development" and "improvement" of unproductive land or areas through economic investment, as they hide constitutive processes of disinvestment that initially lead to dispossession and displacement. Turning to the recent past where these ideologies – or better, noologies – are increasingly obfuscated by forms of algorithmic abstraction, the chapter presents a critical analysis of fifteen years of urban and social housing policies in Rotterdam, their not-so-hidden discriminatory agendas, and their social cleansing rhetoric. In thinking with media-theorist Wendy Chun, the chapter traces how such disguising markers of racial discrimination by naturalized proxies came to be further entrenched into statistics and algorithmic sets of "discriminating data." This "smart" marketing of cities and residential areas as homogenized lifestyle options, the chapter warns in conclusion, erodes the constitutive characteristic of cities as cosmopolitan places of encountering and negotiating difference and heterogeneity. In this regard, the urban echo chamber is used as a conceptual tool to make links to design at the level of law, policy, and planning technicities. This connection points to the frictions between individual possibilities (such as housing ownership) and how they come to be restricted by constraints put forth within a historically-constructed system.

The linkage between gentrification and the colonization of land resonates closely with the geological reading in Chapter 3 by Alina Da Porciuncula Paias. "Ghosts of the Rio Doce: Tracing the Ethical Grounds for A Hauntological Practice of Architecture at the Site of Disaster" frames a mining site as an event in its entangled social, technical and political complexity. Kathryn Yusuf's geology as a way of seeing (and changing) accompanies the unpacking and making present of the colonial transmutation process at work in the mining site.[22] The complex relations between mining, erasure and purity are further problematized, resonating with Athanasiadou's concerns about development, displacement and the social cleansing rhetoric. Paias questions the possibility and necessity of engaging the presence of the past in ways that care for "problematic ghosts" such as colonialism. Through a thread of inquiry that connects different discourses, from Bergson's theorizations of memory and time at a psycho-social level all the way to Karen Barad's conceptualization of indeterminacy at the quantum level, the

"hauntological investigation" emerges as central to making present the repressed or unresolved violence of the mining event. By opening the site to multiple stories, Paias's mobilizations of hauntological investigation not only informs her writing but also shows that there is room for potentializing the unactualized "virtual" of the material traces that colonial logic has backgrounded. Therein the chapter helps to further destratify the first discourses on what may be thought of as primarily social aspects "in space". The more-than-human and posthuman direction it suggests, instead accounts for environmental-material conditions within such self-organizational processes to which we move in the second part.

Part Two centers on questions around "In/Formational Technicities." In a move that starts from the technical, leads to the environmental and then back to social registers, the four contributions to this part examine information not as data, but as the production, consumption, and dissemination of meaning (what is affectively relevant and significant), so as to postulate that the space of technicity is fundamentally informational. In the form of two discourse-analyses and two more synthetic accounts, this part suggests that, if information is the only thing that escapes natural laws and allows the cosmos to individuate further, designing ought to be reconceived sensibly in terms of modes of relationality.

The discussion opens with a contribution by the architect and architecture theorist Gökhan Kodalak, whose research is marked by its longstanding engagement with the philosophies of Spinoza and Simondon, their conception of how environments affect psycho-social life, and the implications these conceptions have for architecture.[23] In Chapter 4, "Gregory Bateson, Distributed Mind, and Cybernetic Ecology," Kodalak guides us through a critique of Western modes of representationalist thinking consolidated within Descartes's division of mind and matter, and the way they haunt current discussions on informational systems. Based on this critique, he elaborates on the radical epistemological operation that led Bateson to understand such diverse entities as thermostats, cities, and redwood forests as a "distributed mind" (an immanent continuum), eventually reframing how design stands in relation to technology and current limitations. The author does so by the reframing of "information," scaffolded by the unwitting resonances between Bateson and the Spinozian ethics of immanence. Accordingly, the mind is not just a biological feature possessed by living things. Rather, it ought to be seen as an emergent becoming inherent in the self-organization of systems that are fundamentally made up from organized but non-living matter; the mind then emerges when these systems process "significance." Asking about the relevance of this conception for architectural modes of thinking through matter, the chapter suggests substituting res extensa visions in which the world is chunked into pre-existing components and elements to form a new Batesonian "minimum unit," namely the "organism *plus* environment," or "being *plus* milieu," whereby

the emerging mental dimension is enmeshed with material environments. The chapter's second half generalizes Bateson's epistemology and cybernetic ecology within a heterarchical framework, a notion systematically explored in Kodalak's work, which helps foster a more Spinozist, immanent conception of affective self-organizing matter. The chapter concludes by stressing the ethical implications (and potentials) of such a conception in light of our current ecological entanglements.

This invitation to rethink the term "(design) intelligence" in ways different to the common usage in design's computational theories, is extended in Chapter 5 by Bruce Clarke, whose research on the wider relation between literature, space, and cybernetics has since the mid-2000s repeatedly engaged with posthuman and Gaian systems theory.[24] The chapter, "Gaian Technics: Lynn Margulis, Natural Technicity, and the Technosphere," approaches Margulis's work as a somewhat inverse and complementary reading to Simondon's ontology of the technical, and his account of its ontogenesis. With a Gaian inflection, Clarke attends to an emergent technical capacity built into natural organic development, which he calls "natural technicity." Based on Margulis's distinction between autogenic organisms (that shape environments via their physical structures) and allogenic organisms (that shape their environments by non-organic means), the chapter highlights Margulis's seminal steps towards a wider history of allopoietic life.[25] In its various natural technicities, which emerge in its ontogenetic form – which biologists call adaptive niche construction – allopoietic life is highlighted as a geological force that arose long before the appearance of humans and their increasingly impactful technologies shaping the planet. In this longer natural history, in which "machines" have always been part of evolving systems, the Anthropocene might be revisited as a "new regime of natural technicity," where previous forms of niche construction have progressively become forms of niche destruction. In connecting niches more explicitly to design theory, Clarke calls for a renewed understanding of the recursive function of "waste" as a resource for change, and recycling processes in life's co-constitutive technosphere.

This investigation of autogenic organisms as engineers and niche constructors is complemented by the subsequent elaborations of Sha Xin Wei, whose transdisciplinary and experimental art, technical research, and scholarship shares a wider interest in topological approaches to poiesis, play, and process.[26] In line with The *Space of Technicity*'s general problematization of the way that technology functions as a mediator between social and environmental formations, Chapter 6 strategically stresses the processual aspect of our world. It considers "how technologies and techniques mediate between human, biosemiotics, and physical *processes*," and introduces – as the title designates – "A Metabolic Approach to Designing Space." Sha critiques a number of limited ways in which design and

architecture have formally mimicked metabolism, in notions of biomimicry, metabolic design, or biophilic design. Instead, he redefines metabolism via the use of biological systems theory, particularly the mathematics of phase space in biology as opposed to mere mathematical readings of phase space. Terms like open-endedness, dense metastability, metastable politics, instability, and non-prestatability form the central conceptual angles for the proposed metabolic theory. This theory is exemplified in the context of a piece of software, called the SC State Engine Project, for composing responsive media environments. In its elaboration of this approach, and how evolution is not guided by laws, Sha's chapter not only harks back and retroactively informs Kodalak's reading of more-than-cybernetic ecologies, but it also anticipates various strands in the subsequent chapters. All focusing on evolving technical objects from the planetary scale (like those of Clarke and Kodalak) to interior spaces (Sha), these three chapters critically revisit the ways in which design's politics and ethics are redefined across different scales within the more-than-human complexity of living systems. Through their shared assumption that life operates by means of technologically mediated forms of co-evolution and sympoiesis, the chapters of this vector lead us through several serious reconsiderations of how design itself designs our own ways of being.

The second part concludes with Stavros Kousoulas and Andrej Radman's "Annotate This! Semiotization, Automation and the Recursive Causality of Images." Chapter 7 challenges the inherent homogenization resulting from the uncritical adoption of automation technologies, commonly referred to as AI. The authors assert that sensibility injects heterogeneity into thought development, establishing contingency an essential thinking condition, unbound by datafication. Their primary focus lies in semiotization, where experience returns the body to a process field of exteriority. *Imagi(ni)ng*, as the creative force within an imagistic cycle, thus emerges as a transindividuating activity that modulates sense.[27]

Part Three offers a discussion of "Onto/Technicities." Moving from the environmental through the social and the technical, the three contributions to this part invite us to rethink subjectivity, especially in its ingrained substantive conceptions, adopting a post-Darwinian notion of sensibility where our receptive faculties are themselves the result of design. By connecting the somatic and the social, the subjective and the objective, through the determining power of affective indeterminacy, the chapters of this vector enunciate a transindividuation that avoids the pitfalls of genetic determinism and social constructivism.

This last part opens with a contribution by Agnieszka Anna Wołodźko, whose affect-theoretical work investigates the ways in which (bio)art and design – using living bodies and matter as its medium – contributes to changes in the contemporary understanding of bodies.[28] Chapter 8, "Agropleasure in Demonic Grounds – On Resistance Across Gardens," attends to gardening as resistance (in

contrast to perhaps more hegemonic technopractices), exemplifying the movement from the environmental (garden) to questions of the socio-technical (labor relations and their implications for the body). While concerned with the questions of whose worlds and worlding the gardening practice engenders, in the spirt of Sohn's essay, the chapter enables a significant extension of the vegetal and its potential for rethinking the complex ways technicities operate at the level of affect and potential. For Wołodźko, the garden and its more-than-human infrastructures generate affects that pave the way for making present the absence of the labor of the many. The movements within and through the multiple layers of the garden become an invitation to traverse the complex terrain of labor.

A similar sort of affective transindividuation is expressed in the contribution by John Protevi, known best for his various expositions of Deleuze and Guattari's assemblage theory, and his numerous contributions at the intersection of political economy, affect-theory, and enactive cognition.[29] Chapter 9, "Under the Dome: The Events of January 6," provides an enactive political philosophy, outlined through an examination of the events that led to the storming of the US Capitol in 2021, and the rioters' affective-cognitive states that led to this type of collective self-organization. After an initial clarification of the Deleuzian conception of an "event" and its implication for what ought to be examined in case studies, Protevi's analysis departs from an enactivist extension of the notion of autopoiesis. Addressed through Ezequiel Di Paolo's ideas of embodied cognition and enactive cognition, Protevi argues (in line with the central arguments detailed in Part Two) that autopoiesis ought to be understood as an adaptive process built into the structural coupling of organisms to their environment. This section takes its lead from the Gibsonian notion of affordances. In sharp contrast to the constraining features of an environment, affordances present relationships between sense-making organisms and environmental structures that afford the potential for certain actions, and which may help incite or solicit action. Protevi then presents an affective cartography of how the Capitol conditioned, in its in its wider political affordances and singular circumstances, one of the mediatized actions, namely the Q Shaman's prayers on the dais of the Senate chamber. He also looks at other instances of defilement that refer us back (both historically and in the overall argument of this book) to the colonial labor processes that enabled the material architecture of the building.

The notion of the event in Chapter 9 resonances with the subsequent theoretical outlines by Marc Boumeester, whose research lies at the intersection of media philosophy, art and design theory, and related pedagogies, problematizing the relation between perception, socio-economic conditions, and affective capacities.[30] Chapter 10, titled "Technicity as the Montage Production of the Mundane," approaches the production of perception as a fundamental part of the technicities

that construct urban life, especially the exceptional role of the mundane in forming an "exo-identity" of places as mental projections. Through a Deleuzian reading in which sense is never given but made, perception is understood as a cinematographic device through which daily life, identities, and reality come to be constructed immanently from an actualization of many virtual elements, whose relation is reciprocally determined within certain events. Harking back to Clark's and Protevi's chapters, Boumeester understand this cinematographing action autopoietically, and extends this conception through the notion of impredicativity: as something produced by what it produces in the first place. Similar to psycho-geographic maps, this mechanism formalizes (and as such actualizes) potentials and virtualities in mental projections, at the expense of others, which guides a selective filtering of information. This biased perception gives further rise to meta-images – which Boumeester calls images by proxy – that merely reify already-existing expectations and significations (a common example being the imaginaries around certain tourist destinations such as Paris). After elaborating how these abstract machines come to form auto-affective systems, the chapter concludes – in a somewhat unexpected twist – that instead of simply re-presenting reality all over again, such machines produce a completely new type of reality, desires, and subjectivities.

Advocating a novel technical literacy in spatial-environmental technologies and associated practices such as architecture and urbanism, the book inaugurates the *Ecologies of Architecture* series. It serves as a point of departure for scholars examining space and its technicities from an e(thi)co-aesthetic angle. We hope that this collection contributes in the form of a general theory (mechanology) of the "technicities of spaces" that emerge from assemblages, and at the same time as a population of specific theories that allow us to strategically intervene in situated processes, where the technicity of (concrete) spaces arises from particular socio-techno-environmental entanglements. And with it we hope that the scholars thinking and working through the complexities and systemic entanglements of our present will not only find a scaffold within these pages through which to individuate new knowledges but also operational ways forward to turn negative and disindividuating processes into affirmative becomings.

Notes

1 Rosi Braidotti, *Posthuman Feminism* (Cambridge/Medford: Polity, 2022), 3.

2 For recent critical extensions of this Lefebvrian position, see e.g. Doina Petrescu and Kim Trogal, eds., *The Social (Re)Production of Architecture* (Abingdon/New York: Routledge, 2017); and Meike Schalk, Thérèse Kristianson and Ramia Mazé, *Feminist*

Futures of Spatial Practice: Materialism, Activism, Dialogues, Pedagogies, Projections (Baunach: AADR, 2017)

3 On the notion of ecologies of practice, see Isabelle Stengers, "Introductory Notes on an Ecology of Practices," in *Cosmopolitics*, trans. Robert Bononno (Minneapolis: University of Minnesota, 2010), 183–96; as applied to architectural practice, see Hélène Frichot, *Creative Ecologies: Theorizing the Practice of Architecture* (London: Bloomsbury, 2019). On ecological approaches to architecture in general, see especially Peg Rawes, ed., *Relational Architectural Ecologies: Architecture, Nature, Subjectivity* (Abingdon/New York: Routledge, 2013); Hélène Frichot; Catharina Gabrielsson, and Helen Runtig, *Architecture and Feminisms: Ecologies, Economies, Technologies* (Abingdon/New York: Routledge, 2017); and Andrej Radman, *Ecologies of Architecture: Essays on Territorialisation* (Edinburgh: Edinburgh University Press, 2021).

4 For a discussion of related extensions of genetic theories towards epigenetic and possibly epiphylogenetic processes, as suggested in the work of philosopher of technology Bernard Stiegler, see Robert A. Gorny and Andrej Radman, "From Epiphylogenesis to General Organology," *Footprint* 30 (2022): 3–20.

5 See Stavros Kousoulas and Dulmini Perera, "Five Points Towards and Architecture In-Formation," *Footprint* 28 (2021): 3–8.

6 See e.g. Alicia Juarrero, *Dynamics in Action: Intentional Behavior as a Complex System* (Cambridge, MA: MIT Press, 2002) and Terrence Deacon, *Incomplete Nature: How Mind Emerged from Matter* (London/New York: Norton, 2012).

7 See Robert A. Gorny, "Reclaiming What Architecture Does: Toward an Ethology and Transformative Ethics of Material Arrangements," *Architectural Theory Review* 22, no. 2 (2018): 188–209.

8 Gilbert Simondon, *On the Mode of Existence of Technical Objects*, trans. Cecile Malaspina and John Rogove (Minneapolis: University of Minnesota Press, 2017).

9 See Simondon, *On the Mode of Existence of Technical Objects*, part III, "The Essence of Technicity."

10 See Stavros Kousoulas, *Architectural Technicities: A Foray into Larval Space* (Abingdon/New York: Routledge, 2023).

11 Dulmini Perera, "Wicked Problems, Wicked Play: Fun Machines as Strategy," *Form Akademisk* 13, no. 2 (2020), doi: 10.7577/formakademisk.3378.

12 On the notion of becoming-with, see Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016), 58. On the notion of entanglement, see e.g. Karen Barad, "Nature's Queer Performativity," *Women, Gender & Research 1*, no. 2 (2012), 25–53.

13 Félix Guattari, *The Three Ecologies*, trans. Ian Pindar and Paul Sutton (London: Athlone Press, 2000 [1989]).

14 Michel Foucault, "Space, Knowledge, Power," in *Essential Works of Foucault*, Vol. 3, ed. and trans. Paul Rabinow and James D. Faubion (New York: The New Press, 1997), here 361–2.

15 Yuk Hui, "On Cosmotechnics: For a Renewed Relation between Technology and Nature in the Anthropocene," *Techne* 21, no. 2–3 (2017): 319–41; Luciana Parisi and Ezekiel Dixon-Román, "Recursive Colonialism and Cosmo-Computation," Social Text Online (2020), available online at https://socialtextjournal.org/periscope_article/recursive-colonialism-and-cosmo-computation/.

16 Manuel DeLanda in conversation with Christopher Cox, "Possibility Spaces," in *Realism, Materialism, Art*, ed. Christoph Cox, Jenny Jaskey, and Suhail Malik (New York/Berlin: Sternberg, 2015), 87–84.

17 This point was wonderfully problematized, for instance by Laura Diamond Dixit, Kadambari Baxi, Jordan Carver, and Mabel O. Wilson, "Who Builds Your Architecture?," in *Asymmetric Labors: The Economy of Architecture in Theory and Practice*, ed. Aaron Cayer et al. (Brooklyn: The Architecture Lobby, 2016), 37–42.

18 On this point see Nathan Van Camp, *Redesigning Life: Eugenics, Biopolitics, and the Challenge of the Techno-Human Condition* (Bern: Peter Lang, 2015), especially ch. 5.

19 See also Nishat Awan, "Mapping Otherwise: Imagining Other Possibilities and Other Futures," in *Feminist Futures of Spatial Practice*, ed. Meike Schalk, Thérèse Kristianson and Ramia Mazé (Baunach: AADR, 2017), 33–42; see e.g. the articles by Anil Bawa-Cavi and Patricia Reed, "Site as Procedure as Interaction," and Elie Ayache, "The Only Possible Project," in *Construction Site for Possible Worlds*, ed. Amanda Beech and Robin Mackay (Falmouth: Urbanomic, 2020), 83–99 and 193–208.

20 Heidi Sohn, "Monstrous Becomings: A Minor Cartography," in *Architecture and Ugliness: Anti-Aesthetic and the Ugly in Postmodern Architecture*, ed. Thomas Mical and Wouter van Acker (London: Bloomsbury, 2020), 77–94; Sohn, "Heterotopia Unbound: Undisciplined Approaches to 'Space Otherwise'," in *Differences in the City*, ed. Julia Urabayen and Jorge León Casero (New York: Nova Science, 2020), 3–15; Sohn and Andrej Radman, eds. *Critical and Clinical Cartographies: Architecture, Robotics, Medicine, Philosophy* (Edinburgh: EUP, 2017).

21 Lila Athanasiadou, "Communication Ontology" and "Lociality/Non-Separability," in *The Posthuman Glossary*, ed. Rosi Braidotti and Maria Hlavajova (London/New York: Bloomsbury, 2018), 86–88 and 235–36; Antoinette Rouvroy in conversation with Lila Athanasiadou and Goda Klumbytė, "Re-Imagining a 'We' Beyond the Gathering of Reductions: Propositions for the Three Ecologies," *Footprint 30* (Spring/Summer 2022): 121–34; Athanasiadou and Klumbytė, "Algorithmic Governmentality and Managerial Fascism," in *Deleuze and Guattari and Fascism*, ed. Rosi Braidotti and Rick Dolphijn (Edinburgh: EUP, 2023).

22 See also Alina da Porciuncula Paias, "The Home of the Witch," *The Funambulist* 23 (2019): 50–53; Paias, "Minas, as in Mines: A Hauntological Approach to the Site of Disaster" (MSc thesis, Delft University of Technology, 2021).

23 Gökhan Kodalak, "Spinoza, Heterarchical Ontology, and Affective Architecture," in *Spinoza's Philosophy of Ratio*, ed. Beth Lord (Edinburgh: EUP, 2018), 89–107; Kodalak, "From Architecture Lifeless to Architecture Alive," in *Architectures of Life and Death*, ed. Andrej Radman and Stavros Kousoulas (Latham: Rowman & Littlefield, 2021); Kodalak, "Simondon, the Question of Technology, and the Architectural Margin of Indeterminacy," *Footprint 30* (2022): 91–106.

24 Bruce Clarke, *Gaian Systems: Lynn Margulis, Neocybernetics, and the end of the Anthropocene* (Minneapolis: University of Minnesota Press, 2020); Clarke, "Rethinking Gaia: Stengers, Latour Margulis," *Theory, Culture, Society* 34, no. 4 (2017): 59–74; Clarke, ed., *Earth, Life, Systems: Evolution and Ecology on a Gaian Planet* (New York: Fordham University Press, 2015); Clarke, *Posthuman Metamorphosis: Narrative and Systems* (New York: Fordham University Press, 2008).

25 Margulis drew on autopoiesis to counter neo-darwinist visions. In this way she moved away from Varela and the notion of autopoiesis through her own research on microbes, her distinction of auto- and allopoiesis (discussed in more detail in Clarke's chapter), and especially Kozo-Polyansky's notion of symbiogenesis and respective theories of evolution. See for instance Lynn Margulis, "Symbiogenesis: A New Principle of Evolution," *Paleontological Journal 44*, no. 12 (2011): 1525–39. For a discussion, see Clarke, *Gaian Systems*, 87.

26 Sha Xin Wei, *Poiesis and Enchantment in Topological Matter* (Cambridge, MA: MIT Press, 2013); Sha, "Topology and Morphogenesis," *Theory, Culture and Society* 29, no. 4–5 (2012): 220–46; Sha, "Theater Without Organs: Co-Articulating Gesture and Substrate in Responsive Environments," in *Living Architecture Systems Group White Papers*, ed. Philip Beesley and Ala Roushan (Toronto: Riverside Architectural Press, 2016), 276–91.

27 Gilbert Simondon, *Imagination and Invention*, trans. Joe Hughes and Christophe Wall-Romana (Minneapolis: Minnesota University Press, 2022).

28 Agnieszka A. Wołodźko, "Ars Demones *2022* Manifesto," *Footprint 30* (Spring/Summer 2022): 135–57; Wołodźko, *Bodies within Affect: On Practicing Contaminating Matters through Bioart* (PhD diss., Leiden University, 2018); Wołodźko, "Between Bio(s) and Art: Intensities of Matter in Bioart," in *Innen – Außen – Anders: Körper im Werk von Gilles Deleuze und Michel Foucault*, ed. Ann-Cathrin Drews and Katharina D. Martin (Bielefeld: Transcript, 2017), 221–36; Wołodźko, "Materiality of Affect: How Art Can Reveal the More Subtle Realities of an Encounter," *This Deleuzian Century: Art, Activism, Life, ed. Rosi Braidotti and Rick Dolphijn* (Leiden: Brill 2014), 169–84.

29 E.g. John Protevi, "Geo-Hydro-Solar-Bio-Techno-Politics," in *Posthuman Glossary*, ed. Rosi Braidotti and Maria Hlavajova (London: Bloomsbury, 2018); Protevi, *Life, War, Earth: Deleuze and the Sciences* (Minneapolis: University of Minnesota Press, 2013); Protevi, *Edges of the State* (Minneapolis: University of Minnesota Press, 2019).

30 E.g. Marc Boumeester, "Unframing Urban Density: The Somaesthetic Cartography of Intensities," in *Rethinking Density: Art, Culture, and Urban Practices*, ed. Anamarija Batista, Szilvia Kovács, and Carina Lesky (Berlin: Sternberg Press, 2017), 42–53; Boumeester, "The Desire of The Medium" (PhD diss., Leiden University 2017); Boumeester and Andrej Radman, "The Impredicative City, or What Can a Boston Square Do?," in *Deleuze and the City*, ed. Hélène Frichot, Catharina Gabrielson, and Jonathan Metzger (Edinburgh: EUP, 2016), 46–63.

Bibliography

Athanasiadou, Lila. "Communication Ontology" and "Locality/Non-Separability." In *The Posthuman Glossary*, edited by Rosi Braidotti and Maria Hlavajova, 86–88 and 235–6. London: Bloomsbury, 2018.

Athanasiadou, Lila and Goda Klumbytė, "Algorithmic Governmentality and Managerial Fascism," in *Deleuze and Guattari and Fascism*, edited by Rosi Braidotti and Rick Dolphijn. Edinburgh: EUP, 2023.

Awan, Nishat. "Mapping Otherwise: Imagining Other Possibilities and Other Futures." In *Feminist Futures of Spatial Practice,* edited by Meike Schalk, Thérèse Kristianson and Ramia Mazé, 33–42. Baunach: AADR, 2017.

Ayache, Elie. "The Only Possible Project." In *Construction Site for Possible Worlds*, edited by Amanda Beech and Robin Mackay, 193–208. Falmouth: Urbanomic, 2020.

Barad, Karen. "Nature's Queer Performativity." *Women, Gender & Research* 1, no. 2 (2012): 25–53.

Bawa-Cavi, Anil and Patricia Reed. "Site as Procedure as Interaction." In *Construction Site for Possible Worlds*, edited by Amanda Beech and Robin Mackay, 83–99. Falmouth: Urbanomic, 2020.

Boumeester, Marc and Andrej Radman. "The Impredicative City, or What Can a Boston Square Do?" In *Deleuze and the City*, edited by Hélène Frichot, Catharina Gabrielson, and Jonathan Metzger, 46–63. Edinburgh: EUP, 2016.

Boumeester, Marc. "The Desire of The Medium." *PhD diss*., Leiden University, 2017.

Boumeester, Marc. "Unframing Urban Density: The Somaesthetic Cartography of Intensities." In Ret*hinking Density: Art, Culture, and Urban Practices*, edited by Anamarija Batista, Szilvia Kovács, and Carina Lesky, 42–53. Berlin: Sternberg Press, 2017.

Braidotti, Rosi. *Posthuman Feminism*. Cambridge/Medford: Polity, 2022.

Clarke, Bruce (ed.) *Earth, Life, Systems: Evolution and Ecology on a Gaian Planet*. New York: Fordham University Press, 2015.

Clarke, Bruce. "Rethinking Gaia: Stengers, Latour Margulis." *Theory, Culture, Society,* 34, no. 4 (2017): 59–74.

Clarke, Bruce. Gaian Systems: Lynn Margulis, *Neocybernetics, and the End of the Anthropocene*. Minneapolis: University of Minnesota Press, 2020.

Clarke, Bruce. P*osthuman Metamorphosis: Narrative and Systems.* New York: Fordham University Press, 2008.

Deacon, Terrence. *Incomplete Nature: How Mind Emerged from Matter.* London/New York: Norton, 2012.

DeLanda, Manuel in conversation with Christopher Cox. "Possibility Spaces." In *Realism, Materialism, Art*, edited by Christoph Cox, Jenny Jaskey, and Suhail Malik, 87–84. New York/Berlin: Sternberg, 2015.

Dixit, Laura Diamond, Kadambari Baxi, Jordan Carver, and Mabel O. Wilson, "Who Builds Your Architecture?" In *Asymmetric Labors: The Economy of Architecture in Theory and Practice*, edited by Aaron Cayer, Peggy Deamer, Sben Korsh, Eric Peterson, Manuel Shvartzberg, 37–42. Brooklyn: The Architecture Lobby, 2016.

Foucault, Michel. "Space, Knowledge, Power." In *Essential Works of Foucault*, Vol. 3, edited and translated by Paul Rabinow and James D. Faubion. New York: The New Press, 1997.

Frichot, Hélène, Catharina Gabrielsson, and Helen Runtig. *Architecture and Feminisms: Ecologies, Economies, Technologies*. Abingdon/New York: Routledge, 2017.

Frichot, Hélène. *Creative Ecologies: Theorizing the Practice of Architecture*. London: Bloomsbury, 2019.

Gorny, Robert A. "Reclaiming What Architecture Does: Toward an Ethology and Transformative Ethics of Material Arrangements," *Architectural Theory Review 22*, no. 2 (2018): 188–209.

Gorny, Robert A. and Andrej Radman. "From Epiphylogenesis to General Organology." *Footprint 30* (Spring/Summer 2022): 3–20.

Guattari, Félix. *The Three Ecologies*. Translated by Ian Pindar and Paul Sutton. London: Athlone Press, 2000.

Haraway, Donna. *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press, 2016.

Hui, Yuk. "On Cosmotechnics: For a Renewed Relation between Technology and Nature in the Anthropocene." *Techne 21*, no. 2–3 (2017): 319–41.

Juarrero, Alicia. *Dynamics in Action: Intentional Behavior as a Complex System*. Cambridge, MA: MIT Press, 2002.

Kodalak, Gökhan. "From Architecture Lifeless to Architecture Alive." In *Architectures of Life and Death*, edited by Andrej Radman and Stavros Kousoulas. Lanham: Rowman & Littlefield, 2021.

Kodalak, Gökhan. "Simondon, the Question of Technology, and the Architectural Margin of Indeterminacy." *Footprint 30* (Spring/Summer 2022): 91–106.

Kodalak, Gökhan. "Spinoza, Heterarchical Ontology, and Affective Architecture." In S*pinoza's Philosophy of Ratio*, edited by Beth Lord, 89–107. Edinburgh: Edinburgh University Press, 2018.

Kousoulas, Stavros. *Architectural Technicities: A Foray into Larval Space*. London/New York: Routledge, 2023.

Kousoulas, Stavros, and Dulmini Perera. "Five Points Towards and Architecture In-Formation." *Footprint 28* (Spring/Summer 2021): 3–8.

Margulis, Lynn. "Symbiogenesis: A New Principle of Evolution." *Paleontological Journal 44*, no. 12 (2011): 1525–39.

Parisi, Luciana, and Ezekiel Dixon-Román. "Recursive Colonialism and Cosmo-Computation." *Social Text Online* (2020), available online at https://socialtextjournal.org/periscope_article/recursive-colonialism-and-cosmo-computation/.

Perera, Dulmini "Wicked Problems, Wicked Play: Fun Machines as Strategy." *Form Akademisk 13*, no. 2 (2020), doi: 10.7577/formakademisk.3378.

Petrescu, Doina and Kim Trogal, eds. *The Social (Re-)Production of Architecture*. Abingdon/New York: Routledge, 2017.

Da Porciuncula Paias, Alina. "Minas, as in Mines: A Hauntological Approach to the Site of Disaster." *MSc thesis,* Delft University of Technology, 2021.

Da Porciuncula Paias, Alina. "The Home of the Witch." *The Funambulist 23* (2019): 50–53.

Protevi, John. "Geo-Hydro-Solar-Bio-Techno-Politics." In *Posthuman Glossary*, edited by Rosi Braidotti and Maria Hlavajova, 175–8. London: Bloomsbury, 2018.

Protevi, John. *Edges of the State*. Minneapolis: University of Minnesota Press, 2019.

Protevi, John. *Life, War, Earth: Deleuze and the Sciences.* Minneapolis: University of Minnesota Press, 2013.

Radman, Andrej. *Ecologies of Architecture: Essays on Territorialisation.* Edinburgh: Edinburgh University Press, 2021.

Rawes, Peg, ed. *Relational Architectural Ecologies: Architecture, Nature, Subjectivity.* London/New York: Routledge, 2013.

Rouvroy, Antoinette, in conversation with Lila Athanasiadou and Goda Klumbytė. "Re-Imagining a 'We' Beyond the Gathering of Reductions: propositions for the Three Ecologies." *Footprint 30* (Spring/Summer 2022): 121–34.

Schalk, Meike, Thérèse Kristianson and Ramia Mazé. *Feminist Futures of Spatial Practice: Materialism, Activism, Dialogues, Pedagogies, Projections*. Baunach: AADR, 2017.

Sha Xin Wei. "Topology and Morphogenesis." *Theory, Culture and Society 29*, no. 4–5. (2012): 220–46

Sha Xin Wei. "Theater Without Organs: Co-Articulating Gesture and Substrate in Responsive Environments." In *Living Architecture Systems Group White Papers*, edited by Philip Beesley and Ala Roushan, 276–91. Toronto: Riverside Architectural Press, 2016.

Sha Xin Wei. *Poiesis and Enchantment in Topological Matter*. Cambridge, MA: MIT Press, 2013.

Simondon, Gilbert. *On the Mode of Existence of Technical Objects, trans. Cecile Malaspina and John Rogove*. Minneapolis: University of Minnesota Press, 2017.

Simondon, Gilbert. *Imagination and Invention,* trans. Joe Hughes and Christophe Wall-Romana. Minneapolis: Minnesota University Press, 2022.

Sohn, Heidi, and Andrej Radman, eds. *Critical and Clinical Cartographies: Architecture, Robotics, Medicine, Philosophy*. Edinburgh: EUP, 2017.

Sohn, Heidi. "Heterotopia Unbound: Undisciplined Approaches to 'Space Otherwise'." In *Differences in the City: Postmetropolitan Heterotopias as Liberal Utopian Dreams*, edited by Julia Urabayen and Jorge León Casero, 3–15. New York: Nova Science, 2020.

Sohn, Heidi. "Monstrous Becomings: A Minor Cartography." In *Architecture and Ugliness: Anti-Aesthetic and the Ugly in Postmodern Architecture,* edited by Thomas Mical and Wouter van Acker, 77–94. London: Bloomsbury, 2020.

Stengers, Isabelle. *Cosmopolitics.* Translated by Robert Bononno. Minneapolis: University of Minnesota, 2010.

Van Camp, Nathan, *Redesigning Life: Eugenics, Biopolitics, and the Challenge of the Techno-Human Condition*. Bern: Peter Lang, 2015.

Wołodźko, Agnieszka Anna. "Ars Demones *2022* Manifesto." *Footprint 30* (Spring/Summer 2022): 135–57.

Wołodźko, Agnieszka Anna. "Between Bio(s) and Art: Intensities of Matter in Bioart." In *Innen – Außen – Anders: Körper im Werk von Gilles Deleuze und Michel Foucault*, edited by Ann-Cathrin Drews and Katharina D. Martin, 221–36. Bielefeld: Transcript, 2017.

Wołodźko, Agnieszka Anna. "Materiality of Affect: How Art Can Reveal the More Subtle Realities of an Encounter." *This Deleuzian Century: Art, Activism*, Life, edited by Rosi Braidotti and Rick Dolphijn, 169–84. Leiden: Brill 2014.

Wołodźko, Agnieszka Anna. "Bodies within Affect: On Practicing Contaminating Matters through Bioart." *PhD diss*., Leiden University, 2018.

PART I
Dis/Empowering Technicities

Ode to Chaos: Neotropical Entanglements and Other Narrative Fictions from the Pluriverse

Heidi Sohn

-§-

Dawn is close. A thick layer of mist lingers a few inches above the ground in a patch of dense tropical forest near *Hopelchén*, the place of the five sinkholes. The air is humid and fat with dew; it smells of cold ashes and smoke, rotting leaves, mushrooms, moss, mud. A thin ray of light starts to make its way through the lush foliage of a gigantic *ya'axche*, the sacred ceiba (or kapok) tree. Its solid bark has the texture of grey elephant skin. It marks the center of the cosmos, the axis of life and death. Next to it lean the remains of a lifeless tree. A shiny black centipede crawls down and disappears in the ground into the bowels of *Xibalbá*, the underworld. Rustling sounds of biped footsteps approach, then stop. Two fingers, a thumb and an index, are inserted into a small hole in the trunk; they wiggle around like blind pigeons and then pinch. A blob of syrupy substance starts oozing out, leaving a trail of golden stickiness along its downward path. A buzzing sound fills the air and intensifies rapidly around the hole: the angry protest of a six-legged, stingless sentinel. The *jícara* is full of honey. Footsteps recede into the background. Silence returns to the forest. The sun is out, bathing the treetops and the creatures that dawdle and play on them. Bright red bromelias, white orchids and cobalt blue morning glories growing in all sorts of height-defying postures soak in the sunrays while a few *xunan-kaab*, stingless honeybees also known as *Melipona beecheii Bennett*, dance on their pistils brimming with pollen and nectar. The buzz of their flightpaths pierces the atmosphere of the forest, crisscrossing it like invisible spiderwebs. Inside the hollow tree trunk, in the *xjobón che*, an intra-world of exquisite spatial patterns, fractal recesses, cavities and chambers filled

with pungent fragrances and substances is being generated with the incessant batting of delicate wings and biochemical reactions. The hive, a sort of entelechy or superorganism, is the interior of an insect matriarchy, a "queendom," that has perfected the reproductive technologies necessary for the continuation of its own gene pool and its expansion in future colonies. It produces legions and swarms of specialized courtesan subjects: consorts, soldiers, drones, builders, workers, foragers, harvesters, caretakers, nannies. They provide the energetic conditions that make possible the perpetual production of a territory, and the surplus nutrients upon which their existence rests. *Kaab* is the word that encapsulates this palynivore world; in its patterned arrangements and rich, waxy modulations the flows of energy and matter are articulated across time and space.

Four bees, one after another, emerge from the hole. One after another, they take flight: east, west, north and south. They land on the branches of four ceiba trees, and merge into them. The transmutation of kingdoms, vegetable and insect, elevates these lifeforms through mutualism to thirteen bee-tree deities, *xmulzen kaab* or *bacab'ob*. Together they support the four cardinal points of the universe and its center. They guard and give consistency to the three existential planes of the universe: *Xibalbá*, the underworld of cenotes or sinkholes and underground rivers and caves; *Iztam Kaab Ayin*, the scaly surface of the Earth; *Oxlahuntikú*, the upperworld of skies and godly heavens. They carry *Xux Ek*, the morning star Venus, along its orbit across the heavens. Descending from the skies like shooting stars, bees dive and land in petrified form on lintels and celestial bands of temples and ceramic expressions of the trajectory of another world they help to feed and organize: the much younger dimension of humans. *Kaab*: the world is the hive is the bee is the honey.

><

Saturday, October 18, 2022, 12.30. Zumaia, Euskadi. 28,6 degrees Celsius, the warmest October day in recorded history. It is high-tide, there is good visibility, the wind is calm. A small boat with a group of tourists sets off a few miles into the Cantabrian Sea towards the flysch formations of the UNESCO-sponsored Geopark. From the open sea the Gipuzkoa coastline becomes visible. An abrupt, yet surprisingly beautiful landscape of cliffs and geological formations that defy the laws of physics and aesthetics with their aggressive verticality meet the sea. The result is an ongoing geogenic spectacle: partially hidden horizontal planes of differential erosion and abrasion patterns where hard limestone layers rise to the surface in low tide, reveal an eerie, watery scape of elongated rocky filaments. Like the rumps of lithic whales stranded on the shore they are also the habitat of a delicate biotope of endemic species of fauna and flora that have evolved under

extreme conditions for millions of years. Together these tectonic formations are the pages of a gigantic open book. Each stratum is a chapter in the deep history of the Earth. The guide then points to the existence of a thin layer of not more than five millimeters of dark sediment trapped between more layers of limestone and marl – a soft, sandy composite material. From the boat it is invisible; yet the impact it has had on the planet is not. It is a layer of nearly pure iridium peppered with iron and nickel-rich micro-spherules that help tell the story of extraterrestrial impact, of extinction and of planetary change. Iridium, a siderophile, is rarely found on the crust of our planet because it prefers to merge with iron, thus becoming heavier and sedimented in much deeper strata close to the hot core of the Earth. But it also occurs in other space-borne objects, including smaller wandering bodies such as asteroids or meteoroids that have the tendency and bad habit of jaywalking into the orbits of other bodies, often provoking serious crashes. In the words of the tour guide, when geologists find iridium on the surface layers, they know that it is proof of some sort of extraterrestrial encounter of violent impact. The guide then hands a large plastic model of an ammonite – its stiff tentacles reaching out into space – to a little boy in the front row, to show the abundant fossils that have been found in the calcium strata of the flysch. The boy thinks it is an octopus hiding inside the house of another animal. The tourists laugh and forget about the ominous tone of an inhuman elementary story written by iridium, nickel, calcium, iron, chrome and gold millions of years ago. A story that connects the flysch coastline of Euskadi to another narrative dimension: the cracking and collapse of civilizational models.

//|\\

Solar zenith during spring (proposed date: April 1). Northern shores of the Western Interior Seaway (today: Hell Creek Formation, Tanis, North Dakota). Cretaceous-Tertiary Boundary (66.043 million years before the present). Large dinosaur herbivores go about their daily existence; they socialize and engage with other animals at the edges of a muddy waterbody. Nearby, next to the log of a gigantic fern, an old, wounded triceratops lies in silent agony as death nears. Suddenly, the bowels of the Earth rattle and rumble with an unknown force. Swarms of screeching pterodactyls take flight. Instants later a flash flood of fittingly antediluvian proportions takes over the canyon and mixes with an intense rain of spherules, ignited ash and balls of fire. Chaos ensues. All territories and strata are brought into violent contact; many vaporize instantly. Rock becomes liquid becomes gas; solid becomes atomized becomes atmosphere. There is no left or right, no up or down, no in or out. Time and space are jumbled into a hot cosmic mess. The ripped-out arm of a small dinosaur, an impaled turtle, an egg filled with debris, a fish's brain saturated with tiny metallic pellets next to another, smaller fish with its gills full

of tektites, black and green glass micro-spheres encased in amber, the blood of trees, will lie entangled in the mud for thousands of years, slowly being swallowed by the Earth and pressurized for eons until their organic matter and their carbon and calcium substrates have disappeared, leaving only an index of their presence; the semblance of their existence in the slowing-down speeds of a fossil entanglement. They will remain in this fossilized form until their next great shape-shifting transformation, in the revival of the nineteenth-century detective story, the forensic procedural (on a planetary scale) and in documentaries on primetime television. Resuscitated and fleshed out by digital technologies, VR media, and the great story-telling abilities of all-too familiar, trusted voices of wise old men, fossils become instrumental in the (re-)construction of our own "paleo-origins" and that of many warm-blooded animal species. They function as artificial evidence in a geo-forensic style, of one of the greatest mysteries of the twentieth century: they explain the sudden acts of appearance, disappearance and reappearance of (specifically non-avian) dinosaurs and reconstruct the theories of catastrophism and extinction that were until then absent (or had disappeared) from the public mind. The reappearance and familiarization of species which no one alive has ever seen, and thus cannot remember, on H&M toddler pj's, in infantilizing literature and grotesque Jurassic Park™ sequels, attest to the construction of a taste for spectacular, tangible extinction and resuscitation narratives; for endings eternally entangled in beginnings; of genesis and memory out of synch. Catastrophe as a malevolent villain, but also as the agent of history and change in which geology becomes biology becomes alloplastic: it becomes language. The resuscitation of Cuvier-inspired stories of cycles of bubbly emergence, surge and creation followed by long-term boredom and stasis followed by rewarding, bombastic and quasi-total obliteration. Mass extinction. Hyperbole works. One morning in November of 2019, we learn from *The Atlantic* that "Bad Luck (and Fossil Fuels) May Have Doomed the Dinosaurs: according to a new study, the infamous asteroid had only a 13 percent chance of exterminating the giant reptiles."[1] This means that it was the combination of several factors that made the collision lethal, from the inclination of the Earth at that precise time and date to the fact that the asteroid crashed into a zone of the planet where the subsoil is drenched in fossil fuels: hydrocarbon, gas, sulfur and many other highly volatile and explosive substances multiplied the blast manyfold. What would have been a "medium-range" cataclysmic strike if it had made contact on a landmass virtually anywhere else on the planet, became the epicenter of the fifth mass extinction event in the Earth's history. A blast of more than a hundred megatons pulverized all strata including deep lying layers of granite, producing trillions of tons of vaporized incandescent rocks and sediment, acid rain, tsunamis with pounding waves of more than 150 meters, widespread fires, followed by an atomic winter when photosynthesis was virtually impossible.

Seventy percent of all living organisms on the planet were victims of the explosion. Un/worlding. Only a small percentage of life survived this boundary event, the smallest organisms and those who had somehow adapted to underground life: smaller reptiles, mammals, insects (among them bees and wasps), amphibians and birds, some of which would eventually evolve in such a way that they could think about their own existence, about what makes it thrive and what endangers it. Today humans can imagine and factually remember the last boundary event of the planet as if they had witnessed it first-hand. It is now easier to remember extinction by cataclysm than by capitalism. Cultural collapse disorder triggered by overdependence on fossil fuels, or shifting baseline syndrome? We cannot forget what we do not know, yet somehow remember. We search for the origin, the exact location of impact: hard evidence of the crime scene.

‹‹››

On an undisclosed date in 1947 a group of geophysicists set camp in the small settlement of *Chicxulub*, tick on a devil's horn, in the heartland of the Yucatán Peninsula in southeastern Mexico. They were experts in gravity studies searching for clues in the structures of rock formation that could reveal deep-laying inland oil deposits. At the time the Mexican government through its state-owned oil company Petróleos Mexicanos (PEMEX) was heading the extractivist race in the Gulf of Mexico. It was believed that due to the proximity to the underwater oil deposits in the gulf, and the very specific geomorphic conditions of mostly brittle porous limestone, the Yucatán Peninsula would become the Walhalla of Mexican oil production, which was already booming by then. The gravity maps, however, were disappointing in terms of finding hydrocarbon dregs in the mainland. Yucatán was no Texas. In the 1950s some drilling took place, but since this yielded no oil, the project was aborted. The geophysicists packed up their belongings and broke camp. Three decades later, on a bright day in the spring of 1978, a new generation of geophysicists led by Glen Penfield and Antonio Camargo returned to *Chicxulub*. The village had not changed at all. The oval houses of mud walls and high ceilings covered with palm leaves lined the main dirt road. The colorful *hamacas* hanging between citrus and mango trees gave shade to the chickens running around below them. A ranchera song was playing on a distant radio competing with the intense chirping of a cicada drunk with sunlight. Empty soup cans filled with flowers and other plants adorned the entrances of homes, and the air smelled of wood fire and freshly handmade tortillas. Glen and Antonio leased a little house for the expedition. They, like their predecessor scientists, had been hired by PEMEX. Following the first oil shock in October of 1973, the Western Fossil Fuel Intelligentsia had rung alarm. A new race to find oil deposits in allied

territories had become not only important but rather urgent. It was worthwhile to run more tests on the Yucatán Peninsula. PEMEX complied. On the evening of their arrival, the scientists were invited for supper by the villagers. After they had eaten their spicy *pibil* meal, they decided to go for a walk. One of the villagers came along to show them the edge of the mysterious mound that had attracted some attention from the previous expedition in the 1940s. In the flat landscape of the Yucatán neotropics, this formation was indeed remarkable, especially because it was clearly a nonhuman structure. The villagers referred to it as the scaly back of *Iztam Kab Ayin*, or Crocodile Earth. Glen and Antonio returned home as the sun was setting, and lying in their hammocks they talked about their encounter with the mound. They insisted that the formation they had seen looked like ground zero of a gigantic crater. They could only speculate what had caused it, and for a moment they were only peripherally interested in finding oil. They lay there speaking under the stars until late at night, when the crickets had become silent. Meanwhile, thousands of kilometers away, the oil embargo was contributing to the waning of Western postwar progress, sending the global economy into deep contraction, and changing the expectations of what life in the West was supposed to be: closer, faster, brighter, warmer was becoming farther, slower, darker, colder. The next morning, they drove the gas-guzzling expedition Jeep to a nearby field where a small plane was waiting for them. They took off and flew in a northwesterly direction over the Alacranes Reef and out into the green Gulf of Mexico, towards the border town of Matamoros. Halfway through the flight, the equipment began receiving intensified airborne magnetic signals. Two adjacent lines showed simultaneously weak magnetic and high frequency anomalies (between 2 and 250 nanoteslas). Eventually, the images formed from the received data revealed an enormous underwater arc of 70 kilometers in diameter and more than a kilometer deep. From the skies, Glen and Antonio had found an underwater crater 180 kilometers in diameter that centered meters away from their little Mayan house they had rented in *Chicxulub*. Three years later, in 1981, after a lot of pushback from PEMEX, NASA, and the scientific communities on both sides of the border, Glen and Antonio contributed part of their research to the call to identify a giant meteorite crater initiated by Nobel prize winner Luis Alvarez, his son Walter and their collaborators, to prove the iridium-based hypothesis of the K-T boundary event. Some parts of Glen and Tony's work were kept classified until the 1990s as it was instrumental to the Mexican government's oil race and in the building of Laguna Verde, the only nuclear electric power plant in Mexico.

~|~

Before the beginning of time... in the silent interstice of cosmic rest the universe was created by *Kukulcán* (Plumed Serpent) and *U K'ux Kaj* (One-Legged God, *Hurakán*, or Hurricane). Sometime in the years of the Lord between 1554–1558, in *Utatlán* or *Chichicastenango*, today Guatemala, the *Popol Vuh* was written by an anonymous Maya K'iche' penman.

July 12, 1562. *Maní*, Yucatán. Fray Diego de Landa, a Franciscan priest, and provincial guardian of the city of *Izamal*, the place where dew descends from the sky, was pressured to establish a tribunal for the Spanish Inquisition on the grounds of the small open chapel in the village of *Maní*, the place where everything happened. It had come to the attention of the Spanish conquerors that a small boy had been crucified in a Mayan locality of the area and deemed this act unacceptable. The misunderstanding set off a disproportionate retaliation. In a so-called act of faith de Landa destroyed and burnt countless idols and other religious objects in stone, clay and wood, skins with paintings and codices, weapons, utensils and other objects used in hidden heathen worship. It is esteemed that a large part of the records of Yucatan Maya knowledge were destroyed that night. A tropical Kristallnacht.

The Maya have been telling stories for centuries. Many stories were written with hieroglyphs on stelae, zoomorphs, ceramics and in *k'uhulhunob*, the sacred books. Some of these stories, the ones that managed to escape the destructive forces of colonization, were later recorded in Latin scripts to preserve the knowledge for future generations. The *Popol Vuh*, or Mat's people's book, is such an example. It narrates the story of the founding of the universe as a parallel event to the establishment of the Mayab, the terrestrial and cosmic universe of Mayan civilization.[2] It is a rather mad account of the design collaboration of under- and over-worldly forces that does not always go as planned; an ode to trial and error, to cosmic experimentation, quite literally. It depicts the accidented processes of materialization from the formless, rippling, murmuring, sighing of antimatter, of *xa'ak'*, chaos, to the slow formation of horizontal atmospheric layering. Before Life can be thought of, before humans can inhabit the Earth, the matters of the Sky need to be slowed down, worked out and established. This is a task that demands an understanding of the processionary movement of the planet in relation to the calendrical structure of the universe. It raises important and very advanced astronomical questions and incorporates them in understanding how these pertain to our planet prior to imagining the world of humans. In the *Popol Vuh* as in the few other Maya *k'uhulhunob*, or sacred books, that survived the Spanish invasion, conquering and colonization, there is a direct acknowledgement that life on Earth, in particular anthropomorphic life, hinges on the successions of events, accidents and phenomena that are quite literally nonhuman, otherworldly. That in

the myths these events are the result or the effect of the moods, desires or intentions of specific naturalist deities, points towards something that could be thought of as proto-environmental geo-design, an animist design "eco-*logic*." That these designs are envisioned by deities (anti-demiurges, masters of chaos) does not mean, however, that they are necessarily successful or productive. In fact, often they are not. Instead of slowing down matter, they speed it up. Or, instead of channeling flows into a prototype, the flows are set loose. Nonetheless, before the sky and the sea can serve as platforms for the animation of Life, *Kulkulkán*, the Plumed Serpent and Maker of Life, and *U K'ux Kaj* the Heart of the Sky, the one-legged lord of storms, engage in many experiments, some of them with entirely cataclysmic "solutions" that lead to mass extinction as one of their outcomes. Two examples are telling: one is to bombard the seas (and the moon) with rocks from the skies in the effort to create land, or to dry up surface areas for horizontal inhabitation, as if intuiting the collision of one or more of the asteroids of the Baptistina formation in our solar system as key to the rise of the Yucatán Peninsula and its remarkable geomorphology and sinkhole-punctured orography. This weird tale runs parallel to another story in which a cosmic crocodilian or "earth monster" must be decapitated in order to bring about the creation of the Earth, which its body then becomes (*Iztam Kab Ayin*, Crocodile Earth). Like most other earth monsters, the crocodilian is a paired monster: it makes mountains and causes earthquakes, and it is because of the instabilities that its ambiguity causes that it must be destroyed.[3] Another example is the great flood that the gods send to inundate the Earth after one of their humanoid experiments goes awry. *Kukulkán* and *U K'ux Kaj*, worried by the lack of luster of their creations, decide to revert bad experiments by simply drowning everything alive, to start over. The impulse to interpret these amazing myths from one's own perspective and worldview is often hard to resist. However, one must avoid reducing them only in function of the similarities one observes with Biblical passages, for instance, and more generally to syncretism or cultural contamination and religious pollution. Much of the colonializing views and some of the post-colonial approaches rely on such interpretations. But as *Kukulkán* and *U K'ux Kaj* teach us, to err is not only normal, but it is also godly. In the spirit of the normalization of mistakes, more experiments are necessary and thus always welcome. What if one thinks of these origin myths as a pedagogical tool, an instrument, to transmit and disseminate scientific knowledge that might be too abstract for laymen and women to comprehend undigested? Would it be possible to see in these accounts the seeds of a literature of worlding, of terraforming in the making? Arguably, these accounts contain delicate naturalist and animist intuition paired with keen observation skills and methods to find in the night sky the clues we seek to understand the universe (astronomy). Or when observing not only the formations on the surface of the Earth (geography/orography) but also the exploration

of caves and sinkholes (speleology) filled with fossils of extinguished beings: smaller avian dinosaurs, saber-tooth tigers, mammoths and even early humanoids (paleontology, pre-histories / paleoanthropology). Would it be far-fetched to think that in the *Popol Vuh* and other survivors of ancient Mayan knowledge there was already an understanding of the geogenic origins of the Yucatán Peninsula, something that has taken thousands of years to imagine and prove in the West? That this knowledge contains the understanding not only of the ontic and the motives for its conditions, but also a sophisticated grasp of the Earth's (and that of other) planetary systems, and the forces that shape them?

The myths of the Mayab take us from the violent, acute, cataclysmic origins of the universe, and the sudden rearrangements of matter (Cuvier smiles), to the slow yet powerful sliding movements of tectonic plates forming the Neartic and the Neotropical bioregions of the Americas, to the miniature processes of waterborne migration undertaken by the *xunan-kaab* stingless honeybees from the Yucatán Peninsula to the balmy shores of Cuba and other islands of the Caribbean. Driven by tropical storms at the moods of Hurakán, floating inside their *jobón*, colonies of *xunan-kaab* stingless honeybees and their pristine, intensely aromatic honey have found habitats on other shores, attesting to how, where relationships end, new worlds appear.

>=<

In the excavations of Structure 99 in the archaeological site of *Nakum* in northeastern Guatemala, archaeologists found an interesting composite offering displaying several objects that tell the story of architectural and ritual practices such as caching and breaking of the Maya people who once used this ceremonial location. On the top of the structure a series of shattered pottery, stone tools and human bones lie scattered, connecting the moment of their discovery to the times when these were made and used for the last time. They are believed to be the remains of the final moments of this site, approximately 1,200 years ago. A few meters below this point, however, on the lower layers of the structure, another cluster of objects, including figurine heads of clay and jade pendants, are waiting to be found. Once unveiled, they tell a different, much older story, dating to the Protoclassic phase between 2,200 and 2,500 years ago. The archaeologists consider these objects evidence of ceremonial and ritual practices as well as signs of the animist culture that gave them shape. In other words, of a culture that symbolically and ritually assigned vitality and agency to everything in the world.[4] The most important finding in *Nakum*'s Structure 99 is an elongated, hollow, polished clay cylinder approximately thirty centimeters long, with individual removable clay lids on each end. The cylinder has a small orifice along

its front side. The odd shape of the object raised many questions as to what it might be, until it was established that this cylinder was not a musical instrument as was first thought, but was in fact an ornamental *xjobón che*, a representation of a beehive, intended as an offering, probably to *Ah Muzen Kaab*, the descending lord of bees and beekeepers (depicted in many cultural objects throughout the Mayab). This would make it the oldest pre-Columbian *xjobón che* found to date in all of Mesoamerica, and proof that *xunan-kaab* stingless honeybees (*Meliponae, Trigonae*, and others) and their keeping (meliponiculture) have been at the center of the ritual, religious and economic practice of ancient and contemporary Maya culture for at least three thousand years. The *Nakum xjobón che* object is an identical reproduction of the traditional *jobón*, the human-made (or adapted) "receptacle" into which a stingless honeybee colony found in the wild is ushered, transported and adopted in closer proximity to the home of the beekeeper, usually in nearby villages in rural areas. Meliponiculture is known as husbandry: xunan-kaab means lady bee, hence, to tend her, humans regardless of their own gender, assume the role of the bees' husbands, protectors and providers. The nests (hives) of xunan-kaab found in the tropical forests of the Yucatán Peninsula and other regions of the Mayab are not comparable with those of other species of honeybees, such as the European species of *Apis mellifera. Meliponas* seek out dead trunks, and a sentinel will either find or drill an orifice into the wood that will serve as the single, main entrance of the hive. The queen enters first with her courtesans, followed in sequences by the rest of the bees. Her colony is slowly formed inside. *Meliponas* do not produce a honeycomb in the traditional sense and stay clustered in small colonies that produce hubs of individual pellets the size of a small pea, little pots of dark brown and black cerumen or wax, filled to the brim with the exquisite honey and propolis they produce. When "adopted" by a human keeper, a colony will continue to produce its nest in the same way as in the wild, but inside their own *jobón*. The human keeper will extract the honey via one of the side lids only on specific occasions during the year (before the rainy season), as this is when the surplus of honey, propolis and royal jelly becomes available for harvesting. In the tropical forest, when a colony has reached its growth threshold, it sends an expedition of drones to locate a suitable nest, followed by symbolic division dances, swarming and ultimately, the establishment of a new queendom. This process of colonial expansion is re-enacted in the human-managed *jobón* system, where the human husband or keeper will help the ripe colony out of the *jobón* and into a new nest. The honey produced by the stingless honeybee is famous for its high medicinal and nutritional value. But it is much harder to extract economic profit from meliponiculture, as it produces honey in much smaller quantities than regular (industrialized) apiculture. Like marriage, meliponiculture is a labor-intensive practice, one which demands mutual respect and dedication from

both, the human and the bee. This relationship has developed and evolved for millennia, as the findings in the offering of Structure 99 in *Nakum* demonstrate. An archaeologically found object becomes *xjobón che* (symbolic beehive), becomes *naijl kaab* (beehouse), becomes *kuxtal* (life): a mode of existence. Meliponiculture is more than a technology. It is the non-scalar nexus of an ancient cosmovision and an ecology of practices that shape the foundations of the Mayan civilizational model and those of the *xunan-kaab's* miniature lifeworld. It foregrounds specific modes of co-emergence, co-production and co-existence of insects and humans. Arthropods and Anthropos, an unlikely interspecies encounter that defies the logics of production, overturns the rules of supply and demand, and questions the laws of exchange. In this short incursion, what is found under layers of soil, artifacts that surge from the past to make us curious, to make us wonder, also make us remember that beyond symbiosis there is always already sympoiesis. That life, and the worlds we inhabit are "complex, dynamic, responsive, situated, historical systems."[5] That *kuxtal* and *kaab* (life and worlds, hives, bees) are creations, and as such they are always already "collective, emergent and relational."[6] Worlding is a transitive act, a making-with.

***

There is a short fable that is told to young children in the Mayab when they squirm at the sight of or encounter with a bee. A boy is walking through the jungle on his way home when he is confronted with a buzzing swarm of bees. He has never seen a colony-dividing swarm choreography, so he is very scared and begins throwing sticks and stones at the loudly humming cloud of insects. The bees are angered by his actions but seek no retaliation. Instead, the swarm finds its way to its new *xjobón che* and disappears in its depths. The boy is confused about the phenomenon he just witnessed and, driven by curiosity, he comes closer to the hive, only to find himself face to face with the sentinel guarding the entrance. He attempts to stick his index finger inside the small orifice but retreats with a holler: he has been stung! Furious, the boy tries to catch the sentinel with his sore index finger and thumb in a tweezer position. But instead of grabbing the insect, the boy feels a warm, soft, bulb-like object inside, and without knowing why, he pinches it. A blob of rich honey erupts and covers his fingers. As he licks the honey off, he tastes the sweetness of this substance, and feels instant goodness and relief. He sits down next to the dead tree where the new colony has formed its home, trying to savor the last little bits of honey on his fingers. The sentinel appears suddenly on his nose and stares at him with its bright blue eyes and its cute body covered in orange hairs and black and white fur. In a voice that is not human but also not godly, the bee tells the boy that she is *xunan-kaab*, the lady bee, named like all her

sisters in the hive and in the world. She tells him that like him, and all humans, she too has teeth, and not a stinger like the wasps or the scorpions; she explains that stingless honeybees and humans are kin. She tells him the secret to harvest her honey and wax before the rains come, before she disappears back into the hive. The boy returns to the village and reveals the gift of meliponiculture. Since then, children are taught to respect and care for bees as their docile cousins. In the Mayab, *xunan-kaab* is often referred to as another Maya sister, as an expression of insect-human kinship.

The long story of the relationship between *xunan-kaab* and her human keepers predates agriculture by a couple of thousand years. In fact, beekeeping, and in the case of the Maya world, meliponiculture, was a constitutive factor in the development of the *milpa* technology upon which the entire agricultural basis of the Mayab is founded. Beyond being the main vector in the production of honey, royal jelly or propolis, and wax, *xunan-kaab* (and other endemic species of stingless bees) are also very efficient pollinators. Beekeeping of *Meliponas* made possible the domestication and spreading of several forms of wild maize. Corn in its domesticated versions is the one single most important product of Maya (and the Mesoamerican) civilization. Maize is not only the base of all food and rich culinary cultures in Mesoamerica, but it is also the cosmic stuff out of which the contemporary generation of humans is made of, *la raza del maíz*. This explains the direct relationships between honeybees and the divine or scared, either in upwards motion towards the heavens, or downwards, into the dark underworld. *Xunan-kaab* in their worldly form as bees or in their transmuted form as *xmulzen kaab* or *bacab'ob* were informants of the state of the human being and the different environmental planes. Bees recorded and transmitted invisible environmental data to the gods, in particular to *Ah Muzen Kaab*, the lord of the bees. Signs of environmental stress such as impending drought or excess rain, the threat of hurricanes and tropical storms on crops, even the behavior of humans – all information of huge significance also in political terms – were transmitted to the gods. Humans who developed the right observation techniques could access these registers as well. This happened through a meticulous interpretation of the qualities of the honey produced by the *xunan-kaab*. Depending on the quantity, viscosity, acidity or color of the honey produced, humans could know if there were environmental developments underway that were cause for concern. In such cases, elaborate ceremonial offerings were made to appease the relevant deities. It would take the West centuries to develop entomology, on the one hand, and on the other for the military complex to adopt one of its applications: the potential of honey to capture and store data and to transmit nonscalar intensive information on the state of the environment, from indices of radioactivity to the presence of land mines. In the Mayab, the honey assemblage connected the plane of human existence and

everyday life in ways that are today unprecedented in other cultures. Honey had a broad application that went far beyond that of a simple sweetener, which, it must be added, was of little value to Maya culture. The ceremonial and ritual import of *Melipona* honey *(kaab)* placed it beyond everyday consumption; it was used in the fermentation process of *balché*, a highly intoxicating drink consumed only on special occasions. Further, it played a central pharmacological role in the production of medicine as a potent antibiotic and anti-inflammatory ointment used for the healing of sores and dressing of wounds. The use of beeswax was also fundamental for the development of Maya culture in the production of molds, tools, and other crafts, and as a substance with tributary value. The relationship between the stingless honeybee and the Maya remained undisturbed for thousands of years, withstanding the arrival of the Spanish invaders in the sixteenth century and the subsequent pressures of the colonization period. Honey was locally and nationally exported to satisfy the sweet tooth of the West, as was the wax, which was used to produce trillions of candles that brought light to countless dark Catholic churches. During colonial times, meliponiculture, in addition to its cultural and anthropological importance, became established as a vital economic activity of the Maya people, something that remained in place until relatively recently, when the world shared by *xunan-kaab* and the Maya was disturbed by the introduction of what experts refer to as biotechnology and bio-economics. Since the mid 1990s, the state of the *xunan-kaab* in the Yucatán Peninsula has been worrisome, as is the case of most bees around the world, with steep population declines and a loss of biodiversity. Next to the waning of cultural practices such as meliponiculture, of interest are four non-human suspects: two cosmopolitan species – the European honeybee (*Apis mellifera*) and sugar cane (*Saccharum officinarum*), and the rogue actions of a third and fourth agent: the so-called Africanized "killer bee" (*Apis mellifera scutellata*) and the non-nutritious, low-calorie artificial sweetener saccharin (E954). But that is another story.

}|{

It is early morning, but the heat of the summer sun is starting to lick the bright white exterior of the eastern walls. I feel sweat pearls on my lip as I unwrap myself out of the low-hanging hammock. Coffee is already brewing in the small kitchen. I can smell it and hear how the lid on the small blue enamel pot rattles as the black liquid starts squishing in. The house cat, a slender black tabby called *Ek* jumps on the kitchen counter to catch a small bee. It's the first day of fieldwork. I have been asked by a group of agronomists from the Autonomous University of Yucatán to make a site model to accompany a poster presentation and panel discussion they are preparing for a conference at the Department of Horticulture and Crop Science

of the University of Ohio. I am excited to join them, and eager to learn more about the intricacies of the Maya Yucatec *milpa* system they are studying. *Milpa* is a Náhuatl-Spanish word usually substituting the Yucatec Maya *kool*, which refers to the pre-Columbian plot of land, a practice, and a symbiotic system or technology of working-with the land (an equivalent of small scale migrating agriculture); a polyculture that combines several species of endemic horticultural plants (corn, sweet potatoes, calabash, chili-peppers, tomato, beans and other legumes) and the animal species they attract (arthropods, mammals), with other forestry activities (beekeeping, small-scale logging, resin collecting, foraging, and so on). It alternates intensive periods of "patch-based" sowing and harvesting with long periods of land rest and recovery, which in the Yucatán Peninsula is of key importance. Due to the geological composition of mostly brittle limestone, the subsoil comprises only shallow layers of arable soil. As a system of land management, it is not compatible with modern agroindustry, biotechnologies, or neurotic monocultures. It is not devised as a system of exploiting the land or the soil, thus, while it does provide for the livelihoods of the community it yields additional benefit in the form of non-monetary value.

We get into a white Nissan pickup truck and leave the city of Mérida. It is a long and uncomfortable ride on bumpy roads through the rainforest. We walk for another hour along narrow trails in the dense tick-infested grass and undergrowth of the jungle before we reach the *milpa.* A clearing of about three thousand square meters opens in the emerald-green patch of dense forest. The *milpa* is covered with tall maize plants crowned with golden manes flowing over the light green leaves of their cobs. Closer to the ground a mesh of pumpkin plants spreads and sprawls, its stems and tendrils, huge leaves and yellow flowers climbing onto the corn stalks. Squash plants, dark green cucumbers, *chilacayotes*, and watermelons grow in runaway positions close to the edge of the field. Multicolored beanstalks, shiny *chile de árbol*, and a few aromatic tomato plants frame the middle parts of the *milpa*. It is difficult to walk through this entanglement of flowers and leaves and bulb-like, shiny vegetables growing without any apparent grid or matrix. The buzz of insects is overpowering and increases as the sun climbs higher in the sky. These are all key pollinators, even if they do not know it. Their purpose, like that of most species of *Hymenoptera*, is to guzzle up as much pollen as their bellies allow and to drink as much nectar as they can hold. Some will produce invertase, the enzyme needed to catalyze nectar into honey. The airspace of the *milpa* is an intense zone of vectors of pollen-eating pollinators zigzagging in all directions. A few light-blue butterflies the size of a large platter flutter by. I can only imagine the size of their caterpillars chewing away on the underside of a leaf. The *milpa* is regularly visited by other endemic animals: *coati, tlacuaches, cacomixtles*, all sorts of large and small field rodents and hundreds of birds who steal a few bites

or pick into the fleshy side of a pumpkin and then poop the seeds out somewhere more private in the forest. They too play a role in the dissemination and reproduction of plants as indirect fertilizers and seed-spreaders. Occasionally a deer will show up and at the first unexpected sight or sound nervously run back into the forest. Deer are believed to be magical animals, guardians of the fresh water sinkholes that are so abundant in the Yucatán Peninsula and the golden treasures submerged in turquoise depths that their waters guard. Time passes slowly here in the milpa. Next to the shadows of the great ceiba and mango trees I think of the primordial cosmic links between plants-soil-toil. Thoughts from the outside, the time of modern life, are strange and utterly useless here. Sitting on a flat stone, I make a few sketches. I start with the date. It is the summer of 1996. It is impossible for me to know that the so-called biotechnology revolution has started and that its first battles are raging not far from here. Or to think that imperceptible pollutants, chemical substances and composites produced thousands of kilometers away in Chinese factories, with the names of German and North American pharmaceuticals, are penetrating the layers of political discourse and public opinion, permeating the thin skins and tissues of seed epidermis, spreading into their cell composition and changing their DNA chains forever. Still invisible to the human eye, these changes are endangering the delicate ecosystems and interspecies relations that the *milpa* affords and makes possible.

]]-[[

Outer layers of the skin register a slight decrease in temperature. Sleep cycles have been completed. Eyelids open slowly. Front arms rub nose, eyes and snout. Whiskers are activated and start receiving signals: frequencies, odors, smells, vibrations, dust particles, cells, hormones. Slight degree of adrenalin-increase due to hints of feline presence in immediate radius. Strong impulse of the sweet smell of complex carbohydrates, protein, riboflavin. Hunger pang. Hindlegs tense and rump relaxed. Exit orifice. Adjust pupils to sudden differential of light. Skittle erratically across the horizontal surface. Dodge random falling object. Activate thermal vision: blue green. Inanimate object. Smell intensifies. Food source located. Layer of textile hinders satisfaction. Sniffle. Nibble. Scratch with extracted nails. Slit achieved. First seed captured. Initial satisfaction as carbohydrate is digested. Enzyme confusion. Overlapping smells, one not identified. Danger in the food source. Assess reaction. Loud noise in secondary radius. Adrenaline rushing to legs. Heat map registers orange and red cluster. Large animal approaching. Abort scavenging. Hide behind dense object. Cease all movement. Whiskers activated on high alert. Ears on radar mode. Large animal approaches food source. Source of food is lifted. Large animal and food source leave the area. Lower heart rate. Return on latest smell trail. Hide in burrow.

The *tlacuache*, a small endemic marsupial that looks like a pocket-size opossum, adopts its usual doughnut position and returns to sleep. It is the third time this week that it has attempted to steal the seeds, this time it will cease the ones that fell out of the sack. There is something odd about the way these seeds smell and taste. Meanwhile, the sack of soybean seeds marked clearly with the text Roundup™ and the 'green-white-blue washed' Bayer ™ logo, has been transported by tropical Menno to his 1958 Chevy pickup truck standing outside with the headlights on. It is 4.30 am in *Hopelchén*, the place of the five sinkholes. Menno and his farmer clan adjust their denim overalls as they get ready for another day of intensive farming. They are members of the Santa Rosa Camp, an Old Colony Mennonite community among many that have relocated to the Yucatán Peninsula after migrating from the northern state of Chihuahua where their ancestors settled exactly a century ago, in 1922. As self-appointed stewards of God's Creation tropical Menno and his clan enact their religious right to ignorance daily. In a carefully manicured selection (and shunning) of modern science and technologies, and a choreographed lack of contact with the Outside, Old Colony Mennonites residing mostly in the southern state of Campeche have become one of the most important agents in the ongoing ecocide of the neotropical forests that cover the Yucatán Peninsula. As the *tlacuache,* and many other lifeforms, will soon find out Mennonites are responsible for rampant deforestation, loss of habitat, and the wide-spread soil, air and water pollution in the region, spreading highly toxic, systemic pesticides and herbicides to protect the genetically modified 'pretreated' seeds upon which their large scale, highly industrialized mono-agricultural empire depends. Among the invisible culprits are systemic pesticides (neonicotinoids, such as imidacloprid and thiamethoxan produced by Syngenta™; and organophosphates, such as broad-spectrum glyphosates – Roundup and Gaucho™, produced by Monsanto-Bayer™). Systemic pesticides are substances that affect the plant genetically, that is, seeds that are pretreated with these pesticides will transmit the substances into the plant as it grows. The sap that circulates through the plant soaks every cell with the toxin contaminating its flowers, pollen and nectar, as well as its fruit and seeds (if the plant is designed to produce seed, that is.) Bees and all pollinators that come in contact with the plant or the substance (through consumption, i.e.) will ingest doses of these toxins and become intoxicated in various degrees and with different symptoms. Seed pretreatment, a form of lacing, spraying and any form of administration, as well as the seeds, the plants, the bees and other pollinators, and the animals that eat these plants or other animals that have been in contact with them, become part of a lethal chain on a micro-scale that extends exponentially. A deadly biotechnology, where the plant becomes the poison, designed to leave few and weak traces. Forensics in the wild.

Hairs on the side of cheek twinkle. Drop in light volume and pressure. Sleep cycle completed. Hunger pang. Activate whiskers. Input signals of strong smell of hexapods. Close range food source. Hunger pang. Skittle across horizontal surface. External plane. Darkness increases. Odors multiply. Large source of immobile insect-based protein. Ingest. Ingest. Ingest. Clean snout and whiskers. Ingest. Activate adrenaline for digestion. Enzyme confusion. Endocrine system on alert. Sharp pain pangs in flank. Return to nest. Failed attempt. Renewed attempt to return to nest. Failed attempt. Hindlegs not reacting. Assume side-position. Loud noise audible. Escape not possible. Large biped animal approaches. Loud voice audible.

"Nog en Waschbä, de sik doot stelt!" (Another racoon that plays dead!) Blackout. The *tlacuache* was not catatonic nor was he playing dead. Due to the lack of other sources of food, it had been feeding on a diet of dead bees piling up in the corner of the shed. They were victims of something known as colony collapse disorder: disorientation, intoxication. Perished due to the combined actions of neurotoxins and death of their gut bacteria by glyphosate. Should an autopsy by performed on the *tlacuache*, it would reveal several miniature tumors growing like grapes inside its tiny body. It died of lymphoma metastasis. In an apparently disconnected event, in 2011 the EU issued a ban on a shipment of honey produced in the Yucatán Peninsula under the claim that it contained traces of genetically modified pollen.[7] This led the Mexican authorities to ban GM seeds and fertilizers in the region.

^|^

It was in 1998 when as a young architect I was invited to participate in the interior re-design of three thousand square meters of office space for the Mexico City headquarters of the sugarcane refinery Beta San Miguel. Although the architectural interventions were limited to the design of mostly open layouts for office workspaces, the project was nevertheless interesting: the owners had a substantial art collection which they wanted to exhibit in their offices. The budget was also practically unlimited. They had a taste for exotic hardwood. Black ebony, swamp mahogany and other expensive timber was to be laced with iron and concrete for the hallway flooring, covered with antique Persian rugs in the main offices, very much in the industrialized postmodern style of the 1990s. They enthused over the proposal of a design for two hundred linear meters of undulating walls executed in sucupira wood, as well as pear and cherry wood panels, on which their art pieces would be displayed. I was involved only peripherally, helping with electrical installation drawings and other less exciting work. The perk of the job was the regular visits to the company's main sugarcane refinery in the state of

Quintana Roo in the Yucatán Peninsula, which we reached taking a small propeller plane from the Cancún airport. There was no runway, so the plane would land on site. The refinery was established on the grounds of *San Miguel de K'ux*, an ancient latifundio that was now the production site of Beta San Miguel. The living quarters were housed close by in a beautiful eighteenth-century hacienda of red and yellow walls and high ceilings in the middle of the jungle. All the rooms were connected by exterior hallways that smelled of bat droppings and wax. The *chacuaco*, the refinery's tall brick chimney, served as the lookout point onto sugarcane plantations that extended as far as the eye could reach. This was the vast landscape of unlimited, sweet capital. The visits were mainly to discuss the headquarters project with the owners, who had temporarily moved to the hacienda while they purchased what they referred to as "some more land" in an *ejido* called *Laguna Om* in the neighboring state of Campeche. The sugar industry, like the extraction of hydrocarbons, is a highly profitable tropical business. It was introduced at a small scale to the Yucatán during the seventeenth century, growing rapidly into one of Yucatán's most important businesses, along with henequén, an agave fiber plant, and honey. During the eighteenth and nineteenth centuries vast landscapes of *latifundios*, large land holdings, or single-owned estates, spread out over the tropical forest, placing exuberant architectural palaces in the middle of the jungle, and introducing widespread deforestation and land-clearing technologies. While in the rest of the New World slavery was a common labor practice, it was not popular in Mexico. The Maya, as were most indigenous people in the country, were a sufficiently docile and cheap labor force, not prone to uprisings or revolt over landgrabs and other exploits (although there are notorious exceptions, including the Caste Wars between 1847–1901). In official discourse, the *latifundio* technology was ended as an outcome of the Mexican Revolution of 1910. Following the ideologies of Emiliano Zapata and his Southern Army, Maya insurgents and revolutionaries fought to put an end to the dominion of sugarcane and *henequén* plantations and the destruction of the *milpa* heritage. The revolutionary motto: *tierra y libertad*; *la tierra es de quien la trabaja* (land and freedom: land belongs to who works it) sounded loudly in Yucatán. It was a premonitory cry. As I saw in the late 1990s, the latifundio technology was back, alive and kicking, fostering a heavily industrialized mode of production based on exploitative monocultures. The sugarcane plant, *Saccharus officinarum*, a wind-pollinated species, was also thriving again. A century earlier it had placed pressure on meliponiculture, which was waning partially due to decreasing quantities of produce. The arrival of sugarcane and *ingenios azucareros* (sugar refineries) triggered the introduction of the cosmopolitan honeybee *Apis mellifera*, colloquially known as the European or American bee. This was an attempt to improve the amount of honey produced in an industrializing context in which the Maya were kept in a disadvantageous

position. It would take decades before the link was established between deforestation and habitat loss, the introduction of invasive species and monocultures not reliant on insect-pollination, and the loss of biodiversity, including the slow extinction of several of the sixteen species of endemic stingless bees in the Yucatán neotropics. I certainly was not aware of that either, but looking at the sun setting behind the palm trees into a horizon of bright green waves and orange skies, I thought about what it would be like to have been a laborer in those plantations before there was electricity. Right then, a *hacienda* employee wearing a black and white uniform offered me a coffee. It was aromatic like the coffee is in the neotropics. Almost automatically, I reached for the trusted little pink envelop with its white powder, the guarantee of "guilt-free" sweetness. I was not aware then that I was ingesting the very first product developed by Monsanto, saccharin, nor that it was connected to the slow waning of meliponiculture, and the rise of lifestyle disease disorders such as metabolic syndromes that would make honey interesting once again to the obese consumer of the twenty-first century.

‡‡

Up until the late 1980s Mexico was ruled by a mighty political class that had remained in power since the 1920s as an outcome of the Mexican Revolution. Governed by masons and patriarchs, the PRI (*Partido Revolucionario Institucional*) ran the country as a sort of low-intensity dictatorship (*dictablanda*) for nearly seventy years. When the PRI rule began showing obvious signs of failure, the reaction of the younger, fresher generation (many of them graduates of American Ivy League universities) was to update the political agendas and dusty discourse. The older generation was colloquially referred to as *los dinosaurios del PRI* (the PRI dinosaurs), alluding not only to the fossilized political views of these reptilian rulers and their refusal to go extinct, but also to their adamant support for and obsession with an extractivist political economy based on hydrocarbons, in particular crude oil and petroleum derivates. Since the 1930s when President Cárdenas nationalized the oil industry (PEMEX), Mexico had been on a steady growth path – or development trajectory – that also sank the national economy in deep debt with the US and the IMF. By the 1980s it was clear that the younger membership of the PRI, important sectors of society and the general electorate wanted the dinosaurs gone. As a result of the global financial crash, in part fueled by the first and second oil crises stemming from conflict with Middle Eastern countries, Mexico declared bankruptcy in 1982. In exchange for a massive bailout package, the country adopted a free-market rhetoric that backed the PRI's full alliance with neoliberal regimes and logics. This enforced important constitutional reforms that benefitted the interests of foreign and private capital, honoring NAFTA and

other such arrangements. Silently, however, the younger PRI was planning the extinction of the dinosaurs with a long-term politico-economic project known as *la reforma energética* (energy reform). In the early 1990s it was unthinkable that Mexico would ever let go of what was both a crown jewel and cash cow, the state-controlled PEMEX, but in the back offices of the PRI, politicians were already preparing the transition that would take the country by surprise more than two decades later. In any case, back in 1988 at the time when President Salinas de Gortari "stole" the election, the countryside and the urban poor were once again on the losing side: *ejidos* and communal land-tenure became private property and were sold off massively, especially in the vicinity of urban areas. In other regions, like the Yucatán Peninsula, the constitutional reforms to land tenure fostered massive selloffs of tropical forest and jungle areas. The same happened to 2,400 parastate-owned industries, such as the national telecommunication company TELMEX. Labor laws further weakened the social contract, making painfully visible the asymmetrical abyss that had always already been there, but which had been ignored or glossed over, between the populations of "deep Mexico,"[8] that is, rural, indigenous populations, as well as the urban poor, and the mostly creole and mestizo urban middle class. The dinosaurs were tentatively placed outside the public eye, of course, but untouchable as they were, they remained active in the background, planning their next parasitic attack.

On January 1, 1994 a loud roar was heard in the deep forests and across the highlands of Chiapas in the southeastern regions of the Mayab. Led by sub comandante Marcos (now called Galeano) the EZLN (*Ejército de Liberación Nacional*, or National Liberation Army), better known as the Zapatistas, took up arms against the Mexican state and stormed the city of San Cristóbal de las Casas. Effectively, they began the second Mexican Revolution of the twentieth century, a revolution that had the potential to liberate the country from centuries of colonial exploitation, and agitate for much-needed reparation. Unfortunately, this revolution was discursively constructed and spun as a "revolt" by the government, the media and powerful elites; a revolt that ended quickly and "peacefully" with the San Andrés Pact in 1995. The Zapatistas achieved many things, among them planting the seed of indignation (*la digna rabia*) and demanding a better life (*el buen vivir*), as well as laying the foundation for the five organizationally autonomous territories known as *caracoles* (snails) and good governance boards (*juntas del buen gobierno*). But perhaps the strongest idea that the Zapatistas contributed was that of radical pluriversal politics, based on "a world in which many worlds fit." The affirmative, almost peaceful ring of that ecumenical mantra attracts the imagination, captures hope, and kindles the creative impulse to design and construct such worlds. Yet, for countless *indígenas* in the Mayab and beyond, this has translated as a world in which many worlds compete, kill, infringe, fight and die off. Worlds of discrimination,

displacement, injustice, exploitation, rape, loss and death. A continuous harvest of constant systemic and structural violence. Low and high intensity wars waged against the autonomy of indigenous cultures with unfair, asymmetrical means for five hundred years. The Mexican state has launched endless attacks and persecutions, covertly or by omission, against the *pueblos originarios*, native or indigenous people, since the San Andrés Pact. One such attack was the Acteal Massacre on December 22, 1997, when forty-five members of the peaceful *Tzoltzil* civil society organization *Las Abejas* (the Bees) were murdered by armed paramilitary forces who had been trained by the Mexican state. Or, in addition to countless other acts of violence, the disappearance and murder of forty-three students in Ayotzinapa on September 26, 2014. *Nos enterraron sin saber que éramos semillas* (they buried us without knowing that we are seeds.)

1712, *Tzeltal* rebellion in Chiapas
1761, *Canek* rebellion in the Yucatán
1821, *Totonicapan* rebellion in Guatemala
1847–1901, "Caste War" in the Yucatán
1915–1922, Socialist Leagues of Resistance in the Yucatán
1932, *Matanza* in El Salvador
1960–1996, Civil War in Guatemala
1994, Zapatista Uprising in Chiapas
1995, Maya Land Rights Movement in Belize
1997, Acteal Massacre
1997, Murder of *Ch'orti'* leaders in Honduras

(())

This is the story of a boy who was like no other. He heard this from his grandmother while she warmed blue tortillas on the fire before sending him off to school in the nearby town of *Tepetitán*, the place between hills, in Tabasco. He heard it from his mother when he returned from school and sat at the table slurping his bean stew. He heard it from his teachers standing next to the papaya trees in the dusty playground at recess. They were all a little afraid of him. The boy was unique in many ways but what made him truly remarkable was that, like an octopus, his skin too would change color when he dreamt. People would pay the grandmother a few coins to peak into the only window of the shack where the boy's family lived while he took his daily afternoon naps, when the heat had become too intense to sleep in the hammock outside. Some days his skin would become brighter than on other days, with truly fascinating kaleidoscopic combinations of swirling tonalities of purple, green, yellow, turquoise and orange running through his short legs and

arms. His skin took on the colors and textures of sunsets, rolling waves, waterfalls, fireworks, jungles, *cempazuchitl* flower fields. Like everything in life, this boy too had to grow and change, and as he did, so did his dreams. Instead of colors and beautiful patterns, his skin started to reflect black and silver tattoo-like shadows of tools, technological objects and machines. Airplanes were delineated one day on his exposed left arm, and what looked like hangars and a runway on his leg. This dream became recurrent until it shifted into what looked like long thin veins of dark green color running through his back. It was a pipeline that connected to a gigantic refinery on the left hand and to a nuclear power plant on the right. People who had become regular spectators over the years, started to worry about the lack of color, the lack of life in his skin, and commented on this in the village during market days. So did his grandmother, who decided to stop the viewing business until further notice to protect her grandson. One afternoon the boy, who was now a teenager, returned home from running errands. He was tired, so he lay down on a wooden bench on the shack's porch. He fell into deep, heavy sleep, his shoulders moving up and down as he took deep breaths. Suddenly the skin around his temples took on a bright, dark yellow color that shifted into large concrete and steel structures with stylized rooftops in the Maya building styles. This image started mutating rapidly into many other, clearly architectural shapes, all of which rendered with very specific materials, typologies and scale. Twenty-one such images were shifting and looping on his face, his cheeks, his forehead, his ears. He was breathing rapidly and somewhat erratically. Along the side of his right jawbone and down his jugular, elongated marks that looked like railway tracks made their appearance and ran down along his limbs. A train began to rumble over his entire body, as it began heaving in regular convulsions. The train ran over the jungle, destroying the lairs of jaguars, wild pigs and monkeys alike. Trillions of insects, bees, butterflies, caterpillars, tarantulas, snakes, snails, crabs, and spiders crawled all over his skin. Ancestral ceibas and other giants of the tropical forest fell over. The train rumbled on, cracking the fragile soil and collapsing into the *cenotes*, the sinkhole system below. Instead of reflecting turquoise water, the boy's skin turned dark red, obsidian green, black. Dead deer and crocodiles piled up around his knees. His arms were covered in what looked like shards of pottery, on his belly a mask of green jade appeared briefly only to be covered in dark ink. The grandmother stood there with a broom in her hand, stupefied by the horrible spectacle taking place on her only grandson's body. She decided it was enough. She filled a *jícara* with water from the well and sprinkled it on the boy's face. He woke up coughing and drenched in sweat and water. The grandmother placed her brown hand on his head and whispered in his ear: "*mi hijo*, it was just a nightmare."

A few decades later the same boy was living in the Palacio Nacional in Mexico City. He had become the leader of the so-called 4T, or Fourth Transformation, and

president elect of Mexico, which he called *La República del Amor* (the republic of love). He was cheered and loved and abhorred and feared. But what he truly wanted was to be remembered for what he was convinced was a vision of the future, that boy-dream that conformed with the dreams of white bearded patriarchs on the other side of the ocean. That one-world world that he missed intensely without ever having seen it or having been there. Unaware of his dream-sensitive skin, he made it his personal mission to materialize his megaprojects at all costs: the airport, the train, the refinery, and all the deadly infrastructures that connected them, even if they belonged to a different era, that of the dinosaurs.

The *Tren Maya* (Maya Train) has been firmly rejected by most Maya people, and criticized as the re-inscription of colonializing tendencies and further pillaging of their lands and heritage. It is a direct affront to the integrity of mountains, jungles, steppes, waters and skies (all of which are alive in the Maya cosmology) as much as to that of human and more-than-human inhabitants, past, present and future. Many Mexicans have united and joined the Maya people in unprecedented acts of solidarity and protest, extending the discontent to the courts of law. Nonetheless, the megaproject is currently being developed as a militarized project of "national security" in seven segments along more than 1,500 kilometers across the Yucatán Peninsula, placing incalculable pressure on otherwise highly fragile ecosystems and modes of life. The impact so far has matched the horrid visions on the boy's skin: countless hectares of tropical forests and wildlife habitats are being cleared and destroyed. The collapse of *cenotes* under the weight of negligent designs and hasty engineering are filling these underground sacred caves and river systems with the debris of the western nightmare. It is a nightmare that, for better or worse, seems to be coming to an end elsewhere, in another world. Uncountable archaeological sites are being carelessly uncovered and quickly archived in unknown locations, forever tampering with evidence of the presence and lives of the ancestors of more than eight million native Maya people who call the Yucatán Peninsula their home today. The train and its deadly infrastructural design expose many Maya communities to a way of life that threatens their own. As dusk falls upon the forest, our skins turn black.

Ik' Yak'ab' Tah'n (black is his dark heart).

--<+>--

> "Chaos is defined not so much by its disorder as by the infinite speed with which every form taking shape in it vanishes. [...] Chaos is an infinite speed of birth and disappearance."[9]

To conclude, a few extra words of explanation. These fragments are compressed versions of a huge amount of material and information that I have collected and drawn from a few corners of my own memory and experience, and of the Mayab, the intoxicating universe of Maya culture and technicities, which I hold so dear. They are approximations of the generating idea that gave rise to this chapter: the co-existence of worlds of insects, non-human animals, people, plants and environmental beings such as tropical forests with the one-world worldview that Western civilization has imposed, and which now seems to be coming to an end. The idea that we all exist in a single world, or reality, and are thus irremediably, fatefully, tied to its collapse, needs to be refuted and chiseled away, starting perhaps with the exploration of other narratives and storytelling experiments that contribute to the construction of worlds that exist, although not equally, in a Pluriverse. These notes attempt to deal with these incommensurable yet interlocked worlds without drowning in an ocean of academic cross-references and citations.

During the past year I have tried over and again to capture and domesticate a wild entanglement of somehow connected elements, domains, scales and story lines, using the tools of academic research and writing that are available to me. These attempts to seize a swirling, moving, twisting constellation using theoretical methods have been stifling and ultimately, in vain. They have, however, brought me closer to the realms of *xa'ak'*, chaos, understood, also in the Maya universe, not as absurdity and disorder, but as a cosmic source prior to all life from where intense energetic flows are propelled into virtually every direction, bringing with them productive creations and/or dysfunctionalities. These can, and do, coexist. Everything that emerges from this source if not possible, is pure potential. The speed with which these flows engulf us determines our constant struggle to slow them down, to construct rafts to float over to calmer shores, even if provisionally they give support while we construct a territory, a Life. In the force flows of cosmic energy that spiral from *xa'ak'*, honey and petroleum function as temporary stabilizers, they create (narrative) territories that help me to speed up the stories and slow them down so that all agents get to inhabit a part of the storyline. The bees and humans that I write about here, follow their own entangled trajectories. But they are vectors, also for storytelling about how order and disorder are continuously at play; how many worlds constantly collide, intersect and interact, often

struggling to maintain a territory, a language, a culture, a religion, a worldview, a technology, a relationship with an insect or with a deadly chemical compound. A world where many worlds *may* fit, or a pluriversal understanding of reality that begins with narratives and stories that bring them together and hold them apart. I take inspiration and thus owe tribute to the marvelous novel *The Actual Star* by American novelist Monica Byrne.[10] Not only does she construct a complex plot, but she also weaves life into worlds distant in historical time, yet not in space or experience. I owe credit and tribute also to Katarzyna Beilin's interesting and carefully curated work on the relationship of plants, humans and non-human animals, and the land of the regions that we care about.[11] The snippets and short anecdotes I share take shape only when read and associated further in the thoughts of the reader. Then, they live on, or they disappear.

Notes

1 Robinson Meyer, "Bad Luck (and Fossil Fuels) Might Have Doomed the Dinosaurs," *The Atlantic*, November 9, 2019 https://www.theatlantic.com/science/archive/2017/11/the-extinction-of-the-dinosaurs-was-very-unlikely/545378/.

2 Anonymous, *Popol Vuh: Las Antiguas Historias del Quiché* (illustrated) (Guatemala: Editorial Piedra Santa, 2003).

3 Gabrielle Vail and Christine Hernández, *Recreating Primordial Time: Foundation Rituals and Mythology in the Post-Classic Maya Codices* (Boulder: University of Colorado Press, 2013).

4 Jaroslaw Zralka et. al., "Excavations in Nakum Structure 99: New Data on Protoclassic Rituals and Precolumbian Maya Beekeeping," *Estudios de Cultura Maya* 44 (2014), https://doi.org/10.1016/S0185-2574(14)71396-6; Jaroslaw Zralka et. al., "The Discovery of a Beehive and the Identification of Apiaries among the Ancient Maya," *Latin American Antiquity* 29, no. 3 (2018): 514–31, https://doi.org/10.1017/laq.2018.21.

5 Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016), 58.

6 Arturo Escobar, *Designs for the Pluriverse: Radical Interdependence, Autonomy and the Making of Worlds* (Durham, NC: Duke University Press, 2018), xvi.

7 Sainath Suryanarayanan and Katarzyna Beilin, "Milpa-Melipona-Maya: Mayan Interspecies Alliances, Facing Agrobiotechnology in Yucatan," *ACME: An International Journal for Critical Geographies 19*, no. 2 (2020): 469–500, https://acme-journal.org/index.php/acme/article/view/1746.

8 Guillermo Bonfil Batalla, *México Profundo* (Mexico City: Grijalbo, 1987).

9 Gilles Deleuze and Félix Guattari, *What is Philosophy?*, trans. Hugh Tomlinson and Graham Burchill (London and New York: Verso, 2003), 118.

10 Monica Byrne, *The Actual Star* (New York: Harper Voyage, 2021).

11 Katarzyna Beilin, website, https://www.beilin.space.

Bibliography

Anonymous, *Popol Vuh*: *Las Antiguas Historias del Quiché* (illustrated) (Guatemala: Editorial Piedra Santa, 2003).

Katarzyna Beilin. Website. https://www.beilin.space.

Guillermo Bonfil Batalla. *México Profundo: Una Civilización Negada*. Mexico City, Mexico: Grijalbo, 1987.

Monica Byrne. *The Actual Star*. New York: Harper Voyage, 2021.

Gilles Deleuze and Félix Guattari. *What is Philosophy?* Translated by Hugh Tomlinson and Graham Burchill (London and New York: Verso, 2003).

Arturo Escobar. *Designs for the Pluriverse: Radical Interdependence, Autonomy and the Making of Worlds.* Durham, NC: Duke University Press, 2018.

Donna Haraway. *Staying with the Trouble: Making Kin in the Chthulucene.* Durham, NC: Duke University Press, 2016.

Robinson Meyer. "Bad Luck (and Fossil Fuels) Might Have Doomed the Dinosaurs." *The Atlantic,* Novem ber 9, 2019. https://www.theatlantic.com/science/archive/2017/11/the-extinction-of-the-dinosaurs-was-very-unlikely/545378/.

Gabrielle Vail and Christine Hernández. *Recreating Primordial Time: Foundation Rituals and Mythology in the Post-Classic Maya Codices.* Boulder: University of Colorado Press, 2013.

Sainath Suryanarayanan and Katarzyna Beilin. "Milpa-Melipona-Maya: Mayan Interspecies Alliances, Facing Agrobiotechnology in Yucatan." *ACME: An International Journal for Critical Geographies* 19, no. 2 (2020): 469–500. https://acme-journal.org/index.php/acme/article/view/1746.

Jaroslaw Zralka, Wiesław Koszkul, Katarzyna Radnicka, and Laura Sotelo. "Excavations in Nakum Structure 99: New Data on Protoclassic Rituals and Precolumbian Maya Beekeeping." *Estudios de Cultura Maya* 44 (2014). https://doi.org/10.1016/S0185-2574(14)71396-6.

Jaroslaw Zralka, Christophe Helmke, Laura Sotelo, and Wiesław Koszkul. "The Discovery of a Beehive and the Identification of Apiaries among the Ancient Maya." *Latin American Antiquity* 29, no. 3 (2018): 514–31. https://doi.org/10.1017/laq.2018.21

Gentrification, Colonialism and Urban Echo Chambers

Lila Athanasiadou

From its coinage in the early 1990s by geographer Neil Smith to being adopted as an urban planning agenda, gentrification has become a force deemed inevitable in contemporary urban discourse. Within the last twenty years, economic inequalities have sky-rocketed, with a rise in precarious employment, greedy landlords, and an opportunistic seizure of public property that contributed to further displacement of vulnerable populations. Gentrification is primarily a double process of displacement of low-income residents and their cultural products in historically disinvested neighborhoods, and their replacement by higher-income residents and their "preferred aesthetics and amenities."[1] Gentrification jumpstarts an economic change with capital investment in private property that attracts further municipal and state funding, a cultural change in the character of the neighborhood and demographic changes in the education level, income level and racial makeup of an area.

Within public policy, gentrification seems like a natural process in cities that deal with populations in flux as a result of a global interconnectedness and an extensive urbanization of the periphery. In reality, gentrification is rooted in a "moral investment in the capitalist ideology of private property and a monetary investment in shifting of property values."[2] The way the paradigms of gentrification and private property have been unconditionally accepted within investment decisions and zoning regulations indicates how our institutions have naturalized land theft by perpetuating policies that result in displacement and dispossession, both logics that have driven colonial expansion. Thus, the relationship between capitalism and colonization is important for developing a nuanced understanding of gentrification and the production of contemporary urban space.

Contemporary property law and the entitlement to property that permeate our Western legal systems have been invented and developed as a way to rule the colonies and establish a Western order.[3] The way this legal system is enmeshed in a racial concept of the human is discussed by Brena Bhandar, offering a framework with which to explore the parallels between gentrification and colonialism.[4] Bhandar draws on Ranaiit Guha's work on the British colonial state in India to point out the relationship between colonialism and private property: the British referred to the "Company's territory as an 'estate'" assuming therefore "responsibilities of an improving landlord in Bengal."[5] The expectation of security of investment and the exploitation of land for profit are concepts that come with the conception of the colonial land as state property. State and private property are inextricably linked with each other, as private property can only exist on the basis of claims of legal proprietorship that come with titles of sovereign territory, that consequently ties into the constitutional legitimacy of the nation state. The state property is the dispossessed indigenous property that, according to the state, "requires improvement" as a result of its inhabitants' inability to "properly exploit" it. The logic of improvement, articulated in various ways, has persisted and permeated the discourse around gentrification and urban development. Bhandar insists that both property law and contemporary racial subjectivities are articulated through and realized in tandem, with both premodern and modern rationales operating conjointly to justify settler colonialism.[6]

But the same premodern and modern rationale that gives rise to the settler city persists through the capitalist mode of production of urban space in areas that have historically escaped the dialectical framework of colonizer/colonized. Nicholas Blomley, in *Unsettling the City*, discusses how in settler societies, global developments such as privatization or "the enclosure of the urban commons" can confront "a very local politics deeply marked by the historical legacy of the colonial dispossession of indigenous peoples."[7] In postcolonial states such as Canada, Australia and South Africa, both old and re-articulated forms of colonialism co-exist, while in active settler cities like Jerusalem, there is no clear line between urban gentrification and colonial rule. David Lloyd and Patrick Wolfe, discussing the case of the West Bank, argue that settler colonialism does not give way to the "emergent global order," but is rather "foundational to that order."[8] For the Israeli state, modern neoliberal practices of dispossession and displacement are continuing the settler colonial logic and ethnic and social cleansing that is disguised within the practice of "managing surplus populations."[9]

Following the above frameworks, this chapter historicizes gentrification as the emergence of colonial attitudes towards urban developments, which follows and rearticulates a racial subjectivity. These attitudes have been persisting in differentiated iterations and carried an ideology of improvement that grounded

property law in racial theory, while managing to enter back into law via obfuscation through algorithmic abstraction. Gentrification relies on the targeted silencing of a past, the wiping of histories and the whitewashing of urban neighborhoods, thus enacting neo-colonial narratives that are evident within the language of "urban regeneration" and "development." The same narratives of progress, safety, and civilization that resulted in the historical erasure of Indigenous culture have been used to gentrify cities worldwide, mirroring processes of colonization that are based on racial and class-based violence, imperialist greed, the homogenization of culture and the eradication of diversity.

The Historical Roots of the Ideology of Improvement

The language used to attract new residents in new developments constructed as part of gentrification plans often carry loaded colonial terms. In the Netherlands, the term "kwartiermaker," a military term that refers to the officer who is tasked with preparing and running a settlement, is often used for the entrepreneurs hired by municipalities to kickstart the process of gentrification by drawing in stakeholders and other investors. The terms that are often used in advertisements for new real estate developments –"lifestyle pioneers" or "cultural pioneers" who "occupy" the new "frontiers" – echo the colonial language of manifest destiny. The latter refers to the nineteenth-century colonial ideology that attempted to justify cultural, territorial and economic expansion of European settlers in North America through exploitative and aggressive industrial modernization that eradicated Indigenous territories and suppressed their culture.[10] Manifest destiny relied heavily on the myth of the "disappearing Indian," wrongly claiming that the Indigenous way of life and relationship to the land were destined to disappear, as they were deemed unproductive and unable to compete with capitalist expansion. At the base of this colonial ideology is the ideology of improvement, which links land use with economic productivity, and constructs subjecthood through legal property and a productive use of land.

In settler colonial contexts both the actual use of land (through cultivation) and the legal status of land ownership were conditioned by the same ideology of improvement, developed by the English economist William Petty as an attempt to conceptualize colonial rule and to quantify agrarian English capitalism. Petty initially serving as a physician general for the army of Oliver Cromwell during the re-occupation of Ireland after the Irish Rebellion of 1941, he was later commissioned to develop efficient methods of mapping, surveying and establishing the value of the land that Cromwell's soldiers confiscated from the Irish. Petty was tasked with a cadastral survey that would not only redistribute the land to English soldiers, but also justify English colonial rule in Ireland. To do so, he devised a system of valuing land based on its efficient cultivation, equating the value of land

and the labor of men "so as to express the value of any thing by either."[11] In a series of propositions, he not only sets out to survey the land, but also suggests ways to improve it through approved cultivation methods that would maximize economic productivity.[12]

The ideology of improvement that permeates Petty's work evaluated uncultivated land, or land cultivated for subsistence, as unproductive, unworthy and even wasteful, and therefore in need of improvement.[13] But land and the labor of men were inextricably bound up with one another, and therefore the improvement of one required the improvement of the other. If the land is under-cultivated and unproductive, then the people who do not engage in marketized forms of cultivation are themselves unproductive and in need of improvement. Discussing the brutal displacement of thousands of Irish, Bhandar argues that Petty's "epistemological framework, where people came to be valued as economic units, set the ground for a fusing together of ownership and subjectivity in a way that had devastating consequences for entire populations who did not cultivate their lands for the purposes of commercial trade and marketized exchange."[14] These populations were cast as uncivilized and premodern, since they did not follow particular forms of cultivation, and were therefore unable to master and truly own their land. Their indifference to capital accumulation and their "premodern" techniques of handling the land also caused them to be seen as having lower cognitive capacities than their European counterparts, notions that resonate with eugenic ideas.

The European subject as the title holder of property was selected by God as the "rational and industrious" individual who holds the "art, science, skill" and "faculty" to improve the land by turning waste land into productive land that creates surplus and results into trade, thus participating in the market economy.[15] Land was not only linked to the people that occupied it, but also to the English law of property that "became the sine qua non of civilized life and society, an axiom sharpened at the expense of indigenous peoples throughout the colonial world."[16] In the work of Frantz Fanon, settler and the native are co-constituted through the regime of private property: "it is the settler who has brought the native into existence and who perpetuates his existence. The settler owes the fact of his very existence, that is to say his property, to the colonial system."[17] Settler and native may be ontologically linked through property, but the way property is constituted and users of land can become owners has been designed to justify colonial rule and profit the settler population. Discussing the uneven nature of the definitions of improvement, Eva Mackey argues that only "specific kinds of improvement can make a human being into the owner and master of land and nature; and that other kinds of relationships with land preclude that ownership."[18] The way property law was drafted in the Irish colonies consolidated modes of living, labor practices and the subjectivities of the natives. The legal act of becoming a sovereign land owner

required a rational economic subject that could maintain capital accumulation through land practices and very particular forms of cultivation excluding natives who maintained a completely different relationship to land use.[19]

Discussing how Petty's theories became spatialized and articulated in the work of John Locke and William Blackstone, Bhandar distinguishes between Petty's idea of improvement stemming from economic imperative, and Locke's conceptualization of improvement as a legal concept in the context of slavery and racial regimes of ownership in North America.[20] Locke discusses the depletion of value of uncultivated land, saying that "Land that is left wholly to Nature, that hath no improvement of Pasturage, Tillage, or Planting, is called, as indeed it is, wast [sic]; and we shall find the benefit of it amount to little more than nothing."[21] In a Protestant theological light, land was given to men who could exploit and subdue the Earth, improving it "for the benefit of life."[22] The native population that used the land in common, without enclosing it, was not considered industrious enough, since a prerequisite of ownership was exclusivity. Locke argues: "the fruit, or venison, which nourishes the wild Indian, who knows no inclosure [sic], and is still a tenant in common, must be his, and so his, i.e. a part of him, that another can no longer have any right to it, before it can do him any good for the support of his life."[23] The natives are described as being in a "state of nature," which excludes them from being able to carry out productive labor that can improve the land by maximizing its potential for extraction and commodity value. Capitalist economic activity was the prerequisite of the legal subject of property of land, which in turn preceded the subject as a civilized individual. As Bhandar frames it: "without ownership, and the law that accompanies it, there could be no civilization. The distinction between cultivated land and wasteland ultimately became the basis, during the eighteenth and nineteenth centuries, upon which European colonial powers justified their legal doctrines of terra nullius and discovery."[24]

Terra Nullius and Urban Disinvestment

The concept of terra nullius – 'nobody's land' in Latin – was developed by Locke and described land that did not fulfil the Western criteria for cultivation and ownership, categorized as belonging to no one, empty and valueless in itself. This "vacant land" doctrine was "based on a racist discourse of the civilized and noncivilized, with civilization being signified by private property ownership, the cultivation of land, modes of governance, and social organization."[25] For Locke, to "not follow the European industrial form of working the land was to leave the land to waste, and as long as land could be considered wasted, vacant, and undeveloped, there would be no dispute over Europeans taking possession of it."[26]

In *Unsettling the City*, Nicholas Blomley discusses the notion of terra nullius and its evolution within gentrification in contemporary cities, where areas of the city, described in reports and legal documents as wasted lands, are ripe to be taken by anyone that will "improve" them via economic investment. He describes how "the conversion of low-income housing into up-scale yuppie lofts, the prevailing 'highest and best' use for many inner-city areas, is not only part of the 'natural' evolution of the area, but actively embraced as marking an 'improvement' or a 'revitalization' of formerly 'depressed' (or 'wasted') areas."[27] Blomley compares the terra nullius doctrine with the ideology of improvement in city planning, concluding that "if gentrification entails progress, it follows that urban space that has not been 'improved' is somehow non-progressive."[28] Following the same line of thought as Petty and Locke, gentrification ideology blames the decaying of urban infrastructure on poor residents. Blomley highlights that "the poor are themselves imagined as causal agents of decline – a decayed built landscape and damaged bodies are locked together. The visual decay of the landscape – the boarded-up buildings, the disorder of the street, the pervasiveness of 'lowest and worst use' – are both cause and effect of the feral population of the 'dazed, drugged, and drunk.'"[29] If poor and migrant communities are the architects of their own destruction and responsible for the decay of their neighborhoods, then as with the terra nullius doctrine, the remedy is their displacement and dispossession.

However, before there is urban decay, there is urban disinvestment. Rebecca Amato, describing the way New York was represented in the media in the 1960s and 70s, argues that "images of disinvestment, reproduced in all manner of media, were dominated by cities cavernous with abandoned factories and apartment buildings, acres of overgrown weeds, rubble-strewn yards, and smouldering ruins."[30] These images represented whole areas of the city as empty voids ready to be filled. The aesthetics of destruction are designed through the stripping of basic resources and the production of "empty space as a catalyst for future growth," which has historically also been a colonial project.[31] Neil Smith argues that strategic uneven development, not the residents of those areas, is what keeps areas in decay. He argues that:

> whatever the dysfunctional social consequences provoked or exacerbated by disinvestment –deteriorating housing conditions, increased hazards to residents' health, community destruction, the ghettoization of crime, loss of housing stock, increased homelessness –disinvestment is also economically functional within the housing market and can be conceived as an integral dimension of the uneven development of urban place.[32]

These "dysfunctional social consequences," Liza Kim Jackson argues, are actually "marginalized economic relations" that are otherwise "fully cultural and vital forms of survival for low-income, marginalized, migrant and urban Indigenous communities."[33] But within the bourgeois status quo in contemporary cities, these economic relations are considered less productive, because the goal of gentrification is not redevelopment in itself, but profit as a function of continuous change.

Amato, using Smith's explanation of gentrification, suggests that its goal is not consumption as a teleology per se, but instead a circle of the production of empty space and then the process of filling it, being repeated again and again. She argues that "land close to the city centre, which had been devalued, or filtered, through under-maintenance, block-busting, redlining, and landlord abandonment in the decades of suburbanization, did not lose its inherent worth simply because it had been leap-frogged. It was just banked until such time as values could rise again."[34] Smith argues that private investors and banks can only invest when the "rent gap" is wide enough to yield a high profit; therefore, the more dilapidated a neighborhood, the lower the land prices, the cheaper the redevelopment, and then the higher the profits for the sale of those properties.[35] It is this cycle that makes gentrification a contemporary reiteration of the ideology of improvement, as the teleology is not capital accumulation that is embedded in the property itself, but capital that follows the continuous recycling of the property through cycles of decay, redevelopment, use, disinvestment, followed again by decay.

Disinvestment happens through direct displacement and dispossession; indirect displacement through economic marginalization and exclusionary displacement. Exclusionary displacement is the process where residents opt to leave as the neighborhood fabric has altered to such an extent that there is no longer a sense of community, leading to feelings of alienation and of being excluded.[36] Appearing as a voluntary process, gentrification hides at its core the targeted strategies of the shrinkage of populations. Discussing the settler colonies of Israel in Palestine, Lloyd and Wolfe argue that the Zionist state has been engaging in just such "techniques of elimination," as Palestinians are deemed "surplus population." [37] The logic of elimination is evident in the strategies of land dispossession through military force, legal acts of violence such as evictions and displacement, spatial confinement and cultural suppression. In urban centers, even within a postcolonial European context, urban policies are aimed at such elimination of populations via a variety of legal acts and national and municipal policies.

In the Netherlands, the terra nullius language and logic have been operational in the social cleansing rhetoric of the Rotterdam Act (*Rotterdamwet*). Popularized in a lot of Dutch cities, the policy aims to shield neighborhoods from people with a low income or a record of public nuisance. Initially developed

explicitly as an anti-immigrant measure, the policy was deemed unconstitutional and was subsequently amended to "improve neighborhood livability" and "ensure diversity" by disqualifying poor people from accessing certain neighborhoods. Other policies, such as the NPRZ (National Programma Rotterdam Zuid), make sure that housing policy, employment policy, educational policy, and urban policy benefit and prioritize higher income "lifestyle pioneers," and disadvantage current residents regarded as less worthy of investment.

After a population forecast in 2003 by the CBS (Centraal Bureau voor de Statistiek) in which Rotterdam appeared to become "younger, poorer and blacker," politician Dominic Schrijer expressed the fear that the quality of life and safety of neighborhoods would deteriorate, and advocated for measures to limit that influx of migrants.[38] The Housing Act (Huisvestingswet) was designed as a tool based on a variety of indices (from employment to income, police record, and previous residence history, to whether one received benefits) that would dictate whether one was eligible to live in a certain neighborhood. The city council argued that there should be no physical wall, but a legal wall that controls the immigrant population. Making no attempt to hide the discriminatory character of such a law, the Rotterdam city council, in a report published the same year, mentions that "the color(of one's skin) is not the problem, but the problem does have a color," thus making an equivalence between race and value as described in economic terms.[39] While Schrijer's suggestion – to discriminate based on migration background – was deemed unconstitutional, prohibited under Article 1 of the Dutch Constitution, the law was amended in order to refuse people based on whether or not they received social benefits. Since the majority of people with a migration background receive such benefits, at least during the first few years of their arrival, the law was indirectly targeting migrants. Hiding race and ethnic background behind proxies such as eligibility for benefits allows the policy to appear color-blind, supposedly eradicating racism, as the system can no longer "see" race as a visual marker.[40]

In 2004, the cabinet started working on drafting the measures of the Rotterdam Act into a national government policy, which took effect on 1 January 2006. The Rotterdam Act did not only discriminate on the basis of reception of social assistance, but also according to the controversial Article 8, on the basis of income as well as the requirement to have lived within the city bounds for six years prior to applying for a permit to specific neighborhoods with a "lower quality of life." The assumption was that neighborhoods of "low quality of life" had a higher concentration of people in social housing, without a stable source of income, or people who received benefits.[41] Despite several reports that disputed that assumption, not only did the Rotterdam Act stay in place for over fifteen years, but was it exported as a model for residential confinement to several cities across the country. While the law did of course manage to increase the number

of residents with a higher income through a combination of direct and indirect displacement, there was no proof that there was any improvement in the safety and overall quality of the city.[42]

Liza Kim Jackson notes how "the logic of both the colonial and capitalist productions of space is based on cordoning off transgressive (or savage) bodies from the morally-sanctified bourgeois/colonial body into segregated urban spaces."[43] Praising themselves for multiculturalism and diversity, gentrifying neighborhoods supported by such policies enact social cleansing under the guise of racial mixing. After more than a decade, in April 2022, the Rotterdam Act was partially amended and continued in a few selected neighborhoods in Rotterdam. The main changes have been that Article 8, which discriminated based on economic background and previous location of habitation, is only applied to a small number of streets, while it is being replaced with the non-prohibitive Article 9. While Article 8 refused a permit to poor residents, Article 9 instead makes it possible to give priority to residents with the desired "socioeconomic characteristics."[44] Such characteristics are employment within the healthcare industry, the police, education or the social sector, a middle-class income, and a certain level of education.[45] With a significant reduction of the social housing stock after the 2018 Housing Vision (*Woonvisie*) policy, limited affordable housing overall, and the expected increase in demand due to the increase in population, the residents that are expected to suffer the most from this measure are of course those already excluded from Article 8: the working class residents predominantly with a migration background. In the current form of the Rotterdam Act, the city council has opted for an algorithmic analysis of data in which every street to be considered for the law, is compared to the "average level of quality of life" for Rotterdam.[46]

Algorithmic Abstraction and Lifestyle Segregation

While abstraction in the context of urban planning is often discussed within the context of smart cities, we have been "ruled by abstractions" since the dawn of bourgeois society.[47] The law is a machine for abstraction that rendered land into a commodity through the notion of property, which valorizes it by quantifying human labor and racial hierarchies. The measurement and quantification of land is not inherently problematic. The problem lies in the way humans and their territories are flattened into economic units, the theological notions of industriousness and productivity measured in economic prosperity, the way non-normative value production equates to lower cognitive abilities, and the reification of capital speculation with capital accumulation as the final goal.

Behind the logic of abstraction hides a series of assumptions and political choices that are anything but natural. The commodity logic of abstraction that underlays early forms of property and has evolved into modern excuses for

disinvestment and targeted elimination of populations was based on racial categorizations and taxonomies of economic terms. In the past decades, policies and decisions about urban investment and zoning have been facilitated by algorithmic infrastructures that input data collected via individual citizens, surveys and smart infrastructure in public space, sort it into categories, and ultimately transform it into actionable suggestions for public administrators. In order to be able to perform these functions, the algorithms are "trained" by running iteratively through data sets, to "discover" patterns: statistical correlations that can be described by a function, generalized enough to act as a prediction scheme for new data sets. This predictive capacity is at the basis of contemporary smart applications and resonates with the anticipatory logic that is proposed by the global imaginary of the smart city as a space that responds to uncertainty and risk based on pre-emption, precaution and preparedness.[48] The capacity to abstract and recombine information makes algorithms highly seductive to the neoliberal city, as they are rendered operational not only in the calculation of property values and zoning, but also with regard to the allocation of housing, and the funding of public infrastructure and social services.

The majority of such algorithms are proprietary, and therefore the way they operate remains a black box. From the mid-1990s until the mid-2000s, the housing market in the Netherlands transitioned from supply-driven to demand-driven as construction boomed and banks together with the government tried to offer incentives to new homeowners. With the housing market driven by demand, housing corporations and developers had to conduct market studies to make sure they matched that demand with an appropriate supply. Credit score companies such as Experian and marketing companies such as MarketResponse have been selling their algorithms to cities and private urban developers worldwide in order to cluster households according to arbitrary and patronizing categories based on so-called lifestyles. The Brand Strategy Research (BSR) model, developed in 2000, is such an algorithm, providing a framework for psycho-sociological lifestyle segmentation that divides the population in four clusters linked to four "distinct" lifestyles. MarketResponse claims that "consumers or citizens are classified into different lifestyles based on four color/archetype combinations."[49] It uses terms that define a sociological axis running from "ego" to "group," and a psychological axis ranging from "extroverted" to "introverted."[50] After a deliberation based on different questions, the algorithm distinguishes between four '"lifestyle worlds: yellow (harmony), green (security), blue (control) and red (vitality)".[51]

According to BSR, each of these clusters demonstrates "unique" needs and motivations, and have different requirements when it comes to the products they consume. For example, the red quadrant (vitality) represents people who are self-confident, energetic and passionate, while the diametrically opposed

green quadrant (security) represents people who are mainly oriented to family and peer group values. The model has been used to gauge the percentage of different consumer types in leisure and holiday activities offered by different provinces. When municipalities such as Rotterdam decided to pair the BSR model with two iterations of the Grote Woontest (Large Housing Test) in 2004 and 2008, the results were used spatialise lifestyle segmentation by mapping it onto the municipality's map. With a nationwide geo-psychographic database (SmartGis) the model claims to "know the lifestyle of all households in the Netherlands."[52] With a total of 149 psychographic questions, the survey consists of five parts: personality descriptors, composition of household, occupation, hobbies and interests, and the responders' values. Research into the way the clustering algorithm operates shows that the people who were assigned to the red cluster, "Vitality" are inclined to be have an "adventurous" personality, live in "single" households, work as "entrepreneurs", choose "snow-boarding" as a hobby and value "independence". By contrast, people described by the blue cluster, "Control," tend to be more "self-assured", live in "busy and dynamic family" households, work in "management", prefer their career over a hobby and value "success in life" above all else. Users that pick one item, get associated immediately with a whole list of items that describe the whole cluster in detail.[53] The way urban subjectivities are reduced to a lifestyle label seem to confirm Neil Smith's assertion: "capitalist ideology and relations have become the dominant logic that either infuses or makes expendable all other bases of sociality in the urban setting."[54] Reducing all social, cultural, economic and psychological aspects of subjectivity to consumer lifestyles leads to a flattening of identity.

The Rise of Urban Echo Chambers

Over the years, the linking of branding philosophies and lifestyle models to housing projects and the zoning of neighborhoods has led to a discussion about the potential exclusion of low income tenants due to dirty data and imbalances created through the process of data extraction.[55] Between the two large scale surveys that produced the BSR model, single-person households were underrepresented, couples with children were overrepresented, and immigrant households were almost completely absent.[56] Similar to the way the Rotterdamwet disguised race behind proxies, the BSR-model's patronizing categories remove any socio-economic histories and parameters that create and maintain inequalities. Quoting Cathy O'Neill, new and digital media studies scholar Wendy Chun states that correlations and proxies compensate for lack of evidence and are not innocent, as "they draw statistical correlations ... between a person's zip code or language patterns and her potential to pay back a loan or handle a job. These correlations are discriminatory, and some of them are illegal."[57] Through this correlational

model, discrimination is amplified and inequality is perpetuated by creating categories of "analytically generated groups in terms of their expected value or risk.'[58] Used both as an analytical tool and producing further datasets, BSR models add and remove value from whole neighborhoods. Wendy Chun warns that "ignoring" explicit markers of race "amplifies – rather than alleviates – racism," by naturalizing racism and therefore embedding "whiteness as default."[59]

Rian Peeters , one of the initiators of the Grote Woontest, which established BSR models in the construction and property management industry in the context of Rotterdam remarked that "it was well known that the area below the river was different (read: less good) than above it, but until then it was mainly the intention to make South more North, to make it more of a city." [60] In condescending language, he continued to refer to Rotterdam South as rural (de boerenzij, derogatory term that refers to the South), claiming that "things happening on North were good, so they had to be transplanted to South."[61] According to the Rotterdam municipality and the designers of the test, the ultimate goal was to increase the vaguely described "quality of life" of the residents of Rotterdam. According to the local and national government, a way to achieve a higher quality of life is to prevent conflict and contribute to a more socially cohesive neighborhood. Lack of social cohesion is described as a "clash of lifestyles" that is the result of conflicts over noise and disagreement over the use of public space.[62] Therefore, following a similar logic to that of Article 9 of the Rotterdamwet, cohesion and similarity between neighbour's identities and lifestyles is desirable. The city and the housing corporations would collaborate to ensure that the different lifestyles in certain neighborhoods would "work well together," and new developments marketed as "communities" would also be designed with a certain lifestyle in mind.[63] The model is not only prescriptive (assigning people with the same lifestyle to a particular neighborhood) but also assumes that people with the same lifestyle would appreciate living among like-minded people.[64]

This attitude exemplifies the logic of homophily, following from the treatise that similarity breeds connection.[65] Chun problematizes homophily, claiming that it "fosters the breakdown of seemingly open and boundless social networks into a series of poorly gated communities, a breakdown accelerated by the agent-based market logic embedded within most capture systems."[66] Chun discusses its uncritical use within the network science discipline, tracing its origin to a 1954 text by sociologists Lazarsfeld and Merton that looked into "the dynamic processes through which the similarity or opposition of values shape the formation, maintenance, and disruption of close friendships."[67] As only one of the ways social groups are formed, homophily – far from being a naturally occurring phenomenon – is a tool, and like any tool, it anticipates and produces its results.

Chun warns that homophily is no longer a mere analytical framework, but "has turned into a generative formula that segregates cities and polarizes networks, rather than encouraging their integration and internal differentiation."[68] Before the Housing Act (*Huisvestingswet*) was amended in 2014, housing corporations and the municipality entertained the idea of introducing lifestyle models in order to steer housing allocation and prioritize tenants of a particular income or housing composition in certain neighborhoods of Rotterdam and Utrecht. BSR would be used also for new developments where, using online tools, lifestyle choices could play a role in the way the complexes are promoted and marketed to future tenants and home seekers.[69] The similarities between suggestion algorithms (used in online shopping and by media platforms like Netflix) and the way lifestyle tests would infiltrate housing seeking platforms are stark. Researchers of the BSR model have noted that "the home seeker can complete the lifestyle test, after which he or she will receive Bol.com-like offers, along the lines of 'People with your lifestyle value neighborhood X highly, or opted more often for a home in neighborhood X.'"[70] Through the recommendation system, correlations between people with a certain lifestyle, who choose to live in neighborhoods with people like themselves, are strengthened and become self-fulfilling prophecies. The model is no longer analytical but rather hints at becoming prescriptive.

It is rather ironic that homophily is used in residential distribution algorithms, since its logic draws heavily on the Schelling model of segregation, a simulation of patterns of residential segregation during the early 1970's in the United States. Schelling's model avoids situating segregation as a structural result of slavery and institutional racism and applies economic motives to both "neighborhood tipping," commonly known as white flight and the persistence of black neighborhoods even after the beginning of the forced school de-segregation[71] Discussing Schelling's assumptions, Chun notes how they

> cover over the history of redlining and other government-sanctioned programs that made it almost impossible for black citizens to buy homes, while helping white citizens do so. It makes race an immutable and immediately recognizable feature, rendering invisible the effects of efforts to 'fix' the fluidity of racial identity within the United States, such as the 'one-drop rule,' which formed the basis for segregation in some states and effectively made black and white identity not about visible differences.[72]

Homophily both "presumes consensus" and similarity and perpetuates it by making segregation "a default characteristic of network neighbourhoods."[73] Homophily logic operates by amplifying identity that relies on the discovered patterns and by creating connections between them through highlighting only

the similarities while ignoring the differences. By recognizing connections only as acts of free will, it "erases historical contingencies, institutional discrimination, and economic realities."[74]

In stark contrast with the original assumptions, research conducted in 2017 in several locations within the Netherlands that were built according to the BSR-model showed that the majority of tenants appreciated diversity in terms of lifestyle, ethnicity, stage of life and cultural background. It was only the residents of owner-occupied homes who were of a significantly higher economic background, that were less positive about the mixing in terms of economic background, education and the fact that rental units were included in their residential complexes.[75] The research concluded that the use of BSR for housing allocation does not generate a better quality of life for the residents, as most residents claimed affordability, good maintenance and proximity to amenities were parameters that defined their satisfaction levels.[76] The researchers pleaded that the core task of housing corporations should be to offer good quality and well maintained rental housing for lower income residents, as these aspects determine their valuation more than segmentation based on lifestyle.[77] Housing corporations should invest more time in contact with their residents and resolving conflicts, instead of trying to pre-emptively avoid such conflict.

Adam Greenfield, discussing the nature of smart cities, highlights how "optimized" urban management, as a sorting process, tends to create epistemic and experiential bubbles in order to eliminate daily friction and resolve conflict, thus limiting our own exposure to difference.[78] Greenfield claims that while the desire to have neighbors like oneself was an attitude that created the suburbs, city planners and municipal bureaucrats nowadays want to attract that bourgeois subjectivity back into the cities.[79] Bourgeois subjectivity is self-absorbed, and according to Greenfield "incapable of negotiating the shared use of resources, whether those resources be spatial, budgetary or attentional."[80] Liza Kim Jackson, referring to people who are seduced by the rhetoric of gentrification and sameness, equates bourgeois subjectivity with settler subjectivity. She argues that such residents adhere to the social cleansing rhetoric of the urban policies and aim "to rehabilitate, cleanse, and restore the underdeveloped and degraded urban landscape, and the bodies within, in their own image, to their own taste, and in support of their own economic advancement."[81]

Conclusion

Gentrification is enacted through policies that counter difference directly by enacting practices of exclusion, and indirectly through the creation of homophilic communities in urban centers. In reality, cities are by definition "sites for the practice of cosmopolitanism" and as Greenfield notes: "anyone who makes the choice

to live in one had better expect that along with the economic opportunity comes the unavoidable necessity of negotiating with people who are different."[82] Within a global economic order that uses gentrification to homogenize not only urban spaces but also the populations that inhabit them, how can we maintain diversity and difference?

Scholars and policy makers struggle to find solutions to tackle the violent consequences of gentrification and the homogenizing effects of contemporary urban development. Common solution to gentrification often rely on design alternatives such as "inclusionary zoning," or incentives to provide more affordable housing. While such measures do tackle some of the symptoms of gentrification, they often cannot conceptualize its cause and therefore address the multiple ways difference and diversity are systemically targeted as problems in contemporary city making. In order to answer the question of maintaining difference and by extension to understand how to counter the consequences of gentrification, we should start by acknowledging the legacy of gentrification as an extension of colonial logic, which is based on a racial concept of the human, an ideology of improvement, an erasure of difference and a possessive individualism that all result in the modern institution of private property. Drawing this lineage between contemporary and historical practices of displacement and dispossession, we are able to link decolonial struggles with actions against gentrification around the world. Approaches that center housing as a human right, such as Housing First measures[83] to tackle homelessness, squatting, and expropriation of vacant properties, prioritize the social rather than financial value of housing. When property ceases to be a financial asset, it opens up a space for thinking legal and design alternatives to the institution of private property and the way we have been practising urban planning under neoliberal rule.

Notes

1 Samuel Stein, *Capital City: Gentrification and the Real Estate State* (London and New York: Verso, 2019).

2 Liza Kim Jackson, "The Complications of Colonialism for Gentrification Theory and Marxist Geography," *Journal of Law and Social Policy* no. 27 (2017): 53.

3 For a nuanced discussion on the reciprocity between colonial spaces, colonial rule and the establishment of western legality see Nasser Hussain, *The Jurisprudence of Emergency: Colonialism and the Rule of Law* (Ann Arbor: University of Michigan Press, 2003): 3.

4 Brenna Bhandar, *Colonial Lives of Property: Law, Land, and Racial Regimes of Ownership* (Durham, NC: Duke University Press, 2018).

5 Ranajit Guha, *A Rule of Property for Bengal: An Essay on the Idea of Permanent Settlement* (Durham, NC: Duke University Press, 1996): 9.

6 Bhandar, *Colonial Lives of Property*.

7 Nicholas K. Blomley, *Unsettling the City: Urban Land and the Politics of Property* (New York: Routledge, 2004): xviii.
8 David Lloyd and Patrick Wolfe, "Settler Colonial Logics and the Neoliberal Regime," *Settler Colonial Studies* 6, no. 2 (April 2, 2016): 113.
9 Bhandar, *Colonial Lives of Property*.
10 Michelle Veitch, "Indigenous Cultural Resurgence, Hotel Murals and Neocolonial Urbanism," in *Art and Gentrification in the Changing Neoliberal Landscape*, ed. Tijen Tunali (New York: Routledge, 2021).
11 William Petty, T*he Political Anatomy of Ireland with the Establishment for that Kingdom when the late Duke of Ormond was Lord Lieutenant. Taken from the Records. To which is added Verbum Sapienti; or an Account of the Wealth and Expenses of England, and the Method of raising Taxes in the most Equal manner* (London: D. Brown, and W. Rogers, 1691): 63, http://name.umdl.umich.edu/A54620.0001.001
12 Ibid., 115.
13 Bhandar, *Colonial Lives of Property*, 35.
14 Ibid., 35.
15 Blomley, *Unsettling the City,* 86.
16 Ibid., 4.
17 Frantz Fanon, *The Wretched of the Earth*, trans. Constance Farrington (London: Penguin Books, 2001): 28.
18 Eva Mackey, *Unsettled Expectations: Uncertainty, Land and Settler Decolonization* (Halifax: Fernwood, 2016): 126.
19 Ibid.
20 Bhandar, *Colonial Lives of Property*, 56.
21 John Locke, "Of Property," in *The Two Treatises of Government*, (Cambridge: Cambridge University Press, 1988), 40.
22 Ibid., 213–214.
23 Ibid., 209.
24 Bhandar, *Colonial Lives of Property*, 56.
25 Laura Brace, "Colonisation, Civilisation and Cultivation: Early Victorians' Theories of Property Rights and Sovereignty," in *Land and Freedom: Law, Property Rights and the British Diaspora,* ed. A. R. Buck, John McLaren, and Nancy E. Wright (Aldershot and Burlington, VT: Ashgate/Dartmouth, 2001): 23–38.
26 Jackson, "The Complications of Colonialism," 63.
27 Blomley, *Unsettling the City*, 86.
28 Ibid.
29 Ibid, 90.
30 Rebecca Amato, "On Empty Spaces, Silence, and the Pause," in *Aesthetics of Gentrification: Seductive Spaces and Exclusive Communities in the Neoliberal City*, ed. Christoph Lindner and Gerard Sandoval (Amsterdam: Amsterdam University Press, 2021), 247.
31 Ibid., 248.
32 Neil Smith, *The New Urban Frontier: Gentrification and the Revanchist City* (London: Routledge, 1996): 189.
33 Jackson, "The Complications of Colonialism," 49.
34 Amato, "On Empty Spaces," 251.
35 Neil Smith, "Toward a Theory of Gentrification A Back to the City Movement by Capital, not People," J*ournal of the American Planning Association* 45, no. 4 (October 1979): 545.
36 Peter Marcuse, "Gentrification, Abandonment, and Displacement: Connections, Causes, and Policy Responses in New York City," *Washington University Journal of Urban and Contemporary Law* 28 (1985): 195–240.
37 Lloyd and Wolfe, "Settler Colonial Logics," 109.

38 Cuneyt Ergun and Marco Bik, "Prognose bevolkingsgroepen Rotterdam 2017," Centrum voor Onderzoek en Statistiek (CBS), Rotterdam (2003) in Hasna El Maroudi, "De Rekening van de Rotterdamwet", *Vers Beton*, March 9, 2021, https://www.versbeton.nl/2021/03/de-rekening-van-de-rotterdamwet/.
39 El Maroudi, "De Rekening van de Rotterdamwet."
40 Wendy Hui Kyong Chun, *Discriminating Data* (Cambridge, MA: The MIT Press, 2021): 17.
41 André Ouwehand and Wenda Doff, "*Twintig jaar Rotterdamwet heeft leefbaarheid niet vergroot*," *Sociale Vraagstukken*, October 26, 2021, https://www.socialevraagstukken.nl/twintig-jaar-rotterdamwet-heeft-leefbaarheid-niet-vergroot.
42 Ibid.
43 Jackson, "The Complications of Colonialism," 68.
44 Woonnet Rijnmond, "Wat is de Rotterdamwet en een Rotterdamwet woning?" <https://www.woonnetrijnmond.nl/service-en-contact/regelgeving/wat-is-de-rotterdamwet-en-een-rotterdamwet-woning>.
45 Ibid.
46 It is important to mention that the Quality of Life Index (Leefbaarometer) up until 2021 still included migration background in the parameters that could affect housing satisfaction, social cohesion and notions of safety. Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, "Leefbaarometer: Online informatie over de leefbaarheid in alle buurten en wijken," <https://www.leefbaarometer.nl/page/FAQ#dimensies%3E.
47 Karl Marx, *Grundrisse: Foundations of the Critique of Political Economy*, trans. Martin Nicolaus (New York: Vintage Books, 1973), 164.
48 James Merricks White, "Anticipatory Logics of the Smart City's Global Imaginary," *Urban Geography* 37, no. 4 (May 18, 2016): 572–89, https://doi.org/10.1080/02723638.2016.1139879.
49 Market Response, "BSR Leefstijlsegmentatie," https://marketresponse.nl/expertises/bsr-leefstijlen/.
50 Ibid.
51 Ibid.
52 Ibid.
53 Pascal van Hattum and Herbert Hoijtink, "Market Segmentation Using Brand Strategy Research: Bayesian Inference with Respect to Mixtures of Log-Linear Models," *Journal of Classification* 26, no. 3 (December 2009): 301.
54 Neil Smith and David Harvey, *Uneven Development: Nature, Capital, and the Production of Space* (London: Verso Books, 2010), 71.
55 Andrew Knott, "Stop Making Sense: Refusing the Algorithmic City," *Failed Architecture: Cities After Algorithms*, March 2022, < https://failedarchitecture.com/stop-making-sense-refusing-the-algorithmic-city/>
56 André Ouwehand, Wenda Doff, and Carlinde Adriaanse, "Voorkeur voor een leefstijl? Een onderzoek naar leefstijlmethodieken in het woondomein," *Platform Corpovenista* (Nicis-Institute, 2011): 29.
57 Chun, *Discriminating Data*, 57; Cathy O'Neil, *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* (New York: Crown, 2016).
58 Oscar H. Gandy, *Coming to Terms with Chance: Engaging Rational Discrimination and Cumulative Disadvantage* (London: Routledge, 2016), 52.
59 Chun, *Discriminating Data*, 20.
60 Ouwehand, Doff, and Adriaanse, "Voorkeur Voor Een Leefstijl?," 33.
61 Ibid.
62 André Ouwehand and Wenda Doff, "Soort Bij Soort: Leefstijlen in Woonruimteverdeling En Beheer," (OTB Research Institute for the Built Environment, 2012).
63 Ouwehand, Doff, and Adriaanse, "Voorkeur Voor Een Leefstijl?," 4.

64 André Ouwehand, Wenda Doff, and Eva Bosch, "Leefstijlsegmentatie in Het Woondomein: Hype of Blijvertje?" in *MOA Jaarboek 2017,* ed. A. E. Bronner et al. (Amsterdam: Venter for Information Based Decision Making & Marketing Research, 2017), 141.
65 Miller McPherson, Lynn Smith-Lovin, and James M Cook, "Birds of a Feather: Homophily in Social Networks," *Annual Review of Sociology* 27, no. 1 (August 2001): 415–44.
66 Ibid.
67 Paul F. Lazarsfeld and Robert K. Merton, "Friendship as a Social Process: A Substantive and Methodological Analysis," *Freedom and Control in Modern Society* 18 (1954): 28.
68 Laura Kurgan et al.,"Homophily: The Urban History of an Algorithm," *E-Flux Architecture*, October 2019, https://www.e-flux.com/architecture/are-friends-electric/289193/homophily-the-urban-history-of-an-algorithm/.
69 Ouwehand, Doff, and Adriaanse, "Voorkeur Voor Een Leefstijl?", 40.
70 Bol.com is a Dutch e-commerce company similar to Amazon.com. Ibid, 35.
71 Chun, *Discriminating Data*, 104.
72 Ibid, 105.
73 Wendy Hui Kyong Chun, "Queering Homophily," in *Pattern Discrimination,* ed. Clemens Apprich et al. (Lüneburg: meson press, 2018): 76.
74 Sinan Aral, Lev Muchnik, and Arun Sundararajan, "Engineering Social Contagions: Optimal Network Seeding in the Presence of Homophily," *Network Science* 1, no. 2 (August 2013): 125–53.
75 Ouwehand, Doff, and Bosch, "Leefstijlsegmentatie in Het Woondomein," 142–143.
76 Ibid, 141.
77 Ibid, 144.
78 Adam Greenfield, "Two Recent Interviews", *Speedbird* (Greenfield's website), February 24, 2014, https://speedbird.wordpress.com/2014/02/24/two-recent-interviews/.
79 Ibid.
80 Ibid.
81 Jackson, "The Complications of Colonialism," 68.
82 Greenfield, "Two Recent Interviews."
83 Housing First is an approach to homelessness that makes stable housing available unconditionally to anyone in need of a house, before they get access to other welfare and care services. Since the 1990s it has been adopted to various small-scale governmental policies and pilot programs in the United States, Canada, Australia and Europe. Even in small-scale studies the program was extremely effective in not only reducing homelessness, but also reducing costs of public services as it allowed for a faster and easier recovery and re-integration. In its various applications Housing First has shifted the conversation from ""serving the homeless" to "ending homelessness."". For an exploration of the origins of Housing First and the efficacy of different programs in the western world see: Padgett, Deborah K., Benjamin F. Henwood, and Sam J. Tsemberis, Housing First: Ending Homelessness, Transforming Systems, and Changing Lives, (New York: Oxford University Press, 2016)

Bibliography

Apprich, Clemens, Florian Cramer, Wendy Hui Kyon Chun, and Hito Steyerl. *Pattern Discrimination.* Lüneburg: meson press, 2018. https://doi.org/10.14619/1457.

Aral, Sinan, Lev Muchnik, and Arun Sundararajan. 'Engineering Social Contagions: Optimal Network Seeding in the Presence of Homophily.' *Network Science* 1, no. 2 (August 2013): 125–53. https://doi.org/10.1017/nws.2013.6.

Bhandar, Brenna. *Colonial Lives of Property: Law, Land, and Racial Regimes of Ownership. Global and Insurgent Legalities*. Durham: Duke University Press, 2018.

Blomley, Nicholas K. *Unsettling the City: Urban Land and the Politics of Property*. New York: Routledge, 2004.

Buck, A. R., John McLaren, and Nancy E. Wright, eds. *Land and Freedom: Law, Property Rights and the British Diaspora*. Aldershot, Hants, England ; Burlington, VT: Ashgate/Dartmouth, 2001.

Chun, Wendy Hui Kyong, and Alex Barnett. *Discriminating Data: Correlation, Neighborhoods, and the New Politics of Recognition.* Cambridge, Massachusetts: The MIT Press, 2021.

El Maroudi, Hasna. 'De Rekening van de Rotterdamwet.' *Vers Beton,* 9 March 2021. https://www.versbeton.nl/2021/03/de-rekening-van-de-rotterdamwet/.

Fanon, Frantz, and Jean-Paul Sartre. *The Wretched of the Earth.* Translated by Constance Farrington. Reprinted. Penguin Classics. London New York: Penguin Books, 2001.

Gandy, Oscar H. *Coming to Terms with Chance: Engaging Rational Discrimination and Cumulative Disadvantage*. London: Routledge, 2016.

Greenfield, Adam. *Two recent interviews*, 24 February 2014. https://speedbird.wordpress.com/2014/02/24/two-recent-interviews/.

Guha, Ranajit. *A Rule of Property for Bengal: An Essay on the Idea of Permanent Settlement.* Durham: Duke University Press, 1996.

Hattum, Pascal van, and Herbert Hoijtink. 'Market Segmentation Using Brand Strategy Research: Bayesian Inference with Respect to Mixtures of Log-Linear Models.' J*ournal of Classification* 26, no. 3 (December 2009): 297–328. https://doi.org/10.1007/s00357-009-9040-1.

Hussain, Nasser. *The Jurisprudence of Emergency: Colonialism and the Rule of Law. Law, Meaning, and Violence.* Ann Arbor: University of Michigan Press, 2003.

Jackson, Liza Kim. 'The Complications of Colonialism for Gentrification Theory and Marxist Geography.' *Journal of Law and Social Policy*, no. 27 (2017): 43–71.

Knott, Andrew. 'Stop Making Sense: Refusing the Algorithmic City. *Failed Architecture: Cities After Algorithms*, March 2022. https://failedarchitecture.com/stop-making-sense-refusing-the-algorithmic-city.

Kurgan, Laura, Dare Brawley, Brian House, Jia Zhang, and Wendy Hui Kyong Chun. 'Homophily: The Urban History of an Algorithm.' *E-Flux Architecture*, October 2019. https://www.e-flux.com/architecture/are-friends-electric/289193/homophily-the-urban-history-of-an-algorithm/.

Lazarsfeld Paul F and Merton, Robert K. 'Friendship as a Social Process: A Substantive and Methodological Analysis.' *Freedom and Control in Modern Society* Vol. 18 (1954).

Lindner, Christoph, and Gerard F. Sandoval, eds. *Aesthetics of Gentrification: Seductive Spaces and Exclusive Communities in the Neoliberal City*. Amsterdam: Amsterdam University Press, 2021.

Lloyd, David, and Patrick Wolfe. 'Settler Colonial Logics and the Neoliberal Regime.' *Settler Colonial Studies 6*, no. 2 (2 April 2016): 109–18. https://doi.org/10.1080/2201473X.2015.1035361.

Locke, John, and Peter Laslett. *Two Treatises of Government.* Student ed. Cambridge Texts in the History of Political Thought. Cambridge [England] ; New York: Cambridge University Press, 1988.

Mackey, Eva. *Unsettled Expectations: Uncertainty, Land and Settler Decolonization*. Halifax ; Winnipeg: Fernwood Publishing, 2016.

Marcuse, Peter. 'Gentrification, Abandonment, and Displacement: Connections, Causes, and Policy Responses in New York City.' *Washington University Journal of Urban and Contemporary Law* 28 (1985): 195–240.

Market Response. 'BSR Leefstijlsegmentatie', n.d. https://marketresponse.nl/expertises/bsr-leefstijlen/.

Marx, Karl. *Grundrisse: Foundations of the Critique of Political Economy*. The Marx Library. New York: Vintage Books, 1973.

McPherson, Miller, Lynn Smith-Lovin, and James M Cook. 'Birds of a Feather: Homophily in Social Networks.' *Annual Review of Sociology* 27, no. 1 (August 2001): 415–44. https://doi.org/10.1146/annurev.soc.27.1.415.

Ministerie van Binnenlandse Zaken en Koninkrijksrelaties. 'Leefbaarometer - Online Informatie over de Leefbaarheid in Alle Buurten En Wijken.' *Leefbaarometer FAQ* (blog), n.d. https://www.leefbaarometer.nl/page/FAQ#dimensies%3E.

O'Neil, Cathy. *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. First edition. New York: Crown, 2016.

Ouwehand, André, and Wenda Doff. 'Twintig Jaar Rotterdamwet Heeft Leefbaarheid Niet Vergroot, Sociale Vraagstukken.' *Sociale Vraagstukken*, 26 October 2021. https://www.socialevraagstukken.nl/twintig-jaar-rotterdamwet-heeft-leefbaarheid-niet-vergroot.

Ouwehand, André, Wenda Doff, and Bosch. 'Leefstijlsegmentatie in Het Woondomein: Hype of Blijvertje?' In *MOA Jaarboek 2017*, 129–46, 2017.

Ouwehand, André and Wenda Doff. 'Soort Bij Soort: Leefstijlen in Woonruimteverdeling En Beheer.' OTB Research Institute for the Built Environment, 2012. https://repository.tudelft.nl/islandora/object/uuid:18cf9ccb-7773-4b76-b5d0-3b487049a97b?collection=research.

Ouwehand, André, Wenda Doff, Carlinde Adriaanse. 'Voorkeur Voor Een Leefstijl? Een Onderzoek Naar Leefstijlmethodieken in Het Woondomein.' Platform Corpovenista, Nicis-Institute, 2011. https://www.verdus.nl/assets/uploads/2019/11/Ad-Branding_Rapport-1-Voorkeur-voor-een-leefstijl.pdf.

Petty, William. *THE Political Anatomy OF IRELAND WITH The Establishment for That Kingdom When the Late Duke of ORMOND Was Lord Lieutenant. Taken from the RECORDS. To Which Is Added VERBUM SAPIENTI; or an Account of the Wealth and Expenses of England, and the Method of Raising Taxes in the Most Equal Manner*. London: D. Brown, and W. Rogers, 1691. , http://name.umdl.umich.edu/A54620.0001.001.

Smith, Neil. *The New Urban Frontier: Gentrification and the Revanchist City*. London ; New York: Routledge, 1996.

———. 'Toward a Theory of Gentrification A Back to the City Movement by Capital, Not People.' *Journal of the American Planning Association 45*, no. 4 (October 1979): 538–48. https://doi.org/10.1080/01944367908977002.

Smith, Neil, and David Harvey. *Uneven Development: Nature, Capital, and the Production of Space.* Third edition. London New York: Verso Books, 2010.

Stein, Samuel. *Capital City: Gentrification and the Real Estate State. Jacobin Series.* London ; Brooklyn, NY: Verso, 2019.

Tunali, Tijen, ed. *Art and Gentrification in the Changing Neoliberal Landscape*. New York: Routledge, 2021.

White, James Merricks. 'Anticipatory Logics of the Smart City's Global Imaginary.' *Urban Geography* 37, no. 4 (18 May 2016): 572–89. https://doi.org/10.1080/02723638.2016.1139879.

Woonnet Rijnmond. 'Wat Is de Rotterdamwet En Een Rotterdamwet Woning?',. https://www.woonnetrijnmond.nl/service-en-contact/regelgeving/wat-is-de-rotterdamwet-en-een-rotterdamwet-woning.

Ghosts of the Rio Doce: Tracing the Ethical Grounds for a Hauntological Practice of Architecture at the Site of Disaster

Alina da Porciuncula Paias

Disaster

On November 5, 2015, the Fundão tailings dam located in the municipality of Mariana in Minas Gerais, Brazil, ruptured, letting out around forty million cubic meters of sediment. The wave crashed into a second dam and the material contained in both reservoirs destroyed the village of Bento Rodrigues three kilometers downstream, entered the Gualaxo do Norte River and joined the Carmo River, causing the mineral-filled water to flood sections of several villages. Besides the damage to buildings and infrastructure and the loss of human life, the flood led to a destruction of riparian vegetation and the death of thousands of terrestrial and aquatic animals by asphyxiation. After moving along the Carmo, the sediment wave entered and covered the entire Rio Doce. On November 21 the mud finally reached the Atlantic Ocean, crossing the last municipal bounds in Linhares, Espírito Santo.[1]

The toxicity unleashed on the landscape was the result of a quest for purity. Kathryn Yusoff describes geology as a way of seeing (and changing) the world based on a grammar of matter that dividuates it in order to form cognizable units.[2] By denying a "geochemically communicative matter-state that is already situated in the earth," geology predicates contemporary life and all its technologies on the exploitation not of land or matter per se, in its physical-chemical "promiscuity," but a pure, charted material obtained through a complete separation between matter and its context.[3] Mining activities result in massive amounts of waste in order to "clean" the minerals. In the case of the ruptured dam, the goal was to obtain high quality iron ore. The tailings that invaded the river were a mixture of byproducts of this cleaning process – metals, minerals, particulates and water.

The dam belonged to Samarco Mineração SA, a joint venture between two multinational companies: Vale SA, from Brazil, and BHP Billiton, a British-Australian enterprise. In 2016, Samarco signed a TTAC (Transaction and Conduct Adjustment Agreement) through which Fundação Renova was founded. Renova is an NGO that manages reparations to those affected by the disaster in the entire river basin.

As the name suggests, the state of Minas Gerais encompasses the former mining centers of the colony during the Portuguese occupation. Until this day, the soil there is processed into aluminum, iron, gold and precious stones. Floods are nothing new in this long history of extraction. Between 1986 and 2015, seven other tailings dams in the state ruptured.[4] In 2019, another massive rupture in Brumadinho led to the death of 270 people. Capanema found indications of floods due to gold mining in the 1730s and 1740s in Mariana, where the 2015 accident also took place.[5] In the midst of these immense movements of matter, lives become forcibly entangled through disaster. In the search for purity, toxicity ends up infiltrating time and space. Events are different and yet the same. The justice of reparations is carried out, albeit poorly. Fundamentally, however, nothing seems to change. The past is dead, the present is sick and the future has been laid out. Within this conundrum, could a hauntological rendition of justice, undoing past and future, provide alternative means of response beyond being fully captured by such events? As architecture constitutes an immediately identifiable practice of intervention upon material reality and is often employed at the site of disaster as a form of reparation, is it pertinent to speak of a hauntological practice of architecture?

Hauntological Movements

Jacques Derrida introduced the term hauntology in *Specters of Marx: The State of the Debt, the Work of Mourning and the New International*.[6] The text, written in 1993, responded to growing neoliberal sensibilities and a revision of the pertinence of Marxism in political life after the fall of the Berlin Wall. Derrida positioned Marx as a specter, laying out the possibility of a beyond-ontology: the specter "does not belong to ontology, to the discourse on the Being of beings, or to the essence of life or death. It requires, then, what we call... *hauntology*."[7] The ghost must be acknowledged because it meddles with the things of the living; "we are in relation to it and it has designs on us such that we must reckon with it."[8] That is so with the specter at the center of Derrida's text: there is a forced death of the spirit of Marx, a "conjuration" in the form of a "deafening consensus" that the dead thing is indeed dead. Yet it continues to work and to cause to work, with little concern to the death that does not kill.

What haunts sits between the there and the not-there: "one does not know if it is living or if it is dead."[9] There is room for the haunting to be taken as the

un-actualized virtual (especially since the not presently there also refers to the not *yet* there), or as a "repressed or unresolved social violence," an unexpected manifestation of an economic or social system whose gargantuan contours cannot be made out and so is mistaken for absent.[10]

Karen Barad names the ontological indeterminacy observed at a quantum level as hauntology. This indeterminacy is seen in quantum field theory experiments that result in diffraction patterns generated by particles when their position is not being measured. These patterns are characteristic of waves, meaning that at some point the particle finds itself in a state of superposition, neither at one place or another, but simply "indeterminately" at a position and another.[11] These results lead to a shift in understanding presence at the ontological level, as superposition is not a result of insufficient means of measurement ("epistemological uncertainty") but to a de facto coexistence in time and space.[12]

Barad considers Kyoko Hayashi's *From Trinity to Trinity* a truly hauntological work of mourning.[13] Derrida presents the work of mourning as conditional upon an acknowledgement of the thing made dead, an ontologizing of remains,[14] and Hayashi (as the narrator), with a deep understanding of how time is undone by nuclear disaster and of how to navigate this undoing, becomes a bodily present witness to all events diffracting across the day the atomic bomb was dropped in Nagasaki at the end of the Second World War. She moves through and finds herself simultaneously "in Nagasaki working alongside classmates," "on a US Air Force base in New Mexico visiting the National Atomic Museum," "counting fifty-two empty chairs belonging to classmates who did not return," "recounting the history of sixteenth-century Spanish explorers colonizing the land now called 'New Mexico' while walking next to Little Boy and Fat Man."[15] These are all the same event, the bombing, happening now, before, and after, in places close and far away from each other.

Radiation infiltrates time and space to extensions we cannot comprehend, only calculate; that is why the ongoingness of the bombing as disaster is immediately apparent. Yet, beyond the specificity of nuclear warfare, other events also diffract and entangle places and lives beyond their time. In *Ghostly Matters*, Avery Gordon conducts a hauntological investigation of Toni Morrison's *Beloved*, where Sethe, an enslaved mother, kills her child so it cannot be taken back into captivity, only to be forced to reckon with its ghost many years later. At a certain point in the story, Sethe discusses the nature of time and the event with Denver, her daughter. The older woman advances the idea of *rememory*, a picture of a place that stays "out there, in the world." Other people can even "bump into a *rememory* that belongs to somebody else." She warns Denver about the dangers of events that are still happening all the time:

> Where I was before I came here, that place is real. It's never going away. Even if the whole farm – every tree and grass blade of it dies. The picture is still there and what's more, if you go there – you who never was there – if you go there and stand in the place where it was, it will happen again; it will be there for you, waiting for you.[16]

Sethe fears the ongoingness of the event that Hayashi chooses to embrace. In the story told by Morrison, she ends up consumed by the haunting(s), withering in the face of a catastrophe too great to bear. Gordon refers to the passage above to contrast the action of seizing the past with the event of being seized by it.[17] The figure of the ghost as a past that moves in a logic beyond us is present for both Gordon and Derrida, who describe it, respectively, as a set of "forces that lay claim to you whether you claim them as yours or not" and as the "revenant," the one who pays a visit, who is an event, who sees us before we see it "or even before we see period."[18] Dionne Brand uses the figure of the haunting to describe the Door of no Return, a presence that follows those who constitute the African diaspora like her. Every one of her movements is a movement towards the Door, as if everywhere she went, the Door was already there waiting for her. The haunting is a past that moves before us, it is a past ahead of us, it knows where to go before we do: "history is already seated in the chair in the empty room when one arrives."[19] And yet, these accounts point to a relationship with the past beyond being only taken over by it: Sethe's, Hayashi's and other bodies, crossed and shaped by tragedy, are able to traverse the folds of space and time, showing us that there are points of access to the spectral movements before they surprise us.

Seizing the Past

Dealing with ghosts is a matter of understanding how the past seizes us and to what extent we can seize it. Alia Al-Saji's interpretation of Bergsonian intuition can help with this inquiry. Sethe's description of a *rememory* already points to how the understanding of time as a chronological succession of episodes fails to account for the experiences of a haunted life. Al-Saji also directs her criticism to this interpretation of time and to how it relates to our tendency to equate reality to what is immediately present, useful or pertinent to action.[20] This shortsightedness is what leads to our often being surprised or confused by our experience of time and memory, since our expectations for a future that is only "the imminent prolongation of the present in action" can only be extremely narrow.[21]

Henri Bergson describes our movement between past and present, which are different at an ontological level, as a leap which can place us in one or the other.[22] His diagram for these associated states is the cone of pure memory, representing the different planes of the past at different levels of contraction, where the

present is the contraction of the entirety of the past as virtuality around a specific object and action.[23] Al-Saji's hypothesis is that the "virtual image," a never-actualized image of the present as past formed during the event of perception, or an "image of the passing present," is what allows us to move between "the past in general" and present perception.[24] It has the power to attract or repel the different sheets of memory, each one corresponding to a different past in terms of "rhythm of duration, style, speed, configuration and affective coloration."[25] Each of the non-representational, virtual memories can then be actualized into one or more memories, usually the ones most useful to present perception. That way, "the virtual image makes possible concrete perception (or attentive recognition), by contracting into it not only the immediate past but also the memories that resonate with this immediate past."[26]

Consequently, we are not only connected to our memories as representational episodes, but to the entirety of memory. The present is not only haunted by our past or the immediate past, but "the whole past," much more than the actualized past that composes one's own processes of becoming.[27] In that sense there is a collectiveness to the pure past that, if tapped into, can help with meeting ghosts where they are, given that they are "not other or alterity as such, ever," but instead an accumulation of "unfulfilled possibility" characterized most of all by repression; from there comes the violence of certain apparitions, as they thrust themselves into actualization.[28] The effort to access the deepest planes of memory relates to an openness to "others" as interrupted histories:

> Although each line of evolution only actualizes one tendency within life (or one plane of the past), it holds simultaneously the trace of other non-actualized lines, other excluded or forgotten planes, all in virtual form. My body or sensori-motor schema may actualize a particular plane of memory, but other planes will continue to haunt it. The memory of other pasts which have never been present for me, of other lives that I have not lived, persist as a virtual 'nebulosity' accompanying my own life or past. And it is through my plane of memory that I have access to the others, as the past is never simply mine.[29]

We cannot simply seize the past: we belong to it and thus move through and within it. We can, however, access planes of the pure past in a more considered manner. Already beyond automatic recognition, there is attentive recognition, which represents an effort not to immediately actualize memories only from the plane of the past that we may access more often. But that is still an interpretation of the past through the present, conditioned by its usefulness in relation to actions performed at a given moment.[30] Pure memory, however, does not relate

to the present either through "resemblance, causality, deduction or derivation."[31] As such it remains a "surplus" to the usual modes of perception.[32] The next question, then, is whether there is a method to be established through which we may access points in this whole of virtuality beyond being just stricken by its actualized manifestations.

Hauntological Investigations

Avery Gordon's hauntological inquiries are, declaredly, the product of an interest in "the relationship between what *assembles and joins* and what is gaping, detouring."[33] This is echoed in her description of Luisa Valenzuela's ability to animate a relationship between three "Open Doors" in Argentina: the title of Valenzuela's own book of short stories, a well-known insane asylum in the country, and a torture method employed during the dictatorship, all with the same name.[34] This animation is a process of careful and responsible selection and articulation in order to bring about the ghost. It is an engagement with the object of study beyond gathering and associating information in order to extract causal and sequential relationships. It demands deep involvement and it is, fundamentally, a creative process, where a connection between two points of information gives rise to a third, new thing.

Centering the mode of engagement in a hauntological investigation is fundamental because of the nature of haunting: it eludes identification through deduction and derivation; it moves in unpredictable ways; it is inconclusive and ontologically indeterminate; it can remain unattainable even after every effort to establish its outlines. Such characteristics prompt the question of whether it is pertinent to categorize a hauntological approach to a system of correlations as *method.*

Gordon proposes starting an investigative enterprise through a haunting of one's own: "to be haunted and to write from that location, to take on the condition of what you study, is not a methodology or a consciousness you can simply adopt or adapt as a set of rules or an identity."[35] This stance is reiterated when she refers to Luce Irigaray's description of method as artifice and reduction, as that which can lead us astray and away from the true questions to be asked, and fundamentally as detour.[36]

A hauntological exercise is not one of gathering knowledge and then establishing connections between any two points of information. Instead, it is about understanding which of the gathered correlations will work in an exercise of bringing forth the ghost: "in and of themselves,... correlations... can be collected, but they will lie like the debris of a system barely thinkable and yet abounding in excessive significations."[37] Gordon steps away from the method as detour and towards the detour as method; that is, an admission of implication

and complication with the object of study.[38] This focus on the thinker's mode of engagement and a contaminated relationship with the object of inquiry foil aspirations of a reproducible method. Importantly, however, the possibility of cultivating an openness towards the ways in which ghosts are formed remains available to anyone.

Such a possibility has import both in defining a substitute for method in a hauntological practice and in the effort to navigate the planes of pure memory in order to relate to ghosts beyond being seized by their manifestations. That is where Al-Saji's interpretation of Bergsonian intuition comes into play. Beyond the effort of attentive recognition, intuition is a "pulling back" from actualizing virtual memory into representational memory altogether; an exercise in remaining "within the cone of pure memory" and, crucially, adjusting to a less familiar plane of memory instead of attempting to filter or reduce the past through present experience.[39] Keeping in mind that the cone is the representation of the entirety of the virtual past, with countless variations, the actualization of different virtual memories can lead to currently unimaginable futures – this prospect is what accords a transformative and even revolutionary potential to such an exercise.

Also keeping in mind that the entire virtual past comprises planes that have configurations and levels of contraction subjected to other rhythms of duration, intensities, "affective tonalities" and perspectives than one's own, moving between these planes is always an exercise of relation to an *other*: "intuition is the attunement to a plane different than that opened up by my body;"[40] thus "it is from the other that intuition takes its bearings, rather than from the self."[41] Sethe's (thus Morrison's) notion of *rememory* is then very pertinent, since the whole of memory is fundamentally "intersubjective."[42]

Intuition is not "a vague feeling," it can be fostered through practice and preparation and that begins by a very concrete contact and coexistence with "others" as much as possible.[43] This concreteness makes it particularly interesting in the context of experimentally defining a hauntological equivalent of method – as Al-Saji's interpretation of Bergsonian intuition enhances Gordon's proposed state of a contaminated scholarship, the two can coalesce into the description of becoming-haunted as a mode of engagement with a system of events.

Justice and Gift

Speaking to and of ghosts, Derrida claims, is done fundamentally "in the name of justice," and thus exactly what makes justice *hauntological* must be defined.[44] In *Unpayable Debt*, Denise Ferreira da Silva explicates the relation between the onto-epistemic structures of modernity and the juridical forms they produce by presenting that which evades all of these – the movements through space and time made by Dana, whose story is told in Octavia Butler's *Kindred*. A young black

woman, Dana finds herself alternately in her house in Los Angeles in 1976 and on an antebellum plantation in Maryland, where she not only meets her white ancestor but saves his life, rupturing, with this action, the "separations of time and space":

> Each instantaneous relocation... traverses that which is sustained by spacetime delineations, namely, the delimitations of then and now (she meets her long-dead ancestors) and the determination of here and there (she saves the life of a long-dead ancestor). That is, Dana's fulfillment of her obligation violates the linearity that is at the basis of the ontological descriptors (formality and efficacy) and pillars (separability, determinacy, and sequentiality) of post-Enlightenment thinking – for instance, as it breaks the rules of both sequentiality (the future operating in the past) and efficient causality (the effect becoming the condition of possibility for the cause), it is incomprehensible.[45]

At every moment she lives her present in the past (and because of the contrast with her present in the present) Dana clearly figures as the "wounded captive body in the scene of subjugation."[46] She has "no place" in the "subject's domain," yet through the transfer of her labor as body energy into whatever she touches she is a constitutive part of everything that translates into wealth within the modern systems of value.[47] Her labor as her "body in the cotton bolls... does not explain or create capital... it is not graspable as a manifestation of her "will" or an effect of her "desire"... yet she is right there"; even given the impossibility of figuring as subject in her current situation, her presence and her personhood matter.[48]

The fabric that results from the spinning of the cotton at a factory elsewhere in the world and that might be shipped to a colony at yet another location is a "composite that gathers the labor and the calor of everything found in the expropriated Native lands where the iron ore or gold was extracted or the cotton grown."[49] This ("raw-materialist")[50] qualification of material implicity, grounded on the actual movements of matter and energy that have structured global modernity, is what allows for the claims Ferreira da Silva has made previously for a transformative (global) theory of justice as a response to colonial expropriation.[51] Even further, the wounded captive body in the scene of subjugation, as neither human nor thing, is unconcerned with either upholding or undoing these two categories which are structuring for the "post-Enlightenment episteme."[52] Her instantaneous movements in spacetime and her finding herself in the scene of subjugation, becoming implicated with the spacetimemattering of modernity, as anything that exists now is "a a re/composition of the flesh, blood, bones, of the bodies of yesterday's colonial figures," is what allows her to rupture with the "delimiting

and determining gestures and devices that have supported modern thought for centuries."[53] As separability, determinacy and sequentiality and their associated prevalent understanding of time step out of scene, justice through decolonization – as diluted as this concept has become, here it means the actual restitution of value lost to slave labor and stolen land – might then be a possibility.[54]

Ferreira da Silva's vision of justice takes place beyond linear time and that means, fundamentally, a restitution to the now-living of what still holds the no-longer-living within. As such, it is particularly inspiring as we search for a justice to counter the ongoing, different-yet-same cycles of material extraction that have locked Minas's past and future into position with little possibility of exit. As a justice that is beyond law and thus beyond calculation and attempts to set things right or restore a lost balance, the hauntological justice presented in Specters of Marx intersects with this proposition. When it comes to architecture, its role in this restitution must be carefully defined, especially as it is a moment of accumulation and reconfiguration of implicated matter. In that sense, I believe that Derrida's presentation of justice as the "incalculability of the gift and singularity of the an-economic ex-position to others" might provide the practice of architecture with a hauntologically-oriented descriptor.[55]

Ex-position to others, it will be argued later, is the corner stone for acknowledgement and response-ability. The incalculability of the gift, on the other hand, is how Derrida interprets Heidegger's formulation of justice: as gift and thus as something beyond punishment, debt and guilt.[56] What Derrida further identifies is the hauntological character of the gift, which is a restitution of what was never there and what one does not even have to give.[57] Thus, the logic of the gift undoes time beyond the present: as an unexpected addition to a given set of entanglements, a restitution introduced from a line of past never actualized has the ability to divert the expected course of the future.

Carla Rodrigues intersects Derrida's restitution within a time out of joint with Aníbal Quijano's "return of the future," that is, a future that unfolds from a suppressed past instead of being a marginally altered repetition of the present.[58] This unfolding has parallels with the results of a Bergsonian movement between different planes of the past, yet it is admittedly claimed in the specific context of coloniality in Latin America and, ideally, as a directly applicable programmatic premise (identifying counter-hegemonic ways of becoming and elevating them).

Nelson Maldonado-Torres also works to situate the gift within the decolonial struggle. Importantly, he frames it as a "logic" and neither as a single action or object, nor quite the same as Derrida's gift, which is more akin to the event, something that "come[s] along."[59] Indeed, it is closer to what Lars Spuybroek calls a "gift culture," identified by the cyclical circulation of grace (*Charis*) through subjects and objects temporarily constituted as such. This movement also ruptures with

causality, as the identity of an object as gift is not an essential aspect of the cycle. The gift can be a feeling, an object, an action; there can be no correspondence of value, no particular relationship between the gift one gives and the next one to be received.[60] The return of the gift – the third stage of the gift cycle – is always a return of the different.

Spuybroek describes gift culture as a particular type of sociability; Maldonado-Torres sees the logic of the gift as a capacity that is enacted with and through other(s) but may have to be restored at the ontological level due to the effects of the coloniality of being. Starting from a critique of Heidegger's *Dasein* as a limited concept, he proposes the adoption of Frantz Fanon's *damné* as a more adequate description of the colonized and racialized being: "while *Dasein* is lost in the They and achieves authenticity when it anticipates its own death, the *damné* confronts the reality of its own finitude as a day to day adventure."[61]

The subjectivity of the *damné* is formed through what Maldonado-Torres calls the non-ethics of war, a rationalization of the extraordinary acts of war during the colonization process.[62] In order to formulate a response to this conditioning in search of other forms of subjectification, Maldonado-Torres refers to Emmanuel Levinas's framing of giving and receiving as acts of self-Other communication (and moments of *ex-position to others*), proposing, finally, a relationship between decolonization and the gift:

> War is the opposite of the an-archical relation of absolute responsibility for the Other that gives birth to human subjectivity... That is the basic meaning of the coloniality of being: the radical betrayal of the trans-ontological by the formation of a world in which the non-ethics of war become naturalized through the idea of race. The *damné* is the outcome of this process. Her agency needs to be defined by a consistent opposition to the paradigm of war and the promotion of a world oriented by the ideals of human generosity and receptivity. This is the precise meaning of decolonization: restoration of the logic of the gift.[63]

In association with becoming-haunted as a mode of approaching a system of events, these complementary visions of justice inform concrete possibilities of response to the event of disaster. Interventions upon the landscape such as infrastructural or architectural projects that should intra-act with existing entanglements could work as a gift, not in the sense of a charitable deed but as a diversion of ongoing cycles towards the future of pasts never actualized. Furthermore, if within a site (as a configuration of relations) these spatial and material interventions have the power to redistribute, sever or engender new entanglements with more or less force, they are put to their best use when they join the many existing

gift cycles in order to amplify them. For that to happen, the way to acknowledge the relations that make up a site of potential intervention must also be hauntologically determined.

Response-Ability and Justice

To Derrida, responsibility is what undergirds the aspiration towards an-economic justice. Being constitutively in relation to ghosts means being charged with the indelible responsibility to address them. We, the now-living, can choose to bring them closer or push them away. Implicated in this choice is what Derrida calls a "principle of selectivity," as even those who decide to welcome the ghosts do so by before, even unwittingly, placing them in hierarchies, excluding some in favor of others:

> We must never hide from the fact that the principle of selectivity which will have to guide and hierarchize among the 'spirits' will fatally exclude in its turn. It will even annihilate, by watching (over) its ancestors rather than (over) certain others. At this moment rather than at some other moment. By forgetfulness (guilty or innocent, it little matters here), by foreclosure or murder, this watch itself will engender new ghosts. It will do so by choosing already among the ghosts, its own from among its own, thus by killing the dead.[64]

There is no escape from the responsibility towards ghosts that we make either dead or doubly dead – haunting will claim you even if you do not claim it.

In *Staying with the Trouble*, Donna Haraway turns responsibility into response-ability and by doing so makes the hinge between acknowledgement and action even more visible. Response-ability can be cultivated, made more complex and more multiple through the recognition of what connects us and our actions to human and non-human others. To Barad, the ontological indeterminacy that results from quantum experiments exposes the limitations of a "classical ontology based on… determinately bounded and propertied objects," as it shows that "there are no separately determinate individual entities that *interact* with one another; rather, the co-constitution of determinately bounded and propertied entities results from specific *intra-actions*" – even space and time would be intra-actively produced.[65] Entanglements are then not simply connections between discrete entities but "specific material relations of the ongoing differentiating of the world."[66] Any analytical boundaries between the self and the other, even the other no longer or not yet there, are thus dissolved. The debt to the other results from the fact that they are "threaded through" the self, indelibly, and intra-acting with the world is becoming mutually constituted with it. Every entanglement is an "irreducible relation of responsibility."[67]

The presence of trace metals as ghostly matter in the bodies of animals along the Rio Doce makes these relations immediately visible. Trace amounts of metals of this type are found in the bodies of living things and are essential for the maintenance of life. The river and its creatures are in a continuous process of co-constitution, exchanging molecules of water and also iron, cadmium, copper, zinc and manganese. After the disaster in 2015, the concentration of trace metals in the water increased, and with it the concentration of trace metals in the bodies of fish, leading to identifiable tissue damage.[68] In the ongoing relation of mutual constitution between river and fish, a contaminated river produced contaminated fish.

There is an alignment between how response-ability is formed and how an an-economic justice as ex-position to others is attained. Both are a result of the action-acknowledgement of the entangled becoming of things. Barad further explains that the indelible ghostly traces of co-constitution with the world are exactly what tells us we cannot look for justice as a precise restitution of what was lost, since there is no such thing as setting things right, putting things back in order or expunging all impurities:

> Only by facing the ghosts, in their materiality, and acknowledging injustice without the empty promise of complete repair (of making amends finally) can we come close to taking them at their word. The past is never closed, never finished once and for all, but there is no taking it back, setting time aright, putting the world back on its axis. There is no erasure finally. The trace of all reconfigurings are written into the enfolded materialisations of what was/ is/ to-come. Time can't be fixed. To address the past (and future), to speak with ghosts, is not to entertain or reconstruct some narrative of the way it was, but to respond, to be responsible, to take responsibility for that which we inherit (from the past and the future).[69]

An "ethics of entanglement" guides our responsibility and the hinging of action-acknowledgement. The possibility to make ghosts suffer further deaths and thus multiply is anterior to response; the choice of what parts of the past to deal with already alters the configuration of the past.[70] In other words – and in a subversion of the usual priorities in the practice of architecture – regardless of the causal alignment between the manner in which one approaches the ghosts and the material responses to their violent manifestations, both already constitute a continued intervention in all processes of becoming.

Haunting and Complexity

A considerable part of the state of Minas Gerais is divided into rectangular areas that are referred to as mining polygons. They represent concessions of the right to extract and commercialize any mineral goods that might be present within their bounds, granted by the Brazilian National Mining Agency (ANM) to private actors. The concessions are the first step in the process of dividuation and charting of matter identified by Yusoff, as they separate the mine from the not-mine – here the convergence of meanings, possession and extraction, consolidate the mine as paradigm.[71] This paradigm extends beyond this system of concessions; it is the possibility of definition and valuation of *all* matter through what Ferreira da Silva calls separability and Barad absolute separation. Even what is not property now can still be, potentially, *mine*. Within each mining polygon there is the ghostly presence of the colonial hereditary captaincies, massive slices of land spanning the entire colony longitudinally and lent by the Crown for management and extraction. This potential for extension is also what drives the evolution from mine to megamine – a name given to open pit operations that can be tens of kilometers wide, larger than any surrounding town or village.

The megamines in Minas where gold and iron ore are obtained are a result of developments in technologies of extraction that make it possible to get what is considered high quality material from soils with increasingly lower percentages of the desired minerals; the downside being the need to excavate larger and larger pits to obtain the same amount of the final product.[72] This arrangement, predicated on absolute separation, drives the expansion of the mine and also the increased complexity of the cleaning assemblages. What began as a combination of an in-humanized black body and a panning tool (*bateia*) has grown into an infrastructural system distributed along steps, sites and dedicated machinery that affect the lives of workers, the villages nearby, the bodies of water that may end up contaminated by tailings, other animals, plants, infrastructure, the economy of municipalities, politics and environmental legislation.

Purity is the negation of the entanglements that result from the ongoing differentiating of the world and thus it needs to be strenuously sustained by a complex and implicating apparatus. That is the contradiction that pervades the reality of mineral extraction. In *Against Purity*, Alexis Shotwell associates the notion of purity with systems of classification imposed upon material reality. Any outstanding expression of complexity that evades such abstracting schemes is taken as impurity.[73] Hauntology constitutes a different response to this surplus to categorization in two ways: first, as mentioned earlier, it already incorporates a co-constitution with and of the world, against separation, into its ethical propositions of response-ability and justice. Second, as the source of a non-method predicated on openness to other lines of becoming (becoming-haunted), it always

already involves a concern with minor stories, not necessarily in terms of scale but in their lack of usefulness towards overarching accounts of events.[74]

Gordon positions hauntology against the "technologies of hypervisibility" that lead to the belief that "not only everything can be seen, but also... everything is available and accessible for our consumption."[75] In a world where everything can potentially be reached, brought to the fore, touched and decoded, there are no ghosts, because ultimately nothing is left repressed. There is, of course, a clear connection between such technologies and the "visualizing technologies without apparent limit" that correspond to the practical and widespread implementation of what Haraway calls the god trick.[76] Against the illusion of boundless seeing and knowing, Haraway argues for knowledge that is "situated and embodied" instead of "unlocatable, and so irresponsible."[77] In Barad's terms, if Man believes he can see the world from a non-position, he fails to acknowledge the entanglements that produce him and his reality, ignorantly assuming a position of no-responsibility.[78]

The critique of universal claims to disembodied knowledge has developed into the common ground of postcolonial, decolonial, feminist and antiracist theory; yet, for all its presence, it is still often taken for an anti-scientific total relativism or simply as a form of reparations in the sense of centering non-white or non-Western European *loci* of knowledge production and enunciation. What can be overlooked in Haraway's claim is that the situating of knowledge is done for the sake of having a more complete and deeper grasp of reality, whatever it may be. A fully disembodied view is impossible, it is an intellectual falsification, and that is why it amounts only to a "trick."[79] Gordon has a similar stance, with the addition of presenting the goal of an inquiry – truth – as something not only bodily produced but also constantly changing – or, to echo Barad, formed by discrete entities that are only impermanently constituted:

> Warnings about relativism to the contrary, truth is still what most of us strive for. Partial and insecure surely, and something slightly different from 'the facts,' but truth nonetheless: the capacity to say 'This is so.' But truth is a subtle shifting entity not simply because philosophy says so or because evidentiary rules of validation are always inadequate, but because the very nature of the things whose truth is sought possesses these qualities.[80]

This understanding of truth has profound consequences for familiar procedures of representation of the real within the practice of architecture, such as the reduction of information through the employment of standardized scales, and the setting of *a priori* vertical (organizational) and horizontal (spatial) limits to the actual interventions. Keeping in mind that these operations ensure the viability of such interventions within the dominant configurations of power and knowledge, what

must emerge is an understanding of space that does not ultimately result in the paradigm of the *mine* – cleaving material reality so it conforms to its diagrammatic interpretation – but that still provides architecture with concrete, pragmatic possibilities for intervening upon the physical realm. After hundreds of years of violence and violation of the land and its inhabitants in order to sustain the material purity that has legitimized Minas's participation in our *mineral modernity*, the Rio Doce valley was faced, at once, with a revenant: the ghosts of extraction and separation, the return of the real with a vengeance.[81] As multiple forms of justice are sought out at the site of disaster, we must take care that architecture as a tool for reparations and as an immediately identifiable mode of intervention upon material reality does not produce these same ghosts.

This final claim implies a need of an architecture to account and care for ghosts without foreclosing on ways through which it may be experimentally defined, especially given the earlier defense of the non-method of becoming-haunted. It is clear, however, that an ethics of entanglement should guide the practice of architecture as a continuous movement of action-acknowledgement – that is, a movement predicated on an understanding that intervening upon the becoming of all things happens before and after the actual presence of any architectural object. It is only through this ethics that the architect can even contemplate the possibility of designing an insertion within existing cycles of gift and care that would effectively amplify them. Even further, this ethics guides the search for a way to not submit the complexity of reality to paradigms of separation while still devising languages and diagrams that enable concrete action: before (and not without) resorting to categories established a priori, the architect's first step becomes to trace the entanglements constituting the site from the inside out, dynamically assessing its limits and mediating its relationship to the extents of the proposed architectural intervention, rehearsing the first movements upon the ethical grounds of a hauntological practice of architecture.

Notes

1 All information extracted from José Adércio Leite Sampaio et al., *Denúncia* (Minas Gerais, Espírito Santo: Ministério Público Federal, 2016).

2 Kathryn Yusoff, "Mine as Paradigm," *e-flux Journal*: *Survivance* (June 2021), https://www.e-flux.com/architecture/survivance/381867/mine-as-paradigm/.

3 Ibid.

4 Márcio Zonta and Charles Trocate, *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco/Vale/BHP Billiton* (Marabá: iGuana, 2016), 30.

5 Carolina Capanema, "Mining and Environmental Destruction in "Minas Gerais: A Historical Comparison," *Arcadia* 6 (Spring 2021), https://doi.org/10.5282/rcc/9217.

6 The text was originally presented as a series of lectures in California in 1993.

7 Jacques Derrida, *Specters of Marx: The State of Debt, the Work of Mourning and the New International*, trans. Peggy Kamuf (New York: Routledge Classics, 1994), 63.
8 Avery Gordon, *Ghostly Matters: Haunting and the Sociological Imagination* (Minneapolis: University of Minnesota Press, 2008), 64.
9 Ibid., 5.
10 Ibid., xvi.
11 Karen Barad, "Troubling time/s and ecologies of nothingness: re-turning, re-membering, and facing the incalculable," *New Formations: A Journal of Culture/Theory/Politics 92* (2018): 65, https://muse.jhu.edu/ pub/248/article/689858.
12 Ibid., 68.
13 Ibid., 70.
14 Derrida, *Specters of Marx*, 9.
15 Quoted in Barad, "Troubling time/s," 70.
16 Toni Morrison, *Beloved* (New York: Vintage International, 2004), 35.
17 Gordon, *Ghostly Matters*, 164.
18 Ibid., 164; Derrida, Specters of Marx, 9.
19 Dionne Brand, *A Map to the Door of No Return: Notes to Belonging* (Toronto: Vintage Canada, 2001), 28.
20 Alia Al-Saji, "The Memory of Another Past: Bergson, Deleuze and a New Theory of Time," *Continental Philosophy Review* 37, no. 2 (June 2004): 204, https://doi.org/10.1007/s11007-005-5560-5.
21 Ibid., 205.
22 Ibid., 207.
23 Ibid., 214.
24 Ibid., 212.
25 Ibid., 216.
26 Ibid., 215.
27 Ibid., 218.
28 Gordon, *Ghostly Matters*, 164.
29 Al-Saji, "The Memory of Another Past," 226.
30 Ibid., 224.
31 Ibid., 205.
32 Ibid., 225.
33 Gordon, *Ghostly Matters*, 27.
34 Ibid., 66.
35 Ibid., 22.
36 Ibid., 40.
37 Ibid., 67.
38 Ibid.
39 Al-Saji, "The memory of another past," 225.
40 Ibid, 226.
41 Ibid., 227.
42 Ibid.
43 Ibid.
44 Derrida, *Specters of Marx*, xviii.
45 Denise Ferreira da Silva, *Unpayable Debt* (London: Sternberg Press, 2022), 15.
46 Ibid., 257.
47 Ibid., 258.
48 Ibid., 259.
49 Ibid.
50 Ibid., 263.
51 Denise Ferreira da Silva, "Speculations on a Transformative Theory of Justice," *Hearings: The Online Journal of Contour Biennale* (April 2017), http://hearings.contour8.be/2017/04/11/speculations-transformative-theory-justice/.

52 Ferreira da Silva, *Unpayable Debt*, 268.
53 Ibid., 260.
54 Ferreira da Silva, "Speculations on a Transformative Theory of Justice."
55 Ibid.
56 Ibid., 29.
57 Ibid., 32.
58 Carla Rodrigues, Rafael Haddock-Lobo and Marcelo José Derzi Moraes, "Specters of Colonialidade: A Forum on Jacques Derrida's Specters of Marx after 25 Years, Part V" *Contexto Internacional 42*, no. 1 (Jan/Apr 2020): 152, http://dx.doi.org/10.1590/S0102-8529.2019420100007.
59 Nelson Maldonado-Torres, "On the Coloniality of Being: Contributions to the Development of a Concept," *Cultural Studies 21*, no. 2–3 (March/May 2007): 260; Derrida, *Specters of Marx*, 29.
60 Lars Spuybroek, *Grace and Gravity: Architectures of the Figure* (London: Bloomsbury, 2020), 8.
61 Maldonado-Torres, "On the Coloniality of Being," 255.
62 Ibid.
63 Ibid., 255.
64 Ibid., 109.
65 Karen Barad, "Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come," *Derrida Today* 3, issue 2 (2010): 253, https://doi.org/10.3366/E1754850010000813; ibid., 261.
66 Ibid., 265.
67 Ibid.
68 See André Alberto Weber et al., "Effects of metal contamination on liver in two fish species from a highly impacted neotropical river: A case study of the Fundão dam, Brazil," *Ecotoxicology and Environmental Safety* 190 (March 2020), https://doi.org/10.1016/j.ecoenv.2020.110165
69 Barad, "Quantum Entanglements," 264.
70 Ibid., 266.
71 Yusoff, "Mine as a Paradigm." Yusoff uses the related binomial property-property, or property as a set of known mineralogical characteristics and property as possession, in her book *A Billion Black Anthropocenes or None*, arguing that the application of this paradigm has supported the establishment of the human-inhuman divide within the human, along racial lines. Yusoff, A Billion Black Anthropocenes or None (Minneapolis: University of Minnesota Press, 2018).
72 See Lindsay Newland Bowker and David M. Chambers, *The Risk, Public Liability, and Economics of Tailings Storage Facility Failures* (Stonington, Bozeman: Bowker Associates Science & Research In The Public Interest, Center For Science In Public Participation, 2015).
73 Alexis Shotwell, *Against Purity: Living Ethically in Compromised Times* (Minneapolis: University of Minnesota Press, 2016).
74 Gordon, *Ghostly Matters*, 24.
75 Ibid., 16.
76 Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies 14*, no. 3 (Autumn 1988): 581, http://www.jstor.org/stable/3178066.
77 Ibid., 583.
78 Barad, "Quantum Entanglements," 264.
79 Haraway, "Situated Knowledges," 589.
80 Gordon, *Ghostly Matters*, 16.
81 For the entire claim of modernity as a mineral creation, see Horacio Machado Aráoz, *Mineração, Genealogia do Desastre: O extrativismo na América como origem da modernidade* (São Paulo: Elefante, 2020).

Bibliography

Al-Saji, Alia. "The Memory of Another Past: Bergson, Deleuze and a New Theory of Time." *Continental Philosophy Review* 37 (June 2004): 203–239.

Barad, Karen. "Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come." *Derrida Today 3*, no. 2 (2010): 240–268. https://doi.org/10.3366/E1754850010000813.

Barad, Karen. "Troubling time/s and ecologies of nothingness: re-turning, re-membering, and facing the incalculable." *New Formations: A Journal of Culture/Theory/Politics 92* (2018): 56–86. https://muse.jhu.edu/pub/248/article/689858.

Brand, Dionne. *A Map to the Door of No Return: Notes to Belonging.* Toronto: Vintage Canada, 2001.

Capanema, Carolina. "Mining and Environmental Destruction in Minas Gerais: A Historical Comparison." *Arcadia 6* (Spring 2021). https://doi.org/10.5282/rcc/9217.

Derrida, Jacques. *Specters of Marx: The State of Debt, the Work of Mourning and the New International*. Translated by Peggy Kamuf. New York: Routledge Classics, 1994.

Ferreira da Silva, Denise. "Speculations on a Transformative Theory of Justice." *Hearings: The Online Journal of Contour Biennale* (April 2017). http://hearings.contour8.be/2017/04/11/speculations-transformative-theory-justice/

Ferreira da Silva, Denise. *Unpayable Debt*. London: Sternberg Press, 2022.

Gordon, Avery. *Ghostly Matters: Haunting and the Sociological Imagination.* Minneapolis: University of Minnesota Press, 2008.

Haraway, Donna. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies* 14, no. 3 (Autumn 1988): 575–99. http://www.jstor.org/stable/3178066

Haraway, Donna. *Staying with the Trouble: Making Kin in the Chthulucene*. Durham and London: Duke University Press, 2016.

Maldonado-Torres, Nelson. "On the Coloniality of Being: Contributions to the Development of a Concept." *Cultural Studies 21*, no. 2–3 (March/May 2007): 240–70. https://doi.org/10.1080/09502380601162548

Morrison, Toni. *Beloved.* New York: Vintage International, 2004.

Rodrigues, Carla, Rafael Haddock-Lobo, and Marcelo José Derzi Moraes. "Specters of Colonialidade: A Forum on Jacques Derrida's Specters of Marx after 25 Years, Part V." *Contexto Internacional* 42, no. 1 (Jan/Apr 2020): 149–71. http://dx.doi.org/10.1590/S0102-8529.2019420100007

Sampaio, José Adércio Leite Gustavo Henrique Oliveira, Jorge Munhós de Souza, Eduardo Henrique de Almeida Aguiar, and Eduardo Santos de Oliveira. *Denúncia*. Minas Gerais e Espírito Santo: Ministério Público Federal, 2016.

Shotwell, Alexis. *Against Purity: Living Ethically in Compromised Times*. Minneapolis: University of Minnesota Press, 2016.

Spuybroek, Lars. *Grace and Gravity: Architectures of the Figure*. London: Bloomsbury, 2020.

Yusoff, Kathryn. *A Billion Black Anthropocenes or None*. Minneapolis: University of Minnesota Press, 2018.

Yusoff, Kathryn. "Mine as Paradigm." *e-flux Journal*: Survivance (2021). https://www.e-flux.com/architecture/survivance/381867/mine-as-paradigm/.

Zonta, Márcio and Charles Trocate (eds.). *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco/Vale/BHP Billiton*. Marabá: iGuana, 2016.

PART II
In/Formational Technicities

Gregory Bateson, Distributed Mind, and Cybernetic Ecology: The Curious Intelligence of Buildings, Cities, and Redwood Forests

Gökhan Kodalak

Gregory Bateson is a thinker with heterodox insights into the nature of mind and the mind of nature. From the late 1920s to the 1970s, he synthesized various fields of study ranging from anthropology, psychology, and semiotics to the subject matter of this chapter: ecology, philosophy of mind, and cybernetics.[1] With this transdisciplinary setup, he challenged tired conventions upholding the bifurcation of internal psyche and external environment. He dared to unify mind and nature.[2]

Behind Bateson's holistic approach lies a step-by-step philosophical construction. His first step is to propose that ideas are modes of differentiation, not representation. The next is to define information, no longer as quantifiable data, but as qualitative significance. The final step is to proclaim that minds are not limited by our skin but enmeshed with the environment. After redefining idea, information, and mind in unconventional ways, Bateson declares the discovery of a strange field, "a science which does not yet exist as an organized body of theory or knowledge."[3] With this incipient science, he navigates the minds of not just humans and animals, but also that of thermostats, cities, coral reefs, and redwood forests as informational gradations of an immanent continuum: cybernetic ecology.

Idea, or Difference

There is an established definition of idea in Western epistemic lineages as a mental representation of the external world. Such conventions state that we perceive the world and record environmental features as secondary mental illustrations. Having established the standards of Enlightenment thinking, René Descartes declared, for instance, that ideas are "images of things" that are "represented

by the operation of the intellect," and "resemble ... things existing outside."[4] The canonical dissemination of these conceptions entrenched a set of bifurcations in the modern collective psyche, bifurcations between the internal mental world and the external material world, between representing mind and represented reality, between mimicking ideas and mimicked facts. That's why even today, we imagine ideas as analogous to Renaissance paintings, trying to represent the outer reality perceived from a human perspective, resembling it as closely as possible. The result is to reduce ideas to imitative representations.

Bateson characterizes such imitation-based definitions as a "pathology of epistemology" – a self-validating error of thinking, whose intangible nature and deep-rooted history lead to "the difficulty of changing epistemological habit."[5] Only by launching a radical critique of representational thinking can we break the imitative shell of ideas, liberate them from the pitfalls of this numbing epistemological habit, and let thinking exhibit its adventurous spirit.

In the introduction to his magnum opus, *Steps to an Ecology of Mind* (1978), Bateson reveals his main aim: "to propose a new way of thinking about ideas."[6] He starts to provoke this epistemological shift with the initial gesture of redefining idea as difference: "I suggest to you, now, that the word 'idea,' in its most elementary sense, is synonymous with 'difference.'"[7] Yet how are we to understand Bateson's conception of difference as equivalent to idea? Are we talking about extrinsic differences arising from the dissimilar qualities of separate modes of existence – like differences in shape, color, and posture between a zebra and a lion? Or intrinsic differences that make up a singular being – like differences of psychosomatic configurations and part-whole relations? Or are we considering substantial differences that make up the immanent fabric of nature – like gradational differences of finite modes of existence (stars, planets, animals, humans) expressing the infinite potentiality of an underlying generative continuum that is the cosmos? With a subtle yet ambitious approach, Bateson seems to argue for all of them at once:

> In a piece of chalk there are an infinite number of potential facts... There is an infinite number of differences around and within the piece of chalk. There are differences between the chalk and the rest of the universe, between the chalk and the sun or the moon. And within the piece of chalk, there is for every molecule an infinite number of differences between its location and the locations in which it might have been.[8]

Meaning, differences or ideas are the building blocks of existence. The crucial nuance here is that Bateson neither reduces ideas to representations floating in our subjective minds, nor to characterizations of objective facts. He redefines them

as relational differences interfusing intrinsic, extrinsic, and cosmic modifications at once. That's why Bateson argues that "a difference cannot be localized."[9] Every local difference is already enmeshed with multiple scales of existence channeling, at its fundamental depths, the extended alteration of its immediate environment and "the continuum or matrix of which or in which 'ideas' are made," that is, the differential dynamo of the cosmos itself.[10] The role of idea, therefore, is not local imitation, but multidimensional differentiation.

Information, or Significance

But isn't there already an inflation of difference-based modes of thinking today, as fashionable facets of Derrida and Deleuze have been institutionalized – and sadly, domesticated – during the last half-century within humanities departments, artist statements, and architectural charades? There surely is. Yet Bateson's approach attains its uniqueness by conceiving differences as the elementary bits constituting a bogeyman of a concept not many of his philosophizing contemporaries dared to touch: information.

The cosmos harbors an infinity of differences or ideas, Bateson suggests, yet we cannot process this infinitude. Myriad differences spill over our cognitive capacities. Our perceptual filters cannot grasp every difference in our reach. We can interact only with "a difference that makes a difference," which corresponds to Bateson's signature definition of "information."[11] There is an infinity of ambient sounds pervading our immediate environment, for instance, yet we only hear the acoustic differences that make a difference to us – a favorite song, the cry of a baby, the horn of an approaching car. We process the sounds that stand out as information, filter out the rest as background noise. Out of an infinity of sounds, we pay attention to, register, and hence, hear only a few. After restructuring idea as difference, Bateson redefines information as a difference that makes a difference, that is, significance.

Information or significance is the doubling of difference through selective processes. As an example, a human ear's average range of hearing is 20 hertz to 20 kilohertz, whereas cats can detect frequencies from 55 hertz up to 80 kilohertz; meaning, cats can hear ultrasounds that we can't. An average naked human eye can see light waves ranging from 400 to 700 nanometers, whereas bees can see in the 300 to 600 nanometer range; meaning, bees can detect ultraviolet lights that we can't. Certain auditory and visual differences that make a difference for cats and bees, therefore, do not make a difference for us, and vice versa. Whether human, cat, or bee, we all embody environmental differences within the spectrum of our capabilities of affecting and being affected, that is, within specific magnitudes.

Now the above-mentioned examples cover only biological thresholds at the level of species based on an imperfect methodology of averaging generalizations. Once we start analyzing the same selective processes on a one-to-one scale, the problem gets much more complicated. Then, it becomes possible to notice that we each select a different set of differences from the same text, the same movie, the same food. And such different selections occur not only across different modes of existence, but even among the same species, among shared cultural formations, and even within the same modality, within us all, during different developmental stages throughout our lifetime. Don't we all catch ourselves enjoying a genre of music, a dish, an architectural construct in later stages of our life, which we had previously ignored or passionately disliked? Significances are not static fixtures, but dynamic selections within plastic thresholds.

Yet if we settle on defining information or significance as a unilateral operation, as though it is only the intentional agency of the subject that chooses or only the pulling power of the object that selects, we are led astray. Just like differences, significances are neither subject- nor object-based, but relational and reciprocal. This might be best exemplified in the aesthetic production of art, design, and architecture. Driven by the push-and-pull between affective differences and aesthetic constructors, aesthetic selection becomes the critical operation foregrounding the question of significance. Which differences, among an infinity of others populating the underlying field of potentials, will be channeled into aesthetic production? Which ideas will become significant in the shaping of aesthetic constructs?

In the aesthetic processes of selection, artists, architects, and designers exert agency, while affective differences ground aesthetic activity. Both sides affect and influence each other. Both sides choose and select one another as part of a mutual dance.[12] When Cézanne painted Mont Sainte-Victoire, the looming mountain of his hometown, again and again, in an extremely varied series amounting to more than sixty works of art, including drawings, oil paintings, and watercolors, from the 1870s until his death in 1906, this was not a simple, one-sided obsession.[13] Concurrently, he was captivated by underlying affectivities and tectonic forces embodied in this mountain. He was bewitched by the affective agency of magmatic undercurrents flowing underneath the mountain's unbending posture. When Francis Bacon, the painter known for his raw, affectively charged imagery, painted a series of forty-five variants of Diego Velázquez's portrait of Pope Innocent X (1650) throughout the 1950s and 60s, this was not a simple, unilateral fascination. Concertedly, he was haunted by underlying potencies manifesting themselves in Velázquez's portrait. In his own words: "I've always thought that this was one of the greatest paintings in the world, and I've used it through obsession," because "it just haunts me, and it opens up all sorts of feelings, and areas of imagination."[14] When Giovanni Battista Piranesi, the eighteenth-century

architect, created his atmospheric etchings of Imaginary Prisons (Carceri d'invenzione), made up of soaring perspectives portraying carceral structures with multiple vanishing points and a virtually impossible Euclidean geometrical unity woven together by chaotic passages and endless stairways, and kept reworking and republishing them between 1745 and 1761, this was not out of a simple, subjective interest in prison architecture and geometrical experiments. Conjointly, it was a way of affirming infinite potencies of spatial modulations and unearthing the play of forces – themselves non-Euclidean – beneath architectural forms, and the social horrors contained within.[15] Indeed, Cézanne, Bacon, and Piranesi discovered and summoned up these significances, chose them out of an infinity of affective differences, and invented their own techniques of expressing their potentials. Yet, in the same breath, Mont Saint-Victoire, Velázquez's portrait, and carceral architectural complexes haunted these aesthetic constructors and lured them with their gravitational pull. Such is the reciprocal pact of aesthetic selection. Affective significances foster attractions, while artists, architects, and designers develop obsessions – they select one another, immanently, in a synchronic manner.

Yet aren't we all suspicious of information today, even though – or perhaps especially because – "the information society" and "the information age" are presented as pervasive sociological labels for our current culture and historical period? Aren't we all bombarded with ever-increasing quantities of data? Is every collectible trace of our existence not registered, processed, and channeled back into our perceptual streams to manipulate our ways of living? Aren't we all becoming more and more numb to flashy inputs thrown our way? Do an increasing number of artworks and architectural projects not fall into the banal trap of data worship, permutating one algorithmic ruleset after another into supposedly cutting-edge, but in fact indistinguishable spectacles and tired sculptural forms? These are all valid suspicions. But they are exactly the misconceptions that Bateson tries to wrestle the notion of information away from. Information is not synonymous with raw floating data.[16] Its elemental unit is neither a quantity nor an algorithmic matrix. Its operating system is not grounded on binary digits of one or zero, true or false, yes or no, plus or minus, on or off. It doesn't aim for the insular resolution of uncertainty as is maintained in mainstream strands of information theory. Rather, information is significance gathered from a gradational milieu of differences – qualitative and custom-fit.[17] It is what makes you tick. The music your ears attune to. The rhythm your body livens up to. Bateson makes it his mission to liberate information from its conventionally impoverished, neutralized, and quantified characterizations.[18] Information is a meaningful call to attention and action. We form, deform, reform only by way of being significantly informed.

Distributed Mind, or Cybernetic System

This brings Bateson to the question of mind. In his redefinition, mind is a matrix, "an aggregate of interacting parts and components," which can engage with differences that make a difference.[19] That is, mind is a "cybernetic system" of complex circuits that can be affected by information and act on cues of relevance.[20] Or, to put it in even simpler terms, mind is a significance processor. Our minds can process significance in a variety of ways: on colorful façades or monochrome surfaces, in signs of joy or danger, from serene breezes by the ocean or thunderous sounds in the distance. We have minds, or better still, we are minds, insofar as we can detect, connect with, and have transformative relationships with environmental significances.

This hints at an expanded redefinition of mind. Mind is no longer deemed exclusive to humans (and animals) as conventionally perceived. "A house thermostat," illustrates Bateson, might be deemed a simple mind as well, in the sense that when "the weather changes outdoors, the temperature of the room falls, the thermometer switch in the living room goes through its business and switches on the furnace; and the furnace warms the room and when the room is hot, the thermometer switch turns it off again."[21] That is, insofar as a house thermostat can detect out of an infinity of differences, a difference that makes a difference for a specific operation (in this case, a significant drop in temperature levels), act upon and make use of such significance by way of self-corrective feedback circuits (switching on the furnace once coldness is detected to warm the room, and switching it off once the desired temperature is attained), we witness the proto-operations of a mind, however basic they might seem in comparison to the complex modes of human cognition.[22] In this peculiar sense, mind is not a biological apparatus that just a few organic species are endowed with, but "applies to a much wider range of those phenomena called 'systems,' including systems consisting of multiple organisms or systems in which some of the parts are living and some are not, or even to systems in which there are no living parts."[23] This is a radical maneuver. Any modality of existence – whether living or nonliving – that can interact with surrounding differences and transform relevant significances is mindful, intelligent.

Bateson explores the potential mindfulness of a rich profusion of modalities that are conventionally deemed mindless. His panoramic selection of intelligence includes "an automobile traveling over a bump in the road;" Carnot heat engines, thermostats and computers; evolution and embryology; "neurons in the phenomenon of synaptic summation;" "all organisms," organs, and individual cells; Kaneohe Bay and Lake Erie; "a coral reef, a redwood forest, or a city."[24] This is an unconventional list that might initially seem a bit strange, if not semi-science fiction or even totally absurd, especially if we insist on evaluating it with respect to

established epistemological prejudices based on anthropocentric measures. But there is a subtle consistency to Bateson's systematic conception which deserves to be considered on its own merits. Bateson is not advocating that any of these modalities have minds with cognitive faculties like those of humans. Rather, he suggests that mind is not a matter of possession (one doesn't have a mind), but a matter of operation (one becomes mindful in proportion to one's engagements with differences and significances).[25] In this specific sense, intelligence, or the capacity to process significances, is shared across a wide range of social and ecological systems.

What does this mean for architecture? It means – and this will sound strange to the uninitiated – that architectural modalities can be mindful too, insofar as they engage with differences in their environment, select the differences that make a difference with respect to their being, and act upon such significances to the degree of their operational complexity. The issue here, for the record, is not the banal, commercial typologies of "intelligent buildings" with high-tech sensors that respond to your voice and turn on the lights, set the alarm, or what have you. What is at stake is the potential intelligence of any architectural modality based on its capability of processing significance. This leads us to a curious question. Given that all architectural modalities express different degrees of material intelligence – bear loads, resist tensions and compressions, manipulate gravitational forces by way of their structural resilience, filter abiotic gradients (of air, sunlight, heat, sound, dampness) via selective thresholds and circuits, and provide spatial potentials and affective stimulations in relation to our interactions – can we entertain the mad thought that every building bears a unique intelligence of its own?

There is a caveat against this expansive conception of mind. We all experience the world from our first-person perspective. Wherever we turn, wherever we look, our perception is anchored in our body. What we see first is literally the tip of our nose, then the world. Such firsthand experience prompts us to believe that we are the center of the universe. Our feelings, perceptions, actions seem primary, intimate, and real, as opposed to those of others that need to be secondarily mediated, always arriving from a seemingly unbridgeable distance. This conception is reinforced even further during our social upbringing, as we learn that other people have similar perceptual setups, experience the world from their own perspectives as well, and believe, just like we do, that they are the protagonists of (their own) reality. The result is a commonplace belief that reality is made up of individual building blocks whose inner lives are separate from the external world. Hence, the great schisms we impose on reality: the bifurcation of inside and outside, the dualism of internally experienced subject and externally perceived object, the polarity of mental life and material nature.

Bateson opposes such schisms, for they presuppose intrinsically defined beings autonomous from their environment: "We commonly think of the external 'physical world' as somehow separate from an internal 'mental world.' I believe that this division is based on the contrast in coding and transmission inside and outside the body. The mental world – the mind – the world of information processing – is not limited by the skin."[26] To be clear, Bateson's counter-proposal is not to posit an organic unity in which everything interior and exterior, mental and physical, collapses into one another as indistinct parts of a homogeneous whole.[27] It is, rather, a precise epistemological shift, to conceive the unit of existence no longer as an autonomous individual but as an enmeshed modality, as being plus milieu, or in the biological context, as "organism plus environment."[28] As such, Bateson contests the deeply entrenched barrier of internal and external worlds with a systems approach of metabolic interactions and cybernetic feedback loops.[29]

Mind, Bateson argues, is not limited by our skin, skull, or brain. It is a system of enmeshment spreading across beings plus environments. Hence, when asked whether it is a man or a computer that does the thinking in a coupled computational operation, Bateson responds that "what 'thinks' and engages in 'trial and error' is the man plus the computer plus the environment," for "the lines between man, computer, and environment ... are the lines across the pathways along which information or difference is transmitted," that is, "what thinks is the total system."[30] This is yet another crucial step in Bateson's worldbuilding. Mind is a creature of connectivity trespassing physical boundaries. Whenever we are entangled with informational meshes, our minds are pushed to their operational limits. We all expand and contract our modes of thinking by way of our enmeshed coalitions.

Bateson likes to repeat that "there are lots of message pathways outside the skin," which "must be included as part of the mental system whenever they are relevant."[31] His discourse is full of evocative examples of distributed minds, like the blind man's stick:

> Suppose I am a blind man, and I use a stick. I go tap, tap, tap. Where do I start? Is my mental system bounded at the handle of the stick? Is it bounded by my skin? Does it start halfway up the stick? Does it start at the tip of the stick? But these are nonsense questions. The stick is a pathway along which transforms of difference are being transmitted. The way to delineate the system is to draw the limiting line in such a way that you do not cut any of these pathways in ways which leave things inexplicable. If what you are trying to explain is a given piece of behavior, such as the locomotion of the blind man, then, for this purpose, you will need the street, the stick, the man; the street, the stick, and so on, round and round. But when the blind

> man sits down to eat his lunch, his stick and its messages will no longer be relevant if it is his eating that you want to understand.[32]

There is also the arresting example of a man felling a tree with an ax:

> If you consider a man felling a tree with an ax, from one stroke of the ax to the next, the behavior of the ax ... is self-corrective in regard to the cut face of the tree trunk. The actual channels, which you would have to map out to understand a man cutting down a tree with an ax (it doesn't matter where you start – it can start with the face of the tree), would include differences in the cut face of the tree, differences in light waves reaching the eye, differences in the behavior of the end organ and showers of impulse in the optic nerve, differences transmitted over very complex networks, going out to differences transmitted to muscles, to differences in the movement of the ax, to differences in the next cut in the face of the tree. The "mental" system involved in cutting a tree is not a mind in a man who cuts a tree but a mind which includes differences in other characteristics in the tree, the behavior of the ax, and so on, all around a circuit.[33]

What is crucial in both examples is Bateson's meticulous explication of mental enmeshments. He specifies the mental systems operating through the blind man's stick and the man felling the tree via cybernetic circuits that extend beyond individuals and incorporate all the relevant pathways, so as to pick up differences, transform them into significances, and modify the system's ongoing flow with dynamic calibrations.

Even beyond Bateson's repertoire, the examples can be multiplied ad infinitum. While wayfinding, we expand the limits of our sense of direction and spatial awareness using a map. In recalling contact information, we integrate the storing capacity of a smartphone to our extended memory. Examining viruses, we extend our visual perception with the help of a microscope to discern their otherwise imperceptibly tiny scale. While listening to a concert, we augment our auditory perception by way of the concert hall's acoustic architecture. All that is to say, mind is not a bounded entity trapped in "our tiny skull-sized kingdoms."[34] Mind is a system, distributed and expandable.[35]

Cybernetic Ecology, or Heterarchical Epistemology

Using his renewed conceptions of idea, information, and distributed mind as building blocks, Bateson sets out to craft a novel epistemological lens. He defines his approach as an "indivisible, integrated metascience," which I would prefer to call cybernetic ecology, as he posits that "perhaps 'epistemology' is only another

word for the study of the ecology of mind."[36] With that, the epistemological study of mind and the ecological study of nature start fusing into one.

Bateson's cybernetic ecology is synonymous with heterarchical epistemology, "the science of mind in the widest sense of the word," which is sensitive enough to unearth the latent intelligence of a broad spectrum of ecological modalities:

> Minimal characteristics of mind are generated whenever and wherever the appropriate circuit structure of causal loops exists. Mind is a necessary, an inevitable function of the appropriate complexity, wherever that complexity occurs. But that complexity occurs in a great many other places besides the inside of my head and yours... Let me say that a redwood forest or a coral reef with its aggregate of organisms interlocking in their relationships has the necessary general structure. The energy for the responses of every organism is supplied from its metabolism, and the total system acts self-correctively in various ways.[37]

These two examples – redwood forest and coral reef – are different from the earlier ones, as the primary subjects are no longer us, humans, or our extended cognitive operations, but the ecological enmeshments of plants, animals, and abiotic environmental forces themselves. This is a subtle but crucial move pushing us beyond our human-centric commitments by way of hinting at the mental capacities of natural circuits on par with cultural formations. Bateson's cybernetic ecology or heterarchical epistemology reveals that – whether human or animal, thermostat or building, redwood forest or coral reef – we are all different expressions of nature's mental operations. We are all convoluted articulations of nature's distributed mind.

Mind, or Nature

The crescendo of Bateson's cybernetic ecology arrives at the end, once all differences, significances, distributed minds come together to constitute the noetic topology of nature: "It means, you see, that I now localize something which I am calling 'Mind,' immanent in the large biological system – the ecosystem. Or, if I draw the system boundaries at a different level, then mind is immanent in the total evolutionary structure."[38] This is a twofold conception. From an extensive viewpoint, mind is immanent to the entire ecosystem – from forests, cities, oceans, deserts to their earthly continuum. From a dynamic viewpoint, mind is immanent to the total evolutionary structure – from the emergence of ancestral cyanobacteria and algae-like plants, to, billions of years later, the rise of the first mammals and the latest advancements of our own genus. Such is Bateson's prelude to the

concluding stage of his slow-burning philosophical construction; he finally starts advocating for "the world seen as mind," or the immanence of mind and nature.[39]

Immanence is a curious concept. Bateson appears well-versed in its clandestine history. He seems aware of its heterodox implications in favor of intrinsic generative potentials of nature as opposed to transcendent worldviews that bestow creative powers only on elevated autonomous agents like gods or humans. Although never referenced explicitly, Bateson's immanent approach resonates heavily with that of Spinoza, the early modern philosopher who pushed the concept to its absolute limits. At a dangerous time when Galileo Galilei was left to die in house arrest and Giordano Bruno was burned at the stake due to their anti-transcendent cosmologies, Spinoza dared to enunciate immanence with his defiant dictum of "Deus, sive Natura," that is, "God, or Nature."[40] With this indifferent equality – achieved with the simple grammatical conjunction "or" – Spinoza posited that there is no transcendent principle, no otherworldly force, no external cause to the cosmos. Nature is already godly, that is, generativity is intrinsic to nature itself.[41]

By invoking immanence with an implicit Spinozist flavor, Bateson attaches himself to this subterranean lineage of heterodox philosophies. That's why he seems to feel the need to pave the way for unifying mind and nature with a brief detour through a renewed conception of God:

> The Mediterranean religions for 5000 years have swung to and fro between immanence and transcendence... The cybernetic epistemology which I have offered you would suggest a new approach. The individual mind is immanent but not only in the body. It is immanent also in pathways and messages outside the body; and there is a larger Mind of which the individual mind is only a subsystem. This larger Mind is comparable to God and is perhaps what some people mean by "God," but it is still immanent in the total interconnected social system and planetary ecology.[42]

From a contemporary secular viewpoint, the sudden arrival of the concept of God might appear slightly out of place here, if not totally shocking. Yet Bateson is acknowledging the existence of "a larger Mind," not in the transcendent (Abrahamic) sense of an otherworldly anthropomorphic God, but in the immanent (Spinozist) sense of nature with its cosmic reach, as the continuous producer, processor, and distributor of differences (or ideas), information (or significances), and cybernetic systems (or mental organizations). That's why Bateson underlines that this larger Mind or God is immanent in the interconnected social and ecological systems. That's the reason he declares that "we now know, with considerable

certainty, that the ancient problem of whether the mind is immanent or transcendent can be answered in favor of immanence."[43] On this account, Bateson insists that "my knowing is a small part of a wider integrated knowing that knits the entire biosphere or creation."[44] And it is no coincidence that Bateson's final pursuit directly overlaps with that of Spinoza, who already argued three and a half centuries earlier that "the supreme good is to arrive, together with other individuals if possible, at the enjoyment of such a nature; ... namely, the knowledge of the union that the mind has with the whole of Nature."[45] Bateson's strange philosophical journey invites us to start from infinitesimal differences and significances, extend towards mental operations distributed across environmental circuits, and reach the intelligent enmeshments of wider social and planetary ecosystems. In doing so, we arrive at the cosmic immanence, the overlapping of psyche and physics – Mind, sive Nature.

Ethics, or Mutualistic Intelligence

In *Roadside Picnic* (1972), a philosophical science fiction novel by Arkady and Boris Strugatsky and the literary source of Andrei Tarkovsky's cult movie *Stalker* (1979), there is a related discussion between two characters on the definition of intelligence:

> "We're talking about the psychology of intelligent beings."
> "True. And that would be just fine, if we knew what intelligence was."
> "And we don't?" asked Noonan in surprise.
> "Believe it or not, we don't. We usually proceed from a trivial definition: intelligence is the attribute of man that separates his activity from that of the animals. It's a kind of attempt to distinguish the master from his dog, who seems to understand everything but can't speak..."
> "Yes, that's us," agreed Noonan.
> ...
> "All right, then here's another definition – a very lofty and noble one. Intelligence is the ability to harness the powers of the surrounding world without destroying said world."
> Noonan grimaced and shook his head. "No," he said. "That's a bit much... That's not us."[46]

Such is the core tension carefully identified by Bateson, two ways of defining ethical extensions of intelligence: either as a special means of elevating ourselves above all modes of existence and dominating nature, or as a way of communicating with all modes of existence on equal grounds and forging mutualistic circuits of ecological co-existence.[47]

But what are all these high-order philosophical speculations supposed to mean? What is at stake in conceiving minds as information processing systems beyond individual skins and skulls? Why does it matter to affirm a diverse spectrum of minds expressing different gradations of a mental continuum rather than restricting intelligence to ourselves and a few special organisms? What is pertinent in acknowledging nature itself as mindful and generative, instead of mindless and mechanical? Bateson is clinically precise in unpacking the ethical implications of these overlapping questions:

> If you put God outside and set him vis-à-vis his creation and if you have the idea that you are created in his image, you will logically and naturally see yourself as outside and against the things around you. And as you arrogate all mind to yourself, you will see the world around you as mindless and therefore not entitled to moral or ethical consideration. The environment will seem to be yours to exploit. Your survival unit will be you and your folks or conspecifics against the environment of other social units, other races and the brutes and vegetables. If this is your estimate of your relation to nature and you have an advanced technology, your likelihood of survival will be that of a snowball in hell... This is not funny, and I do not know how long we have to do it in... If I am right, the whole of our thinking ... has got to be restructured.[48]

Bateson gave this lecture in 1970. It was certainly not funny at the time to confront the severity of our misconceptions isolating mind and nature. And more than half a century later, at our time of impending ecological catastrophes, it is not funny at all to confess that we have yet to sufficiently challenge, let alone abandon, instrumentalizing intelligence as a tool for mastering nature. We have yet to reconceive intelligence as a catalyst of mutualistic co-existence.

Such concerns may still sound too abstract and theoretical, not specific and practical enough. Bateson knows how to zero in on local practical problems – such as the extreme pollution of Lake Erie by the 1960s due to the the waste dumping of Cleveland's heavy industry – and meet them halfway with comprehensive philosophical constructions:

> But when you separate mind from the structure in which it is immanent, such as human relationship, the human society, or the ecosystem, you thereby embark, I believe, on fundamental error, which in the end will surely hurt you... You end up with the species versus the other species around it or versus the environment in which it operates. Man against nature. You end up, in fact, with Kaneohe Bay polluted, Lake Erie a slimy green mess...

> When you narrow down your epistemology and act on the premise "What interests me is me, or my organization, or my species," you chop off consideration of other loops of the loop structure. You decide that you want to get rid of the by-products of human life and that Lake Erie will be a good place to put them. You forget that the eco-mental system called Lake Erie is a part your wider eco-mental system – and that if Lake Erie is driven insane, its insanity is incorporated in the larger system of your thought and experience.[49]

The ethical potency of Bateson's cybernetic ecology lies in affirming the eco-mental interdependence of the self, the collective, and the environment. He underlines that becoming active at the expense of rendering others passive, becoming free at the expense of enslaving ecological modes of existence, becoming empowered at the expense of weakening our shared environments are all misguided approaches. For in proportion to each modality rendered passive, enslaved, and weakened, our eco-mental system itself suffers; we ourselves suffer.

Bateson's cybernetic ecology is an outcry against our self-proclaimed supremacy over and against nature. He warns us that insofar as we insist on imagining ourselves as separate from and elevated above nature, weaponize mind as our exceptional trait and render nature mindless, the result would be mutually destructive:

> Epistemological error is all right, it's fine, up to the point at which you create around yourself a universe in which that error becomes immanent in monstrous changes of the universe that you have created and now try to live in... If we continue to operate in tenets of a Cartesian dualism of mind versus matter, we shall probably also continue to see the world in terms of God versus man; elite versus people; chosen race versus others; nation versus nation; and man versus environment. It is doubtful whether a species having both an advanced technology and this strange way of looking at its world can endure.[50]

Championing myopic self-interest, we have aspired to dominate our environments and each other for so long. With the unification of mind and nature, an alternative ethos becomes possible, the ethos of facilitating intelligent systems of mutual empowerment enmeshing cities and forests, industries and lakes, computers and coral reefs.

Might architecture's problematic relationship with nature benefit from this peculiar approach? Can Bateson's insistence on the qualitative affirmation of the unity of mind and nature and our immanent enmeshment with the

wider ecosystem be an antidote to fake ecological fixes in architectural circles promoting either cosmetic greenwashing postures or bureaucratic eco-certifications earned with quantitative calculations? Such questions can constitute the profession's most pressing problems for the twenty-first century. How can we reconceive architecture's tired relationship with mind and nature? As opposed to imagining them in isolation, can we reconceive architecture and nature as a single continuum teeming with different gradations of intelligence? Rather than subscribing to hierarchical coercions that elevate mind over matter, humans over nonhumans, built environments over ecological milieus, can we acknowledge our equal footing with all modalities of nature? And instead of keeping the discipline as an imperial endeavor self-absorbed in the subjugation of nature, can we reinvent architecture as a planetary practice weaving mutualistic experiments from within the intelligent fabric of the nature-architecture continuum?

Epilogue

In the systematic worldbuilding of Bateson's heterodox philosophy, ideas (expressing differences) constitute information; information (expressing significances) makes up distributed minds; distributed minds (expressing cybernetic systems) compose nature as a generative, intelligent continuum. Bateson's epistemological project emancipates mind from our skull-sized kingdoms, affirms the mental richness of a wide range of technological and ecological modalities that are conventionally deemed mindless, and redefines nature itself as a mental spectrum of which we are all immanent expressions. In parallel, his ethical project sows the seeds of mutualistic co-existence of individual, collective, and ecological enmeshments by way of their intelligent interactions. In the end, Bateson's cybernetic ecology introduces a strategical humility to help us let go of our self-proclaimed exceptionalism. We are instead provoked to set our sights on an unapologetically messy yet convivial ambition, "the dignity or joy of being part of something much bigger."[51] The joy of becoming one with larger ecosystems, planetary feedback loops, and cosmic tunes. When we think, our minds pour out, the universe thinks through us, we catch a glimpse of that turbulent undercurrent, the unity of mind and nature.

Notes

1 For secondary literature on Bateson's transdisciplinary oeuvre, see: Peter Harries-Jones, *A Recursive Vision: Ecological Understanding and Gregory Bateson* (Toronto: University of Toronto Press, 1995); Noel G. Charlton, *Understanding Gregory Bateson: Mind, Beauty, and the Sacred Earth* (New York: SUNY Press, 2008); Jesper Hoffmeyer, ed., *A Legacy for Living Systems: Gregory Bateson as Precursor to Biosemiotics*

(Dordrecht: Springer, 2008); Peter Harries-Jones, *Upside-Down Gods: Gregory Bateson's World of Difference* (New York: Fordham University Press, 2016); Anthony Chaney, *Runaway: Gregory Bateson, the Double Bind, and the Rise of Ecological Consciousness* (Chapel Hill: University of North Carolina Press, 2018). For architectural encounters with Bateson's philosophy, see: Jon Goodbun, "Gregory Bateson's Ecological Aesthetics," *Field* 4, no. 1 (January 2011): 35–46; "An Ecology of Mind," *The Architectural Review*, March 27, 2012; Hélène Frichot, "Daddy, Why Do Things Have Outlines? Constructing the Architectural Body," *Inflection Journal*, no. 6 (2013): 112–24; Dulmini Perera, "Wicked Problems, Wicked Play: Fun Machines as Strategy," *FormAkademisk* 13, no. 2 (2020): 1–19.

2 Bateson even made this approach the title of a book: Gregory Bateson, *Mind and Nature: A Necessary Unity* (New York: E. P. Dutton, 1979).

3 Ibid., xv.

4 René Descartes, "Meditations on First Philosophy," in The P*hilosophical Writings of Descartes*, vol. II, trans. John Cottingham, Robert Stoothoff and Dugald Murdoch (Cambridge: Cambridge University Press, 2005), 7, 26.

5 Gregory Bateson, "Pathologies of Epistemology," in *Steps to an Ecology of Mind* (New York: Ballantine Books, 1978), 478–81.

6 Gregory Bateson, "Introduction: The Science of Mind and Order," in *Steps to an Ecology of Mind*, xv.

7 Gregory Bateson, "Form, Substance, and Difference," in *Steps to an Ecology of Mind*, 451–53.

8 Ibid.

9 Gregory Bateson, "Pathologies of Epistemology," *Steps to an Ecology of Mind*, 481.

10 Gregory Bateson, "Let Not Thy Left Hand Know," in Angels Fear: Towards an Epistemology of the Sacred (New York: Ballantine Books, 1978), 70–71.

11 Gregory Bateson, "A Re-examination of 'Bateson's Rule," in Steps to an Ecology of Mind, 381; "Form, Substance, and Difference", 453; "Pathologies of Epistemology," 481.

12 Erwin Straus develops a resonant conception of sensing between oneself and the world:
"The sensing subject does not have sensations, but, rather, in his sensing he has first himself. In sensory experience, there unfolds both the becoming of the subject and the happening of the world. I become insofar as something happens, and something happens (for me) only insofar as I become. The Now of sensing belongs neither to objectivity nor to subjectivity alone, but necessarily to both together. In sensing, both self and world unfold simultaneously for the sensing subject; the sensing being experiences himself and the world, himself in the world, himself with the world."
Erwin Straus, *The Primary World of Senses: A Vindication of Sensory Experience,* trans. Jacob Needleman (New York: Free Press of Glencoe, 1963 [1935]), 351.

13 "The mountain had always had a peculiar fascination for him. He drew or painted it more than 60 times, beginning around 1870 when it formed the background of his landscape The Railway Cutting... By the mid-1880s the Sainte-Victoire had become the single most important theme in his landscape painting, and it remained so until the end of his life. He did not twice paint it the same way." Richard Murphy, *The World of Cézanne 1839–1906* (New York: Time-Life Books, 1968), 127. "It must have exercised a peculiar fascination for Cézanne, for no mountain has ever been explored by an artist so persistently, so incessantly as this." Roger Fry, *Cézanne: A Study of His Development* (New York: The Noonday Press, 1958), 74.

14 David Sylvester, *The Brutality of Fact: Interviews with Francis Bacon* (London: Thames & Hudson, 1987), 23, 25. Bacon's most renowned piece out of the series is a painting called *Figure with Meat* (1954). In the hands of Bacon, Velázquez's authoritative figure draped in shiny satins and lace is dissipated by a gravitational pull, his commanding posture is collapsed inwards as if by an imperceptible spasm, his face and hands are

wiped by a ghastly bleach with an overall effect of an uncanny, vibrating dread. For further details, see Deleuze's book on Bacon and my essay analyzing this painting through the aesthetic lenses of Spinoza and Deleuze. Gilles Deleuze, *Francis Bacon: The Logic of Sensation* (Minnesota: University of Minnesota Press, 2005), 34–43; Gökhan Kodalak, "Affective Aesthetics beneath Art and Architecture: Deleuze, Francis Bacon and Bowerbirds," *Deleuze and Guattari Studies Journal* 12, no. 3 (August 2018): 402–27.

15 A contemporary reproduction of the Carceri can be seen here: Giovanni Battista Piranesi, *The Prisons / Le Carceri: The Complete First and Second States* (New York: Dover Publications, 2010). See Tafuri's elaboration of Piranesi's Carceri, as "an infinite space" in which "Reason" is itself "transformed into irrationality": Manfredo Tafuri, *Architecture and Utopia: Design and Capitalist Development*, trans. Barbara Luigia La Penta (Cambridge, MA: The MIT Press, 1976), 13–19. See Wilton-Ely's book for an in-depth analysis of the Carceri in relation to his overall work and aesthetic vision: John Wilton-Ely, *The Mind and Art of Giovanni Battista Piranesi* (London: Thames and Hudson, 1978). See also Vidler's focus on the uncanny dimensions of the Carceri following the lineage of Coleridge, Walpole, Loutherbourg, Beckford, and De Quincey: Anthony Vidler, *The Architectural Uncanny: Essays in the Modern Unhomely* (Cambridge, MA: The MIT Press, 1992), 37–44.

16 "I stressed the fact that "data" are not events or objects but always records or descriptions or memories of events or objects. Always there is a transformation or recoding of the raw event which intervenes between the scientist and his object. The weight of an object is measured against the weight of some other object or registered on a meter. The human voice is transformed into variable magnetizations of tape. Moreover, always and inevitably, there is a selection of data because the total universe, past and present, is not subject to observation from any given observer's position. In a strict sense, therefore, no data are truly "raw," and every record has been somehow subjected to editing and transformation."
Bateson, "Introduction: The Science of Mind and Order," xviii.

17 "The phenomenon of context and the closely related phenomenon of 'meaning' defined a division between the 'hard' sciences and the sort of science which I was trying to build." Ibid., xvii.

18 Bateson's conception of information resonates with that of Gilbert Simondon, the postwar philosopher of individuation and technology: "Information… is the tension between two disparate reals, it is the signification that will emerge when an operation of individuation will discover the dimension according to which two disparate reals can become a system." Gilbert Simondon, *Individuation in Light of Notions of Form and Information,* trans. Taylor Adkins (Minneapolis: University of Minnesota Press, 2020), 11–12. For an introduction to the potential exchanges of Simondon's thinking and architecture, see my symphilosophy with Kousoulas. Gökhan Kodalak and Stavros Kousoulas, "Simondoniana," *Footprint* 30 (Spring/Summer 2022): 91–106.

19 Bateson, *Mind and Nature*, 91–93.

20 "The elementary cybernetic system with its messages in circuit is, in fact, the simplest unit of mind." Bateson, "Form, Substance, and Difference," 459.

21 Gregory Bateson, "From Versailles to Cybernetics," in *Steps to an Ecology of Mind,* 470–71.

22 "Obviously neural impulse is a very different sort of a thing from a difference in light or a difference in temperature, which is what triggers the end organ. When such differences are transformed in successive ways through the system, mind becomes a very complex network of pathways, some of them neural, some of them hormonal, some of them of other kinds, along which difference can be propagated and transformed." Gregory Bateson, "Mind/Environment," in *A Sacred Unity: Further Steps to an Ecology of Mind, ed. Rodney Donaldson* (New York: Cornelia & Michael Bessie, 1991), 164–65

23 Gregory Bateson, "The World of Mental Process," in *Angels Fear*, 18–19, my emphasis.
24 Bateson, *Mind and Nature*, 96; "Form, Substance, and Difference," 456–60; "From Versailles to Cybernetics," 471; "Pathologies of Epistemology," 483–84; Gregory Bateson, "The World of Mental Process," in *Angels Fear*, 16–19.
25 There are certain overlaps between Bateson's cybernetic conception of mind and 1) computational theories of mind by Warren McCulloch and Walter Pitts, and 2) functionalist theories of mind by Hillary Putnam. Yet Bateson's final metaphysical step of uniting mind with the whole of nature (yet to arrive in this chapter) is enough to render his approach distinct (as Bateson deems mental operations not limited to local embodiments in brains or computers, but immanent to an underlying mental continuum that is nature). Warren McCulloch and Walter Pitts, "A Logical Calculus of the Ideas Immanent in Nervous Activity," *Bulletin of Mathematical Biophysics* 5 (1943): 115–33; Hilary Putnam, "Minds and Machines," in *Dimensions of Minds*, ed. Sidney Hook (New York: New York University Press, 1960), 138–64.
26 Bateson, "Form, Substance, and Difference," 454.
27 An expanded conception of mental continuum does not mean that all minds are the same or interchangeable with one another. A continuum doesn't mean a homogeneous totality. A continuum is made of gradational differences, while still expressing the underlying commonality of various mental organizations. Each mode of mind is singular from the viewpoint of harboring and enacting its one-of-a-kind potentials, yet continuous with all the others.
28 Bateson, "Pathologies of Epistemology," 483.
29 See also Whitehead's approach, which resonates with that of Bateson on this point: "If we are to avoid this unfortunate bifurcation, we must construe our knowledge of the apparent world as being an individual experience of something which is more than personal... We must reject the distinction between nature as it really is and experiences of it which are purely psychological. Our experiences of the apparent world are nature itself." Alfred North Whitehead, *Principle of Relativity* (New York: Barnes & Noble, 2005), 52.
30 Bateson, "Pathologies of Epistemology," 483.
31 Bateson, "Form, Substance, and Difference," 458.
32 Ibid, 459. Bateson uses the example of blind man's stick in other texts too: "The Cybernetics of 'Self': A Theory of Alcoholism," in *Steps to an Ecology of Mind*, 318; "Mind/Environment," in *A Sacred Unity*, 165.
33 Bateson, "Form, Substance, and Difference," 458–59. Bateson repeats the man-axe-tree example in different texts: "The Cybernetics of 'Self': A Theory of Alcoholism," in *Steps to an Ecology of Mind*, 318; "Mind/Environment," in *A Sacred Unity*, 165.
34 I take the elegant phrase "our tiny skull-sized kingdoms," from David Foster Wallace's commencement speech to the graduating class at Kenyon College in 2005. David Foster Wallace, *This is Water* (New York: Little, Brown, 2009).
35 Bateson's cybernetic insights were developed during the mid-1990s, in cognitive science by Edwin Hutchins under the name "distributed cognition (DCog)," and in the philosophy of mind by Andy Clark and David Chalmers under the name "extended mind thesis (EMT)," and have since opened up multiple areas of research. Edwin Hutchins, *Cognition in the Wild* (Cambridge, MA: The MIT Press, 1995); Andy Clark and David Chalmers, "The Extended Mind," Analysis, 58, no. 1 (Jan. 1998): 7–19.
36 Bateson, *Mind and Nature*, 87–88; "A Re-examination of 'Bateson's Rule," 396.
37 Bateson, *Mind and Nature*, 87–88; "Introduction: The Science of Mind and Order,", xv–xxvi. Bateson's heterarchical epistemology marks yet another resonance with that of Spinoza, as Spinoza's parallelism of mind and body suggests that every material formation expresses immaterial information.
38 Bateson, "Form, Substance, and Difference," 460.
39 Ibid., 457.

40 See Spinoza's preface to the fourth book of *Ethica* and the demonstration of its fourth proposition: Spinoza, [E IVPref.; E IVP4Dem.]; or, Baruch Spinoza, "Ethics," in Complete Works, ed. Michael Morgan, trans. Samuel Shirley (Indianapolis: Hackett, 2002), 320–22; 324–5. It is important to note that at the time of *Ethica's* posthumous publication the phrase "God, or Nature" was left unchanged in the original Latin editions as "Deus, sive Natura," yet Spinoza's friends felt the need to censor the immanent equivalence by omitting "or Nature" from Dutch translations and leaving "God" alone, fearing extreme reactions from the local population. Steven Nadler, *Spinoza: A Life* (Cambridge: Cambridge University Press, 2001), 231.
41 For an introduction to the latent connections between Spinoza's philosophy and architecture, see my essay "Spinoza and Architecture: The Air of the Future," *Log* 49 (2020): 123–45.
42 Bateson, "Form, Substance, and Difference," 461.
43 Gregory Bateson, "The Cybernetics of 'Self': A Theory of Alcoholism," in *Steps to an Ecology of Mind*, 315.
44 Bateson, *Mind and Nature*, 88.
45 Spinoza, [TIE 13]; or, Baruch Spinoza, "Treatise on the Emendation of the Intellect," in *Complete Works*, 5.
46 Arkady and Boris Strugatsky, *Roadside Picnic*, trans. Olena Bormashenko (Chicago: Chicago Review Press, 2012), 130.
47 See also Kropotkin's eco-anarchist classic that posits mutualism as both an evolutionary strategy of biological organisms and a radical mode of sociopolitical organization. Peter Kropotkin, *Mutual Aid: A Factor of Evolution*, (New York: McClure Phillips, 1902).
48 Bateson, "Form, Substance, and Difference," 462–63.
49 Bateson, "Pathologies of Epistemology," 483–84.
50 Ibid., 485; "The Cybernetics of 'Self'," 337.
51 Bateson, "Form, Substance, and Difference," 461–62.

Bibliography

Bateson, Gregory. *Angels Fear: Towards an Epistemology of the Sacred*. New York: Ballantine Books, 1978.

Bateson, Gregory. *A Sacred Unity: Further Steps to an Ecology of Mind*, ed. Rodney Donaldson. New York: Cornelia & Michael Bessie, 1991.

Bateson, Gregory. *Mind and Nature: A Necessary Unity*. New York: E. P. Dutton, 1979.

Bateson, Gregory. *Steps to an Ecology of Mind*. New York: Ballantine Books, 1978.

Chaney, Anthony. *Runaway: Gregory Bateson, the Double Bind, and the Rise of Ecological Consciousness*. Chapel Hill: University of North Carolina Press, 2018.

Charlton, Noel G. *Understanding Gregory Bateson: Mind, Beauty, and the Sacred Earth*. New York: SUNY Press, 2008.

Clark, Andy, and David Chalmers. "The Extended Mind." *Analysis* 58, no. 1 (January 1998): 7–19.

Deleuze, Gilles. F*rancis Bacon: The Logic of Sensation*. Translated by Daniel Smith. Minnesota: University of Minnesota Press, 2005.

Descartes, René. "Meditations on First Philosophy." In T*he Philosophical Writings of Descartes, vol. II*. Translated and edited by John Cottingham, Robert Stoothoff and Dugald Murdoch. Cambridge: Cambridge University Press, 2005.

Frichot, Hélène. "Daddy, Why Do Things Have Outlines? Constructing the Architectural Body." *Inflection Journal* no. 6 (2013): 112–24.

Fry, Roger. *Cézanne: A Study of His Development*. New York: The Noonday Press, 1958.

Goodbun, Jon. "An Ecology of Mind." *The Architectural Review*, March 27, 2012.

Goodbun, Jon. "Gregory Bateson's Ecological Aesthetics." *Field 4*, no. 1 (January 2011): 35–46.

Harries-Jones, Peter. *A Recursive Vision: Ecological Understanding and Gregory Bateson*. Toronto: University of Toronto Press, 1995.

Harries-Jones, Peter. *Upside-Down Gods: Gregory Bateson's World of Difference*. New York: Fordham University Press, 2016.

Hoffmeyer, Jesper, ed. *A Legacy for Living Systems: Gregory Bateson as Precursor to Biosemiotics.* Dordrecht: Springer, 2008.

Hutchins, Edwin. *Cognition in the Wild*. Cambridge, MA: The MIT Press, 1995.

Kodalak, Gökhan. "Affective Aesthetics beneath Art and Architecture: Deleuze, Francis Bacon and Bowerbirds." *Deleuze and Guattari Studies Journal 12*, no. 3 (August 2018): 402–27.

Kodalak, Gökhan. "Spinoza and Architecture: The Air of the Future." *Log* 49 (2020): 123–45.

Kodalak, Gökhan, and Stavros Kousoulas. "Simondoniana." *Footprint* 30 (Spring/Summer 2022): 91–106.

Kropotkin, Peter. *Mutual Aid: A Factor of Evolution*. New York: McClure Phillips, 1902.

McCulloch, Warren, and Walter Pitts. "A Logical Calculus of the Ideas Immanent in Nervous Activity." *Bulletin of Mathematical Biophysics* 5 (1943): 115–33.

Murphy, Richard. *The World of Cézanne 1839–1906*. New York: Time-Life Books, 1968.

Nadler, Steven. *Spinoza: A Life*. Cambridge: Cambridge University Press, 2001.

Perera, Dulmini. "Wicked Problems, Wicked Play: Fun Machines as Strategy." *FormAkademisk* 13, no. 2 (2020): 1–19.

Piranesi, Giovanni Battista. T*he Prisons / Le Carceri: The Complete First and Second States*. New York: Dover Publications, 2010.

Putnam, Hilary. "Minds and Machines." In *Dimensions of Minds*, edited by Sidney Hook, 138–64. New York: New York University Press, 1960.

Simondon, Gilbert. *Individuation in Light of Notions of Form and Information*. Translated by Taylor Adkins. Minneapolis: University of Minnesota Press, 2020.

Spinoza, Baruch. "Ethics." In *Complete Works,* edited by Michael Morgan, 213–383. Indianapolis: Hackett, 2002.

Spinoza, Baruch. "Treatise on the Emendation of the Intellect." In *Complete Works*, edited by Michael Morgan, 1–31. Indianapolis: Hackett, 2002.

Straus, Erwin. T*he Primary World of Senses: A Vindication of Sensory Experience*. Translated by Jacob Needleman. New York: Free Press of Glencoe, 1963.

Strugatsky, Arkady and Boris. *Roadside Picnic*. Translated by Olena Bormashenko. Chicago: Chicago Review Press, 2012.

Sylvester, David. *The Brutality of Fact: Interviews with Francis Bacon*. London: Thames & Hudson, 1987.

Tafuri, Manfredo. *Architecture and Utopia: Design and Capitalist Development*. Translated by Barbara Luigia La Penta. Cambridge, MA: The MIT Press, 1976.

Vidler, Anthony. *The Architectural Uncanny: Essays in the Modern Unhomely*. Cambridge, MA: The MIT Press, 1992.

Wallace, David Foster. *This is Water*. New York: Little, Brown, 2009.

Whitehead, Alfred North. *Principle of Relativity*. New York: Barnes & Noble, 2005.

Wilton-Ely, John. *The Mind and Art of Giovanni Battista Piranesi*. London: Thames and Hudson, 1978.

Gaian Technics: Lynn Margulis, Natural Technicity, and the Technosphere

Bruce Clarke

In their anthropology of contemporary visions of apocalypse, *The Ends of the World*, Déborah Danowski and Eduardo Viveiros de Castro characterize the time of the Anthropocene as a "Gaia War," an agon between the Humans and the Terrans. The Humans are Westernized modern humanity in its attachments to so-called progress and development and thus in its addictions to the monumental technologies driving Capital's ecocidal extractivism alongside its virtual double, totalizing algorithmic surveillance and governmentality. Against the Humans stand the Terrans, the "people to come," to whom will be left what's left of the Earth when this world collapses. Moreover, the Gaia War is also more than human: "the division between Humans and Terrans is not only internal to our species... . The Gaia War opposes two camps or sides populated by humans and non-humans – micro-organisms, animals, plants, machines, rivers, glaciers, oceans, chemical elements, and compounds. In short, the whole range of existents that find themselves implicated in the advent of the Anthropocene."[1] Alongside this image of the current state of hostilities between the contemporary technosphere and its encompassing but beleaguered biosphere, however, we should also acknowledge a less fraught relation between living beings and the matter of their enmeshments in technical structures and systems. In short, there has not always been war between organisms and machines, nor is such a negative biopolitical fight to the death the way to secure the relatively peaceful future coexistence of the full range of planetary existents. We are coming to understand the imperative to inscribe devotion to biodiverse multispecies life into current and future technospheres. Danowski and Viveiros de Castro may intimate as much in remarking that

there are also "Terran technologies," and that these include "the vast repertoire of technical detours mobilized by Darwinian evolution in organisms... . Bricolage, tinkering, the hack, the crack, the exploit—all of these are anthropogenetic to the extent that they are *inherent to the living*."[2]

This passage offers a passing recognition of *natural technicity* in the sense I will trace here, as it emerges in the work of the pioneering evolutionary thinker Lynn Margulis, especially in writings where she evokes Gaia in relation to the technosphere.[3] To set up the conceptual stakes of this exercise, let us first unpack the nature of these "technical detours . . . *inherent to the living*," as developed in the discourse of organicity in Yuk Hui's impressive 2019 study *Recursivity and Contingency*.[4] In Hui's compelling reading of the post-Kantian condition of the philosophy of nature on its way to the contemporary metaphysics of cybernetics, the Western stage for conceptualizing natural technicity is set by the *Naturphilosoph* Friedrich Schelling's Kantian reading of Plato, in which "the organic form allows the integration of the mechanical into itself, into a higher potency. There is therefore no longer an opposition between the organic and the mechanical, since the opposition is subsumed within the structure and operation of the organism."[5] Then in the twentieth century, in synchrony with the arrival of the first cybernetics, the French physician and philosopher Georges Canguilhem coins the phrase *general organology*, "to prioritize life as the ground of mechanization."[6] In his seminal article "Machine and Organism," Canguilhem now advances on updated techno-scientific grounds a comparable resolution of the supposed antithesis between organism and mechanism. In Hui's summation, for Canguilhem, "The organic is irreducible to the mechanical. On the contrary, the mechanical can be seen as a particular case of the organic."[7]

Within this conceptual history, Hui sets up a discussion of the Gaia concept with the cogent observation that "Gaia must first be seen as the meeting point of James Lovelock's cybernetics and Lynn Margulis's organicism."[8] This remark is unfolded in the next chapter: "In contrast to Lovelock's strong form of Gaia, consisting of a single organism, Margulis forced Lovelock to admit that Gaia does not consist of a single organism but is rather a symbiogenesis of a great variety of organisms, including plants, animals, fungi, protists, and bacteria."[9] Despite the melodramatic framing, this statement is basically and importantly correct, while still incomplete. As Margulis consistently stressed, the organic component of the Gaian system is the planetary *sum* of the biota. The evolution of biodiversity, particularly in the complexification of life's prokaryotic origins into its eukaryotic radiations, is fundamentally driven by symbiogenetic processes over geological time producing an expanding reticulation of divergent organismal congregations. Hui's overall treatment of Gaia in this book hews more to the holistic and totalizing side of Lovelock's cybernetic descriptions and somewhat overlooks

the extent to which Margulis's organicism is, one might say, proto-organological. That is, Margulis's treatments of natural technicity are already inflected by the concerns at the heart of Hui's own heuristic investigations for the philosophy of technology he terms *cosmotechnics*.[10] His discourse provides a conceptual milieu sufficiently capacious for that further comprehension. Thus, if Gaia arises as the production of a co-constructed biosphere-geosphere, and if living organisms are the fundamental source of the "technical detours" that are now turning Earth's veins into our planetary technosphere, then Gaia's own contingent recursivities as a planetary system would already have been over eons an encompassing case of a planetary technics as that emerges precisely from the form and resources of living systems. This essay will argue that Margulis's science provides a detailed sketch if not a fully developed brief for such a consequential conception, one that can now be brought to bear on the philosophy of technology.

Natural Technicity and Gaia Theory

> *Organisms do not adapt to their environments; they construct them out of the bits and pieces of the external world.*
>
> – R. C. Lewontin[11]

Developing work begun in collaboration with Gaia progenitor James Lovelock and frequently partnering with her eldest son, Dorion Sagan, Margulis cultivated a series of durable, at times prescient ideas concerning the biosphere's dealings with its extra-biotic environments. To begin with, one key interface occurs in the originary and still evolving encounter of the biosphere with the geosphere. Living processes are everywhere interlaced and compounded with the material dynamics of rock, sediment, water, and air, with energetic fluxes of geothermal heat and solar radiation. Yet these primal and persistent contingencies have long set the stage for new and different forms of worldly materialization. In her signature pursuit of planetary biology, or Gaia by another name, Margulis made numerous observations on the ability of living systems to accumulate and process abiotic materials and biotic residues into new "concretizations" – new bodily and environmental formations, new modes of habitation. Margulis explicitly referred to these supplementary domains of further emergence as the "second nature" of technology. In her view, this organic technicity begins to operate some three billion years ago, soon after life gets a persistent grip on the planet. Such natural technological productions draw on both geological and biological affordances, but for Margulis the survival tricks and exorbitant desires of living beings remain at the heart of her discussions of natural technicity.

Let us clarify some key terms: how would such a concept of *natural* technicity sit in relation to the essentially cybernetic concept of technicity per se in Gilbert Simondon's influential ontology of technical objects? Simondon's discussion of the *concretization* of technical objects – that is, the augmentation of the operational coherence of machines in the process of their technical evolution – consistently draws on analogies between such inventions and "living being."[12] In Aud Sissel Hoel's helpful synopsis of Simondon's text, the technical object "incorporates parts of the natural world into its system by entering into a relation with its environment (*milieu*)."[13] Cybernetics meets ecology: like living systems, technical objects also come to specify a range of reciprocities with the environments that their presence also takes part in creating.[14] For Simondon, the concretization of technical being "creates around itself a certain regime of natural elements that it depends on for its functioning – which means that it conditions the associated environment just as much as it is itself conditioned by it. ... The evolved technical object constitutes a circular regime of causes and effects, or more precisely, a system 'in which there exists a multitude of reciprocal causalities' ['dans lequel existent une multitude de causalités réciproques']."[15]

If these statements had been addressed to organisms in relation to the biosphere, they would read like a brief for Gaia theory: whether natural or technological, such emergent technicities constantly alter the grounds of their own material possibility. The dynamics of circular causation in self-referential systems and their environments occurs in both domains: "Thus, through the process of concretization, the technical object loses its artificial character and approaches the mode of existence of natural objects. In becoming more concrete, the technical object comes closer to constituting a natural system; it 'naturalizes itself' by incorporating parts of the natural world into its regime of functioning. Challenging established distinctions, Simondon refers to the process of concretization as 'a natural technical evolution'."[16] Margulis's evolutionary focus on natural technicity, then, as it shifts to biotic matters, inverts Simondon's analogies of the technical to the natural. In relation to the ontogenesis of Simondon's technical object, the notion of *natural* technicity would describe a *technical* capacity that inheres in organic development – as when the evolution of living beings brings about, on the one hand, new bodily structures, new modes of incorporation that thrive by exteriorizing or encasing living tissues or, on the other hand, new environmental affordances through the relatively permanent rearranging, alteration, or recomposition of its material milieu – creating a "naturally" *built* environment out of, in Richard Lewontin's phrase, "bits and pieces of the external world." However, if technicity may be said to occur in both natural and cultural domains, does it still make sense to maintain a distinction between the natural and the technical? Taking its lead from Margulis, my argument here affirms the importance of maintaining

a fundamental ontological distinction between life forms and machines, while acknowledging the many gradations of entanglement between organic technicity and technical objects, and in the final instance, as argued by Simondon's contemporary Canguilhem, the priority of life as the ground of technical emergence.

Margulis's own philosophical and extra-disciplinary writings also lay out the Gaian inflection on natural technicity, eventually codified by her and Sagan in "four propositions" on the biospheric origins of the technosphere. These are presented in a popular piece originally titled "Second Nature: The Human Primate at the Borders of Organism and Mechanism," then republished as "Welcome to the Machine": "First, that technology – the fabrication by living beings of useful objects and materials outside their bodies – is far more ancient than its tenure with modern humanity."[17] This is precisely the point made above by Danowski and Viveiros de Castro. Thus, for one, *Homo faber* is an extinct description: the possession of technology no longer holds any water as a criterion of the human. "Second, that life as a whole, not just human life, naturally incorporates its inanimate environment as it evolves."[18] That is, beyond the demands of nutrient uptake and organic waste removal, external substances become incorporated into or extruded from living tissues in ways that take enduring heritable form, as when ambient or biotically derived environmental calcium is organically carbonated and repurposed as shells, bones, teeth, and horns. "Third, that what begins as pollution in a growing population of thriving living organisms becomes material for change as a species matures."[19] The Great Oxidation Event of 2.4 billion years ago will be the premier exhibit for this evolutionary long view, which suggests that, over geological time, what appear as pollutants that degrade a given environment may persist as viable, essential elements within later ecosystemic formations.[20] "And fourth, that machines and electronic devices are natural products of evolution, and are co-evolving with us even as you read."[21]

Margulis's occasional and popular writings in this vein investigate issues of conceptual aggregation and distinction among planetary energies and materials, life forms, and the accumulation of artifacts, or again, among the domains mapped by geology, biology, and technology. I take one of her key theses to be that technology is specifiable as such and is the outcome of distinctive interactions among biological organisms and geological affordances and processes. Complicating matters of conceptual demarcation is the propensity of the term *environment* – against which the organism is posited – to oscillate between its geological and technological phases. Margulis's remarks on natural technicity written with and without Sagan as co-author invoke distinctions that parse the concept of the environment into its geological and technological moments. Moreover, while geological dynamics per se may exhibit forms of self-organization resulting ultimately from thermodynamic processes of gradient reduction in the realm of energy-matter, the

realm of *technicity* must be considered, in distinction from geology, as necessarily involving the contributions if not also the originary motivations of living organisms. Matter may take on crystalline or other appealing recursive forms on the basis of molecular biases, but it will not spontaneously rise to purposive machinic structures. For literal technicity to emerge, life's purposes must also play a role. The Gaia concept in its proper complexity is itself the final iteration of natural technicity – the systemically distinct coevolution of environmental shells for organic bodies taken to the planetary limit.[22]

Margulis's first lead-authored Gaia article in the scientific literature, published in 1974, may be viewed in hindsight as foregrounding the natural technicity already involved in her topic. We read in "Biological Modulation of the Earth's Atmosphere": "The role of prokaryotic microorganisms in environmental alteration is well documented."[23] Although the argument for Gaia itself hangs on a global notion of self-regulation theorized at that moment as "atmospheric homeostasis," a formulation that comprehends the biota at large, it is also "a recognized fact of biology that environments are regulated on a much more local scale, e.g., H_2 is emitted by purple nonsulfur photosynthetic bacteria to maintain a local reducing environment, termites build elaborate nests in which temperatures and humidity are maintained at an optimum for the inhabitants; acids and bases are secreted by protozoa to regulate local pHs; fossil fuels are burned to maintain a semitropical environment in temperate zones by *H. sapiens*. We merely suggest the extrapolation of these ideas to the entire atmosphere-biosphere system."[24] The evocation of fossil fuel consumption as a human mode of environmental regulation may allude to Lovelock's consultancies at that moment analyzing atmospheric emissions for Shell Oil.[25] Fossil fuel use in particular "naturalizes" the deliberate intentionality of human technologies in the direction of selected natural technicities over deep time modulating the habitability of living spaces. And after all, it is the massively increased combustion of fossil fuels due to the unchecked proliferation of humans that is driving a large share of the current climate crisis.

Another metabolic activity Margulis observes for its Gaian implications is the widely distributed phenomenon of biomineralization. This topic also marks an encounter between biology and geology that prepares for the manifestations of natural technicity. Here mineral substances formed not by geological but metabolic processes may then be more readily seized upon by those same or other lifeforms as a medium for ecological constructions. Biomineral forms first emerged in Archaean bacteria as extracellular precipitates and the layered and agglutinated sediments of stromatolites. Then, with the symbiogenetic arrival of the Protoctista, the first eukaryotic kingdom, protists such as amoebae, foraminifera, and diatoms evolved the production of tests or shells from ambient calcium carbonate or silica. In Margulis and Sagan's expositions of biomineralization, such

biological engineering leads directly to analogues in the human technosphere: "Life had been reusing hard materials and shaping solid wastes long before the appearance of technological humans. Bacteria came together to form protoctists that in turn could mine and use calcium, silica, and iron from the world's seas. Protoctists evolved into animals with shells and bones. Animals individually or in concert, engineered inert materials into tunnels, nests, hives, dams, and the like. The propensity to 'engineer' environments is ancient. Today people make over the global environment."[26]

Ecosystem Engineering and Niche Construction

As it happened, developing alongside Margulis's Gaian approach to natural technicity was a comparable phase of ecological thought devoted to rethinking organisms as "ecosystem engineers":

> Ecosystem engineers are organisms that directly or indirectly modulate the availability of resources (other than themselves) to other species, by causing physical state changes in biotic or abiotic materials. In so doing they modify, maintain and/or create habitats. The direct provision of resources by an organism to other species, in the form of living or dead tissues is not engineering. Rather, it is the stuff of most contemporary ecological research, for example plant-herbivore or predator-prey interactions, food web studies and decomposition processes. Autogenic engineers change the environment via their own physical structures, i.e. their living and dead tissues. Allogenic engineers change the environment by transforming living or non-living materials from one physical state to another, via mechanical or other means.[27]

So-called autogenic engineers are organisms that transform, in the first instance, the biogenic matter of their own bodies, for instance, through calcium sequestration (shells, bones, beaks); allogenic engineers are organisms that directly transform their material surroundings (dens, kelp forests, coral reefs). Among autogenic organisms are marine phytoplankton (microalgae, that is, protoctists) whose blooms, due to their calcium carbonate shells, modulate light in water columns, enhancing warming of water surfaces and inducing thermoclines and nutrient flow through transient environmental modulations. The cycles of plant life in general also partake of autogenic soil engineering, continuously leaving seasonal litter whose natural composting alters soil microenvironments, affects drainage and heat and gas transfer, and lays down bedding for seedlings and food for fungus. Allogenic engineering projects include the wallows of alligators providing refuge for other wildlife, and ubiquitous marine burrowing microfauna

producing bioturbation, redistribution and ventilation of sediments, thus transporting solutes and increasing oxygenation.[28] The authors signal how their current focus on the environmental repercussions of organismal activities involved a shift from traditional ecological concerns of trophic chains and food webs to, it could be said, a more virtually Gaian inscription and overwriting of the environment with the material residues and temporary architectures of organic individuals and communities. In the engineering trope, then, what is at stake is not immediately the cycling of nutrients but instead the resourcing of environmental transformations.

In an adjacent theoretical effort to combine ecology and evolutionary biology, such processes had already come to be named *niche construction*, a development dated to seminal papers published in the 1980s by Richard Lewontin and John Odling-Smee.[29] The niche construction literature tilts toward the concerns of evolutionary biology in its distinction of the *ecological* niche – as exemplified by the material constructions of the "ecosystem engineers" just surveyed – from the behavioral dynamics of the *evolutionary* niche, defined as "the sum of all the natural selection pressures to which the population [of any organism] is exposed."[30] As developed within the field of evolutionary biology, niche construction theory nevertheless "challenged the then-dominant position that living beings had only a passive role in the face of an environment considered independent of their actions."[31] According to Dutreuil and Pocheville, attention to the active role living beings play in relation to their environments closely connects the separate discourses of the Gaia hypothesis and of niche construction, even while disciplinary disjunctions determined that their often similar arguments would proceed in isolation from each other:

> In both literatures, this idea [that organisms take an active role in relation to their environments] was first argued on the basis of a long list of empirical examples. The Gaia hypothesis has mainly focused on effects that are global in spatial scale and span, with temporal scales of up to several billion years (i.e., close to the age of the earth); for instance, living things have influenced silicate erosion and thus climate on the scale of the earth's history. More regional examples are also sometimes found, such as the influence of tropical forests on regional and global climate. In contrast, niche construction has focused on much more local effects: animals build nests, burrows, cocoons, beavers build dams, worms change the chemical composition of soils.[32]

Yet despite the eventual if largely inadvertent convergence of interests between these two fields by the turn of this century, some decades earlier, Margulis's original conceptions of natural technicity as connecting local to global scales and

in relation to the human technosphere had already bridged the Gaian effort to model the biosphere as a scene of environmental modulation with the ecological discourse of ecosystem engineering and the evolutionary discourse of niche construction theory. Since then, in the era designated as the Anthropocene, the latter formation has developed in the direction of *human* niche construction.[33]

These earlier discourses of natural technicity – Gaia theory, ecosystem engineering, niche construction theory – let us say, *prefit* the idea of the Anthropocene for the extension of human environmental effects to planetary dimensions. Critiques of the Anthropocene update the prior references in this literature to the harmful ecological repercussions that now attend these anthropogenic alterations. Treating the entire planet as our exclusive niche, the Moderns have been committing niche *destruction*, eradicating habitable spaces for myriads of other organisms, undermining the viability of the environments we construct for ourselves. Jones, Lawton, and Shachak noted in 1994 that

> While human engineering often has intent or purpose, it is probably true to say that the major reason why humans have such adverse effects on the environment is because of the unintended consequences of our activities as engineers. Indeed people are now the primary agents of environmental change in most areas of the world. Many human activities, from dam-building and skyscraper construction to forest clearance and the dredging and canalization of water courses, conform exactly to cases ... in which humans are allogenic engineers, altering the physical environment and modulating the flow of resources to other species.[34]

These same discourses suggesting the environmental morbidity of human niche construction, as opposed to earlier regimes of natural technicity, also anticipate the funereal note sometimes heard in the geological turn of Anthropocene discourse. For instance, on the matter of fossils, Kathryn Yusoff shifts the plane of interest from life to death, from biological evolution to the geological stuff of organic and posthumous mineralization: "Fossils speak to and raise questions about human genealogy, inheritance, and modes of future and past survival, and thus they provoke thought to travel along the temporal cusp of geologic corporeality, crossing 'live' and 'dead' matter. Fossils both make manifest and historicize the geological condition of the human, a reminder that our bodily composition has an originary mineralization and a fossilized end."[35] The signature emphasis of the geological turn on deeply buried operations of Earth dynamics resituates the Gaian view on biospheric integration within the critical zones of the Earth's mantle and crust. Nigel Clark observes, in the Anthropocene moment, Earth system sciences' "increasingly accomplished theorization of the interactions between the

Earth's geological strata and the more mobile and flowing envelope of the outer Earth. But the interface between lithic crust and outer Earth system is not the only juncture in the planetary body currently under review. As Tim Lenton explains: 'the planet Earth is really comprised of two systems – the surface Earth system that supports life, and the great bulk of the inner Earth underneath.'"[36] Calling attention to the systemic differentiation between the critical zones at Earth's surface and the physical pulsations between solid and fluid phases of matter that enter the biosphere from its deep geology is an important corrective to simplistic versions of "the Earth system" that indulge "the imaginary of closed systems and unicity."[37]

But that critique does not apply to the mature work of Margulis and her collaborators on scientific Gaia theory and discourse, which resists holistic capture through careful attention to the evolutionary compounding of systemic differences and the complexities of their coupled performances.[38] Coming back to the theme of natural technicity within this wider context, we note that it first occurs in Margulis's earliest correspondence with Lovelock at the start of the 1970s, informs her first dedicated scientific Gaia writings, and then reaches sustained articulation in several co-authored think-pieces from the 1980s and '90s, including "Gaia and Philosophy," "Gaia and the Evolution of Machines," and "Second Nature," republished, with Dorion Sagan's nod to Pink Floyd, as "Welcome to the Machine."[39] Natural technicity in Margulis and Sagan's formulations comprehends the build-out of the human technosphere as a Gaian epiphenomenon. It is just that Gaia plays no favorites: if our technosphere proves to be an unviable planetary niche, it will be subducted in due time and another biota will try something else.

Autopoietic Gaia and the Technosphere

In the midst of a decades-long correspondence centered on Gaia, in December 1985, Margulis wrote a letter to Lovelock rehearsing the concept of *autopoiesis* as a biological and Gaian criterion in relation to the ontology of technology. Her letter arrives at this passage: "Machines (like hives, shells, teeth, nests, stromatolites) can be *part* of autopoietic systems."[40] Unpacking this densely compressed statement will lead us effectively toward a refined view of the space of natural technicity. Let us start with Margulis's comparison of "machines," without further stipulation, to the extrusions or constructions achieved by nonhuman lifeforms. In the context of her long Gaia conversation with Lovelock, Margulis's extended conception of *machine* may allude in some playful degree to Lovelock's occasional and idiosyncratic manner of referring to the Gaian system, or Earth's atmosphere specifically, as a *contrivance* on the cybernetic engineering model. He does so in an important early publication that was also, when still in draft, a topic of their earliest discussions. The published piece in question, a 1972 letter to the editor of *Atmospheric Environment*, outlines a series of premises that

> justify the probability that the atmosphere is a biological contrivance, a part and a property of Gaia. If this is assumed to be true then it follows that she who controls the atmospheric composition must also be able to control the climate. In this hypothesis the air is not to be thought of as a living part of Gaia but rather as an essential but non-living component which can be changed or adapted as the needs require. Like the fur of a mink or the shell of a snail.[41]

At issue here, heightened by the freewheeling gendered personification, is the distinction between living and nonliving, biological and geological, elements and aggregations, a difficulty that the Gaia concept's systematic integration of life and its environment will compound but also help to resolve. This complication of boundary issues in Lovelock's outlook also has a root in the cybernetic frame indicated by the mention of atmospheric and climate "control," indeed by means of a natural "contrivance" for the regulated maintenance of a far-from-equilibrium atmospheric chemistry over geological time. Lovelock's two-page note in *Atmospheric Environment* announces Gaia's formal debut on the scientific stage precisely as this planetary entity, cooked up by the interpenetration of life and Earth, and ready to be "seen through the atmosphere" by a suitably prepared scientific gaze.

What then *is* the status of the atmosphere, seen as a Gaian contrivance, in relation to life understood in its normal cellular or organismal forms? Is the atmosphere itself "alive"? Once Lovelock and Margulis set to work as a writing team preparing to compose co-authored papers, this issue quickly comes up in their initial correspondence over Lovelock's own articles in progress. Discussing a draft of "Gaia as Seen through the Atmosphere" with regard to an unrecovered Margulis letter that must have expressed some concern about Lovelock's referring to the atmosphere as a living thing, sometime in February 1972 Lovelock replies about the passage in question:

> I agree with you that it would be read to imply that the atmosphere was a living part of the world. The following passage is therefore added between paragraph 1 and 2 on page 4. "In this hypothesis the air is not to be thought of as a living part of Gaia, but rather as an essential non-living component which can be changed and adapted to the needs of the time. Like the fur of a mink or the shell of a snail."[42]

And as we saw, this is very nearly the language of the published article. However, within their personal correspondence, Margulis's immediate response

joined Lovelock's effort to posit valid analogues for the relation between living phenomena per se and the environment in its Gaian complexion, as itself worked over and worked upon by living processes.

Replying to Lovelock on February 16, 1972, she abruptly returns to that boundary issue to suggest an operational criterion of biotic/abiotic demarcation. One of Lovelock's figures, she suggests, the fur of the mink, is still too attached to its organismal origin to accurately model the relation of the atmosphere to life. Rather, she suggests, the atmosphere is the planetary iteration of the myriad environmental envelopes fabricated by lifeforms out of ecological affordances:

> My examples, rather than the fur of the mink (which is composed of keratin protein mostly and directly attached to cells) would be any of the following: the nest of the paper wasp, the dam of the beaver, the sand-cemented shell of *Arcella*, the mound of a termite colony, the webs of spiders, the hills of ants etc. These are all complex and extensive elaborations of the environment by the organisms.[43]

Instead of fur, Margulis inserts a series of environmental constructions "contrived" by living organisms but then returned to the status of reorganized material substances and structures. Here is natural technicity in its originary articulation in Margulis's text – organismal agency applied to the elaboration of the material environment for the sake of survival and habitability.

These same issues – natural technicity and the planetary atmosphere in relation to the biotic/abiotic distinction – return a decade later in "Gaia and Philosophy," an early co-authored Sagan and Margulis essay. Previously those issues arose in consideration of the atmosphere's lifelikeness in a Gaian view of its self-regulating tendencies. But this time, they arose in consideration of the atmosphere's artifactuality, the material justice in crediting its status as a natural contrivance, an abiotic "shell" exuded by and for the biosphere. Given the "Gaian blending of organisms and environment into one, wherein the atmosphere is an extension of the biosphere," Sagan and Margulis write, it could follow that "there is no clear division between the technological and the biological."[44] This gesture toward the indistinction of the organic and technical domains has often been the more popular formulation in the milieu of the environmental humanities, for it broadly deconstructs overly rigid and restrictive categorizations of complex phenomena. Nevertheless, in the fullness of Margulis's own text, this general proviso slightly predates a series of vigorous discussions stipulating the distinction between biology and technology as that between autopoietic living systems and allopoietic contrivances.[45] For instance, regarding "the sand-cemented shell of *Arcella,*" a genus of "testate" amoeba, this single-celled protist carries out, as

part of its autopoiesis, the production of an allopoietic contrivance, its shell. Here is natural technicity writ small.

Let us place a larger sampling of Margulis's striking 1985 statements about machines and autopoietic systems against this background:

> Machines (like hives, shells, teeth, nests, stromatolites) can be *part* of autopoietic systems of course (I'll send you our paper "Gaia and the evolution of machines" written for W. I. Thompson – under separate cover). Like viruses – because they do not exchange chemical components w. environment to keep form and info intact at expense of solar energy (e.g., don't metabolize) they ain't autopoietic systems alone – they can't be – but they are clearly part of autopoietic systems.[46]

From the perspective of natural technicity, machines are like hives or teeth, or viruses, because they are also the non-living but post-biotic and reorganized material extrusions and transformative catalysts of autopoietic, that is, living, systems in relation to their ecological niches. In Margulis's view of autopoietic Gaia, which considers the technosphere as a differentiated anthropogenic continuation of the biosphere's engineering of the geosphere, then, machines are "clearly *part* of autopoietic systems." Margulis's letter further unfolds what is at stake in this predication of the *partial* status of cybernetic machines – designed or deliberate contrivances – relative to autopoietic organisms:

> Cybernetic systems are different from autopoietic ones because their set points are imposed from outside, their boundaries are not self-maintained – but clearly in all the cases we know of engineered cybernetic systems they too are parts of (extensions of) autopoietic systems but they don't metabolize so they are not by themselves autopoietic. If left untended by autopoietic systems their (cyber. Sys.) boundaries do not self-maintain and their integrity erodes. The set points and purposes of cybernetic systems are not determined by the system itself – not determined from inside the system.[47]

Margulis's mid-1980s take on Maturana and Varela's original discourse of autopoiesis draws out a further version of what we referred to previously as a criterion of biotic/abiotic demarcation. Margulis has now articulated that concern through the biological presentation of autopoiesis as a theory specifying the dedicated formal operations of living systems. In her evolving conceptual vocabulary, autopoietic theory is now tasked to codify the biotic/abiotic demarcation precisely as operational rather than ontological. Fur just keeps growing, but beehives, bird

nests, termite mounds, beaver dams, coral reefs, and stromatolite colonies do not come into being and expand by their own operations but by those of their living constructors. Their production is fundamentally outsourced. They are structural accretions, products of organic building that accrue as environmental affordances for the autopoietic and reproductive operations of lifeforms. The human technosphere may be seen in the same light, as the currently final iteration of technical space, an accomplished and pervasive but always partial environment-altering restructuring. At the same time, while analogies to organisms are always available, its concept should also be withheld from falling into the misplaced concreteness of a biotic description. No manner of cybernetic sensoria feeding artificial intelligences will render the technosphere as a living system. But as the sum of the machinic interventions made by humans in particular, the technosphere is, once again, "clearly *part* of autopoietic systems."

The extemporaneous text of Margulis's December 1985 letter to Lovelock documents its origins in the drafting process of a Sagan and Margulis article in progress, another important early philosophical excursion on Gaian themes, "Gaia and the Evolution of Machines," eventually published in the *Whole Earth Review* for summer 1987. That article arrives at the following conclusions, which continue to refine the operational distinction between an autopoietic biosphere and a cybernetic technosphere:

> From a biospheric view, machines are one of DNA's latest strategies for autopoiesis and expansion. The classification of machines as non-autopoietic and nonliving does not negate the fact that they reproduce, and reproduce with mutation, as avidly as viruses. Like beehives, termite mounds, coral reefs, and other products of the activity of life, machines – if indirectly through DNA and RNA – make more of themselves. Through us they make other machines.[48]

Sympoiesis as Natural Technicity: The Allegory of the Lichen

> *The strength of symbiosis as an evolutionary force undermines the prevalent notion of individuality as something fixed, something secure and sacred.*
>
> – Lynn Margulis and Dorion Sagan, *What is Life*?[49]

> *If it is true that neither biology nor philosophy any longer supports the notion of independent organisms in environments, that is, interacting units plus contexts/rules, then sympoiesis is the name of the game in spades.*
>
> - Donna J. Haraway, *Staying with Trouble*[50]

We can now turn the discussion of natural technicity toward Margulis's more familiar signature themes of symbiosis and symbiogenesis as fundamental ecological and evolutionary dynamics binding communities, producing new species and generating Gaian biodiversity. Largely due to the feminist theorist Donna Haraway's popularizations of Margulis's work, these concepts are now regularly invoked as precursors to the concept of *sympoiesis*, the bundle of processes enabling the mutual and relational becomings and assemblages out of which distinct beings appear to emerge.[51] In rigorous usage, *symbiosis* names the intimate bodily cohabitation, whether mutualistic or parasitic, of different *biotic* forms; *symbiogenesis* names processes of speciation arising from the operational coupling of previously distinct kinds of organisms, whether by lateral gene transfer or wholesale endosymbiotic incorporation. As a scientific term, "symbiosis" was invented in the late nineteenth century to describe the formation of the lichen – an organism arising from a mutualistic alliance between a fungus and a bacterium or an alga. And in our own time, as environmental scholar Derek Woods has pointed out, "lichens are more than one life form among others. They are special because of their status as symbiotic organisms. They are symbols of future coexistence. Indeed, lichens have an ecotopian meaning that has attracted some cultural attention in recent years ... lifting them from obscurity and the injustice of being mistaken for moss."[52] I take the "ecotopian" sense to which Woods refers to be the lichen's emblematic status in aid of the liberating deconstruction of the traditional views, from "selfish genes" to "survival of the fittest," of organisms treated as isolated and strictly self-involved individuals.

Margulis's career-defining discourse of symbiosis as an essential condition of participation in the biosphere was a key driver in this reorientation of biological doctrine. An important announcement consolidating this shift in thinking arrives with Gilbert, Sapp, and Tauber's anthemic "A Symbiotic View of Life: We Have Never Been Individuals," which article concludes with these bracing observations: "For animals, as well as plants, there have never been individuals. This new paradigm for biology asks new questions and seeks new relationships among the different living entities on Earth. We are all lichens."[53] What can account for the contemporary allegory of the lichen, its extended significance currently abroad in the environmental humanities, its charismatic resonance as the poster-organism for sympoiesis? This compressed equation – *we are all lichens* – limns sympoiesis as an appealing posthumanist figure of thought: the lichen-likeness of the human holobiont joins us to the more-than-human living world. We are all lichens insofar as we are also sympoietic beings, that is, evolutionarily speaking, symbiogenetic consortia of distinct biological entities. The cultural allegory of the lichen symbiosis universalizes and socializes a humbly appealing vista of the good-natured interrelatedness that sustains and nurtures the Gaian system.

Before unfolding the concept of sympoiesis further, however, let us step back for a moment and review the basic biology of the lichen. The lichen association is not a universal but a highly specific arrangement. Margulis's major study *Symbiosis in Cell Evolution* provides a diagram of lichenization that stresses its status as a symbiogenetic holobiont coordinating distinct processes of symbiosis and autopoiesis.[54] In her depiction, the lichen consists of:

- Two bionts from separate biological kingdoms – always a fungus allied with a photosynthetic partner, which can be either an alga or a bacterium.
- Two distinct autopoietic entities achieving integration and association in a composite body unlike the body of either symbiont on its own.

Gregor Pichler et al.'s "How to Build a Lichen" provides additional details summarizing the current understanding of lichen formation. Upon sensing the other's proximity, cross-kingdom bionts enter into productive relations initiating chemical communications that release signaling compounds leading to metabolite exchange, the envelopment and incorporation of the photosynthetic partner by the fungal partner, and the differentiation of the lichen thallus as a new organic formation.[55]

In Margulis's own idiom, the processes of mutual recognition and nutrient sharing between the lichen symbionts may also be said to be mediated by the cellular cognition that emerges from and so accompanies active autopoietic organizations. The key thing to note in the lichen symbiosis, as specified in her own account, is the maintenance of autopoietic distinction between the bionts even as the effective operation of their symbiotic association produces a third thing that is neither fungus nor photosynthesizer alone – the lichen thallus. The sympoietic process that "builds a lichen" emerges from the combination of symbiosis and autopoiesis, from the maintenance of differentiation in the midst of incorporation. Moreover, unlike the earlier, permanent endosymbiotic incorporations at the evolutionary base of the fungal and algal components, the lichen symbiosis is not obligatory on the part of its symbionts. When environmental conditions change, lichen symbionts may dissociate and go their separate ways. The survival of the symbionts beyond lichen dissociation is possible because they retain autopoietic differentiation throughout their sympoietic interlude within the lichen symbiosis.

Turning now to sympoiesis as a general process of mutual becoming-with that renders its participants more than individuals, the development of this discourse beyond its original articulation has occasionally sought to subtract autopoiesis from symbiosis on the consideration that the "self-production" of the former is transcended by the collectivity of the latter.[56] The biology of the lichen

undercuts this ideological gambit, showing instead that the concept of sympoiesis is more productively treated – as signified all along by the additive portmanteau neologism itself – as the production of consortial complexity through the differential aggregation of symbiotic and autopoietic processes. The life-cycle of the lichen teaches us that there are good reasons to hold on to the autopoietic description of distinct living beings, both as contrasted with the dynamics of symbiotic consortia and as grasped in their necessary commerce with allopoietic, that is, externally produced technical structures. We noted that this is precisely how Margulis introduced "machines" into her Gaian schemas, as "parts of (extensions of) autopoietic systems" that "are not by themselves autopoietic."[57]

The autopoietic perspective underlines the cellular basis of viable metabolisms. It is the case that, for instance, diverse chemical signaling on the part of adjacent cells can induce tissue and organ differentiations within, say, the developing cells of animal fetuses. Scott F. Gilbert neatly delineates these dynamics as "developmental symbiosis – symbiopoiesis," a body of processes within embryonic elaboration in plants and animals that conclusively belies any absolutist formulation of the autonomy of autopoietic operations.[58] Nevertheless, whenever external factors lead to such cellular modulations, the actual molecular and metabolic processes arising from the *operational* closure of the cell's membrane-bounded organization have not been outsourced: minimal but definitive individual specificity persists at the autopoietic level of any biological cell's recursive integrity. Derek Woods notes the biological bottom line in this matter: "even if it is difficult to demarcate the boundaries of individuals, they remain individuals to the extent that they can die."[59] In other words, whereas the loss of sympoietic interrelation may well not be terminal for its components, the autopoietic process is biologically primary in that, if *it* is lost, life ends for that organism. No matter how complex any holobiont may be, its component bionts – including the ostensible plant or animal host of that sympoietic consortium – can perish one by one and on their own time. For all its utility at other levels of biospheric organization, exclusivist notions of sympoiesis risk sidelining the datum of mortality and covering over the supplemental and accidental contingencies of abiotic elements and environmental structures.

So where does the idea of natural technicity fit into these concepts of symbiosis and sympoiesis? In "Prosthetic Symbiosis," Woods argues persuasively that symbiotic relations among diverse organisms operationalize a technical dynamic that is no longer precisely organic per se, but rather, metabiotic, a mutual coupling of prosthetic supplementation, a reciprocal co-environmental externalization: "Symbiosis is a kind of prosthesis or technological process"; moreover, in this construction of symbiosis, "Prosthesis is no metaphor but actually how symbiosis works."[60] Lest this statement be misconstrued as a kind of simplistic mechanistic

schema, Woods clarifies that "symbiogenesis is not a matter of organisms using one another like nonliving tools or machines, but a fundamental technical process in which one autopoietic life form externalizes functions into another. Life forms in mutualism supplement one another to open new functions and relations to their environments."[61] In this light, "lichens are nonhuman technologies. The fungus is a greenhouse for the alga and the alga is a solar panel for the fungus."[62] As I have stressed, this metabiotic technology is possible precisely because the symbionts' autopoietic specificity renders them formally discrete and so mutually external to each other, and as such, suitable for discrete reorganization within an encompassing superstructure. In the lichen, even as the symbionts will be "functionalized by the new lichen-like symbiotic unit," lichenization is fundamentally a technical process afforded by autopoietic differentiation. This view is strengthened when considering that there are no lichen cells as such: there are only algal or bacterial and fungal cells that, for the duration of their symbiotic consortium, mutually induce each other to participate in the formation of a thallus and dwell within the body of a lichen.

Let us widen out for a moment from the idiosyncrasies of the lichen with a further glance at the filamentous talents of the fungi as detailed in Merlin Sheldrake's *Entangled Life*. While lichenized fungi first appeared in relatively dry niches, many other varieties of fungi supported a wide world of watery symbiotic regimes at the basis of the evolution of those other world-making photosynthesizers, land plants: "Sometime around six hundred million years ago, green algae [photosynthetic protists] began to move out of shallow fresh waters and onto the land. ... But the algal ancestors of land plants had no roots . ... It was only by striking up new relationships with fungi that algae were able to make it onto land."[63] So, plants, too, have never been individuals, because only the emergence of and association with fungi made it possible for aquatic algae to evolve into land plants in the first place. As in the lichen, fungal integration with photosynthetic algae maintained autopoietic differentiation while inducing the formation of coevolutionary organs, this time, the tissues of plant roots as these were gradually unfolded from the affordances of symbiotic proximity. Moreover, echoing Woods's formulation, Sheldrake too notes a technical prosthesis in the fungi-plant symbiosis: "By partnering, plants gain a prosthetic fungus, and fungi gain a prosthetic plant. Both use the other to extend their reach. It is an example of Lynn Margulis's 'long-lasting intimacy of strangers.' Except that they're hardly strangers anymore."[64] This status of natural technical mediation is patently evident as well in the long-hidden but recently described fungal-plant symbioses of the Wood Wide Web.[65] But Sheldrake also marks some key distinctions between the lichen symbiosis and mycelial networks: "Whereas the partners in lichens come together to make a body altogether unlike those of their individual members, the partners

in a mycorrhizal relationship do not: Plants stay recognizable as plants, and mycorrhizal fungi stay recognizable as fungi. This makes for a very different, more promiscuous type of symbiosis."[66] In mycelial forms of non-obligatory mutualism, soil-borne sympoiesis denotes an open-ended networking of cellular contacts among diverse plant, fungal, protistan, and bacterial actors.

In the earliest life forms – archaea and bacteria, evolution proceeded symbiotically by lateral gene transfer among metabolically diverse strains, what Woods terms "a kind of biotechnics at work in the prokaryotic milieus of the ancient Earth."[67] Certain of these ancient recombinations led to the invention of photosynthesis in cyanobacteria and oxygen respiration in alphaproteobacteria, on the way to their endosymbiotic incorporation, as chloroplasts and mitochondria respectively, into diverse iterations of the eukaryotic or nucleated cell at the base of the post-bacterial biological kingdoms. Coming back now to the phenomenology of the lichen: their fungal and algal or bacterial partners – the autopoietic entities available for mutual prosthesis through the lichen's symbiogenesis – are *phylogenetic*, Woods remarks, in that once their symbiogenesis is stabilized, these organisms directly descend from progenitors by vertical heredity. However, unlike with its symbiotic partners, lichen reproduction itself is not phylogenetic, but rather, *epiphylogenetic*, that is, "passed down via technical externalization rather than genetics."[68] In the celebrated symbiosis from which the lichen phenotype emerges, "prosthetic symbiosis brings at least two autopoietic systems into a close relationship. . . . Lichens, but not their fungi or algae, are . . . *already epiphylogenetic* in Stiegler's sense of the term," that is, in our phrase, a form of natural technicity.[69]

To review the French philosopher Bernard Stiegler's schemas, citing Woods's glosses in this context along with my own elaborations:

- "First memory" is phylogenetic, "the heritable organic" – the "vertical" inheritance involved in biological reproduction through the replication of genomes.[70]
- "Second memory" is epigenetic, the "ephemeral organic" – "memory" in traditional parlance, the embodied reflex or experience of somatic or psychic recollection.[71]
- "Third memory" is epiphylogenetic, "the organized inorganic that exteriorizes organic functions into technical objects and systems" – technics proper, concretized in external information-transfer systems, such as writing, or inscription in general.[72]

In Stiegler's own system, third memory or "tertiary retention" is largely applied to matters of anthropogenesis: "unlike animals," Hui summarizes, with "technology, human beings are able to pass their memory from generation to generation, without

affecting the soma and gene cell."[73] The concept of prosthetic symbiosis displaces the epiphylogenetic process of prosthetic supplementation from anthropology to the natural technicity already operating in biological or organismal symbiosis as far back as the first eons of autopoiesis and symbiosis. As applied to the lichen, here autopoiesis belongs to the first memory of the fungal and algal or bacterial *symbionts*, but not to the third memory of the lichen *symbiosis*, which is "both life and technical becoming", or in Stiegler's phrase, as quoted in *Recursivity and Contingency*, "the pursuit of life by means other than life".[74] Thus the sympoietic lichen is as much a technical mediation as it is a biological organism, a communal housing project constructed by diverse actors for mutual shelter.

The lichen arises from a cross-over between two different eukaryotic kingdoms. Sympoiesis operates here without crossing out their autopoietic and phylogenetic differentiations. In these examples of natural technicity, then, we also have instances of a *Gaian* technics precisely insofar as the autopoietic processes of specific biota, even when aggregated with their symbiotic fellows, operate across a boundary that simultaneously divides and connects them to the externalized, hence environmental affordances produced by their very aggregation. It could be said that our own human or animal lichen-likeness is equally a product of our own *technogenesis*, which derives in the last instance from a long archaeological history of modulations mediated by epiphylogenetic natural technicity alongside an evolving phylogenetic heredity. All of which is to say that the human technosphere, too, has its deepest roots in the mechanicities contrived by the evolution of organicity. From this angle, culturally extended readings of sympoiesis may be seen as wider ecological and social mappings of the natural technicity afforded in symbiotic and symbiogenetic processes. Thus, when taken to the level of the resulting aggregation, Gaian technicities built on the supplemental differentiation of symbiosis and autopoiesis nonetheless trouble the demarcation, not between life and technology per se, but between natural technical constructions, such as shells or lichens, and human cultural constructions, such as texts or sculptures, built environments or cellphones. Sympoiesis is best understood as an organicist framing of metabiotic processes, the natural technicities involved in the very symbiotic and symbiogenetic dynamics that its concept is intended to celebrate.

Recycling the Technosphere

"They stood in a clearing, dense tangles of junk rising on either side to walls lined with shelves of crumbling paperbacks. The junk looked like something that had grown there, a fungus of twisted metal and plastic."[75] William Gibson's seminal cyberpunk novel *Neuromancer's* near-future storyworld naturalizes images of technological waste, bringing it back under the wing of the biosphere: "it seemed that it was changing subtly, cooking itself down under the pressure of time, silent

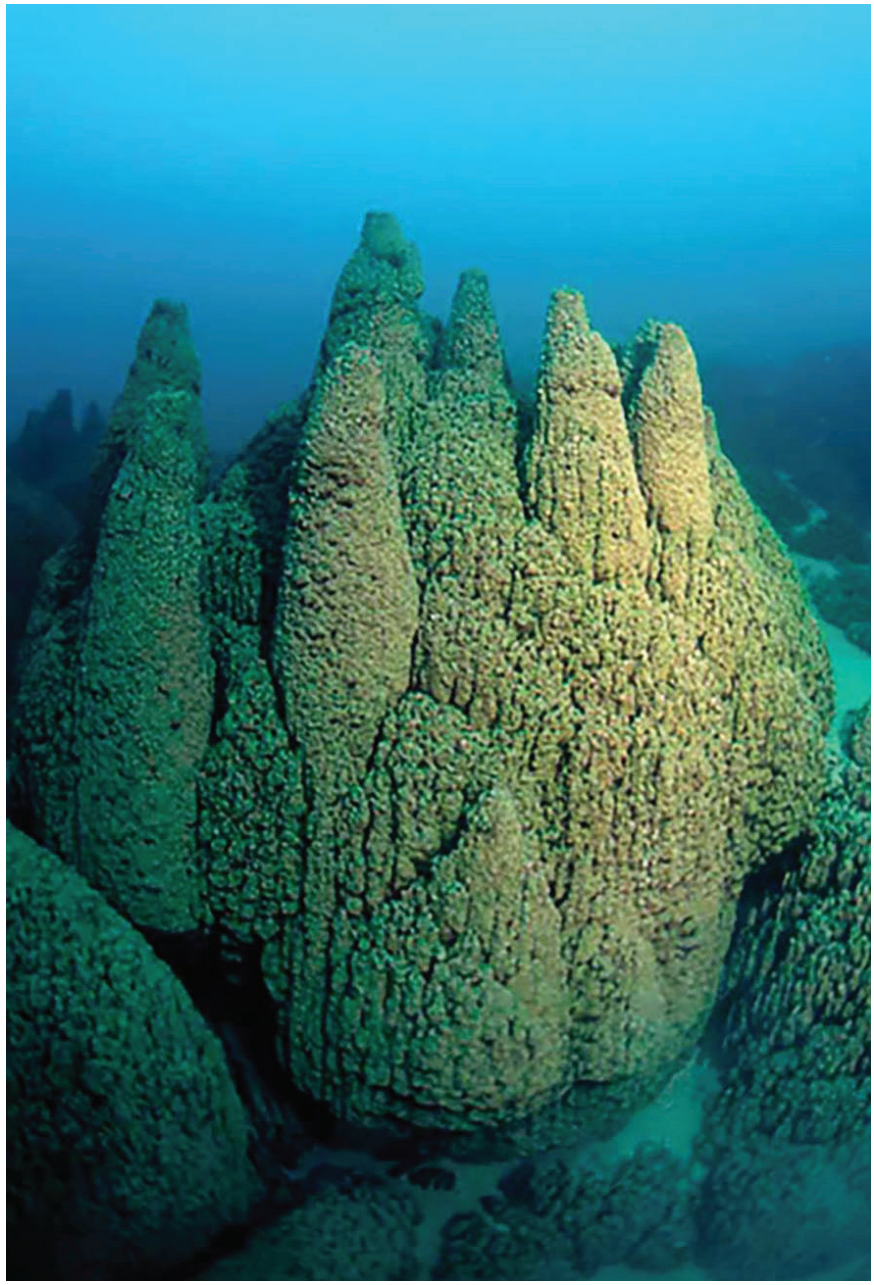


Fig. 1: Microbialite towers at Pavilion Lake, British Columbia. Source: https://commons.wikimedia.org/wiki/File:Pavilion_Lake_microbialite_towers.jpg
Public Domain: NASA

invisible flakes settling to form a mulch, a crystalline essence of discarded technology, flowering secretly in the Sprawl's waste places."[76] Depicted here is the natural technicity of compost, breaking down entangled distinctions between the biosphere and the technosphere, suggesting that machinic detritus is ultimately bio- or geo-degradable, perhaps digestible in analogy with the fungal decomposers that are now indispensable components of Gaian cycles that help to close the geobiological loop by which the corpses of organic forms are resolved into reusable nutrients for new life. For as Sagan and Margulis aver in "Welcome to the Machine," it is the case that "so often, in the history of life, what began as cast-off shell or anal exudate – as 'excrement,' 'waste product,' or 'pollutant' in a growing population of thriving organisms – becomes a resource for change and expansion. Processes of recycling and reuse become increasingly refined and complex."[77]

A sustainable technological civilization will need to carry out an ecologically durable and effective recycling of its technosphere, and ideally, make this happen over the requisite stretch of geological time. This recursive space of human technicity has yet to be comprehensively designed but it can easily be imagined. It must refine the elements of its contrivances for Gaian recycling, invent new machines for the ecofriendly dismantling and decomposition of broken, obsolete, or otherwise discarded machines. Perhaps then our too-easy visions of cyborg fusion might truly rise to the evolutionary accomplishment of the Archaean and Proterozoic bacteria that first built the futuristic high-rise dwellings we call stromatolites and sustained that communal lifestyle for at least two billion years. In the same lead-authored Gaia article from which I cited at the opening of this article, Margulis dilated on her vision of stromatolites as premier formations of natural technicity in "ancient ecosystems":

> Some are shaped like cones and some like cauliflowers. They are recognized now to be products of microbial activity. They represent sediment that was trapped and bound primarily by photosynthetic filamentous blue-green algae. Evidence is accumulating that certain deep ocean stromatolites known as manganese nodules are the products of aerobic, nonphotosynthetic bacteria. They have a world-wide distribution, clearly forming the dominant biotic component of certain ancient ecosystems.[78]

In "Welcome to the Machine," Sagan and Margulis review once more the natural history of natural technicity: "Technology, in short, is an integral part of the ancient ecological cycles of procurement, removal, and reuse that appeared on Earth long before our ancestors turned human."[79] We note again Margulis's cautionary insistence that the entanglements of biology and technology are not to be rendered as a seamless merger: "From a biospheric point of view, machines are one of

life's latest strategies for incorporating new elements and expanding life's role as a geological force."[80] And moreover, with reference to the Russian geologist Vladimir Vernadsky, whose signature work *The Biosphere* made many prescient statements on the recycling of "living matter" through the geosphere, "perhaps, emulating termite colonies, future human-machine communities will diligently recycle their own dead bodies, menstruum, sweat, and other exudates. ... Cultural 'excretions' – various discarded materials now labeled as sewage and pollution – will, we suspect, in accordance with Vernadsky's ideas, be brought effectively into the enlarging recycling system."[81]

Perhaps, too, with the emergence of the noosphere Vernadsky envisioned as the telos of the technosphere, Gaia's contemporary efforts to absorb the excretions of the Anthropocene will find their enlightened resolution. If something along those lines is not forthcoming, I doubt the capacity of even the most refined algorithms to fashion and maintain the perpetual recycling of the hardware environment on which their digital existence must depend. These considerations ought to defuse the dystopian specter of a runaway totalizing technosphere in which "*the organizing inorganic*" achieves autonomy from the biosphere's own natural technicity and "functions recursively to produce its own structures and patterns."[82] That is to say, let's not get ahead of ourselves. Life must still take the lead. As Simondon's discourse on the technical object affirms, "technical being requires living being; it requires the human in its double capacity as a living being and as a being that understands the functioning of machines."[83] And on a comparable note, at the conclusion of "Welcome to the Machine" we find the following caveat: "Unable, as yet, to self-reproduce, machines without humans have no more evolutionary staying power than shells without snails."[84] And it is the wager of the autopoietic sensibility at the heart of Margulis's discourse of natural technicity that this anticipation of future machines liberated from organic contingencies is not to be fulfilled.

Notes

Thanks to Sébastien Dutreuil, Scott F. Gilbert, Caroline A. Jones, and Derek Woods for helpful criticisms.

1 Déborah Danowski and Eduardo Viveiros de Castro, *The Ends of the World*, trans. Rodrigo Nunes (Malden, MA: Polity Press, 2017), 100–01.

2 Ibid., 100.

3 For a Derridean approach to "natural technicity" as a kind of arche-writing of the solar gift, see Donovan Stewart and Georgios Tsagdis, "On Natural Technicity: Oikos, Articulation, and the Gift," *Technophany* 1, no. 2 (2023): 1–17.

4 Yuk Hui, *Recursivity and Contingency* (New York: Rowman and Littlefield, 2019). For more on this initial conjunction, see "For a Strategic Primitivism: A Dialogue between Eduardo Viveiros de Castro and Yuk Hui," *Philosophy Today* 65, no. 2 (Spring 2021): 391–400.

5 Ibid., 62.
6 Ibid., 147.
7 Ibid., 161.
8 Ibid., 28.
9 Ibid., 83.
10 See Yuk Hui and Pieter Lemmens, eds., *Cosmotechnics: For a Renewed Concept of Technology in the Anthropocene* (New York: Routledge, 2021).
11 Richard C. Lewontin, "Gene, Organism and Environment," in D. S. Bendall, ed., *Evolution: From Molecules to Men* (Cambridge: Cambridge University Press, 1983), 280.
12 Aud Sissel Hoel, "Technicity," in Rosi Braidotti and Maria Hlavajova, eds., *Posthuman Glossary* (London: Bloomsbury, 2018), 421. Hoel's article in English cites from the French text of Simondon's *Du mode d'existence des objets techniques* (Paris: Aubier, 1958).
13 Ibid., 421.
14 A contemporaneous pairing of cybernetics and ecology occurs in the work of Gregory Bateson, most famously in *Steps to an Ecology of Mind* (New York: Ballantine, 1972). See Gökhan Kodalak's article in this volume.
15 Hoel, "Technicity," 421–22.
16 Ibid.
17 Lynn Margulis and Dorion Sagan, "Second Nature: The Human Primate at the Borders of Organism and Mechanism," *UMass Magazine* (Fall 1999), reprinted as "Welcome to the Machine," in Margulis and Sagan, *Dazzle Gradually: Reflections on the Nature of Nature* (White River Junction, VT: Chelsea Green, 2007), 77.
18 Ibid.
19 Ibid.
20 See David C. Catling and James F. Kasting, "The Rise of Oxygen and Ozone in Earth's Atmosphere," in *Atmospheric Evolution on Inhabited and Lifeless Worlds* (Cambridge: Cambridge University Press, 2017), 257–98.
21 Sagan and Margulis, "Welcome to the Machine," 77.
22 One could think of the shell-formative aspect of natural technicity as an evolutionary preformation of the immunitary enclosures Peter Sloterdijk expounds in *Spheres, Volume 1: Bubbles – Microspherology*, trans. Wieland Hoban (Los Angeles: Semiotext(e), 2011).
23 Lynn Margulis and James Lovelock, "Biological Modulation of the Earth's Atmosphere," *Icarus* 21 (1974): 477.
24 Ibid., 486. Cf. their first co-authored Gaia essay in the scientific literature, James Lovelock and Lynn Margulis, "Atmospheric Homeostasis by and for the Biosphere: The Gaia Hypothesis," *Tellus* 26, no. 1–2 (1974): 2–10.
25 See the section "Environment, Pollution, and Politics: Gaia and the Anthropocene" for an overview of Lovelock's corporate entanglements in Gaia's first decades, in the introduction to *Writing Gaia: The Scientific Correspondence of James Lovelock and Lynn Margulis* , ed. Bruce Clarke and Sébastien Dutreuil (Cambridge: Cambridge University Press, 2022), 26–29.
26 Lynn Margulis and Dorion Sagan, *What is Life?* (Los Angeles: University of California Press, 2000), 27.
27 Clive G. Jones, John H. Lawton, and Moshe Shachak, "Organisms as Ecosystem Engineers," *Oikos* 69, no. 3 (April 1994): 374.
28 Ibid., 375.
29 Kevin Laland, Blake Matthews, and Marcus W. Feldman, "An Introduction to Niche Construction Theory," *Evolutionary Ecology* 30 (2016): 191–202.
30 John Odling-Smee, Kevin Laland, and Marcus W. Feldman, *Niche Construction: The Neglected Process in Evolution* (Princeton: Princeton University Press, 2003), 40. See also Rose Trappes, "Defining the Niche for Niche Construction: Evolutionary and Ecological Niches," *Biology & Philosophy* 36, no. 3 (2021): 1–20.

31 Sébastien Dutreuil and Arnaud Pocheville, "Les organismes et leur environnement: la construction de niche, l'hypothèse Gaïa et la sélection naturelle," *Bulletin d'histoire et d'epistemologie des sciences de la vie* 22, no. 1 (2015); DeepL translation from the French, checked by Dutreuil. See also the seminal article by Lewontin, "Gene, Organism and Environment," i.
32 Dutreuil and Pocheville, "Les organismes et leur environnement."
33 See, for instance, Jeremy Kendall, Jamshid J. Tehrani and John Odling-Smee, "Human Niche Construction in Interdisciplinary Focus," *Philosophical Transactions of the Royal Society* B 366 (2011): 785–92, a contribution to a theme issue on "Human Niche Construction." See also, from the ecological side of the issue coordinated with the discourse of the Anthropocene, Erle C. Ellis, "Ecology in an Anthropogenic Biosphere," *Ecological Monographs* 8, no. 3 (2015): 287–331.
34 Jones, Lawton, and Shachak, "Organisms," 379.
35 Kathryn Yusoff, "Geologic Life: Prehistory, Climate, Futures in the Anthropocene," *Environment and Planning D: Society and Space* 31 (2013): 788.
36 Nigel Clark, "Planetary Cities: Fluid Rock Foundations of Civilization," *Theory, Culture & Society* 39, no. 2 (2022): 182.
37 Ibid., 181. On "critical zones," see Bruno Latour and Peter Weibel, eds., *Critical Zones: The Science and Politics of Landing on Earth* (Karlsruhe: ZKM – Center for Art and Media and Cambridge, MA: MIT Press, 2020).
38 See Bruce Clarke, *Gaian Systems: Lynn Margulis, Neocybernetics, and the End of the Anthropocene* (Minneapolis: University of Minnesota Press, 2020), 93–97.
39 Dorion Sagan and Lynn Margulis, "Gaia and Philosophy" (1984), in *Margulis and Sagan, Dazzle Gradually*, 172–84; Dorion Sagan and Lynn Margulis, "Gaia and the Evolution of Machines," *Whole Earth Review* 55 (Summer 1987): 15–21; Sagan and Margulis, "Welcome to the Machine."
40 Lynn Margulis to James Lovelock, December 7, 1985, in Clarke and Dutreuil, eds., *Writing Gaia*, 256. For more on Margulis and autopoiesis, see Bruce Clarke and Scott F. Gilbert, "Margulis, Autopoiesis, and Sympoiesis," in *Symbionts: Contemporary Artists and the Biosphere*, ed. Caroline A. Jones, Natalie Bell, and Selby Nimrod (Cambridge, MA: MIT Press, 2022), 63–77. For an evocation of beehives as machines, see the chapter by Heidi Sohn in this volume, and Clarke, *Gaian Systems*, chap. 6.
41 James Lovelock, "Gaia as Seen through the Atmosphere," *Atmospheric Environment* 6 (1972): 580.
42 James Lovelock to Lynn Margulis, no date, early–mid February 1972, in Clarke and Dutreuil, eds., *Writing Gaia*, 61.
43 Lynn Margulis to James Lovelock, February 16, 1972, in Clarke and Dutreuil, eds., *Writing Gaia*, 63. The full text of these two letters (numbered 18 and 19 in *Writing Gaia*) is much more extensive and documents a highly significant early exchange across a range of issues. See also Clarke, *Gaian Systems*, 30–31.
44 Sagan and Margulis, "Gaia and Philosophy" (1984), in Margulis and Sagan, *Dazzle Gradually*, 183. In 2023 London-based Ignota.org republished this essay with a new introduction by Dorion Sagan and images by Anicka Yi.
45 "Allopoiesis," meaning "production (not by the self but) by the other," is the counter-term to *autopoiesis* coined by Maturana and Varela.
46 Lynn Margulis to James Lovelock, December 7, 1985, in Clarke and Dutreuil, eds., *Writing Gaia*, 256. W. I. (William Irwin) Thompson, director of the Lindisfarne Association, published several essays by Margulis during this period. For details, see Clarke, *Gaian Systems*, chapter 5.
47 Lynn Margulis to James Lovelock, December 7, 1985, in Clarke and Dutreuil, eds., *Writing Gaia*, 257. See also Clarke and Dutreuil, eds., *Writing Gaia*, 250–52.
48 Sagan and Margulis, "Gaia and the Evolution of Machines," 19. For a more detailed discussion, see Clarke, *Gaian Systems*, 165–69. I comment there, with regard to

the discourse of autopoiesis in "Gaia and the Evolution of Machines" in relation to the seminal presentation of that concept in Francisco J. Varela, Humberto M. Maturana, and Ricardo Uribe, "Autopoiesis: The Organization of Living Systems, Its Characterization and a Model," *BioSystems* 5 (1974): 187–96, that "Sagan and Margulis place their current argument on the same discursive tracks, but they repurpose Maturana and Varela's logical architecture. They endorse the autopoietic organization as the prime criterion of living systems. Then they take reproduction, genetic mutation, and evolution – the same history-bound and ontogenetic qualities that, according to the autopoietic critique, mainstream biology has misplaced as the prime criteria of life per se – and transfer them to the epiphenomenal and metabiotic realm of machines, of designed technological systems. In other words, while granting living systems' exclusive title to autopoietic self-production, Sagan and Margulis put the mechanistic side of modern biological theory back where it belongs, on the description of machines" (Clarke, Gaian Systems 166).

49 Margulis and Sagan, *What is Life?*, 236.

50 Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016), 33.

51 Discussions of sympoiesis figure prominently in Haraway's *Staying with the Trouble* and in her ongoing writing. Scott F. Gilbert and I trace the history of the concept of sympoiesis in "Margulis, Autopoiesis, and Sympoiesis."

52 Derek Woods, "Prosthetic Symbiosis," *New Centennial Review* 22, no.1 (Spring 2022): 162.

53 Scott F. Gilbert, Jan Sapp, and Alfred I. Tauber, "A Symbiotic View of Life: We Have Never Been Individuals," *The Quarterly Review of Biology* 87, no. 4 (December 2012): 336.

54 Lynn Margulis, *Symbiosis in Cell Evolution: Life and its Environment on the Early Earth*, 2nd ed. (W. H. Freeman, 1993).

55 Gregor Pichler, Lucia Muggia, Fabio Candotto Carniel, Martin Grube and Ilse Kranner, "How to Build a Lichen: From Metabolite Release to Symbiotic Interplay," *New Phytologist* 238, no. 3 (January 29, 2023): 1362–78, https://doi.org/10.1111/nph.18780.

56 For instance, "The earth of the ongoing Chthulucene is sympoietic, not autopoietic" (Haraway, Staying with the Trouble, 33).

57 Lynn Margulis to James Lovelock, December 7, 1985, in Clarke and Dutreuil, eds., *Writing Gaia*, 257.

58 Clarke and Gilbert, "Margulis," 73. See also Scott Gilbert, "A Sympoietic View of Life: Gaia as a Holobiont Community," *Preprints* (2023), 2023091072, doi.org/10.20944/preprints202309.1072.v1.

59 Woods, "Prosthetic Symbiosis," 166.

60 Ibid., 160, 168.

61 Ibid., 160.

62 Ibid., 160.

63 Merlin Sheldrake, *Entangled Life: How Fungi Make Our Worlds, Change Our Minds and Shape Our Futures* (New York: Random House, 2020), 124.

64 Ibid., 125.

65 For instance, see Monika A. Gorzelak et al., "Inter-plant Communication through Mycorrhizal Networks Mediates Complex Adaptive Behavior in Plant Communities," *Annals of Botany Plants* 7 (2015): 1–13.

66 Sheldrake, *Entangled Life*, 125.

67 Woods, "Prosthetic Symbiosis," 174.

68 Ibid., 175.

69 Ibid., 175–77.

70 Ibid., 173.

71 Ibid.

72 Ibid. On the "organized inorganic," see Hui, *Recursivity and Contingency*, chapter 3, "Organizing Inorganic." On epiphylogenesis, see in particular Robert A. Gorny and Andrej Radman, eds., "Introduction: From Epiphylogenesis to General Organology," in *The Epiphylogenetic Turn and Architecture In (Tertiary) Memory of Bernard Stiegler*, in *Footprint* 16, no. 1 (Spring/Summer 2022): 3–20.
73 Hui, *Recursivity and Contingency*, 204.
74 Woods, "Prosthetic Symbiosis," 177; Hui, *Recursivity and Contingency*, 205.
75 William Gibson, *Neuromancer* (New York: Ace, 1984), 48.
76 Ibid., 72.
77 Sagan and Margulis, "Welcome to the Machine," 81.
78 Margulis and Lovelock, "Biological Modulation," 477–78.
79 Sagan and Margulis, "Welcome to the Machine," 83.
80 Ibid., 85.
81 Ibid., 87. Beginning in the mid 1980s, in line with her advocacy for Gaia theory, Margulis championed Vernadsky's masterwork, *The Biosphere*. Written in the 1920s, it enjoyed a resurgence of interest at the end of the twentieth century, leading to a compendious full translation with a detailed foreword lead-authored by Margulis. See Vladimir Vernadsky, *The Biosphere*, trans. David B. Langmuir, revised and annotated by Mark A. S. McMenamin (New York: Copernicus, 1998). Although Lovelock demurred, Margulis lauded Vernadsky as a precursor to Gaian thinking by treating life in cosmic and planetary context. Vernadsky also developed an influential concept of the *noosphere* independently of Pierre Teilhard de Chardin; see Vladimir Vernadsky, "The Biosphere and the Noosphere," *American Scientist* 33, no. 1 (1945): 1–12. In this light, natural technicity is an evolutionary vector out of which the human technosphere materializes in its turn and the noosphere rooted in the biosphere then unfolds. See also Clarke and Dutreuil, "Vladimir Vernadsky," in *Writing Gaia*, 258–60; and Adam Frank, David Grinspoon, and Sara Walker, "Intelligence as a Planetary Scale Process," *International Journal of Astrobiology* 21 (2022): 47–61.
82 Hui, *Recursivity and Contingency,*" 217.
83 Noel, "Technicity," 422.
84 Sagan and Margulis, "Welcome to the Machine," 87; see also Andrea Roli, Johannes Jaeger, and Stuart A. Kauffman, "How Organisms Come to Know the World: Fundamental Limits on Artificial General Intelligence," *Frontiers in Ecology and Evolution* 9 (January 28, 2022): 1–14. doi: 10.3389/fevo.2021.80628: "We argue that organismic agency is strictly required for truly open-ended evolution through radical emergence" (1).

Bibliography

Bateson, Gregory. *Steps to an Ecology of Mind*. New York: Ballantine, 1972.

Catling, David C., and James F. Kasting. "The Rise of Oxygen and Ozone in Earth's Atmosphere." In *Atmospheric Evolution on Inhabited and Lifeless Worlds.* Cambridge: Cambridge University Press, 2017, 257–98.

Clark, Nigel. "Planetary Cities: Fluid Rock Foundations of Civilization." *Theory, Culture & Society* 39, no. 2 (2022): 177–96.

Clarke, Bruce. *Gaian Systems: Lynn Margulis, Neocybernetics, and the End of the Anthropocene*. Minneapolis: University of Minnesota Press, 2020.

Clarke, Bruce, and Scott F. Gilbert. "Margulis, Autopoiesis, and Sympoiesis." In *Symbionts: Contemporary Artists and the Biosphere*, edited by Caroline A. Jones, Natalie Bell, and Selby Nimrod, 63–77. Cambridge, MA: MIT Press, 2022.

Clarke, Bruce, and Sébastien Dutreuil, eds. *Writing Gaia: The Scientific Correspondence of James Lovelock and Lynn Margulis.* Cambridge: Cambridge University Press, 2022.

Danowski, Déborah, and Eduardo Viveiros de Castro. *The Ends of the World*, trans. Rodrigo Nunes. Malden, MA: Polity Press, 2017.

Dutreuil, Sébastien, and Arnaud Pocheville. "Les organismes et leur environnement: la construction de niche, l'hypothèse Gaïa et la sélection naturelle." *Bulletin d'histoire et d'epistemologie des sciences de la vie* 22, no. 1 (2015): 27–56.

Ellis, Erle C. "Ecology in an Anthropogenic Biosphere." *Ecological Monographs* 8, no. 3 (2015): 287–331.

Frank, Adam, David Grinspoon, and Sara Walker. "Intelligence as a Planetary Scale Process." *International Journal of Astrobiology* 21 (2022): 47–61.

Gibson, William. *Neuromancer*. New York: Ace, 1984.

Gilbert, Scott. "A Sympoietic View of Life: Gaia as a Holobiont Community." *Preprints* 2023, 2023091072. doi.org/10.20944/preprints202309.1072.v1.

Gilbert, Scott F., Jan Sapp and Alfred I. Tauber. "A Symbiotic View of Life: We Have Never Been Individuals." *The Quarterly Review of Biology* 87, no. 4 (December 2012): 325–41.

Gorny, Robert A., and Andrej Radman, eds. "Introduction: From Epiphylogenesis to General Organology." In *The Epiphylogenetic Turn and Architecture In (Tertiary) Memory of Bernard Stiegler*, in *Footprint 16*, no.1 (Spring/Summer 2022): 3–20.

Gorzelak, Monika A., Amanda K. Asay, Brian J. Pickles and Suzanne W. Simard. "Inter-plant Communication through Mycorrhizal Networks Mediates Complex Adaptive Behavior in Plant Communities." *Annals of Botany Plants* 7 (2015): 1–13. doi: 10.1093/aobpla/plv050.

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

Hoel, Aud Sissel. "Technicity." In *Posthuman Glossary*, edited by Rosi Braidotti and Maria Hlavajova. London: Bloomsbury, 2018, 420–22.

Hui, Yuk. *Recursivity and Contingency*. New York: Rowman and Littlefield, 2019.

Hui, Yuk, and Pieter Lemmens, eds., *Cosmotechnics: For a Renewed Concept of Technology in the Anthropocene*. New York: Routledge, 2021.

Jones, Clive G., John H. Lawton, and Moshe Shachak. "Organisms as Ecosystem Engineers." *Oikos* 69, no. 3 (April 1994): 373–86.

Kendall, Jeremy, Jamshid J. Tehrani, and John Odling-Smee. "Human Niche Construction in Interdisciplinary Focus." *Philosophical Transactions of the Royal Society* B 366 (2011): 785–92.

Laland, Kevin, Blake Matthews, and Marcus W. Feldman. "An Introduction to Niche Construction Theory." *Evolutionary Ecology* 30 (2016): 191–202.

Latour, Bruno, and Peter Weibel, eds. *Critical Zones: The Science and Politics of Landing on Earth.* Karlsruhe: ZKM – Center for Art and Media and Cambridge, MA: MIT Press, 2020.

Lewontin, R. C. "Gene, Organism and Environment." In *Evolution: From Molecules to Men*, edited by D. S. Bendall, 273–85. Cambridge: Cambridge University Press, 1983.

Lovelock, James. "Gaia as Seen through the Atmosphere." *Atmospheric Environment* 6 (1972): 579–80.

Lovelock, James, and Lynn Margulis. "Atmospheric Homeostasis by and for the Biosphere: The Gaia Hypothesis." *Tellus* 26, no. 1–2 (1974): 2–10.

Margulis, Lynn, and James Lovelock. "Biological Modulation of the Earth's Atmosphere." *Icarus* 21 (1974): 471–89.

Margulis, Lynn, and Dorion Sagan. "Second Nature: The Human Primate at the Borders of Organism and Mechanism." *UMass Magazine* (Fall 1999).

Margulis, Lynn, and Dorion Sagan. *What is Life?* (1995). Los Angeles: University of California Press, 2000.

Margulis, Lynn, and Dorion Sagan. *Dazzle Gradually: Reflections on the Nature of Nature.* White River Junction, VT: Chelsea Green, 2007.

Odling-Smee, John, Kevin Laland, and Marcus W. Feldman. *Niche Construction: The Neglected Process in Evolution.* Princeton: Princeton University Press, 2003.

Pichler, Gregor, Lucia Muggia, Fabio Candotto Carniel, Martin Grube and Ilse Kranner. "How to Build a Lichen: From Metabolite Release to Symbiotic Interplay." *New Phytologist* 238, no. 3 (January 29, 2023): 1362–78. https://doi.org/10.1111/nph.18780.

Roli, Andrea, Johannes Jaeger and Stuart A. Kauffman. "How Organisms Come to Know the World: Fundamental Limits on Artificial General Intelligence." *Frontiers in Ecology and Evolution* 9 (January 28, 2022): 1-14. doi: 10.3389/fevo.2021.80628.

Sagan, Dorion, and Lynn Margulis. "Gaia and the Evolution of Machines." *Whole Earth Review* 55 (Summer 1987): 15–21.

Sagan, Dorion, and Lynn Margulis. "Gaia and Philosophy" (1984). In *Dazzle Gradually*, edited by Margulis and Sagan, 172–84.

Sagan, Dorion, and Lynn Margulis. "Welcome to the Machine." In *Dazzle Gradually*, edited by Margulis and Sagan, 76–88; a republication of Margulis and Sagan, "Second Nature."

Sloterdijk, Peter. *Spheres, Volume 1: Bubbles – Microspherology.* Trans. Wieland Hoban. Los Angeles: Semiotext(e), 2011.

Stewart, Donovan, and Georgios Tsagdis. "On Natural Technicity: Oikos, Articulation, and the Gift." *Technophany* 1, no. 2 (2023): 1–17.

Trappes, Rose. "Defining the Niche for Niche Construction: Evolutionary and Ecological Niches." *Biology & Philosophy* 36, no. 3 (2021):1–20.

Varela, Francisco J., Humberto M. Maturana, and Ricardo Uribe. "Autopoiesis: The Organization of Living Systems, Its Characterization and a Model." *BioSystems* 5 (1974): 187–96.

Vernadsky, Vladimir. *The Biosphere.* Translated by David B. Langmuir. Revised and annotated by Mark A. S. McMenamin. New York: Copernicus, 1998.

Vernadsky, Vladimir. "The Biosphere and the Noosphere." *American Scientist* 33, no. 1 (1945): 1–12.

Viveiros de Castro, Eduardo, and Yuk Hui. "For a Strategic Primitivism: A Dialogue between Eduardo Viveiros de Castro and Yuk Hui." *Philosophy Today* 65, no. 2 (Spring 2021): 391–400.

Woods, Derek. "Prosthetic Symbiosis." *New Centennial Review* 22, no. 1 (Spring 2022): 157–86.

Yusoff, Kathryn. "Geologic Life: Prehistory, Climate, Futures in the Anthropocene." *Environment and Planning D: Society and Space* 31 (2013): 779–95.

A Metabolic Approach to Designing Space

Sha Xin Wei

How can we design material structures as ambients to human and more-than-human living organisms, co-articulating themselves together with their hosted life? By material, I'll mean extensive distributions of matter + energy + affect, which are always in flux.[1] Taking my cue from the recent history of experimental arts in the wake of electronic and digital algorithmic technologies where music is characterized as organized sound, let's for the purposes of this essay regard architectural design as the organization of extensive matter-energy.[2] I add immediately that in the course of this discussion we will also consider the flux of material intensities as functions of relation, recalling a subjective characterization of music as that sound to which intention and attention have been drawn, famously exemplified by John Cage's *4"33'* (1952). In any case, one can see that this approach to architectural design incorporates from the outset a processualist concern with dynamic, flux, change, transformation, which may seem at odds with the classical concept of architecture as the quintessential art of static form. Nonetheless it constitutes a pragmatic and radically empiricist engagement with both concept and practice; design for change in multiple scales and registers is the mandate of our time of anthropogenic climate change. Now, Alfred North Whitehead's compact characterization of a processualist approach – "how an actual entity becomes constitutes what the actual entity is" – suggests that in place of categories of objects defined by their predicates, we focus on the manner, the way objects transform, in short on adverbs.[3]

This volume generally treats how technology mediates between the human (social) and the ambient; in this chapter I highlight the processual aspect of our

world, and consider how technologies and techniques mediate between human, biosemiotic, and physical processes. Against this backdrop I propose a core challenge for consideration: how to design our built environments for change, to enable, even affirm life in all its weedy, unruly growth? There are ethico-aesthetic motivations for looking to living processes: on one hand, we can start with the aspiration to create spaces of design that enable, affirm, welcome rather than deaden or exclude life. On the other, we examine techniques and technologies with an eye for how they enable more rather than less sense-making. There too, living process provides insight. In their own respective ways Stuart Kauffman and Giuseppe Longo have argued that living organisms in particular, and more generally metabolic processes 1) are conditioned but not determined by physics, 2) have no pre-statable domains of existence, and 3) obey no entailing laws: there are no a priori structures and rules that determine how living organisms co-structure their ambient. How can we conceive designing space processually, designing space as organized tissues of material processes, with such features of metabolic process? Taking a processualist attitude calls for attending to not merely the products of metabolic processes of design and fabrication, but the manner in which they develop. This manner, bearing the hallmarks of open-endedness and dense metastability, could be productively characterized, in a word, as playful.[4] I look for qualities drawn from living metabolism to enrich our concepts of process and temporality – the sense of dynamic, change, rhythm – that have been desiccated by models from digital algorithmic machines.

This essay proposes an approach to design in a metabolic manner, but to be worthy of its name, metabolic design should be more than the definition of static structures according to a priori form. After all, even a potted plant, if it grows enough, will eventually need re-potting. And invertebrates with carapaces of fixed sizes need to molt as they grow. Indeed, this last example and the examples of coral reefs and lignified cells in trees cue us to the possibility of inactive – no-longer living – distributions of matter as the resultants of metabolic relations between an organism or a colony of organisms and its ambient. The Metabolism architectural movement in 1960s Japan focused in characteristically hylomorphic fashion on formal features such as modularity and an abstract functionalism, but paid no attention to the material processes of wet, living, metabolic earth and tissue.[5] On a systemic scale, the illuminating failure of the Biosphere project in Arizona shows the limits to expanding the purified bubble of a hydroponic plant system to the much larger apparatus of a garden in a self-contained world.

So, metabolic design has to be more than biomimicry, more than biophilic design, and in fact, if we follow through on the implications of non-anthropocentric ethico-aesthetics, more than a matter of pressing living tissues into utilitarian service like filtering synthetic chemicals from the estuaries we have wasted.

In this essay, informed by recent theoretical biology – Stuart Kauffman, Giuseppe Longo, Maël Montevil – but also plant science and general ecology – James Mauseth; Timothy F. H. Allen and Thomas W. Hoekstra – I will consider some essential characteristics of metabolic processes, trying on one hand to adopt a radically empirical approach that constructs characteristics from observing some living systems, but on the other hand avoiding the Pythagorean snare of elevating features of a particular animal or digital computer into a transcendental property. To do this I take inspiration from recent thinkers – Emanuele Coccia, Michael Marder, Francis Halle – who have opened the door for philosophical consideration of vegetal experience, not being but becoming plant, to use Deleuze's tactic.

Features of Biological Metabolism

What are some features of biological metabolism that we might wish to consider as hallmarks also of a metabolic design process? There is no definitive, fundamental list, but for the purposes of this chapter, I draw upon Stuart Kauffman, Giuseppe Longo, Maël Montévil, and Elena Pagni's biological theory of organisms, characterized by irreducible materiality, protentive and retentive temporality and multi-scale / multi-dimensional rhythm, reflexive sense-making, "biological temporal organization [like], ... extended criticality, ... anti-entropy," and most importantly, open-ended non-prestatability.[6] It's important to underline here that what mathematicians mean by *critical* is quite distinct from political, theoretical, cultural critique. In mathematics, a critical point is a point at which the function's derivative is zero. This means that at so-called critical point *x*, the function is neither increasing nor decreasing. Such a point is also called an equilibrium point, and the value *f(x)* an equilibrium value. Later we will see that the metabolisms of living organisms have a characteristic relation to a particular kind of criticality: metastability.

In their essay "Extended Criticality and Structural Stability: 'Architectures' of Biological Individuation," Giuseppe Longo and Elena Pagni write:

> The radical contingency and materiality of life does not allow to split software from hardware, since only *these* DNA, RNA, membranes ... and material organisms as such are actually living. In other words, there is no biological event nor mind process that can be conceived as independent from the physical matter in which it happens.[7]

This strong proposition rules out hylomorphic approaches that posit ideal, a priori forms which pre-exist the event of material formation in the course of material dynamics. Longo and Pagni's proposition implies much more. For instance, one can properly create metabolic processes only by remixing the protoplasmic

materials of living tissue. And interpreting this strictly would imply that metabolic design would have to accommodate living things, and incorporate their proliferate activity in a non-hylomorphic way. This notion of material formation calls into play Gilbert Simondon's rich account of individuation, which in his more-than-cybernetic concept of information amalgamates description of material with the shaping and articulating of material, in place of hylomorphic impression of transcendental form upon formless, undifferentiated matter.[8] For the purposes of this account, although not all matter is vital, it is never inert. That is why I prefer to think in terms not of matter but of material, an amalgam of dynamical and boundlessly variegate matter + energy + affect.

What does incorporate mean? It cannot mean 3D printing structures mimicking biological forms, fashioned out of polylactic acid (PLA) plastic, which would amount to a zombie materiality.[9] At the same time, replacing PLA by fungal mycelium and shaping it to the designer's imagination is no less hylomorphic and no more "metabolic" than working with plastic. Indeed, the homogenization of raw material needed in order to eliminate all unplanned formations, whether the knots and whorls in a tree trunk, or the contingently formed fibers of the mycelium from which mushrooms fruit, also eliminates metabolic, structural coupling between the technical individual, the technical object, and their milieu.[10]

Agriculture, forestry, and the design of gardens and parks constitute our most refined technologies (techne) mediating humans and their ambient, and so any practical reconstitution of architectural design should balance the proposals in this essay with those much more mature domains of collective epiphylogenetic memory, to use Bernard Stiegler's characterization of technology. Our larger challenge is to (re)constitute a *metabolic* technology. As Eleni Myrivili, the chief heat officer of the city of Athens Greece, said:

> Carbon is there from the get go, from the materials that we use for the types of construction, from the way we use the buildings, we heat and cool them, the way we eat, the way we consume, the way we move around in our urban environments. So we need to redesign our cities beyond energy efficiency and cutting carbon emissions. We need an urban design revolution, a total paradigm shift that probably needs to be led not by architects anymore, but landscape architects that know more about thermodynamics and soil and the importance of soils for biodiversity and all these things that can really bring about a real paradigm shift, a revolution in design, a new type of urbanity that actually is a different metabolic animal. Our cities of the future will be different metabolic systems.[11]

This essay proposes a thorough-going consideration of what this "different metabolism" could mean, learning from but extending beyond both ancient and carbon-capitalist Anthropocene technologies.

In the next sections, I describe a few characteristic phenomena of living processes, ranging from concrete accounts of material biology to more global phenomena like the temporalities of organisms. In each case, I consider how such characteristics transpose not literally but conceptually to designing space, the organizing of material.

Material Chemistry: Coordinate Growth via Chemotaxis versus Geometry

When growth is modulated by hormones that are produced and modulated by the organism's metabolism as well as ambient chemical and physical processes, the morphological development of the organism inevitably is a function of extensive relations as well as intensive dynamics. One example is the distinct resonances at play between physical processes and hormonally-mediated coordination of metabolic processes that are different in the spiraling of a tendril of a climbing plant in open space, versus a tendril curling around a physical affordance like a twig. Those processes are in turn canalized by an elaborate set of organ structures at multiple scales – from intra-cellular to whole organism and even biome – that are reflexively the morphological and structural result of metabolic development.

Endomembrane Biochemical and Morphological Dynamics

First of all, plant cells differ from animal cells in that they have a proportionately large central vacuole containing water and dissolved salts that play both intracellular metabolic roles and organism-scale structural roles. By changing the permeability of the central vacuole's membrane in response to conditions, the cell can transport more or less water into its vacuole, and thus change the size of the cell by a very large factor. So in hours, a plant and change shape and grow in ways that no animal can. Plant cells also deposit substances that are not to be metabolized and unrecycled elements of disused cellular organelles in their central vacuoles: "a system to excrete wastes never evolved in plants; instead, metabolic waste products are pumped across the vacuole membrane and stored permanently in the central vacuole. The tonoplast is otherwise impermeable to these wastes."[12] Note, this implies an irreversibility which is an instance of how biological processes are typically irreversible, a radical difference with physics, and with abstract algebras that by definition have formal inverses.

All cells, plant and animal, conduct central aspects of their metabolic processes via the action of dictyosomes.[13] These intracellular organelles function in intricate ways to transmute and transport intracellular material: with vesicles forming on one face of the stack of folded membranes, being processed through

the stack, and then emerging on the maturing face to release their (transformed) contents. To give an idea of the material dynamics and how different they are in kind from purified mathematical functions or procedural software logic, I quote Mauseth's description:

> A stack of thin vesicles held together in a flat or curved array ... ER [endoplasmic reticulum] vesicles accumulate on one side of the dictyosome and then fuse together and form a wide, thin vesicle called a cisterna... that becomes attached to the dictyosome.... Soon more ER vesicles gather next to this one and form a new cisterna. The first cisterna becomes embedded more deeply in the dictyosome as more vesicles accumulate on that side, which for obvious reasons is the forming face. At the other side, the maturing face, vesicles are being released; their contents have been processed. After separation, vesicles can move to the plasma membrane and release their contents.... The outer edges of dictyosomes form an inter-connected network of curving tubes, and these may absorb the contents from the center of the dictyosome cisterna and then detach and move away. It is not known why some dictyosomes concentrate material in the central cisternae, whereas others use the peripheral ones.[14]

In fact, Mauseth mentions that these identifiable intricate morpho-chemical-energetic processes are part of the much richer and incompletely observed phenomenon of membrane flow, where the membranes of organelles and the endoplasmic reticulum of a cell gradually and in a conditioned manner transmute themselves across organelles.[15] In our anthropic condition, it would be as if the skins of people or surfaces of objects were to flow and transmute into bounding surfaces of other entities with which they have a metabolic relation. Simple transposition of these intricately bio-material phenomena would risk reducing to mere mimicry, or to hylomorphic casting of the ideal onto matter made brute. So let me propose a reterritorializing of the abstract machines corresponding to such processes to a different scale and material context: the re-use of Roman stone in the walls of cities of south England, Gaul and Spain. To carry out that project would require a much more detailed accounting of not only the traces, but also the motivations – utilitarian, but also based on ritual, pride ("romanitas"), or the projection of power – driving the dissolving and reconstituting flows of membranes of built structures from roman monuments to city walls and many other structures in England, from the third to the sixth centuries and later in England, Gaul and Spain, and Italy.[16] And then a "functorial" account would be needed to transpose the relations of relations before we could look for insights from resonances or indeed dissonances generated by the reterritorialization.

Eating versus Metabolizing

On the macroscopic level of biological organisms, angiosperms – fruit-bearing plants – in their macroscopic relations to other organisms epitomize the relation of mutual aid that stands in sharp contrast with the animal operation of eating: an animal ingesting the material of another living being and disintegrating the metabolic processes maintaining that being. I find it helpful to flip this observation and characterize the vegetal by this distinction: the vegetal is the form of life that converts light into life and enables other life as well as its own.[17] On the most fundamental energetic level, among all terrestrial living beings, plants are the forms of life that metabolize non-biological non-metabolic energy – light from the sun – into biological, metabolic energy. As Eduardo Coccia put it:

> [Plants] transform everything they touch into life, they make out of matter, air, and sunlight what, for the rest of the living, will be a space of habitation, a world. Autotrophy – the ... power ... to transform into nourishment everything they touch is not just a radical form of alimentary autonomy; it is above all the capacity that plants have to transform the solar energy dispersed into the universe into a living body, [to transform] the deformed, disparate matter of the world into a coherent, well-ordered, and unified reality.[18]

This brings us to consider arguably the most fundamental metabolic process of our world.

Photosynthesis

Without walking through all the details of this fundamental metabolic process, look just at the different representations of the photosynthetic process which converts incident light (electromagnetic product of solar physics) into metabolic energy in multiple forms, such as the highly reactive ATP molecule (inside the intricate structure and dynamic chemistry of the mitochondria), and the much less reactive carbohydrates which can be stored in plant cells. Mauseth contrasts the abstract diagram of the photosynthetic process as a chemical equation: $6CO_2 + 6H_2O$ " $C_6H_{12}O_6 + 6O_2$ with a second figure which diagrams the ever-evolving cellular, membrane, fluid and molecular structures, relations and transformations in temporally distinct phases in the soup of material dynamics:

> Light-dependent reactions of photosynthesis occur by means of membrane-bound carriers, but the actual formation of carbohydrate occurs in the chloroplast liquid (stroma). ATP-ADP and NADP + -NADPH diffuse between the two regions. No region of the chloroplast is far from

> a membrane, so the distances traveled are only a few hundred times the diameter of a molecule.[19]

To represent this either by a bald tally of the difference in energy or even as a chemical equation ignores the material processes in play. As Mauseth writes:

> Although this chemical equation [in the first diagram] succinctly summarizes photosynthesis, it reveals virtually nothing of the reaction mechanism or the many carriers and enzymes that participate. We cannot draw a reaction diagram because photosynthesis does not occur by the direct interaction of six molecules of carbon dioxide with six of water.[20]

Continuity

I register one essential aspect of metabolic process before turning to more global concepts: continuity. Continuity in a precise *topological* sense concretizes the intuition that a continuum has no gaps, holes or interruptions, and a continuous transformation does not introduce or remove gaps, holes or interruptions. The "topological type" is more primordial than dimension and geometry. Thus continuity is a concrete, yet ample and generative concept with which to think the discrete or the so-called digital and its alternatives.[21] What is obvious from observing these intricate metabolic processes is that they are largely continuous, not just as spatiotemporal extension, but as transformations of energies, molecular formations, distributions of fluids, hormones, and ever-evolving morphologies of structured living tissue. Longo and Pagni write:

> Explanations referring to discrete structures may be applied to a few levels of biological organization, but excluding whatever, in a living being, works in a non-discrete way, such as the role of continuous deformation extensively analyzed in morphogenesis since Turing's work....
> The physical singularity of the living state of matter cannot be understood without referring to the whole field of complex interactions taking place at each level of an organism's development, among the different and several levels of biological organization.[22]

These complex metabolic interactions are continuous. Why is this important? Digital algorithms, based on discrete, that is, discontinuous, formal structures have calcified contemporary technologies and economies, not only in digital fabrication and measurement, but conceptually in design and technoscientific imaginaries, for example by reinforcing the myth that data = matter = Earth = ground-truth. Indeed, this constitutes the core of what Bernard Stiegler has identified as our

contemporary technologies of tertiary retention, such as mass time-based media, social media, and computer technologies, which have "industrialized" individual consciousnesses on a global scale.[23]

In an essay on biological organization and anti-entropy, Bailly and Longo write:

> Many also tried to analyze biological organization in terms of (Shannon's) information: since entropy increase may characterize loss of information, its negation should provide (an increase of) information. Besides its relevance in transmission theory, this approach has inspired new analyses also as for negative entropy in quantum systems.... Yet, both classical and quantum information basically refer to classical or quantum bits, as the discrete mathematical frames are at the core of information and computation theories. In contrast to this, we tried to deal with equations (balance and diffusion, typically) that are better understood in ... *continua* and where Shannon's theory and its quantum variants hardly apply.[24]

With this in hand I turn to more global concepts associated with the metabolic: negentropy, dense metastability, and a precise sense of contingency: non-prestatability of potential states.

Anti-Entropy (Negentropy)

It is useful to define and then set aside the notions of entropy from physics and from (digital) information theory. The usual definition of entropy posits a number-valued function $E(p_1, p_2, ..., p_n)$ of the probabilities *pi* of the possible states of a given system (entity, organism, situation, ...), where the set of possible states is specified in advance. (In the discrete case, *n* is the number of possible states.) This entropy function *E* is required to have certain properties reasonable for a measure of disorder: 1) *E* should be continuous as a function of the probabilities, 2) when the events are equiprobable *E* is monotonic in the number of events – or in Claude Shannon's words, "with equally likely events there is more choice, or uncertainty, when there are more events," and 3) the entropy of a compound event is the sum of the entropy of its subsidiary events weighted by the probabilities of the subsidiary events.[25] Note the essential presumption that the space of possible states of the system is pre-given, and that there is a pre-given probability measure on this space of possible states. The key point is that this is *not* the case for metabolic systems, cells, organisms, or for the epiphylogenetic development of technology.[26] I will return to this fundamental point in the section on indeterminacy and non-prestatability.

Whereas physicists from Schrödinger onward have proposed to characterize life as that which decreases entropy locally (at the expense of exporting disorder to its ambient), Bailly and Longo carefully define a distinct kind of entropy, what I will call life-entropy, E_{life}, which indexes how much structure has been created in metabolic process. Bailly and Longo set the negative of life-entropy equal to what they call complexity $K = - E_{life}$, a measure of structure (order), and extend thermodynamics by having K satisfy the following inequalities:

$$- K = E_{life} \leq 0 \text{ and } -dK/dt = d(E_{life})/dt \leq 0$$

In other words, complexity – the degree of metabolic structure – is non-decreasing in a living organism. They elaborate their measure of complexity K as the sum of 1) differentiations in cell lineages, 2) the morphological complexity of topological forms and structures, and 3) functional complexity: "relationships established to the fulfilled biological functions; metabolic relations, neuronal relations, interaction networks."[27] Note that these definitions do not reduce readily to scalar quantities. This life-entropy is formally independent of the physicist's entropy, but has the same dimension of energy. The key point is that Bailly and Longo extend thermodynamics to account for how, under the input of energy from outside the system, a living organism creates order (metabolic structure) from order. (Living beings also reverse the local physical entropy, but that is an example of creating order from disorder. An example of organismic order formation opposed by physical entropy would be piling sand into a sand mandala before letting the wind sweep it away.) An example of increasing metabolic structure complexity K would be the morphological-chemical formations of dictyosomes and membrane flow operating in the cell, which we encountered earlier.

Dense Metastability

In their book *Perspectives on Organisms*, Longo and Maël Montévil discuss a fundamental difference between the dynamics of physical systems and that of biological organisms in terms of the critical points of the dynamics in their state spaces, or more anexactly, domains of possible existence.[28] For the purposes of this paragraph, by a physical "system" I will mean a configuration of time-based media plus matter (including living bodies), plus observables that can be measured with physical sensing technologies like pressure gauges, wind-gauges, thermometers, photocells, microphones, motion tracking devices, together with some durable mechanisms that can modulate the configuration. I put "system" in quotes to single out and remove the common implicit presumption that the entity is finite, bounded, closed, and has a sharp distinction between itself and its ambient. A physical system could be that of a window, a courtyard, a city. The key

here is that there is no restriction on the nature and multiplicity of the forces and interpretations that may animate the observed aspect of the dynamics. Therefore what accounts we can make of the dynamic of an organism or a city necessarily omit boundlessly many factors of the dynamic, not least because those accounts depend on the relation between the account's subjects and objects, which in turn arise in the course of the formation of the account.[29] For a start, we focus on (physical) observables in order to introduce the notion of state space, while, to repeat, keeping in mind the boundless openness and indeterminacy of effect. So, to be more precise, when we say a physical system of some environment or occasion, we should always think that we are considering some *particular* configuration of a finite subset of physically observable aspects and relations of the processes in action in that environment or occasion. The first abstraction is to represent the physical system by a choice of finitely many observables that index the configurations of the physical system. Let *M* be the manifold of those possible observables.[30] For example, in a courtyard, *M* could be the compound, non-Euclidean structured space of locations and orientations of the chairs and sun-shades, the parameters controlling the fountain's jets of water, and how reverberant the acoustics are made by the treatment of the space (for example by mechanically controlled drapes or by live acoustic processing via real-time electronics). [31] Configuration c is a set of physical observables and parameters indexing the physical arrangement of material objects + media in a given environment = occasion. State σ is a human-sensible description of a state of affairs associated with a physical configuration.[32] And let S be the space of states, usually not only infinite, but infinitely dimensional. It is at the level of state where the concepts of metastability can be defined.[33] If we construct a notion of energy U on the state space:

$$U: S \rightarrow \mathbb{R}$$

associating a scalar value with every possible state (or more generally a measure to regions in state space), then we can apply the principle of least action to describe how the system may evolve from an initial configuration corresponding to an initial state continuously through various configurations that locally tend to minimize that energy *U*. A critical point is a state σ where the gradient of *U* is 0, meaning small perturbations in any way from $\boldsymbol{\sigma}$ will vary *U* to a vanishing amount. Such a point (and the energy value associated with it) is called an equilibrium. If we look to a second-order – difference of difference – effect on *U* with respect to variations in the configuration, we can distinguish different sorts of critical points: 1) a stable critical point, where the system will tend to settle back to state σ given any small perturbation, 2) an unstable critical point, where the system will tend to fall away from the equilibrium given any small perturbation, and 3) metastable,

where some perturbations will tend to lead to the system falling away from the equilibrium, whereas under other perturbations the system will tend to return to the equilibrium.

The principle of least action is one of the most fundamental principles of both physics and certain philosophies of change, but that it is not a transcendentally necessary principle for change has become one of the most compelling conundrums of our day.[34] Gilbert Simondon gives a multi-layered account of individuation that does not, I believe, require a least-action principle.[35] But he does adapt the notion of metastability to understand transindividual processes of individuation, and inspired by Simondon's usage, I will propose a notion of generic, or *dense* metastability as another hallmark of life.

Montevil and Longo have proposed, in their theory of organism, that biological organisms are distinguished from physical systems in that their critical points, unlike well-behaved physical systems, are not isolated, that in fact their state spaces have extended regions of criticality, hence their proposal that one of the hallmarks of life is extended criticality (where criticality is to be interpreted in its mathematical rather than political sense). I suggest that the hallmark of a living system co-articulating with its ambient can be more particularly a dense metastability. (As an aside: it bears underlining that thanks to the innumerable metabolic processes ranging from respiration, immune response, sensorimotor enaction, to epigenetic and epiphylogenetic development, the relation between organism and its ambient is topologically far subtler than what naive geometric intuition can afford.) Effectively, an entity or system in stable equilibrium will tend to stay in its given configuration under the impact of any small perturbation; such an entity would be essentially passive, more like a boulder that has rolled to the bottom of a valley than a living entity co-articulating its ambient. If the entity is in an unstable equilibrium, any small perturbation will cause it to "fall" away from the given state. An example would be an egg balanced vertically on its pointed end, equally at the mercy of its ambient as the boulder at rest. If we are considering a configuration space which includes dimensions critical to sustaining the viability of an organism, a falling away could entail the disintegration of the organism's autopoietic metabolism, in other words death. Organisms typically are resilient to certain ranges and degrees of perturbations, so they ordinarily would not be in extensive regions of unstable equilibria, unless they are diseased. Now, one interpretation of a metastable point is a state such that under some perturbations the organism tends to return to the equilibrium, but other perturbations lead to disequilibrium. That living organisms are generically in metastability seems the sine qua non of the indeterminacy and boundlessness of life that is conditioned but not determined by history and physics.[36] Speaking somewhat more precisely, this genericity can be presented by a topologically dense distribution of metastable points, meaning for

any state, no matter how small a neighborhood of that state one examines, there is always a metastable point in that neighborhood.[37]

Indeterminacy and Non-Prestatability

Stuart Kauffman, one of the pioneers in studying evolutionary biology from the perspective of complexity and emergence, has argued that unlike informatic or physics models, there can be no pre-given "entailing laws" determining biological development. He characterizes living systems in terms of constraint, work, and catalytic "closures," which operate in a living system that creates "order from order" in structural coupling with, and absorbing energy from its ambient. Kauffman concludes his book *A World Beyond Physics*:

> We can write no laws of motion ... for the emergence of the eukaryotic cell, sex, multi-celled organisms, the Cambrian explosion with its specific marvels of the explosion of diversity of early flora and fauna, promissory of us, fish, amphibians, reptiles, mammals, and primates, let alone the specific proteins that have emerged. We live in an unprestatable, literally unimaginable, myriad of emergent becoming.
> ...
> Thanks to the three closures – constraint, work, and catalytic – life literally constructs itself [toward novel forms]....
> This vast emergent becoming is beyond physics, yet based on it. This is life co-constructing itself and enabling its own vast evolutionary diversification here, and on any biosphere, in the universe.[38]

Longo and Pagni provide a positive characterization of non-prestatability:

> A biolon's [cell, organism, species] domain of existence (which has to be distinguished from the phase space of physics) is not given beforehand, but ... is co-constituted through the interaction of the living entity with the ecosystem to which it also contributes by determining the entity. In this sense, we insist, the passage from one layer [representing the existence of the biolon in a given set of internal and external conditions] to another presents a specifically biological *indeterminacy*, related to the fact that this set of layers can be adopted as such in an *a posteriori* analysis (corresponding to what we call a history of the biolon), but not in a completely *a priori* predictability of its specific developmental trajectory.[39]

Synthesizing Implications for Design

We gather the implications for a metabolic design of material processes – elastic, energetic, thermodynamic, wet chemical – at a couple of scales of organization of the built environment, to speculate an approach to design that accommodates indeterminate social, physical and vegetal sense-making. Working, thinking processually and materially, we consider indeterminate novelty and non-prestatable conditions as not only features of life, but of any organized material in flux. In this setting, we consider the delicate question of how to design not forms and categories but the conditioning of events that enable contingent, meaningful, life-affirming co-articulation of built-structures, inhabitants' activities and the ambient environment in the face of indeterminacy. To fully temporalize architectural design, we turn to the composition of not just specific configurations of physical materials, or even of actions and reactions (mechanical, algorithmic interactivity), but of changes in the potential responsivities and affordances of the material (physical + media) environment, in response to both prior design and contingent sense-making, subject-making activity.

A concrete example is the state-based evolution system developed for enlivening richly responsive media environments, and experimentally prototyped in the Topological Media Lab (Concordia University, Montreal, 2001–2012), and Synthesis (2013 to the present). Originally named Oz, and then Ozone, the present incarnation – the SC State Engine – is designed to enable a composer of the behavior of a responsive environment to specify not the moment-to-moment actions of the inhabitants of the space (for example, Louis-Philippe Demers and Bill Vorn's *Inferno*,[40] or of people riding an escalator), nor the moment-to-moment configuration of physical material + media, but the potential responsive behavior of the physical + media environment to any activity whatsoever in that environment.[41]

In the state space S from the description above, a trajectory σ[t] is a particular one-dimensional course of development or evolution of *M*. But this trajectory should be coordinated with and relative to a subject. Different subjects co-articulate different trajectories as they co-articulate an experience in *M*.

Now consider the dynamics, not the physical movements of bodies in physical time and space, but the evolution of states of affairs, in other words movement in S not *M*. The designer can freely define certain regions in state space S, associate them as desired with characterizing configurations – bundles of characteristic observables in the space of observables *C*. Then the designer can define how states in any region of states will tend to flow into other regions of state according to a latent field of tendencies. In the current implementation, the field of tendencies is automatically derived as a gradient on an energetic landscape defined by the composer. For example, the composer can declare that a certain

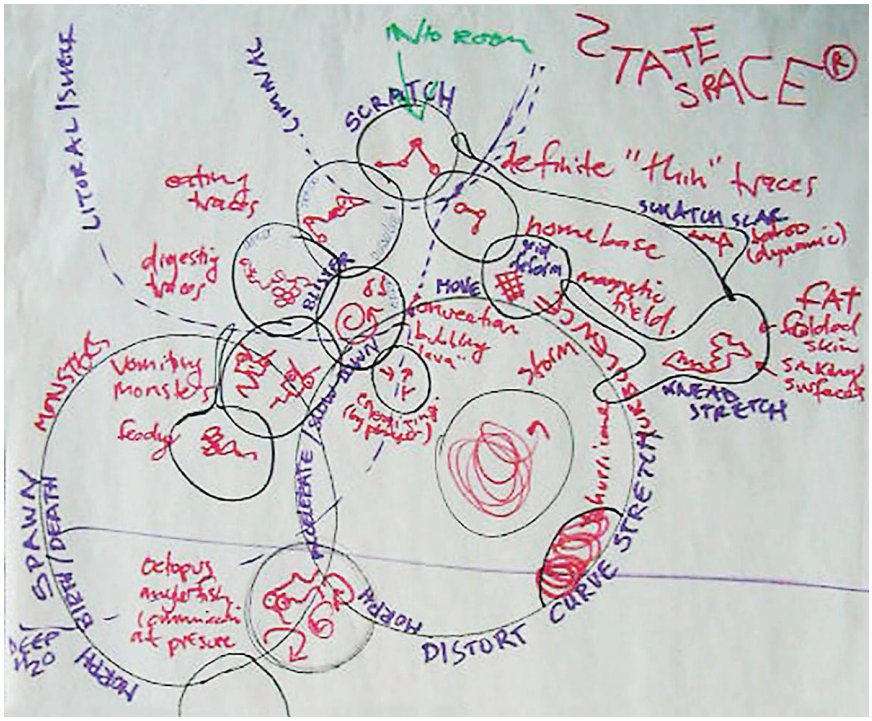


Fig. 1: Composer's metaphorical state space for a playspace event. Source: Synthesis Sponge, FoAM.

configuration, say a crowd of people gathered at the entry to a courtyard constitutes the "prologue" state to the occasion; whereas a single voice by the fountain in the center of the courtyard with a distribution of people around the perimeter of the courtyard constitutes an "aria" state; and a handful of rapidly moving entities with loud music constitutes a "dance" state ; and where people are milling about with loud conversation and medium volume music constitutes an "after-party" state.

The state evolution engine evolves its assessment of state by flowing it according to both observations *C* of the contingent situation of *M*, and according to the field of dynamical propensities defined by the composer's energetic landscape over the state space $\mathcal{S}$. Note that the composer does not specify specific sequences of actions or specific sequences of things or media to be placed. Note also that what we have described is not a single unidimensional narrative structure of so-called linear media (video, film, song), nor even a branching narrative ("interactive" game), but a continuum of possible states. Every particular person who enters into *M* will co-articulate with the environment and all the other inhabitants in co-present activity a specific experiential trajectory. This can be as directed, and as concrete as any linear narrative experience.[42]

However one key difference here is that the inhabitant is free to enact changes of state through a continuum of ad hoc or rehearsed activity. No matter what the inhabitant does, the environment will co-articulate ("respond") in concert, much as a swimming pool will ripple no matter how (and no matter how many) people move in its waters. (There is no syntax or schema according to which there is a type of movement to which the water will react, and others that the water will ignore; matter has no syntax checker.) Consider Bailly and Longo's negentropy – life-entropy (and in Stiegler's larger frame of neganthropology): they have defined a life-entropy whose negative is a measure of the never-decreasing richness of structure enabled by life's creation of order from order, which in my terms includes a sense-making in the more precise notions of sense provided by Deleuze and Voss.[43] Perhaps the most enabling aspects of this manner of composing the behavior of a responsive environment is to think of the design of the regional (not finite graph) topology of the state space dynamics as not determining but conditioning the implications of arbitrary activity. Longo and Pagni conclude their essay:

> We do not see DNA as activating developmental processes in general, but as a fundamental chemico-physical structure constraining and canalizing intracellular activity. Mutations and environmental effects could modify these constraining and inhibition capacities in the same respect as activation capacities. This view radically changes the perspective and stresses

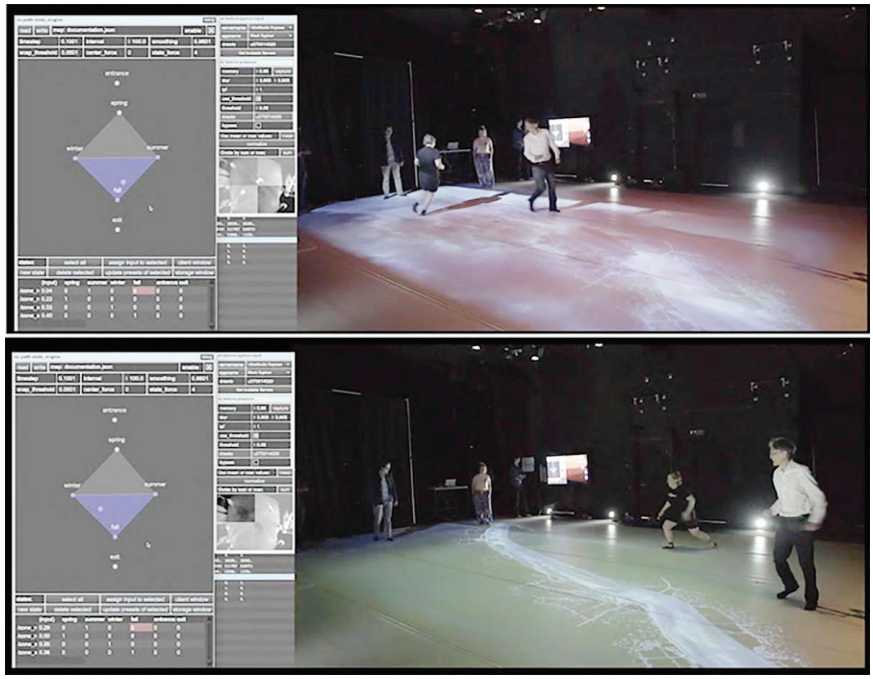


Fig. 2: State-engine playtest, crossing the river leading to state change. Source: "Synthesis State Engine Play Test," Matthews Center iStage, ASU (2019), Synthesis Center; available online at https://vimeo.com/synthesiscenter/stateengine. (used with permission)

> the role of DNA as constraint, in the wider sense that we should consider constraints in biology as fundamental, not just as 'border conditions' like in physics, since they guide or canalize the default state of life, which is activity.[44]

Transposing from phenotypic development to the development of an event, just as the DNA can be understood more properly not as a determining script but a constraint canalizing the organism's co-articulation with its ambient, we can regard the composer's state topology not as a fully deterministic script or ("computer") program for the event, but as a set of conditions canalizing any activities that co-articulate the occasion.

Why is this significant? The continuity and absence of a minimum threshold for an activity to be significant enables the possibility of arbitrarily fine actions that can evoke response, and thus engender sense. This accommodates and enables the dense metastability which is the sine qua non of living and life-affirming material process, and in particular, of a collective, ecosystemic, ethico-aesthetic improvisation of sense.

Notes

1 Sha Xin Wei, *Poiesis and Enchantment in Topological Matter* (Cambridge, MA: MIT Press, 2013), 90.

2 One could add "intentional," but as Maturana and Varela would say, ascription of intentionality (or any telos) depends on the point of view of the one who is making the ascription. "Behavior is not something that the living being does in itself (for in it there are only internal structural changes) but something that we point to." Humberto R. Maturana and Francisco J. Varela, *The Tree of Knowledge: The Biological Roots of Human Understanding* (New York: Random House, 1987), 138, and see generally the discussion in the section "Razors Edge," 129–38.

3 Alfred North Whitehead, *Process and Reality: An Essay in Cosmology*, ed. David Ray Griffin and Donald W. Sherburne, corrected edition (New York: The Free Press, 1978), 64.

4 This notion of play picks up from the final page of my *Poiesis and Enchantment in Topological Matter*:
What our play spaces could offer us are not allegories of other worlds, whether cosmological, political, religious, or psycho-fictive, but events affording playful processes that open life up to more life. Let me close by suggesting a few senses of play that may merit but also escape more careful consideration. There's the play of water lapping against the side of the boat, making the lazy slapping sound that evokes sunlight and fish in the clear water just beyond the reach of your fingers. There's the play, the empty space, between the teeth of interlocking gears, without which the entire assembly of gears would lock up; the teeth guarantee discrete synchrony, but it's the gap that allows movement to be born. And yet that gap is never a vacuum, because the world's structures are always and everywhere part of the substrate magma of the world. There's play in the sense of continuous, infinite-dimensional variation from any given trajectory, that articulates arbitrary degrees of novelty. And there's

play as the endless deferral of definition, a passionate sense making that develops ever more virtuosity in reenchanting the world. Sha, *Poiesis and Enchantment*, 267.

5 See Tian Wang, "A Brief History of Metabolism in Architecture," *Architizer,* April 14, 2022, https://architizer.com/blog/inspiration/stories/history-of-metabolism/.

6 Giuseppe Longo and Elena Pagni, "Extended Criticality and Structural Stability: 'Architectures' of Biological Individuation," *Philosophical Inquiries* 3, no. 2 (2015): 85–114, 88.

7 Ibid., original emphasis.

8 In particular, this makes my approach antithetical to schools of thought predicated on modular and synthetic a priori forms, such as the Metabolism architects in Japan. Christopher Alexander's "no two things alike" is not a formula whose execution would guarantee life-affirming architecture, but is a useful check. Any design-build process that is "canalized" as it individuates automatically yields "no two things alike" simply because of the contingency of the processes of individuation. Indeed, it is not deviation but perfect modular congruency that must be justified and incessantly, even psychotically maintained, against the ever-evolving contingent relations in world.

9 See Sha Xin Wei, "Replacing Thought by Algorithm, Gesture by Mechanism, Organism by Golem," in *European Graduate School Public Lectures*, Saas-Fee, Switzerland, 3 December 2018.

10 Gilbert Simondon, *On the Mode of Existence of Technical Objects*, trans. Cecile Malaspina and John Rogove (Minneapolis: Univocal, 2016).

11 Eleni Myrivili, "A 3-Part Plan to Take on Extreme Heat Waves," *TED Talks*, A New Era, Session 8: Regeneration (13 April 2022, Vancouver).

12 I thank Oana Suteu Khintirian for this observation, and for referring me to James D. Mauseth, *Botany: An Introduction to Plant Biology*, seventh ed. (Burlington: Jones & Bartlett Learning, 2021), 98.

13 Ibid., 105.

14 Ibid., 68.

15 Mauseth writes:
New membrane is synthesized in the ER and then transported by vesicles to growing organelles. Although organelles appear to be distinct entities when viewed by light or electron microscopy, they are actually highly interrelated by this membrane flow. All membranes of the cell, except the inner membranes of mitochondria and plastids, actually constitute just one extensive system, the endomembrane system.
Ibid., 69.

16 Robin Fleming opens an essay on the subject with this capsule summary of the archeological record:
Almost all the stone used in England before the Norman Conquest had been salvaged from abandoned Roman buildings; and this is as noticeable in naturally stone- rich regions (where people could have quarried new stone, if they had had a mind to) as it is in stone-poor ones. Indeed, it was unnecessary to quarry new stone in Britain for at least 600 years after Rome's fall, because so much worked stone was available from derelict Roman sites.
Fleming goes on to detail a type of incorporation that was not simply pragmatic but for ritually charged activity. Robin Fleming, "The Ritual Recycling of Roman Building Material in Late 4th- and Early 5th-Century Britain," *Post-Classical Archaeologies* 6 (2016): 147–70. See also Simon Barker, Penny Coombe, and Simona Perna, "Re-Use of Roman Stone in London City Walls," and related essays in *Roman Ornamental Stones in North-Western Europe: Natural Resources, Manufacturing, Supply, Life & After-Life*, ed. Catherine Coquelet et al. (Namur: Agence Wallonne du Patrimoine, 2018).

17 In their "Manifesto of Urban Cannibalism," (2013) Wietske Maas and Matteo Pasquinelli reject the "political correctness of urban ecology, the petty bourgeois ideology of urban gardens, the self-imposed siege of sustainable development, peak oil

catastrophism and many other current machines of biopolitical control." They cite Reza Negarestani: "any form of religion and politics that expresses and promotes horizontality is in fact the easiest to control and exploit by vertical structures of power. Any polytheism of nature will always be an easy prey of the monotheism of Nature." http://matteopasquinelli.com/accelerate-metrophagy.
However this is an animal-centric view. Plants are far from passive. The most basic anti-entropic form of life is the vegetal: unlike animals, plants do not have to eat – disintegrate their autopoietic modality – other life in order to live. Indeed they proliferate by enabling self and other's proliferation. And they are by far the most powerful anti-entropic processes on earth. And the vegetal is that metabolic which converts non-living energy, sunlight, into living energy.

18 Emanuele Coccia, *The Life of Plants: A Metaphysics of Mixture* (Medford, MA: Polity, 2019).

19 Ibid.

20 Mauseth, *Botany*, 299.

21 One of the twentieth century's great conceptual achievements was to follow the nineteenth-century invention of infinitely many inequivalent metrics (geometries) by a theory of shape, proximity, and transformation that requires no metric at all. Continuity can be defined without any metric, and just by its relation with open sets. See Xin Wei Sha, "Topology and Morphogenesis," *Theory, Culture and Society* 29, no. 4/5, Topologies of Multiplicity, ed. Celia Lury (2012): 220–46; Sha, *Poiesis and Enchantment*, 177.

22 Longo and Pagni, "Extended Criticality and Structural Stability," 90.

23 See, for example: Matt Bluemink, "Stiegler's Memory: Tertiary Retention and Temporal Objects," 3:AM Magazine, 23 January 2020; and Georgios Tsagdis, "Architectures of Thought: Negentropy, Metabolics and the General Ephemeral," *Footprint* 30, The Epiphylogenetic Turn and Architecture: In (Tertiary) Memory of Bernard Stiegler (Spring/Summer 2022): 31–44.

24 Francis Bailly and Giuseppe Longo, "Biological Organization and Anti-Entropy," *Journal of Biological Systems* 17, no. 1 (2009): 63–96, 87, emphasis added.

25 Claude E. Shannon, "A Mathematical Theory of Communication," *The Bell System Technical Journal* 27 (July and October 1948): 388.

26 For a lucid introduction to Bernard Stiegler's concept of epiphylogenesis mediated by our technologies which constitute a collective "impersonalized" exterior memory "of past world interactions that are preserved within the tools function," see Bluemink, "Stiegler's Memory."

27 Bailly and Longo, "Biological Organization and Anti-Entropy."

28 Giuseppe Longo and Maël Montévil, *Perspectives on Organisms: Biological Time, Symmetries and Singularities* (Heidelberg: Springer, 2014).

29 Given space limitations I simply refer to the deep beginning made by Timothy Allen and Thomas Hoekstra to reflexively account for how narratives and policies are constructed, by whom and to what effect within ecological discourse, in chapters 8 and 9 of their book *Toward a Unified Ecology* (New York: Columbia University Press, 2015).

30 For a definition of a manifold, see Sha, *Poiesis and Enchantment,* 185–86.

31 See for example, Meyer Sound's Constellation system: https://meyersound.com/product/constellation.

32 By human-sensible, I mean that it makes sense to a human; and by sense, I mean something that is added to a state of affairs that makes it appear differently, but is neither causal interaction nor an instance of propositional language. For a brief discussion of "sense" in Deleuzian terms, see Sha, "Adjacent Possibles: Indeterminacy and Ontogenesis," in *A Margin of Indetermination: Contingency and Plasticity in Everyday Technologies*, ed. Natasha Lushetich, Iain Campbell and Dominic Smith (Lanham:

Rowman and Littlefield, 2023 forthcoming). For an extended treatment of "sense" from a distinct but nonetheless processualist genealogy, see David Morris's extensive treatment in Merleau-Ponty's *Developmental Ontology* (Evanston: Northwestern University Press, 2018).

33 In this context of dynamics, the concept of criticality has nothing to do with political or analytic critique.

34 See Sha Xin Wei, "Whitehead's Poetical Mathematics," *Configurations* 13, no. 11, Special Issue on Whitehead, ed. Steven Meyer and Elizabeth Wilson (2005): 77–94; and Christopher Alexander's critical considerations of variously inadequate accounts of "emergence of form from the whole," including the principle of least action, in *The Process of Creating Life: The Nature of Order, an Essay on the Art of Building and the Nature of the Universe, Book 2* (Berkeley: Center for Environmental Structure, 2002), 35–48.

35 See Muriel Combes, *Gilbert Simondon and the Philosophy of the Transindividual: Technologies of Lived Abstraction* (Cambridge, MA: MIT Press, 2013).

36 Following Pascal Michon's reading of the pre-Socratics' *rhuthmos*, or Lucretius' swerve, one might argue that all matter has an irreducible indeterminacy. This aligns with Calude and Longo's distinction between randomness, which is always defined relative to a theory and a system of measurement, and noise, which lies outside any theory or empirical regularity. Cristian S. Calude and Giuseppe Longo, "Classical, Quantum and Biological Randomness as Relative Unpredictability," *Natural Computing* 15, no. 2 (2015): 263–278.

37 Strictly speaking, one does not need to say "small."

38 Stuart A. Kauffman, *A World Beyond Physics: The Emergence and Evolution of Life* (New York: Oxford University Press, 2019).

39 Longo and Pagni, "Extended Criticality and Structural Stability," 103, original emphasis.

40 See Louis-Philippe Demers and Bill Vorn's participatory robotic performance: "Inferno," 2015, https://vimeo.com/130670526.

41 See Brandon Mechtley, Julian Stein, Connor Rawls, and Sha Xin Wei, "SC: A Modular Software Suite for Composing Continuously-Evolving Responsive Environments," in *Living Architecture Systems Group White Papers*, ed. Philip Beesley, Sascha Hastings and Sarah Bonnemaison (Cambridge, Ontario: Riverside Architectural Press, 2019), 197–206.

42 See Sha Xin Wei, "Theater without Organs: Co-Articulating Gesture and Substrate in Responsive Environments," in *Living Architecture Systems Group White Papers*, ed. Philip Beesley and Ala Roushan, (Cambridge, Ontario: Riverside Architectural Press, 2016), 276–291.

43 Daniela Voss, "Deleuze's Rethinking of the Notion of Sense," *Deleuze Studies* 7, no. 1 (2013): 1–25, DOI: 10.3366/dls.2013.0092.

44 Longo and Pagni, "Extended Criticality and Structural Stability," 102.

Bibliography

Alexander, Christopher. *The Process of Creating Life: The Nature of Order, an Essay on the Art of Building and the Nature of the Universe, Book 2*. Berkeley: Center for Environmental Structure, 2002.

Allen, T. F. H. and T. W. Hoekstra. *Toward a Unified Ecology. Second edition*. New York: Columbia University Press, 2015.

Bailly, Francis, and Giuseppe Longo. "Biological Organization and Anti-Entropy." *Journal of Biological Systems* 17, no. 1 (2009): 63–96.

Barker, Simon, Penny Coombe, and Simona Perna. "Re-Use of Roman Stone in London City Walls." In *Roman Ornamental Stones in North-Western Europe: Natural Resources*, Manufacturing, Supply, Life & After-Life, edited by Catherine Coquelet, Guido Creemers, Roland Dreesen and Éric Goemaere. Namur: Agence Wallonne du Patrimoine, 2018.

Bluemink, Matt. "Stiegler's Memory: Tertiary Retention and Temporal Objects." *3:AM Magazine*. 23 January 2020.

Calude, Cristian S., and Giuseppe Longo. "Classical, Quantum and Biological Randomness as Relative Unpredictability." *Natural Computing* 15, no. 2 (2015): 263–278.

Coccia, Emanuele. *The Life of Plants: A Metaphysics of Mixture*. Translated by Dylan J. Montanari. Medford, MA: Polity, 2019.

Combes, Muriel. *Gilbert Simondon and the Philosophy of the Transindividual: Technologies of Lived Abstraction*. Translated by Thomas Lamarre. Cambridge: MIT Press, 2013.

Fleming, Robin. "The Ritual Recycling of Roman Building Material in Late 4th- and Early 5th-Century Britain." *Post-Classical Archaeologies* 6 (2016): 147–70.

Kauffman, Stuart A. *A World Beyond Physics: The Emergence and Evolution of Life.* New York: Oxford University Press, 2019.

Longo, Giuseppe, and Maël Montévil. *Perspectives on Organisms: Biological Time, Symmetries and Singularities.* Heidelberg: Springer, 2014.

Longo, Giuseppe, and Elena Pagni. "Extended Criticality and Structural Stability: 'Architectures' of Biological Individuation." *Philosophical Inquiry* 3, no. 2 (2015): 85–114.

Maturana, Humberto R., and Francisco J. Varela. *The Tree of Knowledge: The Biological Roots of Human Understanding*. New York: Random House, 1987.

Mauseth, James D. *Botany: An Introduction to Plant Biology. Seventh edition.* Burlington, MA: Jones & Bartlett Learning, 2021.

Mechtley, Brandon, Julian Stein, Connor Rawls, and Sha Xin Wei. "Sc: A Modular Software Suite for Composing Continuously-Evolving Responsive Environments." In *Living Architecture Systems Group White Papers*, edited by Philip Beesley, Sascha Hastings and Sarah Bonnemaison, 197–206. Cambridge, Ontario: Riverside Architectural Press, 2019.

Myrivili, Eleni. "A 3-Part Plan to Take on Extreme Heat Waves." *TED Talks*, A New Era | Session 8: Regeneration. 13 April 2022, Vancouver.

Morris, David. *Merleau-Ponty's Developmental Ontology*. Evanston: Northwestern University Press, 2018.

Sha Xin Wei. "Whitehead's Poetical Mathematics." *Configurations* 13, no. 11, Special Issue on Whitehead, edited by Steven Meyer and Elizabeth Wilson (2005): 77–94.

Sha Xin Wei. *Poiesis and Enchantment in Topological Matter*. Cambridge, MA: MIT Press: 2013.

Sha Xin Wei. "Theater without Organs: Co-Articulating Gesture and Substrate in Responsive Environments." In *Living Architecture Systems Group White Papers*, ed. Philip Beesley and Ala Roushan, 276–91. Cambridge, Ontario: Riverside Architectural Press, 2016.

Sha Xin Wei. "Topology and Morphogenesis." *Theory, Culture and Society* 29, no. 4/5, Topologies of Multiplicity, edited by Celia Lury (2012): 220–46.

Shannon, Claude E. "A Mathematical Theory of Communication." *The Bell System Technical Journal* 27 (July and October 1948): 379–423 and 623–56.

Simondon, Gilbert. *On the Mode of Existence of Technical Objects*. Translated by Cecile Malaspina and John Rogove. Minneapolis: Univocal , 2016.

Tsagdis, Georgios. "Architectures of Thought: Negentropy, Metabolics and the General Ephemeral." *Footprint 30, The Epiphylogenetic Turn and Architecture: In (Tertiary) Memory of Bernard Stiegler* (Spring/Summer 2022): 31–44.

Wang, Tian. "A Brief History of Metabolism in Architecture." *Architizer*. April 14, 2022. https://architizer.com/blog/inspiration/stories/history-of-metabolism/.

Alfred North Whitehead. *Process and Reality: An Essay in Cosmology*. Edited by David Ray Griffin and Donald W. Sherburne. Corrected edition. New York: The Free Press, 1978 [1929].

Wietske Maas and Matteo Pasquinelli. "Accelerate Metrophagy (Notes on the Manifesto of Urban Cannibalism)." *dismagazine*, dismagazine.com/dystopia/67349/manifesto-of-urban-cannibalism (2022).

Annotate This! Semiotization, Automation and the Recursive Causality of Images

Stavros Kousoulas and Andrej Radman

Unnatural Birth

It is common enough question: What is the human? Sure enough, it is also a question that has troubled some of the greatest minds to walk this planet. Nevertheless, one might wonder, is it really a good question in its own right? To show our allegiances from the outset, we categorically declare it an extremely bad question – in the sense of being unproductive. Like most "what is" questions, to ask "what is the human" cannot avoid but fall victim to an implicitly essential and reductionist definition of the human that would, in addition, aspire to remain eternal and unchangeable, a supposed one-size-fits-all account. However, many of those same "what is" thinkers have appraised the human as the greatest among animals, the one who possesses logic, the one who can adapt to anything that this harsh and cold existence throws at it. The contradiction becomes obvious then: how can there be a universally applicable and everlasting definition of the human if the human is the animal that can (supposedly) adapt and transform better than any other? To avoid this conflict, we propose to follow Gilles Deleuze (who, on this topic, followed Marcel Proust) and adopt what we can call *minor* questions: *when, where, how* and *for what purpose* is the human?[1] Such questions do not essentialize but rather impose an approach that demands to be returned to experience itself and therefore provide *plastic* – as in, transformable and open to revaluation – definitions.

When, where, how and for what purpose is the human then? We claim, following a specific line of thinkers who – despite their objections to this title – could be qualified as philosophers of technology, that the human is continuously

produced.[2] The production of the human – our beloved thinkers would probably agree on this to a greater or lesser extent – is fundamentally technological. To put it simply: technology makes the human (and not the other way around). This nonetheless begs the question: what do we refer to as technology? In equally straightforward terms, technology is literally any environmental manipulation, any attempt to transform the environment. In the very process of environmental transformations, technology is being born while also birthing the human: not as a biological entity but as one that has the capacity to remember and desire outside its body. In a very Stieglerian sense, the human is human because it can exteriorize its memory and its intentions, its tertiary retentions and protentions.[3] These processes of exteriorization can be understood under the terms of what Gilbert Simondon has called "technicity": how humans relate to and transform their environment through technology, and how these relations transform all of them in turn – humans, technology and environment.[4] Here we propose a twist: what we call human evolution is tightly connected not just to the technicities that produce the human but, crucially, to the degrees of automation that these technicities acquire.

Contrary to common belief, automation is not restricted to programming or computer science. As philosopher (of technology, no coincidence there) Benjamin Bratton proposes, the automation of labor-demanding processes needs to be transversally examined, and as such, to be extended horizontally and vertically on a planetary level that expresses its full complexity.[5] Think of the simplest of activities: flushing the toilet. A once laborious activity with an implied sequence of steps – taking a bucket, walking to the river, walking back home – is now automated and initiated by the push of a button. Even in breaking down the now-automated activity via the flush button, we find instances of proto-automations: what is a bucket but a technicity that automated the previous habit of bringing your palms together, creating the cavity where water (or any other liquid) could be gathered, drunk or transported. In terms that Simondon would use, and we will return to this again, the degree of automation in any given technicity highlights its capacity to restore the continuity of action.[6] To this we will add that in doing so, degrees of automations also alter our "response-ability."[7]

Tell us your relations, and we will tell you who you are!

The neologism "response-ability" aims to challenge the moralistic notion of responsibility in favor of a situated ethological and, consequently, ethical capacity to respond, which is inherently relational and, thus, pharmacological. Emphasizing activity as the irreducible grain of reality or the minimum unit of analysis acknowledges that life-affirming measures can only be found through minor or pragmatist inquiries – addressing questions of when, where, and especially how – to prevent

toxic relations. Technicity, in effect, constitutes evolution by means other than life, serving as a potent tool for defatalization.[8] It was clearly not our fate to shit where we eat, a situation that would literally have been toxic. But automating excrement disposal should not be limited to efficient causality. Regrettably, the scientific reason has progressively disregarded not only the "not-rigorous-enough" final and formal causes, but also neglected its "bedfellow", the material cause. The so-called digital turn has worsened the misguided belief in substrate-neutrality.[9] We just have to be reminded that the seemingly immaterial data cloud consumes an astonishing amount of energy.

Thinking ecologically means embracing the irreducibility and non-entailment of the four Aristotelian causes. As Nietzsche had proposed, we should stop separating the doer from the deed.[10] The automated flow of shit is as good an example as any of the profound ontogenetic entanglement of sense and sensibility, where the endo-referential and endo-consistent urban subject, as the *efficient* cause, both engenders and is engendered by the hydraulic *material* cause, the toilet as the *final* cause, and the *formal* cause of what we commonly refer to as hygiene in the exo-referential and exo-consistent sense. Values are not bestowed from the heavens; they are manufactured, much like toilet bowls.[11] They are immanently tied to the contingently obligatory state of the world and our continuously varying abilities to manipulate it. Crucially, such a recursive process of asignifying semiotization that skirts re-presentation invariably unfolds in a collective manner as it adheres to the complexity of problems rather than providing facile solutions.[12] After all, every problem has the solution that it "deserves" or "merits."

Reintroducing all four causes and destabilizing the hegemony of efficient causality – positioning it as one among others – proves to be a crucial move.[13] What the four causes do, even in the case of a toilet bowl, is that they underline (and provide a rough methodological bootstrap with which to approach) the contingent state of the cosmos: the world, in and because of its relationality, is indeterminate. Our proposed twist on the degree of automated technicities can now meet Simondon's requirement as to how one can understand the evolution of technological phyla. When Simondon claims that the progressive perfecting of machines, whereby we could say a machine's degree of technicity is raised, corresponds not only to an increase of automation, but also to the fact that the operation of a machine harbors a certain margin of indeterminacy, he is indeed claiming that it is this margin that allows the machine to be *sensitive* to outside information.[14] Let us rephrase then: degrees of automation alter our responseability precisely because their sensitivity can crucially determine the margin of our (us, the technologically produced species) sensitivity as well. The *pharmakon* works both ways: once sensitive to what occurs in a river where excrement was dumped daily, now sensitive to the scented sticks that make your bathroom "smell

good." Values – keep the river clean, keep your bathroom scented – are but the expression of an automated (de)sensitization. In other words, there are not just five senses, and their gradients are not fixed; there are as many (and as few), they *feel* as good and as bad, as a continuously techno-modulated and value-generative automation of our sensibilities.

Absolute Forms, Relative Acts

Before delving into the issue of annotation, as indicated by the chapter's title, we require an additional conceptual element, one sourced not from the realm of technology, but from the domain of biology. This perspective is offered by the philosopher Raymond Ruyer.[15] Ruyer concurs with the idea that the process of morphogenesis, or individuation in Simondonian terminology, cannot be adequately elucidated through the lens of efficient causality based on contiguity. In this regard, both Ruyer and Simondon follow Alfred North Whitehead, who famously dismissed the notion of "simple location," viewing it as a bias that overly favors self-presence and the tangible.[16] Ruyer proposes an alternative by suggesting that every process of a temporal, "horizontal" sequence, is complemented by a "vertical," trans-spatial and trans-temporal theme in the musical sense of the term. According to Ruyer, it is non-locality that holds the key, not only to the question of subjectivity but also to the problem of life itself.[17] To underscore the contingency of human sense and sensibility, which simultaneously represents both a conquest and a creation of space and time, Ruyer famously distinguishes between three distinct forms (as opposed to structures). These forms can be likened to melodic themes, and their repetition ("*ritornello*" in Deleuze and Guattari), either in their entirety or as variations dispersed throughout, guides their own development. Form I is a common thread among all living entities, involving self-sustaining, self-conducting, and self-enjoying activities – a domain of space. Form II, on the other hand, possesses a more "reflective" nature and is shaped through the evolution of perception and the development of sensorimotor diagrams – an aspect connected to the *Umwelt.* Finally, Form III is uniquely human, yet it should not be confused with the thesis of human exceptionalism. It pertains to a domain of subjectless subjectivity.[18] According to Ruyer, it "appears when utilitarian perception, which serves only as a signal or index of instinctive life in animals and in humans insofar as they lead an animal life, changes its role, and when the signal becomes a symbol, manipulable by itself, and detachable from every context of vital or immediate utility."[19] In our allegory, where isomorphism exists without resemblance, Form III marks the transition to an acquired response-ability for maintaining the cleanliness of the river and the pleasant aroma of the bathroom beyond immediate utility. As Brian Eno eloquently states, everything we don't have to do effectively qualifies as

culture: "We have to eat, but we don't have to have 'cuisines' .... We have to cover ourselves against the weather, but we don't have to be so concerned as we are about whether we put on Levi's or Yves Saint-Laurent. We have to move ..., but we don't have to dance. ... I call the 'have-to' activities functional and the 'don't have tos' stylistic. ... The first thing to note is that the whole bundle of stylistic activities is exactly what we would describe as 'a culture'."[20] Drawing from Ruyer's insights, one could argue that every living form is the unfolding of a virtual melodic theme. As "higher" forms evolve from "lower" ones, we observe a growing autonomy in the organization of both time and space. This process results in an increasing separation of subjectivity from morphogenetic formative activity, along with an enhanced independence of aesthetic forms from their vital context. Such a conceptual framework constitutes a mereotopology that challenges the dominance of step-by-step causation and *partes-extra-partes* mereology, all without reverting to vitalism. The rigid mechanistic if-then paradigm gives way to the dynamic what-if dance of value, and time ceases to be a mere measurement of movement. While it may be relatively straightforward to trace part-to-whole relations within actual aggregates, the mapping of multiplicities or "absolute forms" (defined as unities not contingent on totalities) remains the holy grail of automation in general, and machine learning in particular.[21]

An absolute form can be understood as a domain in constant formation, with an irreducible unity.[22] It is to be distinguished from a molar structure (an aggregate) by its having a non-dimensional or absolute survey of itself, which establishes non-localizable bonds between its constitutive components, while those components produce their own zone of overlapping indeterminacies.[23] For Ruyer, anything from a molecule to a virus, from an embryo to a brain and from consciousness to culture (which for Ruyer is an externalized technics) is an absolute form, while a molar structure would be the statistical aggregation (and distribution) of those forms.[24] Our point, in a nutshell, is that absolute forms *cannot* be annotated. Why so? The key lies in their first (and perhaps most crucial) characteristic: the capacity of absolute forms to perform an absolute survey. In his *Neofinalism*, Ruyer claims that one's own visual field is "surveyed" by one's consciousness without there ever being a need to position oneself at a distance from it.[25] In other words, as philosopher Daniel Smith summarizes, "the details of perception are not linked to each other through casual links, like the parts of a machine, but are grasped in the immediacy of an absolute time-survey and space-survey, independent of any supplementary dimension."[26] For Ruyer, consciousness is not to be confused with knowledge or the capacity thereof, but with a domain of absolute survey which, while it needs no extra dimensions cannot, by definition, procure any annotation: there is, simply, nothing that can be measured and pinpointed.

Ruyer will add another crucial element that ties to our argument: what is common to all absolute forms is a domain of absolute survey and *activity*.[27] While an absolute survey is, well, absolute, activity is always plus (at least) one: an organism *plus* its environment and in their activity an absolute form (what Simondon calls a vital individual) emerges that can, indeed, perform a survey of its enacting and enacted self, binding, in other words, action together with perception. Activity, by merit of being non-absolute, has the capacity to be memorized and be *potentially* detached. For Ruyer, absolute forms – from Form I to Form III – are differentiated according to the degree of the detachment of their memory, since, for example, an atom is pure uninterrupted activity that lacks a detachable memory, precisely because it has no need for one, never having to take up again the thread of its uninterrupted activity.[28] For us humble Form III humanoids, what is the toilet's flush button but the detached memory of an interrupted activity? And what is the degree of the automation implied in it but the expression of a more or less seamless restoration of the continuity of that activity? Our point, in more detail now, is that not only can absolute forms in their capacity for an absolute survey not be annotated, but the same applies to their activities, since they are always in indeterminate formation. Absolute forms are relational domains and not isolatable points or moments. In this sense, all that can be annotated is the (potentially detached and exteriorized) molar statistical aggregates of the memorization of an activity: the diameter of the button, the color of the piping system, the distance from the floor, the gap between one's feet. However, if that is so, then what is intelligent about artificial intelligence and what exactly does it automate in its endless demand and pursuit of exhaustive annotating?

Non-Statistical Intelligence

Let's address these questions one at a time. It is already clear that the early twenty-first century will be defined by the emergence of artificial intelligence and the ongoing exploration of the distinction between human and cybernetic intelligence. According to Catherine Malabou, until recently, we were in an era of weak artificial intelligence, because it appeared unable to compete with human intelligence.[29] However, it seems that we are now transitioning into an era of strong artificial intelligence, and this shift owes its existence to two recent inventions. The first is IBM's revolutionary neurosynaptic chip TrueNorth.[30] If we relate traditional Neumannian computers to left-brain-like fast symbolic number-crunching calculators, then TrueNorth can be compared to a slower right-brain-like sensory pattern recognition. It is constructed with different neural synaptic correlates that function autonomously and asynchronously, so that its inactive components remain dormant, resulting in significantly lower energy consumption. This chip's ability

to mimic the brain stems from its capacity to exhibit a certain degree of plasticity. It can vary its energy use based on its synapse-like connections, allowing the system to develop its own form of "experience." It's a chip with its own learning capabilities insofar as it can adapt to the context in which it operates.

The second ground-breaking invention is what is known as the recurrent artificial neural network. In simple terms, when these neural networks are sufficiently exposed to annotated images (for instance, "horse" or "not horse"), they autonomously identify additional images (of horses) and devise their own recognition rules as they function. This process is referred to as "deep learning," where neural networks acquire knowledge without explicit programming. It is thus safe to conclude that intelligence becomes truly intelligent through its plasticity. This in turn prompts a discussion about significant observables and the mapping of singularities that can be seen as the "memory of the future."[31] In other words, to what extent does the system asymptotically converge towards neofinality? The focus isn't on categorizing all types of entities under an essentialist concept like "horseness." Instead, it involves linking each singular concept or multiplicity (used as a noun) to the variables that define its individual transformative evolution or the *unlimited* process of ethico-aesthetic (asignifying) semiosis.[32] It becomes evident that the depth of deep learning relies on the absolute surface in Ruyerian terms. Therefore it should not be surprising that until now, deep learning has heavily depended on human (neofinalist) activity, particularly involving precarious and secretive human labor. To quote an industry insider:

> You might miss this if you believe AI is a brilliant, thinking machine. But if you pull back the curtain even a little, it looks more familiar, the latest iteration of a particularly Silicon Valley division of labor, in which the futuristic gleam of new technologies hides a sprawling manufacturing apparatus and the people who make it run.[33]

As the saying goes, "it's only fools and horses that work," not AI. While a responseable annotator can grasp the concept of "horse" with just a few examples, machine-learning programs require thousands of examples. These examples must be (pre)categorized with perfect consistency, yet contain sufficient variation (black horses, white horses, racehorses, working horses, painted horses, etc.) to enable the highly literal (or should we say, literary?) system to handle the diversity and unpredictability of the ever-changing world.[34] As Deleuze and Guattari put it, "the concept speaks the event, not the essence of the thing."[35] To quote Ruyer, "the horse is not material organic tissue *plus* the Idea of Horse! The horse is a horse because it 'horses'."[36] This is what we refer to as the extra-propositional "sense," as exemplified in the infinitive "to horse," itself a trans-spatial and trans-temporal theme.[37]

Still Life

What, then, does artificial intelligence automate? In the most straightforward manner, we claim that artificial intelligence automates perception, but to achieve that, it needs to rely first on a perception that is separated from action. That perception, no longer tied to action, needs a different name altogether. Let us unpack this claim, while also devising a name for it. To account for a perception that can (potentially) be separated from action, we need to, counterintuitively, destabilize perception itself, and to achieve such a destabilizing move, we turn again to none other than Simondon. This time, we will rely on a part of his work that has only recently started to gain traction: his provocative understanding of images.[38] Recently published in English, Simondon's work on images is part of a seminar he taught at the Sorbonne during 1965–66. What makes his theory so fitting is that, especially after his work on individuation, information and technical objects, his approach to images finds him at perhaps the most mature (and most radical) moment of his unfortunately limited academic output. Simondon wishes to provide an account of a genetic unity between distinct phases of individuation that are bound together by the transductive dynamism of the image.[39] At the core of his concerns is precisely the problem of the relation of imagination and invention to perception itself; he addresses this concern by making clear that if we account for the evolutivity and the genetic character of the image, then we cannot but admit that *images precede perception*. To be precise, Simondon claims that perception and imagination cannot be separated; on the contrary, one must think them together, without, however, confusing them.[40] As he claims, "the capacity to perceive is hardly distant from the force of imagining," and it is his careful choice of words that makes all the difference here: perception is a capacity whose potentiality depends on an imaging force.[41] For Simondon, the potential of perceiving and the genetic force of imagi(ni)ng are tied together in the *a praesenti* of activity itself. As philosopher Jean-Yves Chateau writes in the preface of the English translation of *Imagination and Invention*:

> Perception and, generally, behaviors of *reaction* to the milieu are not primary; it is the *spontaneous* motor behaviors that are primitive, which one misrecognizes when perception is made to be an exclusive, *sui generis* essence of any influence of the imagination and, more originary, of all motor spontaneity: images do not first come from antecedent perceptions, and the worry of confounding them with perception is not decisive in defining them; they come from spontaneous movements – and as for their relation to perception: they precede it and inform it.[42]

To understand this, we need to briefly examine the four different phases of the cyclical (and independent) life of images. What makes the image to be of such great interest for Simondon is its peculiar (and as such, transductive) in-betweenness: both objective and subjective, abstract and specific, of the world and of the self.[43] Far from being confused with their representational or annotational modes alone, images can be first approached in terms of their relation with time: there are images that are turned towards the past – or what we can call memory; there are also those images that constitute a rapport with the future – in the sense of anticipating, desiring, inventing; and there are images that are of and act in the present – these are the images that Simondon relates directly to perception.[44] All these different temporalities do not imply different images, and this is a crucial point for Simondon: there is but one single activity, *imaging*, undergoing a developmental process and the different stages that correspond to it.[45] For Simondon, much like for Ruyer, activity has primacy over consciousness and perception. Or, to be true to our Ruyerian origins, activity is consciousness and perception, as this is precisely the point Ruyer is trying to make through his account of the progressive differentiation between Forms I, II and III. Therefore, for Simondon, the first images "are not conscious ... since they precede perception (the reception of signals coming from the milieu), they are motor, linked to the most simple behaviors through which the living take possession of the milieu and proceed to the first identification of the (living or non-living) objects they encounter."[46] Far from being confused with any representational fixation, the primitive motor images have no other content than movement itself: they are autokinetic and non-finalized.[47] It is this dimension of motricity and movement that constitutes the first phase of images, what we can call a motor-image. Through and in movement, experience registers its own "being experienced," leading to what Simondon identifies as the second phase of imagistic life, that of perception. As a result of perceiving, images are organized and systematized, allowing therefore the exercise of capacities we associate with consciousness – or, Form III – such as remembering and anticipating. In other words, through the a praesenti of the activity of movement, the potential of an a priori (memory, the past) and an a posteriori (the future one longs for) is produced. These three phases constitute the life of the image that, by simplifying, we can claim belongs to the relationship between the individual and the environment proper: movement/space (Form I), perception/Umwelt (Form II), consciousness/nomadic subject (Form III). It is at this exact point that Simondon introduces a fourth phase, capable of being a germinal pharmakon that can either allow the cycle of images to progressively differentiate in a heterogeneous manner by repeating itself while differing, or it can simply fold upon itself, remain rigid, impenetrable, and simply recycle itself to a homogeneous exhaustion. This final phase, the inventive phase of the object-image is precisely what machine learning attempts to automate.

If the tensions between movement, perception and the conscious systematization of both cannot be resolved through bodily dispositions alone, then, Simondon claims, the need arises for a heterogeneous mediator,[48] or in terms that avoid the dangers of mediation, a transductor arises. Think of the toilet flush, the bucket or the scented candle of our previous examples, as well as the degrees of automation each implies. In all of these cases, as media theorist Aurora Hoel would claim,

> object images allow the human being to handle phenomena from extremely disparate orders of magnitude (the very small, large, heavy, hot, cold, toxic, corrosive, etc.) as if these phenomena belonged to an order homogeneous to its own. The introduction of an object image (say, a lever) induces an inventive phase shift in the human-world system by initiating a new middle-order regime of reality in which a new readiness for action comes to prevail: equipped with a lever, the human being can lift loads many times its own weight. In addition to tools and machines, Simondon's list of object images includes artworks, monuments, clothing fashions, and proverbs in language. Indeed, by his lights, all created objects or artifacts are to some extent adaptive mediators.[49]

The germinal effect of object-images is that in their transductive potential of resolving disparate tensions between different orders of magnitude, they effectively restore the continuity of activity that has been interrupted. In doing so, object-images restore movement (albeit differentiated), and in restoring movement, they are bootstrapping the imagistic cycle once again (albeit differentiated): a transductive object-image that alters motricity and therefore leads to novel perceptions (remember our discussion on senses and their dependence on the automation of our sensibilities), leading to eventually differentiated systematizations of past and future values. In addition, by dint of their detachability, object-images can be circulated, shared, communicated and transmitted to a radically broader extent, so much so that it would demand the development of a plethora of sciences (those that can be called generic, major or royal) that deal precisely with that: how one can study and optimize the circulation of object-images, from early Enlightenment encyclopedias to endless typologies in architecture. It is these generic sciences that find their ultimate (automated) apotheosis in contemporary artificial intelligence, albeit with a crucial twist.

The breaking of the imagistic cycle that artificial intelligence induces by exhaustingly annotating object-images effectively disables their transductive capacities, in the sense that it deprives them of any indeterminacy. Remember Simondon's claim that the degree of any technicity is raised when automation

leads to an increase of sensitivity to indeterminacy, to outside information, and subsequently that a rise in degrees of indeterminacy allows our sensitivity to be modulated. The thousands upon thousands of heavy, underpaid, human labor hours of annotating literally every object-image that can be of (commercial) interest, make those object-images so determined but also so dependent simply on each other, that new rules emerge in order to sustain a now annotative (and not imagistic) cycle. Due to the demands of the annotative cycle, motricity, perception and temporal systematization are completely cut off: movement and activity are of no interest, besides the activity implied in annotation itself. In the emerging regime of imagistic alienation, not only does the horse never horse but, almost by definition, there is no interest in any invention other than those that restore the continuity of annotative activity.

The Ratcheting of Transindividuation

It should not be surprising that ChatGPT exhibits human-like qualities, given that it was trained by an AI that mimicked humans, who in turn were evaluating an AI that imitated humans pretending to be an improved version of an AI trained on human writing.[50] Unfortunately, the circuitous technique known as "reinforcement learning from human feedback" (RLFH) inherently limits the output to statistical aggregates, cut off from eventful forms. The profound axiological implication can be summed up in the adage "no invention, no transindividuation," and vice versa. Novel norms and values (sense) do not emerge *between* fully formed individuals; rather, they emerge *through* them. By harnessing the spiraling and ratcheting process of imag(in)ing, the transindividual relation bypasses the existing individual and collective reticulations. To genuinely think differently, one must first feel differently, and this is accomplished exclusively by transforming and acting upon life, not by representing it.[51] In his treatise on attention, the Simondonian scholar Yves Citton refers to Bernard Aspe's astute description of the "transindividual":

> It is only in a community that emotion can take place as such. And the fact that it can take place signifies that it can be extended in an *action* on the world. Emotion does not call for an outpouring, but an overturning of individuated structures, which can only be performed communally. ... The transindividual relation passes through individuals, incorporating them into a reality that is larger than them: a system of resonance. Before individuals, there is the preindividual; but beyond, there is the system of resonance. It is when it gives rise to a particular consistence that the transindividual relation configures itself as it gives birth to this new being: the group of interiority, or the *transindividual collective*. This can be understood as a

> 'unified system of reciprocal beings', and it is this reciprocity that enables the resonance effect. ... The paradigm of the transindividual collective for Simondon is the group of researchers or rather inventors – because it is in invention that the transindividual relation best reveals its fecundity.[52]

In simpler terms, communities have no teleology. They lack a predetermined purpose but derive sense from their coupling with an (indeterminate) environment.[53] Affectivity therefore takes precedence over perception: "perception always presupposes a certain unity of a perceiving subject, whereas affectivity is a transductive operation, which constantly changes and is changed both by internal impulses and external sensations."[54] Inventiveness is contingent upon the creation of images that transduce anticipation, perception, and (over)saturated memory, much like Whitehead's concept of "non-bifurcated experience."[55] This process, akin to what Deleuze describes as dramatization, involves adopting an artificial or constructivist attitude where the resultant state of metastability becomes a necessary condition for the ontogenetic cycle of imag(in)ing to start anew.[56] Put more straightforwardly, dramatization serves as the antidote not only to optimization, but also to the "bifurcation of nature" that Alfred North Whitehead denounced as the most serious error of modern Western thought.[57] Residing within the non-apodictic realm of metastability entails operating far from equilibrium, where the boundary between facts and values is far from clear-cut, and where resingularization may occur. The radical empiricist (organicist) conception of sense and sensibility simply defies mechanicism, substantialism and hylomorphism. Instead, it adheres to immanent causality or absolute form, which is not linear but recursive.[58] As a result, any strenuous attempts to reduce the (ineffable and incomputable) event of worlding through imag(in)ing and imag(in)ing through worlding condemns us to what Antoinette Rouvroy, an authority on algorithmic governmentality, describes as acquiescence to a transcendental platitude.[59] To guard against the allure of clichés disguised as truths, we conclude with her cautionary list. Ultimately, the value of interesting theories lies in their capacity to challenge essentialist ideas about the world.[60] Print it, read it, and commit it to memory to avoid succumbing to the temptation of reductionism and ceaseless annotation that merely offers a facile capture of thinking.[61] We ought to stop...

> - reducing singularities (or processes of individuation or subjectification) to particularities (the detected or inferred infra-individual attributes or supra-individual patterns that are the grips of subjection of machinic enslavement in semiocapitalism);
> - reducing the status of citizens to that of consumer-user;
> - reducing politics to the juxtaposition of individual interests;

- reducing the commons to the juxtaposition of sectorial logics;
- reducing "the people that are missing" to present political representation;
- reducing the future to the optimization of the state of affairs;
- reducing the virtual to "real time";
- reducing social justice to post-actuarial calculation;
- reducing justice to law;
- reducing hermeneutics to digital seismography;
- reducing imagination and creation to innovation;
- reducing foresight to the extrapolation of past trends;
- reducing work to employment;
- reducing the plasticity and alterability of life to the execution of a genetic programme;
- reducing life to flows of digital information;
- reducing the human person to the sum of his or her digital records and interactions;
- reducing the public to the audience;
- reducing "right measure" to high-resolution;
- reducing people to their behaviour;
- reducing existence to pure presence;
- reducing singularities to symptoms, and so on.[62]

Notes

1 Gilles Deleuze, *Proust and Signs: The Complete Texts, trans*. Richard Howard (Minneapolis: University of Minnesota Press, 2000).
2 Gilbert Simondon, André Leroi-Gourhan and Bernard Stiegler are good company, and good to think with.
3 Bernard Stiegler, *Technics and Time 1: The Fault of Epimetheus*, trans. Richard Beardsworth and George Collins (Stanford: University Press, 1998).
4 Gilbert Simondon, *On the Mode of Existence of Technical Objects*, trans. Cecile Malaspina and John Rogove (Minneapolis: Univocal, 2017); cf. Stavros Kousoulas, *Architectural Technicities* (London and New York: Routledge, 2022).
5 Benjamin H. Bratton, *Terraforming* (Moscow: Strelka, 2019).
6 Emilien Dereclenne, "Simondon and Enaction: The Articulation of Life, Subjectivity, and Technics," *Adaptive Behaviour* 29, no. 5 (2021).
7 Donna J. Haraway, *Staying with the Trouble: Making Kin with the Chthulucene* (Durham NC: Duke University Press, 2016), 29.
8 'Defatalisation' serves as an antidote to determinism. See: Andrej Radman and Robert A. Gorny, "From Epiphylogenesis to Generalised Organology," *Footprint* 16, no.1 (Issue 30, ed. R.A. Gorny and A. Radman) (2022): 3–19, https://doi.org/10.7480/footprint.16.1.6291.
9 Friedrich A. Kittler, "There is no Software," in *Literature, Media, Information Systems*, ed. J. Johnston (London: Routledge, 1997), 147–155.
10 In Nietzsche's words: "For just as common people separate the lightning from its flash

and take the latter as a doing, as an effect of a subject called lightning, so popular morality also separates strength from the expressions of strength as if there were behind the strong an indifferent substratum that is free to express strength – or not to. But there is no such substratum; there is no "being" behind the doing, effecting, becoming; "the doer" is simply fabricated into the doing – the doing is everything." Friedrich Nietzsche, *On the Genealogy of Morality: A Polemic*, trans. Maudemarie Clark and Alan J. Swensen (Indianapolis: Hackett Publishing Company, Inc., 1998 [1887]), 25.

11 Žižek compares the design of three distinct European toilet bowls, transcending purely utilitarian considerations, so as to elucidate three different existential attitudes: German reflective thoroughness, French revolutionary hastiness and English utilitarian pragmatism: "In political terms, this triad can be read as German conservatism, French revolutionary radicalism, and English liberalism. ... The point about toilets is that they enable us not only to discern this triad in the most intimate domain, but also to identify its underlying mechanism in the three different attitudes towards excremental excess: an ambiguous contemplative fascination; a wish to get rid of it as fast as possible; a pragmatic decision to treat it as ordinary and dispose of it in an appropriate way." Slavoj Žižek, *The Plague of Fantasies* (London: Verso, 2008), 3–4.

12 Rem Koolhaas, "?" in AMO and Rem Koolhaas, Countryside: A Report (Cologne: Taschen, 2020), 324–351.

13 Alicia Juarrero, *Context Changes Everything: How Constraints Create Coherence* (Cambridge, MA: MIT Press, 2023).

14 Simondon, *On the Mode of Existence*, 17.

15 Ronald Bogue, *Deleuze on Music, Painting, and the Arts* (London: Routledge, 2013), 62–66.

16 Alfred North Whitehead, *Science and the Modern World* (New York: Pelican Mentor Books, 1948), 50.

17 Raymond Ruyer, *Neofinalism*, trans. Alyosha Edlebi (Minneapolis: Minnesota University Press, 2016), 94.

18 Paul Bains, "Subjectless Subjectivities," in *A Shock to Thought: Expression After Deleuze and Guattari*, ed. Brian Massumi (London: Routledge, 2002).

19 Raymond Ruyer, *The Genesis of Living Forms*, trans. Jon Roffe and Nicholas B. de Weydenthal (London: Rowman & Littlefield, 2019), 149.

20 Brian Eno, "Culture," in *A Year with Swollen Appendices* (London: Faber and Faber, 1996), 317).

21 Ruyer breaks from the hegemony of both mechanism and vitalism, neither of which really understands the nature of desiring machines in Deleuze and Guattari's terms. The difference between the two organising principles – mechanicism as a whole derived from the parts, and vitalism as an "original" whole from which the parts emanate – cannot be resolved by some dialectical totalisation.

22 Daniel W. Smith, "Raymond Ruyer and the Metaphysics of Absolute Forms", *Parrhesia* 27 (2017): 119.

23 Ibid., 119.

24 Ibid.

25 Ruyer, *Neofinalism*, 97.

26 Smith, "Raymond Ruyer and the Metaphysics of Absolute Forms", 123.

27 Ibid, 162.

28 Ibid, 152.

29 Catherine Malabou, *Morphing Intelligence: From IQ measurement to artificial brains, trans. Carolyn Shread* (New York: Columbia University Press, 2019), 87.

30 Dharmendra S. Modha, the founder of IBM's Computing Group at IBM Research, and his team developed the first cognitive chip in 2011. Their ambition was to create low-power electronic neuromorphic computers capable of scaling to biological levels.

This chip comprises 4096 neurosynaptic cores, designed to mimic the structure of the human brain. See: Malabou, *Morphing Intelligence*, 85.

31 Sanford Kwinter, "Radical Anamnesis (Mourning the Future)," in *Far From Equilibrium: Essays on Technology and Design Culture* (Barcelona: Actar, 2008), 142.

32 Gilles Deleuze, *Negotiations*, 1972–1990, trans. Martin Joughin (New York: Columbia University Press, 1995 [1990]), 31; cf. Andrej Radman and D. Hauptmann, "Asignifying Semiotics as Proto-Theory of Singularity: Drawing is Not Writing and Architecture does Not Speak," *Footprint 8*, no. 1 (Issue 14, ed. D. Hauptmann and A. Radman) (2014): 1–12.

33 Josh Dzieza, "AI Is a Lot of Work: As the technology becomes ubiquitous, a vast tasker underclass is emerging – and not going anywhere," *Intelligencer* (June 20, 2023), https://nymag.com/intelligencer/article/ai-artificial-intelligence-humans-technology-business-factory.html.

34 Affect theory effectively merges Simondonian mechanology and Ruyerian organology. Hence, Deleuze and Guattari assert that there are greater differences between a work-horse and a racehorse than between an ox and a work-horse. This is because neither the racehorse nor the work-horse has the same affects or the same capacity for being affected; the work-horse has more affects in common with the ox. See: Gilles Deleuze, *Spinoza, Practical Philosophy*, trans. Robert Hurley (San Francisco: City Lights Books, 1988 [1970]), 124.

35 Gilles Deleuze and Félix Guattari, *What Is Philosophy?*, trans. Hugh Tomlinson and Graham Burchell (New York: Columbia University Press, 1994 [1991]).

36 Ruyer, *The Genesis of Living Forms*, 164 (emphasis in the original).

37 In the words of a contemporary Ruyerian: "Univocal, semiotic reality – the reality of experience – is not reducible to the mind's own workings (e.g., as in the Kantian synthesis) nor is it to that of a prejacent external physical world in which the mind has no part. It is a limitless interface where the line between what is and what is not, independent of interpretative activity, is a constantly shifting semiotic process." Paul Bains, T*he Primacy of Semiosis: An Ontology of Relations* (Toronto: University of Toronto Press, 2006), 68.

38 Gilbert Simondon, *Imagination and Invention*, trans. Joe Hughes and Christophe Wall-Romana (Minneapolis: Minnesota University Press, 2022).

39 Simondon, *Imagination and Invention*, xii.

40 Ibid., xvii.

41 Ibid., xviii.

42 Ibid., xxvi

43 Ibid., xxiii.

44 Ibid.

45 Ibid.

46 Ibid. xxvi.

47 Ibid.

48 Aurora Hoel, "Technicity and the Virtual," *Humanities* 11, no. 135 (2022): 135.

49 Ibid., 135.

50 Dzieza, "AI Is a Lot of Work".

51 Claire Colebrook, *Understanding Deleuze* (Crows Nest: Allen & Unwin, 2002), xxiv.

52 Bernard Aspe, "Simondon et l'invention du transindividuel" (Simondon and the invention of the transindividual), *La Revue des Livres* no. 12 (July–August 2013): 78, cited in Yves Citton, T*he Ecology of Attention*, trans. Barnaby Norman (Cambridge: Polity Press, 2017), 94.

53 Audronė Žukauskaitė, *Organism-Oriented Ontology* (Edinburgh: University Press, 2023), 7.

54 Ibid., 32

55 Tony D. Sampson, "Nonconscious Affect: Cognitive, Embodied, or Non-bifurcated

Experience?" in *The Affect Theory Reader 2: Worldings, Tensions, Futures,* ed. Gregory J. Seigworth and Carolyn Pedwell (Durham, NC: Duke University Press, 2023), 311.

56 Ibid., 100; cf. Didier Debaise, "The Dramatic Power of Events: The Function of Method in Deleuze's Philosophy," trans. Alex Feldman, *Deleuze Studies* 10, no. 1 (2016): 5–18.

57 The division between primary and secondary qualities, nature, and culture, etc. See: Alfred North Whitehead, *The Concept of Nature* (Ann Arbor: Ann Arbor Books, 1957 [1920]), 26–48.

58 Yuk Hui, *Recursivity and Contingency* (New York: Rowman and Littlefield, 2019).

59 Antoinette Rouvroy, "Re-Imagining a 'We' Beyond the Gathering of Reductions: Propositions for the Three Ecologies," interview by Lila Athanasiadou and Goda Klumbyte, *Footprint 16,* no. 1 (Issue 30, ed. R.A. Gorny and A. Radman) (2022): 129.

60 Murray S. Davis, "That's Interesting: Towards a Phenomenology of Sociology and a Sociology of Phenomenology," *Philosophy of the Social Sciences* 1, no. 4 (Dec. 1971): 309–344.

61 Sampson, "Nonconscious Affect", 303.

62 Rouvroy, "Re-Imagining a 'We' Beyond the Gathering of Reductions', 129.

Bibliography

Aspe, Bernard. "Simondon et l'invention du transindividuel" (Simondon and the invention of the transindividual). *La Revue des Livres no. 12* (July–August 2013).

Bains, Paul. "Subjectless Subjectivities." In *A Shock to Thought: Expression After Deleuze and Guattari*, ed. Brian Massumi. London: Routledge, 2002, 101–116.

Bains, Paul. *The Primacy of Semiosis: An Ontology of Relations*. Toronto: University of Toronto Press, 2006).

Bogue, Ronald. *Deleuze on Music, Painting, and the Arts*. London: Routledge, 2013, 62–66.

Bratton, Benjamin H. *Terraforming*. Moscow: Strelka, 2019.

Citton, Yves. *The Ecology of Attention*, trans. Barnaby Norman. Cambridge: Polity Press, 2017).

Colebrook, Claire. *Understanding Deleuze*. Crows Nest: Allen & Unwin, 2002.

Davis, Murray S. "That's Interesting: Towards a Phenomenology of Sociology and a Sociology of Phenomenology." *Philosophy of the Social Sciences* 1, no. 4 (Dec. 1971): 309–344.

Debaise, Didier. "The Dramatic Power of Events: The Function of Method in Deleuze's Philosophy," trans. Alex Feldman. *Deleuze Studies* 10, no. 1 (2016): 5–18.

Deleuze, Gilles and Félix Guattari. *What Is Philosophy?*, trans. Hugh Tomlinson and Graham Burchell. New York: Columbia University Press, 1994 [1991].

Deleuze, Gilles. *Negotiations, 1972–1990*, trans. Martin Joughin. New York: Columbia University Press, 1995 [1990].

Deleuze, Gilles. *Proust and Signs: The Complete Texts, trans. Richard Howard*. Minneapolis: University of Minnesota Press, 2000.

Deleuze, Gilles. Spinoza, *Practical Philosophy*, trans. Robert Hurley. San Francisco: City Lights Books, 1988 [1970].

Dereclenne, Emilien. "Simondon and Enaction: The Articulation of Life, Subjectivity, and Technics," *Adaptive Behaviour* 29, no. 5 (2021): 449–458.

Dzieza, Josh. "AI Is a Lot of Work: As the technology becomes ubiquitous, a vast tasker underclass is emerging – and not going anywhere." *Intelligencer* (June 20, 2023), https://nymag.com/intelligencer/article/ai-artificial-intelligence-humans-technology-business-factory.html.

Eno, Brian. "Culture." In *A Year with Swollen Appendices*. London: Faber and Faber, 1996, 317–321.

Haraway, Donna J. *Staying with the Trouble: Making Kin with the Chthulucene*. Durham NC: Duke University Press, 2016.

Hoel, Aurora. "Technicity and the Virtual." *Humanities* 11, no. 135 (2022).

Hui, Yuk. *Recursivity and Contingency*. New York: Rowman and Littlefield, 2019.

Juarrero, Alicia. *Context Changes Everything: How Constraints Create Coherence*. Cambridge, MA: MIT Press, 2023.

Kittler, Friedrich A. "There is no Software." In *Literature, Media, Information Systems*, ed. J. Johnston. London: Routledge, 1997, 147–155.

Koolhaas, Rem. "?." In *AMO and Rem Koolhaas, Countryside: A Report.* Cologne: Taschen, 2020, 324–351.

Kousoulas, Stavros. *Architectural Technicities*. London and New York: Routledge, 2022.

Kwinter, Sanford. "Radical Anamnesis (Mourning the Future)." In *Far From Equilibrium: Essays on Technology and Design Culture*. Barcelona: Actar, 2008, 140–142.

Malabou, Catherine. *Morphing Intelligence*: *From IQ Measurement to Artificial Brains*, trans. Carolyn Shread. New York: Columbia University Press, 2019).

Nietzsche, Friedrich. *On the Genealogy of Morality: A Polemic*, trans. Maudemarie Clark and Alan J. Swensen. Indianapolis: Hackett Publishing Company, Inc., 1998 [1887].

Radman, Andrej and D. Hauptmann. "Asignifying Semiotics as Proto-Theory of Singularity: Drawing is Not Writing and Architecture does Not Speak," *Footprint 8*, no. 1 (Issue 14, ed. D. Hauptmann and A. Radman) (2014): 1–12.

Radman, Andrej and Robert A. Gorny. "From Epiphylogenesis to Generalised Organology," *Footprint 16,* no.1 (Issue 30, ed. R.A. Gorny and A. Radman) (2022): 3–19, https://doi.org/10.7480/footprint.16.1.6291.

Rouvroy, Antoinette. "Re-Imagining a 'We' Beyond the Gathering of Reductions: Propositions for the Three Ecologies." Interview by Lila Athanasiadou and Goda Klumbyte, *Footprint 16*, no. 1 (Issue 30, ed. R.A. Gorny and A. Radman) (2022): 121–134.

Ruyer, Raymond. *Neofinalism*, trans. Alyosha Edlebi. Minneapolis: Minnesota University Press, 2016.

Ruyer, Raymond. *The Genesis of Living Forms*, trans. Jon Roffe and Nicholas B. de Weydenthal. London: Rowman & Littlefield, 2019.

Sampson, Tony D. "Nonconscious Affect: Cognitive, Embodied, or Non-bifurcated Experience?." In *The Affect Theory Reader 2: Worldings, Tensions*, Futures, ed. Gregory J. Seigworth and Carolyn Pedwell. Durham, NC: Duke University Press, 2023), 295–314.

Simondon, Gilbert. *Imagination and Invention*, trans. Joe Hughes and Christophe Wall-Romana. Minneapolis: Minnesota University Press, 2022.

Simondon, Gilbert. *On the Mode of Existence of Technical Objects*, trans. Cecile Malaspina and John Rogove. Minneapolis: Univocal, 2017.

Smith, Daniel W. "Raymond Ruyer and the Metaphysics of Absolute Forms", *Parrhesia* 27 (2017): 116–128.

Stiegler, Bernard. *Technics and Time 1: The Fault of Epimetheus*, trans. Richard Beardsworth and George Collins. Stanford: University Press, 1998.

Whitehead, Alfred North, *The Concept of Nature*. Ann Arbor: Ann Arbor Books, 1957 [1920].

Whitehead, Alfred North. *Science and the Modern World*. New York: Pelican Mentor Books, 1948.

Žižek, Slavoj. *The Plague of Fantasies*. London: Verso, 2008.

Žukauskaitė, Audronė. *Organism-Oriented Ontology*. Edinburgh: University Press, 2023.

PART III
Onto/Genetic Technicities

Agropleasure in Demonic Grounds: On Resistance Across Gardens

Agnieszka Anna Wołodźko

This chapter grew out of exhaustion and shame cultivated across many generations. Here, the shame as a paralyzing feeling circulating in a body has a particular relation and attachment rooted between labour, plants, more than human bodies and their perceived roles in society as well as silence that accompanies the distribution of these roles within a space. I invite the reader to encounter this space in its tension, in its violence and in its "interhuman geographies" that are close to the demonic grounds as described by Katherine McKittrick.[1] The space of not belonging, of denying the value of experience and knowledge, which nevertheless shapes the materialities, becomes demonic because it escapes capture, because it is in constant transformation that even though conditioned by constraints, mutates. What happens when a space becomes not only a violent territory through its indexifying logic but also a resistance – a possibility to think otherwise? How can we think with McKittrick and practice what she describes as "new humanism, planetary humanism, radical theories of liberation, poethics of relation" that emerges from these demonic grounds?[2] Through mapping bodies produced by and producing these spaces, through the transformations and shifting borders they imply, the pleasure of creating and contaminating emerges. Out of the exhaustion and liminality of the territories, I invite the reader to contaminate their academic narratives, and to slow down, but not in order to find clear-cut answers, the demonstration of deductive arguments giving the comfort of transparency. Instead, I am to multiply and muddy the waters that feed the ground, through three bodies that initiate the resistance: *precariat, agrariat* and *vegetariat*.

Precariat

November 5, 2021. I am sitting in a tourist bus. We are driving through the streets of Rotterdam-North where I used to live, passing the stops where I used to wait in the early mornings for a tram to take me to work. It was the city where I first started working, as an immigrant: production work, cleaning work, to pay for my study, for our small apartment. The memories are tinged with melancholy when I see the bridge where I said yes, in Dutch, to my partner, and the bus stop where the driver reprimanded me for not speaking Dutch, as we were in Holland. Memories of being lost, of not belonging and yet becoming, flashed through me as we drove, as if in a bubble from a different world, a tourist from the future, looking at the past through the moving territory of bus windows.

The bus was to take us into the nurseries of the Westland Greenhouses surrounding Rotterdam. The trip was part of the "Automation of Care" research conducted by Špela Petric at V2_Lab for the Unstable Media, an interdisciplinary center for art and media technology in Rotterdam, within their platform devoted to conducting experiments called 3x3. In the research, the artist was to examine "the entwinement of advanced technologies with living bodies, positing horticulture as a model of these relations." The participants that, as revealed later, mostly consisted of academics, students, artists, designers, writers and other cultural workers, were thus invited to investigate, with the artists, the technologies of care in agriculture and medical practice. This investigation was done in a very particular way. As the artist explained in the preparation handouts given to all participants: "Our expedition leads us into the viscera of functional systems, where plant and human bodies are cared for by automation's finest achievements. Our task is to observe the proximal relations of body-machine up close."[3]

The observation method was described as taking "ethnographical fieldnotes". Each participant, before entering the glasshouse, had to choose a persona, "a tentative framing" from which the observation would take place, listing as possibilities: "engineer, essential worker, person with chronic illness, employer, immigrant, environmentalist, plant ... or another." The selection of a persona, the commitment to become a different body, was not definite, but situated the enabling constraints of the observation in order to maintain its embodied and embedded practice.[4] Following the study of Robert M. Emerson et al. on ethnographic fieldnotes,[5] Petrič mapped the entry points for the participants, describing how to enter the persona of the ethnographer who, rather than seeking universal truth, is to look for multiple truths emerging from the bodies within the encountered space. In this way, a process of observation was conceptualized not as a passive registration of facts, but rather as demanding engagement, understanding one's implications within the space and among the bodies encountered. Importantly, such a notion of observation as learning how to be implicated paralleled the acknowledgment

of radical selectivity, because of the marginalization of what is not experienced.

By inviting the participants to choose a persona from within which the observation is entered, which followed not the rules of imitation of bodies ascribed to a space, but rather becoming intimate as a collaborative methodology for practising knowledge which escapes unification, certainty and universality, the artist invited risk, tension and vulnerability into an encounter. In her approach, she anticipated the possibility of embodying multiple observing personas that would make it possible to encounter otherwise, unpredictably. Affirming the risk of being in the middle, the risk of entering the privileged and/or discased spaces, she proposed a way to maneuver between the comforts of expertise.

In the moving bus, without thinking much about it, the persona of an immigrant became too obvious to ignore. I thus embodied the painful yet close category as my ethnographic perspective. I was ready to enter the greenhouse, to meet the plants grown in the agricultural gardens, anticipating the human and non human workers and the wonders of technology conditioning their labor. And while I was contemplating the industrial scenery of never ending fields of transparent houses flickering in the windows of the bus, while the landscape of the city quickly changed into the industrial fields of glasshouses reflecting the ever-changing skies, the silence was broken by one of the participants siting behind me. As an uninvited response to a question never raised, the person started to reflect out loud how strange the landscape is, how we never see this world of production, how hidden it is from us. I did not turn to respond. I said nothing. As usual, I was too late with any reply, out of surprise of not knowing. I was struck and silently asked myself: "*we* never see?" Who is *we* that the person behind me was referring to? What is being recognized as the visible marker of production? What counts as visible and recognizable symptoms of capitalist exploitation? Most of my family and friends had worked or still work in the urban industries, supporting the consumption and being exploited to create ever new desires. Why would *we* be taken as an unquestioned status quo in this bus? I felt the words of Cynthia Cruz materializing in my body: "When the working-class subject looks out into the world, she does not see herself reflected back, she sees only the middle class mirrored back to her."[6] In that moment I travelled in time, and the past was in the bus, shaping the felt presence.

According to Cruz, neoliberalism operates along the ideology of the non-existence of the working class:

> neoliberalism's ideology that we are born equal, each of us with the same access to capital – monetary, cultural, and social – and that if we fail we

> have only ourselves to blame, has been so fully integrated into society it is taken as in indisputable fact. Thus neoliberalism, by its very nature, precludes the concept of social class. It is common, for instance, for the middle class to insist they never see members of the working class.[7]

The assumption about universal equality that does not recognize cultural, social and material differentiation of access, demonizes a working class body as monstrous, alien, and unclean.[8] A working class body is not recognized unless it carries these characteristics. As Cruz argues, the working class bodies and their surroundings operate in the void, as ghosts, not seen yet haunting, as a contradiction between the presence of capitalism and the ignorance of its tools and mechanisms. If seen, then only from a distance, giving the comfort of the generalized view, regulating the senses and values of what counts as meaningful. Thus the gaze by which the working class body is seen is ocularcentric – the eyes of the neoliberal subject can only contemplate its invisibility, because it does not fit into the patterns of the aesthetic regime.[9]

The bus became an ocularcentric trap infiltrating my body. With every turn revealing new scenes of the familiar workplaces I thought: I am captured by the shame of my own not belonging to either the bus or the passing landscapes. And then, randomly, the bus driver erupted that this used to be his work space, as we were driving through the fields of glasshouses. He was used to work with orchids and explained how in the first year the orchids do not bloom, so the owner of the glasshouse earns no money. Soon, a few participants of the trip started to share their experiences of working in these glass gardens, how difficult and hard this work is, and how, even though the use of technology is omnipresent, the physical work is demanding, how the human body's joints become too weak to continue this work long term. The work is precarious, because relies upon the vegetation of plants, weather conditions, gas prices, and the desire of the market. At that moment the flow of time shifted. Through the vocalized stories of the precariat, the window of the bus became a porous membrane, fuzzy and warm.

Agrariat

We arrive at the glasshouse. The air, even though it is November, is warm, and I leave my coat on the bus, knowing that I will not need it. We pass the entrance where ornamental *Euphorbia pulcherrima* (Poinsettia), also known as Christmas plants, greet us. This is one of the main plant grown here, along with many varieties of chrysanthemums. The chrysanthemums are sturdy plants, despite they fluffy and delicate looks, so they are ubiquitously sold at the groceries shops as cut flowers and as plants to decorate urban autumn gardens. Since I moved to

the Netherlands, I have always been surprised by how eagerly people buy them, how present they are among the living. Where I grew up, chrysanthemums are solely devoted to the dead. You only buy them for graveyards, particularly during the Day of all Dead in November, just before the first frost. I looked around this glasshouse of the plants made ready for their multiple service to the living and not living, bitterly amused by their and inevitable human coexistence, initially failing to notice the embedded present absence. We move forward along aisles passing the many tables filled with plants in their various stages of growth, some already packed in plastic foil, ready to ship. My co-participants take pictures of plastic waste (broken plant pots, plastic foil, ribbons) in a big container next to plants. Everyone seems to be focused on documenting the automation, the grandiose scale and vastness of the garden. We are enchanted and silenced by the machinery and automated mechanism of care that supports the life of the plants: the watering and light system, the packaging and identifications stickers. Our guide proudly gives a tour of what he describes as a "top sport," what he understands as horticulture. Here, that is in the Netherlands, he explains, "we don't like to be arrogant, but we are the best in the world". He argues for the superiority of the Dutch growers by emphasizing the presence of specialists in every essential aspect of the growth of the plant, such as light, heat, water. Indeed, according the World Horti Center, "Westland is the largest contiguous greenhouse horticultural community in the world and has a unique economic strength that is associated with great social responsibility" and innovation.[10] We all keep taking pictures in silence, smiling and nodding politely, acknowledging the culturally accepted arrogance. Our guide's favorite words, "specialist" and "top sport", thus continued to embellish his monologue on the wonders of Dutch ingenuity, as he randomly mentioned how plant cuttings are brought in from Uganda and Kenya, how the Dutch growers are teaching "them"- the Africans – to grow food varieties preferred by Europeans, how the labor of picking up cuttings in Uganda is done by the girls, because they have more delicate hands, because they constitute a cheaper source of labor. With each new sentence coming out of the guides' mouth, our fascination and enchantment with the glasshouse diminished. I could see the sarcastic looks participants threw at each other, and heard the little comments calling out the racism and chauvinism. I exchanged a few angry looks with the participants myself, but kept observing and meticulously documenting the encounter, devoting myself to the performative task the artist had assigned to us.

It was late afternoon, we were told the workers are gone, and indeed only a few were present, moving on to their break. Then, unrecognized by my fellow participants, I noticed a few post-it notes stuck to the machines at strategic points on the machine lane: "pakowanie," "wyłącz światło," next to the Dutch notes identifying "packaging" and instructing to "turn off the light." I knew the code of this

other language, because it is the one I think and dream in. I have realized that, indeed, I am in the Dutch greenhouse of wonders, whose plants are from Mexico and South America, whose cuttings are made by workers from Uganda and Kenya, whose plants are cared for and packed by Polish workers. I started eagerly to look for further marks of their absent presence, the signs of how it is like to work here. I was like a moth searching for the light, even if knowing it will burn me. As I continued to find new details written entirely in Polish, such as a Covid-19 poster on how to be safe in the working environment, how to clean your hands and keep a social distance, I was having flashbacks of my father working in the meat warehouse, of my cousin working in the cucumber greenhouse, my aunt, my friends and me at the tomato packaging warehouse. I remembered how my bare hands were covered with dark green, almost black dirt from the pesticides, my panic that grew out of my lack of experience of being an automaton standing still in a moving production line. At that moment, the plants, the technologies, the workers and the sound of the guide's voice intertwined in one mesh of past and present, of an ongoing structural correlation exposing their mutation into the postcolonial present. The imperceptibility of glasshouse workers, their exploitation internationally stretched across many different times is something that was kept hidden, even though it conditioned the prosperity of the glasshouse.

In a published report by The Open Society European Policy Institute on the exploitation of the agri-food workers in the North of Europe, Karin Astrid Siegmann and Tyler Williams argue that "the high productivity of Dutch agriculture goes hand in hand with high risks for migrant workers."[11] According to the report, migrant workers are the structural component of Dutch agriculture, the majority of which are Polish, followed by Romanians and Bulgarians. They are hired as seasonal workers by recruitment agencies, often based in the worker's country of origin, on what are called "first-phase" contracts, that is, a contract that "can be terminated at any time and the workers are paid for the hours worked."[12] Such contracts are not recognized as a violation of Fair Work standards by the EU, even though they mean that the worker can be fired at any point and for any reason without any security or sick leave. In this way, the precarization of the labor force is inscribed in the system; it guarantees the prosperity of the agrobusiness both for recruitment agencies and greenhouse owners, but not for workers.

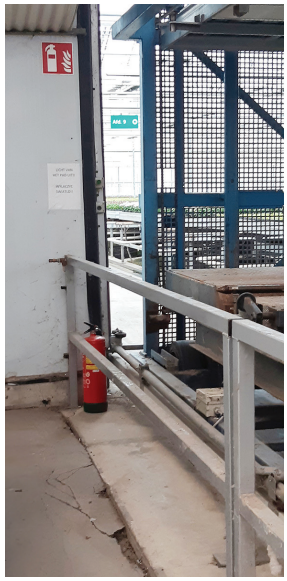
Isabel Lorey argues that the logic of precarization has become an instrument of regulation and governance in neoliberal capitalism. Precarization enables the implementation of ever new and complex mechanisms of insecurity that are designed to numb and give a sense of management and control over risk. In this way, precarization is the "process that produces not only subjects, but also insecurity as the central preoccupation of the subject."[13] It is not meant to resolve or

Fig. 1, 2, 3: Inside the Greenhouses of Westland during the performative ethnography by Špela Petrič, Automation Of Care II, November 5, 2021, photos: Agnieszka Anna Wołodźko.

diminish risk, but simply to manage it, to produce it in order to sustain and create ever more new technologies of governance and exploitation for the sake of profit. In the case of agrobusiness, the production of the subject through the technologies of precarization reaches as far as the general sentiment about the labor force and immigration. As the aforementioned report summarizes: "Dutch civil society appear not to be vocal about unfair labour practices in agriculture. The rights of farmworkers in the Netherlands are generally not taken up by a labour movement that has not yet effectively reached migrant workers or by environmental groups pushing for alternative food systems."[14]

The report was written in 2020, and while I am writing this text, there is an ongoing protest of Dutch farmers against the government's plans for "the reduction of nitrogen emissions and the improvement of nature quality."[15] After numerous farmers' protests, one can still find many national flags hanged upside down to signal the alliance with the farmers, across rural and urban spaces. If there is some discussion about the care of an environment, care for the farmers, there is no concern for the workers, or about the omnipresence of pesticides which continues to variously influence their health. The dominant framing of the farmers' crisis is within the dualistic logic of technology versus the purity of nature.[16] If there has been a discussion on the toxicity of Dutch ground water caused by agriculture due to the excessive use of pesticides,[17] there is a tendency not to consider the most vulnerable workers in the greenhouses, who work in a closed environment where the residue of pesticides remains on the crops for a long time.[18] The new governmental policy of nitrogen reduction and the farmers' protest against it is framed as a conflict of dual narratives within the binary ideology of man against nature. Here, on the one hand, the farmers are portrayed as the lone agents who struggle to feed their families, who provide food for the population at large, and who fight against the government's ecofascism. On the other hand, the farm is viewed as a business, which can be bought and easily dismantled by risk-mitigating governance to save nature.[19] The nuances, the multiple agencies and bodies, the structural incorporation of violence that conditions agrobusiness, is polarized into an old narrative of fighting opposites, where the only form of relation is power.

During the break, we were invited for coffee and cake, where we could hear more agrotech praise supported by printed charts and graphs held up by our guide. On the wall next to me there was a screen streaming images of "workers of the month," and I wondered: were they distinguished because they did not take any sick leave? What were the conditions of their promotion to this wall? Were they even real? Imperceptibility dressing up the automation of labor as a three-generation family business gave the growers a romantic representation. One of them is smiling, with a Dutch woman's name, *Ingrid*; she cares for the plants because she



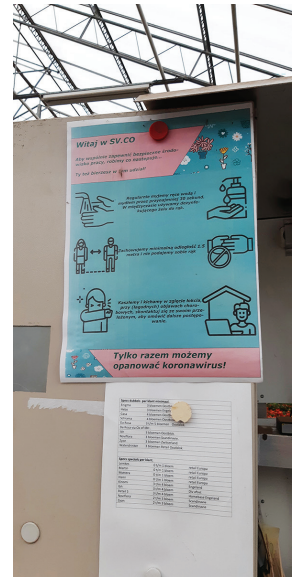


Fig. 4, 5, 6: Inside the Greenhouses of Westland during the performative ethnography by Špela Petrič, Automation Of Care II, November 5, 2021, photos: Agnieszka Anna Wołodźko.

wants to feed the people. In this way any connections with capitalist prioritization of profit are disguised.[20]

On the way back I took more pictures of these "family gardens," of their houses set among the glasshouses that stretched over the flat landscapes as if a post-plantation scene. The sunset reflected on glass surfaces, intensifying the overwhelming feeling of the infinite, disavowing even its own materiality: "only 9 percent of Westland glasshouses are made of glass. Most of them are made of plastic, as it is a cheaper material," as the guide reported. According to Max Liboiron,

> colonialism is not just about taking Land, though it certainly includes taking Land. Stealing is a manifestation, a symptom, a mechanism, and even a goal of colonialism. But those are the teeth of colonialism, and I want to look at its bones. Stealing Land and dispossessing people are events with temporal edges, but ongoing Land theft requires maintenance and infrastructure that are not as discrete.[21]

The glasshouses, made of plastic, are not discrete. They stretch for kilometers, distributing their goods, from the seeds to the cultivated plants, across the globe.[22] The national pride that emanates from the plastic windows of the greenhouses is nevertheless conditioned by the international exploitation and is thus inscribed within material geographies out of which bodies emerge, which, as McKittrick argues, "illustrate the ways in which the raced, classed, gendered, and sexual body is often an indicator of spatial options and the ways in which geography can indicate racialized habitation patterns; they are places and spaces of social, economic, and political denial and resistance; they are fragmented, subjective, connective, invisible, visible, unacknowledged, and conspicuously positioned."[23] I thus ask, how is any form of resistance possible in the face of the flickering ubiquity of these plastic greenhouses?

Vegetariat

The Westland's area of vastly spreading greenhouses are considered to be well-known for its "cutting edge, but fuel-intensive, innovations such as heating, lighting, aeration, irrigation, transport, fertilizers and machinery."[24] It is a flat land, carefully mastered into what Clemens Driessen argues to be a Cartesian space, where there is no center, where space is ordered according to the transparency of measurement. As Driessen reports, at Wageningen University, the Dutch university whose research is devoted to local and international agriculture and the life sciences, such countryside is called Cartesian because it is characterized by "regularity, order, grid-like spaces that allow for calculating and maximizing use:

[these] spaces [allow] for efficiency, [because they are] easily worked by large machines, automated systems, or humans who appreciate clarity and repetition."[25] The Westland, in that sense, is a "perfectly controlled environment with rows and rows of optimized plants in endless glass boxes."[26] Pronounced as "the ultimate" and "the most Cartesian of all," it is no coincidence that the Westland is praised in this regard. According to Driessen, Westland greenhouses started as a garden project by Amalia von Solms (1602–1675), who was married to the Dutch stadtholder Frederik Hendrik van Oranje-Nassau (1584–1647) in 1625. She was a patroness of the arts and "influencer" at the court in the Hague.[27] As Driessen writes, to design her garden at the center of the Westland, she had the help of Descartes, and soon these gardens "became a key site for horticultural innovation: grafting fruits onto trees and producing conditions for exotic plants. Bulbs, tubers, seeds, and seedlings were shipped from the colonies run by the Dutch East India Company (VOC), extracted from indigenous cultivators and their ecologies to serve an urbanizing Dutch population."[28]

With Descartes's philosophy solidifying the problem of dualism by ordering bodies (*res extensa*) and thoughts (*res cogitans*) according to the relation of power and governance, with his geometric calculation that allowed for measuring land at a distance and with his assumptions that all phenomena can be explained and governed by calculation, the Westland and the Netherlands were shaped.[29] By this, and by the colonialism casually mentioned by Driessen, without which there would be none of the plants cultivated there.[30] The VOC, established in 1602, was not only the first private corporation, which established high profits, but mostly a company that relied and conditioned its success upon slavery, bioprospecting and biopiracy from early on its existence. As Londa Schiebinger writes, botanical gardens and imperial expansion were tightly interwoven and conditioned by each other, becoming the "laboratories of colonial botany." What is more, as she argues: "The sixteen hundred botanical gardens that Europeans had founded worldwide by the end of the eighteenth century were not merely idyllic bits of green intended to delight city dwellers, but experimental stations for agriculture and way stations for plant acclimatization for domestic and global trade, rare medicaments, and cash crops."[31] Thus, though the botanical gardens fell, together with the fall of the VOC, their "glory" was reinstalled at the beginning of the twentieth century by the engineers returned from the Dutch colonies of Indonesia.[32]

In the face of the growing monoculture of the greenhouses of the Westland, which devotes its land to one-crop cultivation, Driessen outlines the need to rebuild diversity, of following the control and grid mindset of the Cartesian space, but complexifying it by symbiotic philosophies and indigenous knowledges. As he writes: "a good starting point may be to again celebrate the joy and beauty of growing vegetables in a garden, and, rather than banishing food production

to distant monocultures and greenhouse conglomerations, to actually see how places of food production are central drivers of space and culture."[33] Thus the garden becomes for him a place of return to the Cartesian principle of calculability, a transparent and neutral place of witness, outside of geopolitical conditioning, celebratory because free of any violence, contamination or exploitation.

However, the longing for the purity and neutrality of space, the belief in its transparency, as McKittrick argues, "assumes that geography – specifically, physical and material geographies – is readily knowable, bound up with ideologies and activities that work to maintain a safe socioeconomic clarity."[34] Believed to be "innocent" and "self evident", the transparent space naturalizes infrastructures, arrangements of the movements of bodies, their indexing, classifications and hierarchizations. It emerges out of them and it solidifies the very conditions of its endurance due to it assumed neutrality. And as she argues, the resistance, the thinking otherwise, starts from different desires that can contest its transparency: "The various kinds of madness, the pathological geographies, the dismembered and displaced bodies, the impossible black places, the present-past- time-space cartographers, and topographies of something lost, or barely visible, seemingly not there – these material and metaphoric places begin to take us there."[35]

The PVC gardens, muddy and murky from the residue of pesticides and therefore needing constant cleaning and purification so that daylight will reach the plants, are spaces of discomfort cultivation, as Catriona Sandilands puts it, rather than a refuge from it.[36] Interwoven with and of interspecies relations, colonial and imperial violence, class and capital exploitation, these gardens force us to resist the fiction they embody, namely of an orderly, pure landscape of ingenuity, prosperity and purity. These gardens, like the botanical gardens of eighteenth century that served "as an instrument of empire detaching plants from their native cultural moorings and placing them within schema comprehensible first and foremost to Europeans,"[37] subsume and dematerialize geography either by the imperial logic of decentered neutrality and calculability of technological innovation, or by the romantic fantasy of the goodwill of the family farmer. And these plastic greenhouses condition not only how and what we eat, but also how we relate to bodies that condition the eating. The plastic greenhouses that stretch beyond the Westland of the Netherlands, become our condition rather than a tool.

Agropleasure

Rita Daley when writing about the artists working with the digital technologies of surveillance that indexifies bodies by the ever new forms of power relation, perpetuating the slow violence of the regimes of signification, notices, how these artists undermine the traditional philosophical assumption of the necessary distance in reflection. As she writes: "critique and critical reflection are at their most powerful

Fig. 7, 8: Inside the Greenhouses of Westland during the performative ethnography by Špela Petrič, Automation Of Care II, November 5, 2021, photos: Agnieszka Anna Wołodźko.

when they [the artists] do not adopt a spectatorial position on the (putatively neutral) outside, when they do not merely sketch a surface, but rather penetrate the core of the system itself, intensifying identification so as to produce structural change."[38] Resistance from the glasshouse in which we all live in, if unevenly, starts thus from the realization that we are already part of the infrastructure of violence when we buy our favorite cherry tomato, and acknowledging that it will never taste quite like the one from childhood; when planting tulips bulbs and hoping that they bloom during the first days of spring; or watering beloved pot plants purchased at the local garden market. We are part of the imperceptible infrastructure, abstract machine of vegetation. We share similar yet unequal predicaments with the bodies of glasshouses, embodying what Sandilands called the vegetariat: a condition where plants fueling the bioprospecting practices of capitalism are also objects of its exploitation.[39] As greenhouse plant, we are conditioned by its success and we are complicit in its uprooting practices. As Špela Petrič argues in her work, we humans share with plants their uncommon commodification, but instead of despair and panic, a resistance starts from a pot plant – from embracing the constraints one is conditioned by, but not in order to sustain the status quo. Rather, by embracing one's implication within the constraints, we can learn how to find pleasure in the demonic spaces, because constituted by the transformative processes of not belonging, of betrayal, of repotting.[40]

Édouard Glissant argued that our bodies and identities are conditioned not by territories and roots alone, but also by relations and processes of uprooting. We can thus also affirm the uprooting process – not its violence, but as a way of becoming that overcomes the violence emerging from the longing for the identification and the territory it enforces.[41] Achille Mbembe describes this affirmation as a process against powers that claim to protect from risk, from dangers. The need to distrust the desire and practices of risk control and its management is urgent, as it enforces and perpetuates the very mechanism of capitalist, Eurocentric and racialized logic of ownership. As Mbembe argues,

> behind this quest for a stable life is actually the refusal of a mobile world and a will to preserve life, to stay alive and be biologically safe at any cost. The body that these powers seek to manufacture is a body haunted by the ever-imminent possibility of being no more. One of the properties of such a body is to refuse its imminent death, and permanently disavow its precariousness and its essential fragility.[42]

Resistance thus starts from affirming not precarization as a tool of governance and commodification, but precariousness as a way of living. The affirmation of contamination as a condition and desire forces us to care and be responsible,

but outside the logic of power characteristic of a moral imperative, as Deleuze and Guattari write: "we are not responsible for the victims but responsible before them."[43] Instead, affirmation of precariousness forces us to reimagine care and responsibility not from the position of power, but participation. Caring *before* another agency, another body, molds caring in a way that, rather than making bodies numb,[44] creates the possibility to think otherwise, to *care before* not only living, but also before ways of dying.[45]

I follow Špela Petrič, enchanted by the way she teaches care before the automation of every new form of pest control. I look at my hands covered with pesticides, affirming how washing them with an alcohol soap will make my skin more porous. I think of my cousin returning from the cucumber greenhouse, his clothes covered with dirt, his skin irritated and itchy. My sweat sinks into the ground and I devour the plants and compost, bulbs and sprouting cuttings. I swallow the murky pleasure of the plastic garden I live with – and I refuse to think of any pure way out.[46]

Notes

1 Katherine McKittrick, *Dear Science and Other Stories* (Durham, NC: Duke University Press, 2021), 108.
2 McKittrick, *Dear Science and Other Stories*, 25.
3 Špela Petrič and Aad Verduijn, *Automation of Care II: "Weltinnenraum," or How to Love the Plant SO Much You Could Eat It Visit To Westland Nurseries*, November 5, 2021, handout instructions given to participants.
4 Braidotti, *Posthuman Knowledge*.
5 Robert M. Emerson, Rachel I. Fretz, and Linda L. Shaw, *Writing Ethnographic Fieldnotes* (Chicago: University Of Chicago Press, 1995).
6 Cynthia Cruz, *The Melancholia of Class: A Manifesto for the Working Class* (London: Repeater, 2021), 9.
7 Cruz, *The Melancholia of Class*, 72.
8 Ibid., 2.
9 See on the ocularcentric gaze as colonial aesthetics Rolando Vazquez, *Vistas of Modernity: Decolonial Aesthesis and the End of the Contemporary* (Amsterdam: Mondriaan Fund, 2020); Martin Jay, *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought* (Berkeley: University of California Press, 1993).
10 See *World Horti Center*, collaboration between MBO Westland, Demokwekerij Westland, WHC Expo and Municipality of Westland in the Netherlands devoted to education, research and economy, https://www.worldhorticenter.nl/en/about-us; https://www.worldhorticenter.nl/en/about-us/municipality-of-westland.
11 Karin Astrid Siegmann and Tyler Williams, "The Netherlands," in *Are Agri-Food Workers Only Exploited in Southern Europe? Case Studies on Migrant Labour in Germany, the Netherlands, and Sweden*, ed. Letizia Palumbo and Alessandra Corrado (Open Society Foundation, July 2020), https://www.opensocietyfoundations.org/publications/are-agri-food-workers-only-exploited-in-southern-europe#publications_download, 13.
12 Ibid., 18.
13 Isabell Lorey and Judith Butler, *State of Insecurity: Government of the Precarious*, trans. Aileen Derieg (London: Verso, 2015), viii.

14 Siegmann and Williams, "The Netherlands," 20.
15 Rijksoverhijd, *Startnotitie Nationaal Programma Landelijk Gebied*, June, 10 2022, https://www.rijksoverheid.nl/documenten/rapporten/2022/06/10/startnotitie-nplg-10-juni-2022.
16 Claire Moses, "Dairy Farmers in the Netherlands Are Up in Arms Over Emission Cuts," *New York Times*, August 20, 2022. https://www.nytimes.com/2022/08/20/world/europe/netherlands-farmers-protests.html?searchResultPosition=1; "Nature Reserves More Vulnerable To Nitrogen Compound Pollution: New Report," DutchNews.nl, September 2, 2022, https://www.dutchnews.nl/news/2022/09/nature-reserves-more-vulnerable-to-nitrogen-compound-pollution-new-report/.
17 P. N. Schipper, M. J. Vissers, and A. M. van der Linden, "Pesticides In Groundwater And Drinking Water Wells: Overview Of The Situation In The Netherlands," *Water Science & Technology* 57, no. 8: (February 2008): 1277–86, https://doi.org/10.2166/wst.2008.255.
18 Martina Beránková, Jarmila Hojerová and Zuzana Peráčková, "Estimated exposure of hands inside the protective gloves used by non-occupational handlers of agricultural pesticides," *Journal of Exposure Science & Environmental Epidemiology* 27 (2017): 625–31, https://doi.org/10.1038/jes.2016.47
19 Senay Boztas, "'Emotion And Pain' As Dutch Farmers Fight Back Against Huge Cuts To Livestock," *The Guardian*, July 21, 2022, https://www.theguardian.com/environment/2022/jul/21/emotion-and-pain-as-dutch-farmers-fight-back-against-huge-cuts-to-livestock.
20 During the farmers' crisis in the Netherlands, there has been a tendency to romanticize the farm as a family business. Such framing of the agriculture business, misrepresents the history of the Dutch farm. Here, for the sake of profit, in a phase of economic instability, the farmers transitioned themselves from the social working class into the independent worker, in this way avoiding implications of working class rights: "The industrial processing needed more production. Waged labor gradually proved too expensive. Dutch farmers had to mechanise in order to stay in business and do the hard work themselves. That is why family farming was 'reinvented'; former capitalist farmers came out of that process as a commercial risk taking working class category on its own." Dick Veerman, "Dutch Agri: The Dutch used to be capitalist farmers, the 19th century forced them into family farming," *Agrifood Network*, August 29, 2020, https://agrifoodnetworks.org/article/the-dutch-used-to-be-capitalist-farmers-the-19th-century-forced-them-into-f.
21 Max Liboiron, *Pollution Is Colonialism* (Durham, NC: Duke University Press, 2021), 16.
22 Frank Viviano, "How the Netherlands Feeds the World," *National Geographic Magazine*, August 31, 2017, , https://www.nationalgeographic.com/magazine/article/holland-agriculture-sustainable-farming.
23 Katherine McKittrick, *Demonic Grounds: Black Women And The Cartographies Of Struggle* (Minneapolis: University Of Minnesota Press, 2006), 7.
J. Kasmire, Igor Nikolic, and Gerard Dijkema, "Evolving Greenhouses: An Agent-Based Model of Universal Darwinism in Greenhouse Horticulture," *Journal of Artificial Societies and Social Simulation* 16, no. 4 (2013), https://doi.org/10.18564/jasss.2234.
24 Clemens Driessen, "Descartes Was Here: In Search of the Origin of Cartesian Space," in *Countryside, A Report*, ed. AMO and Rem Koolhaas, exhibition catalogue (Los Angeles: Taschen: 2020), 275.
25 Ibid., 275.
26 Saskia Beranek, "Strategies of Display in the Galleries of Amalia van Solms," *Journal of Historians of Netherlandish Art 9,* no. 2 (Summer 2017), https://doi.org/10.5092/jhna.2017.9.2.4
27 Driessen, "Descartes Was Here," 278.
28 René Descartes, *Meditations on First Philosophy: With Selections from the Objections*

and Replies, ed. John Cottingham, intro. Bernard Williams (Cambridge: Cambridge University Press, 1996).

29 Londa Schiebinger, *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, MA: Harvard University Press, 2007).

30 Ibid., 11.

31 Driessen, "Descartes Was Here," 294.

32 Ibid., 297.

33 McKittrick, *Demonic Grounds*, 5.

34 Ibid.

35 Catriona Sandilands, "Worlds," in *On the Necessity of Gardening: An ABC of Art, Botany and Cultivation*, ed. Laurie Cluitmans (Amsterdam: Valiz, 2021), 180.

36 Schiebinger, Plants and Empire, 224.

37 Rita Raley, "Dataveillance and Countervailance," in *"Raw Data" Is an Oxymoron*, ed. Lisa Gitelman (Cambridge, MA: MIT Press, 2013), 137

38 Catriona Sandilands, "Vegetate," in *Veer Ecology: A Companion for Environmental Thinking*, ed. J. J. Cohen and L. Duckert (Minneapolis: University of Minnesota Press, 2017), 16–29.

39 Agnieszka Anna Wołodźko, "Demonological Re-Enchantments: Or How To Contaminate Through Intimate Stories Of Commons Without Consensus," *Technoetic Arts: A Journal of Speculative Research*, 18, no. 2–3, (2020): 97–104, https://doi.org/10.1386/tear_00029_1.

40 Edouard Glissant, *Poetics of Relation*, trans. Betsy Wing (Ann Arbor: University of Michigan Press, 1997), 18.

41 Achille Mbembe, *The Earthly Community: Reflections on the Last Utopia* (Rotterdam: V2 Publishing, 2022), 124.

42 Gilles Deleuze and Félix Guattari, *What Is Philosophy?*, trans. Hugh Tomlinson and Graham Burchell (London: Verso, 1994), 108.

43 Agnieszka Anna Wolodzko, "Living Within Affect as Contamination: Breathing in Between Numbers," *Capacious: Journal for Emerging Affect Inquiry 2*, no. 1–2 (2019–2020): 211–24.

44 Agnieszka Anna Wolodzko, "Tiny Mining: Theory Of The Earth From A Sweatshop – On Practising Becoming Cosmic," in *Tiny Mining, A Handbook For Internal Extraction*, ed. Martin Howse, e-book (Rotterdam:V2 Publishing, 2022).

45 I thank Špela Petrič for inviting me to take part in her performative ethnography workshop Automation of Care, which resulted in the urgency of writing this text and for her comments and feedback on the final draft of this chapter.

Bibliography

Achille Mbembe, *The Earthly Community: Reflections on the Last Utopia*. Rotterdam: V2 Publishing, 2022.

Beranek, Saskia. "Strategies of Display in the Galleries of Amalia van Solms," *Journal of Historians of Netherlandish Art* 9, no. 2 (Summer 2017), https://doi.org/10.5092/jhna.2017.9.2.4.

Beránková, Martina, Jarmila Hojerová and Zuzana Peráčková, "Estimated exposure of hands inside the protective gloves used by non-occupational handlers of agricultural pesticides," *Journal of Exposure Science & Environmental Epidemiology* 27 (2017): 625–31, https://doi.org/10.1038/jes.2016.47.

Boztas, Senay. "'Emotion And Pain' As Dutch Farmers Fight Back Against Huge Cuts To Live-

stock," *The Guardian*, July 21, 2022, https://www.theguardian.com/environment/2022/jul/21/emotion-and-pain-as-dutch-farmers-fight-back-against-huge-cuts-to-livestock.

Braidotti, Rosi. *Posthuman Knowledge*. Cambridge: Polity, 2019.

Cruz, Cynthia. *The Melancholia of Class: A Manifesto for the Working Class*. London: Repeater, 2021.

Deleuze, Gilles and Félix Guattari. *What Is Philosophy?* Translated by Hugh Tomlinson and Graham Burchell. London: Verso, 1994.

Descartes, René. *Descartes: Meditations on First Philosophy: With Selections from the Objections and Replies.* Edited by John Cottingham, introduction by and Bernard Williams. Cambridge: Cambridge University Press, 1996.

Driessen, Clemens. "Descartes Was Here: In Search of the Origin of Cartesian Space." In *Countryside, A Report*, exhibition catalogue edited by AMO and Rem Koolhaas, 274–299. Los Angeles: Taschen, 2020.

Emerson, Robert M., Rachel I. Fretz, and Linda L. *Shaw. Writing Ethnographic Fieldnotes*. Chicago: University Of Chicago Press, 1995.

Glissant, Edouard. *Poetics of Relation*, trans. Betsy Wing. Ann Arbor: University of Michigan Press, 1997.

Jay, Martin. *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought*. Berkeley: University of California Press, 1993.

Kasmire, J., Igor Nikolic, and Gerard Dijkema, "Evolving Greenhouses: An Agent-Based Model of Universal Darwinism in Greenhouse Horticulture," *Journal of Artificial Societies and Social Simulation* 16, no. 4 (2013), https://doi.org/10.18564/jasss.2234.

Liboiron, Max. *Pollution Is Colonialism*. Durham, NC: Duke University Press, 2021.

Lorey, Isabell and Judith Butler. *State of Insecurity: Government of the Precarious*. London: Verso, 2015.

McKittrick, Katherine. *Dear Science and Other Stories*. Durham, NC: Duke University Press, 2021.

McKittrick, Katherine. *Demonic Grounds: Black Women And The Cartographies Of Struggle*. Minneapolis: University Of Minnesota Press, 2006.

Moses, Claire. "Dairy Farmers in the Netherlands Are Up in Arms Over Emission Cuts," *New York Times,* August 20, 2022, https://www.nytimes.com/2022/08/20/world/europe/netherlands-farmers-protests.html?searchResultPosition=1.

Raley, Rita. "Dataveillance and Countervailance." In *"Raw Data" Is an Oxymoron*, edited by Lisa Gitelman, 121–45. Cambridge, MA: MIT Press, 2013.

Sandilands, Catriona. "Vegetate." In *Veer Ecology: A Companion for Environmental Thinking*, edited by. J. J. Cohen and L. Duckert, 16–29. Minneapolis: University of Minnesota Press, 2017.

Sandilands, Catriona. "Worlds." In *On the Necessity of Gardening: An ABC of Art, Botany and Cultivation*, edited by Laurie Cluitmans, 179–82. Amsterdam: Valiz, 2021.

Schiebinger, Londa. *Plants and Empire: Colonial Bioprospecting in the Atlantic World*. Cambridge, MA: Harvard University Press, 2007.

Schipper, P. N., M. J. Vissers, and A. M. van der Linden. "Pesticides In Groundwater And Drinking Water Wells: Overview Of The Situation In *The Netherlands*." *Water Science & Technology* 57, no. 8: (February 2008): 1277–86, https://doi.org/10.2166/wst.2008.255.

Siegmann, Karin Astrid and Tyler Williams. "The Netherlands." In *Are Agri-Food Workers Only Exploited in Southern Europe? Case Studies on Migrant Labour in Germany, the Netherlands, and Sweden*, edited by Letizia Palumbo and Alessandra Corrado. Open Society Foundation, July 2020, , https://www.opensocietyfoundations.org/publications/are-agri-food-workers-only-exploited-in-southern-europe#publications_download, 13.

Vazquez, Rolando. *Vistas of Modernity: Decolonial Aesthesis and the End of the Contemporary*. Amsterdam: Mondriaan Fund, 2020.

Veerman, Dick. "Dutch Agri: The Dutch used to be capitalist farmers, the 19th century forced them into family farming." *Agrifood Network*, August 29, 2020, https://agrifoodnetworks.org/article/the-dutch-used-to-be-capitalist-farmers-the-19th-century-forced-them-into-f.

Viviano, Frank. "How the Netherlands Feeds the World." *National Geographic Magazine*, August 31, 2017, https://www.nationalgeographic.com/magazine/article/holland-agriculture-sustainable-farming.

Wołodźko, Agnieszka Anna. "Demonological Re-Enchantments: Or How To Contaminate Through Intimate Stories Of Commons Without Consensus." *Technoetic Arts: A Journal of Speculative Research* 18, no. 2–3 (2020): 97–104, https://doi.org/10.1386/tear_00029_1.

Wołodźko, Agnieszka Anna. "Living Within Affect as Contamination: Breathing in Between Numbers." *Capacious: Journal for Emerging Affect Inquiry* 2, no. 1-2, (2019–2020): 211–24.

Wołodźko, Agnieszka Anna. "Tiny Mining: Theory of the Earth from a Sweatshop – On Practising Becoming Cosmic." In *Tiny Mining: A Handbook For Internal Extraction*, edited by Martin Howse, e-book. Rotterdam: V2_ Publishing, 2022.

Under the Dome: The Events of January 6

John Protevi

Something happened at the Capitol on January 6, 2021: an event, a drama, a haecceity, a case. Many others have interpreted the meaning of the actions – among them, fighting, shitting, praying – so rather than simply repeat their efforts, I want to contextualize the meanings of the event by looking at the "political affordances" of the Capitol building. Think of this as a case study in ecological psychology, a Gibsonism, of political actions, bodily affects and architectural affordances in a politically charged built environment.[1]

In looking for the conditions of the event, I'll first tackle the methodology of case studies, and then detail what would be an "enactive" political philosophy of mind that would enable us to see what we need to do to examine the affective-cognitive states of the rioters. I'll follow that with a recap of current work on the convergence of enactivism with Gibsonian ecological psychology. I'll end with a look at how features of the building solicited actions that are ordinarily mundane but were spectacularly out-of-place when performed by those people that day at the Capitol. In particular, I'll look at how the dais in the Senate Chamber solicited prayers by Jacob Chansley, the "Q Shaman,"[2] in the simultaneously grandiose and paranoid "Trumpian ecumenical" style.[3]

Methodology of Case Studies

The events of January 6 had a sense, "insurrection." Sense lies at the surface separating the transcendence of words, concepts, and names and the depths of bodies, things, states of affairs. Sense is expressed in propositions and attributed to states

of affairs, but it is neither height nor depth, but surface. In *Logic of Sense*, Deleuze suggests that it was the Stoics who first discovered the dimension of sense.[4] We can attribute the proper name "Capitol insurrection of January 6" to a particular state of affairs, but the insurrection itself is an incorporeal event (or sense) with no other reality than that of the expression of that proposition; what we find in the state of affairs are bodies mixing with one another – flagpoles stabbing flesh, bullets flying through the air, bear spray shot into faces, bodies being trampled – and the insurrection itself is the *effect* or the *result* of this intermingling of bodies.

The insurrectionary events were dramatic in the ordinary sense, but they were also a "dramatization" in Deleuze's sense, a set of actions or "spatio-temporal dynamisms" that resolved tensions inherent in a problem, or network of intersecting processes.[5] For Deleuze, problems cannot be solved once and for all, though they can be dealt with, or resolved, practically and temporarily in concrete situations by singular actions.[6] As networks of intersecting processes, problems admit only tweaks to open-ended situations that produce another iteration of the problem. In other words, just as hurricanes only temporarily resolve the problem of global heat transfer, the insurrection was only a temporary resolution to the pressures built up by Trump's intransigence regarding the normal processes of certifying presidential elections.

Dramatizations can also be seen as immanent haecceities, compositions of the movements and affects of bodies.[7] In the concept of haecceity, an event is individuated in part by its temporal and spatial coordinates, its being situated. That is, the "block of space-time" that was January-6-at-the-Capitol-building provided some of the dimensions of the event of the insurrection.[8] A haecceity is also defined by its "longitude" (the "speeds and slowness" of its material motions) and by its "latitude" (its set of affects).[9] Think of a haecceity as the temporary configuration of a kaleidoscope that constantly shifts its aspects as its components act and react on each other, shuffling their affections and affects.

The multiple and interconnected pressures and consequences of open-ended and evolving problematic haecceities can be studied better in case studies than in experiments done in the armchair or even in the lab.[10] There can be synergy here: an apprenticeship in case studies can help us identify key dimensions of situations that can be isolated from their real-world context and tested experimentally, and that very experimental knowledge helps us critique old case studies and produce new ones. For a case study itself involves the choice of what to include: a map that produces a 1-to-1 duplication of the territory, as in the Borges story, is no map at all. Hence my focus on the Q Shaman's prayer being solicited by the Senate Chamber dais.

Toward an Enactive Political Philosophy of Mind

Philosophy of mind is the philosophical treatment – the conceptual development and clarification – of psychological and brain science that seeks to explain the navigation of an organism in its world. In the last several decades it has developed a branch that calls itself the 4EA approach to cognition (embodied, embedded, enactive, extended, affective). The 4EA approach challenges the traditional emphasis on an individualist, representational, and brain-bound or "neuro-centric" model of mind that has a digital computer as its main model.[11] I'll present a brief overview to prepare for discussing the latest development, which is most relevant to our purposes here, a political philosophy of mind.[12]

I will concentrate here on the enactive branch of the 4EA approach;[13] in the next section, I'll look at ecological psychology, which is sometime proposed as a fifth "E."[14] Enactivists define cognition as the direction of action of an organism in its environment, rather than as a kind of information processing in which cognition is the middle slice in what Susan Hurley called the "classical sandwich": sensory input -> processing of representations -> motor output.[15] Enactivists reject such linearity, and see most cognitive processes as the real-time interaction of a distributed and differential system composed of brain, body, and world, in which perception and action are mutually looped: we move to perceive and our perception guides our action.

A base concept in enaction is autopoiesis, developed by Humberto Maturana and Francisco Varela in the 1970s.[16] An autopoietic cell creates a self in distinguishing itself from an environment with which it exchanges matter in "structural coupling"; it is hence said to be autonomous yet related to its world. In a groundbreaking work, Ezequiel Di Paolo showed that "adaptivity" must be added to autopoiesis, as the latter cannot explain organismic sense-making – directed action responding to environmental change relevant for the organism – precisely because it is all-or-nothing: "But what makes bacteria *swim up* the gradient? What makes *them* distinguish and prefer higher sugar concentrations? As defined, structural coupling is a conservative, not an improving process; it admits no possible gradation."[17] Instead of the autopoietic binary of survival and death, then, adaptivity adds a graded discrimination of tendencies to the capacity of organisms.

Autopoiesis and adaptivity establish a first-person perspective. To find a political philosophy of mind, we must now find ways to connect to second- and third-person perspectives. A decisive step occurs with an enactive analysis of second-person cognition as "participatory sense-making," a move that breaks with the focus on individual organisms to look at groups of interacting people.[18] Beyond the second person we want also to take a final step to a *political* notion of non-reductive third-person analyses. Rather than only going "below" the subject

to neurons, can we go "above" and "beside" the subject to social and political structures? The key here, parallel to the enactive demand to not reduce experience to neurons, is not reducing first- and-second person experience to a mere extrusion of a structure, but also without a naïve existentialist championing of raw agency.[19]

The move to a political philosophy of mind within the enactive framework can be said to begin with Shaun Gallagher's discussion of the "socially extended mind."[20] Gallagher looks at "enactive processes (e.g., social affordances)," which for him move beyond second person relations to consider "institutional structures, norms, and practices." Taking a critical turn, Gallagher asks us to "take a closer and critical look at how social and cultural practices either productively extend or, in some cases, curtail mental processes."[21] In his 2020 book, *Action and Interaction*, Gallagher goes on to cite Iris Marion Young on oppression and Charles Mills's critique of ideal theory to support his call to "give cognitive science a critical twist."[22]

A second important figure here is Jan Slaby, moving over from his work on critical neuroscience to political philosophy of mind.[23] Slaby and Gallagher take up the notion of institutional extension in a 2015 paper: "The rational human subject is not an exclusively biological entity – it is an entity coupled to other biological individuals and various cognition-enabling institutions, tools, procedures and practices."[24] The political edge comes when we realize that such extension is not always enabling; in the paper in which he coins the term "political philosophy of mind," Slaby points out that many social embeddings produce affective reactions that inhibit rather than expand human potentials:

> we can ... distinguish enabling from disabling social structures, we can assess to what extent social domains work toward setting up mental patterns that are in the long run empowering, conducive to individual and collective flourishing, or whether they are rather creating unhealthy dependencies, tie us to oppressive routines, sustain inequality, destroy communal bonds or lead to affective, and other mental habits that are detrimental to us or our kin.[25]

In my own contributions to the field, I have always insisted that when cognitive science looks at the extended mind, it needs to have a political analysis of the subjectification processes in a population.[26] Without a population variation perspective, we risk relegating the cultural to a storehouse of heuristic aids for an abstract problem-solver who just happens to be able to interact successfully with the people and cultural resources to which it just happens to have access. So, we need to analyze not simply technical training for cognitive capacities in

a restricted sense, but also the training necessary for acquiring positive and empowering emotional patterns, thresholds, and triggers. Hence, we need to think in terms of a range of subjectification practices that are distributed in a society at various sites (family, school, church, media, playground, sports field, and so on) with variable goals, intensities, and efficacies. These multiply situated practices resonate or clash with each other and with myriad other practices (gendering, racializing, and so on). But even this is still too simple, as these subjectification practices also enter complex feedback relations with the singular body makeup (genetic and epigenetic) of the people involved. All the way down, we are biological and social; we are "bodies politic."

Political Affordances

Ecological psychology gets its inspiration from J.J. Gibson's work, in which invariant structures of the "ambient optic array" or field of light in an environment allowed organisms to attend to these structures to guide their perception and action.[27] While there was some tension between ecological psychology and early enactivists,[28] recent work shows a rapprochement of the two orientations.[29] Kevin Ryan and Shaun Gallagher highlight some resonances: "Orthodox ecological psychologists and enactivists agree that the best explanation for a large share of cognition is non-representational ... instead of focusing solely on factors interior to an agent, a good part of cognition is to be found in the link or coupling between an agent and the external world. This link is fluid, dynamic, and active in a variety of ways."[30]

Enactivism had always conceded that only certain environments allowed world-enactment for certain organisms. The environment had to provide viability; but this requirement provided only loose constraints rather than inciting adaptive optimization.[31] The action came inside-out as it were, from the side of the world-enacting organism, whose organizational closure allowed for structural coupling. Ecological psychology worked from outside in, specifying invariant structures in the ambient optic array, but it was never naïve realism or objectivism any more than enactivism was naïve subjectivism or constructivism. Affordances are not features of the environment, but are relations between organism and environment.[32]

Just as enactivism has developed a branch that moves from a focus on the perceptual-motor linkage in individual organisms to second-person participatory sense-making to third-person political philosophy of mind, ecological psychology has moved from a focus on perceptual motor links to "social scaffolding," environmental structures that enable or afford characteristic action of properly attuned agents. In this vein, Erik Rietveld and Julian Kiverstein emphasize the difference

between the landscape and the field of affordances. Affordances in a landscape are potentials that might be taken up, while those in the field are currently in use by a particular organism.[33] When an organism is engaged with features of the environment, these features are "experienced as 'solicitations,' in that they solicit (further) affective appraisal and [hence] act as perceptual and affective prompts for the organism to act on the affordance." I will emphasize this notion of solicitation in our analysis of the Q Shaman's prayer on the dais of the Senate Chamber.

Hence, the last step toward the study of the political affordances of the Capitol riot is taken by Maxwell Ramstead and collaborators, who develop the claim that the full range of affordances for humans must include the social-cultural world. This insistence on affordances soliciting politically meaningful action resonates with the manifesto of the "Skilled Intentionality Framework," in which the authors insist that "affordances always have to be understood in the context of an ecological niche that implies the form of life of a certain kind of animal."[34] In something of an existence proof for what I will attempt below, Simon Harrison provides a case study that links a social affordances analysis with an ethnographic study of consumers in a cosmetics pop-up store in Hong Kong, revealing "the affective and emotional experience of perceiving relevant affordances in the environment."[35] I will follow Ramstead et al. in looking to the political affordances of the Senate Chamber, as I follow Harrison in looking at the emotional attunement of the participants as their actions unfold.

Prayer in the Senate Chamber

When I say I'm looking at political affordances of the Capitol building as conditions of the insurrection, I don't want to avoid hermeneutic analyses altogether. Rather, I just want to see them anchored to the concrete experience of embodied and affective subjects, past and present. Some very useful readings of the Capitol insurrection, in a genre we might call Critical Race Architecture, in fact highlight the contradiction of a building that purports to represent democratic ideals of freedom and equality having been built by enslaved persons. Carolina Miranda puts it bluntly: "In the Capitol building, idealized narratives of liberty and democracy rest on brute force."[36] Peter Minosh, in an essay written before the insurrection, puts it this way:

> The neoclassical design of the Capitol has been taken to represent the classical virtues of an American enlightenment. I argue that the proper subjects represented in this monument to representational democracy are not the citizens of the Republic, but the enslaved people excluded from political and architectural representation. By examining Thornton's preliminary designs

> for the Capitol in consideration of the greater trajectory of his philosophical projects and political activities, we can discern in this neoclassical edifice the terms of an irresolvable crisis between the enlightened Republic and its foundation within a regime of chattel slavery.[37]

A case study must, however, narrow its focus, even as it keeps the big picture claims that the building itself embodies a conflict of democratic symbolism and the labor of enslaved persons in the background. We will focus on the Q Shaman prayer in the Senate Chamber, which, given the civil religion aspects of the chamber, was both in place and out of place.[38] Let's begin with a brief description of the Senate Chamber.[39] The chamber is encircled by a balcony serving as the viewer's gallery. The entrance doors to the chamber open under the balcony onto a gently sloping floor lined with the senators' desks in a semi-circular pattern. In the well of the chamber, we find first the clerk's desk; then, a small level up sits a long marble counter; and finally, another small level up we see the senate president's desk, flanked by the US flag and the US Senate flag, serving as the focal point for the room.

I'll now use the Luke Mogelson video from The *New Yorker* to document a small subset of the events, culminating in the Q Shaman's prayer.[40] We first see Jacob Chansley, the Q Shaman, shouting and chanting from the balcony. It's something of a commonplace of political architectural analysis to note the penchant of authoritarians to give balcony addresses, and in fact Trump's balcony appearance after his release from hospital (where he had been treated for Covid) in October 2020 sparked dozens of commentaries noting just that.[41] So we can speculate that for Chansley, the balcony solicited a powerful urge to vocalize, not simply from being higher than others (although not neglecting that physical relation), but also from the resonances with balcony speaking by strongmen. The chants and howls were, however, more of a California-style Men's Rights, Iron John, back-to-nature performance, befitting Chansley's wild-man look, highlighted by his bare torso and tattooed body (prominent among the signs is Thor's hammer), and by now infamous horned helmet with cascading fur pieces framing his face.

We then see Chansley triumphantly striding down the aisle, face jubilant, chest expansive, feeling the power of strides aided by the slope, shouting "Fucking A, man!" while carrying his bullhorn and spear wrapped with the American flag. He greets people already in the chamber, congratulating them, paternalistically, on their service. Shortly thereafter, a police officer enters the frame and asks if an injured man needs help. Having established his bona fides as a public servant, he asks them to leave. The injured insurrectionist says, "I been making sure they ain't disrespecting the place." The policeman says, "just want you to know, this is like *the* sacredest place." This exchange definitively primes the participants to recall

the civil religion aspect of the Capitol as a "temple of democracy," further charging the affective space of the chamber for Chansley.

Chansley has soon mounted to the president's desk, where he puts his bullhorn down and takes off his backpack; he then sits in the president's chair. The police officer asks him to move, but Chansley replies that he's sitting there "cause Mike Pence is a fucking traitor". Sitting in a chair is the classic example of meshing action with an affordance, but this is not just "a" chair, for Chansley is taking possession of a chair whose occupant has forfeited the right to control it.

The police officer again asks the people if they could leave. There is some agreement, but Chansley demurs, staying around to write a note, appropriating paper from the desk. The policeman objects to this, saying "I feel you're pushing the line." The injured man further primes the scene as one resonant with civil religion: "C'mon man. This is our Capitol, let's be respectful. There's four million people coming in... we love you guys, we love the cops." We now see a shot of Chansley's note: "It's only a matter of time. Justice is coming!" So, we've moved from the injured man's rootedness in the day (albeit rather hilariously exaggerated) to Chansley's apocalyptic channeling of what he thinks will be justice.

There are now four men at the dais, behind the president's desk. One raises his fist to the heavens in a power salute, arm at ninety degrees, and yells out "Jesus Christ, we invoke your name, amen!" Chansley takes over, suggesting to the participants, "Let's say a prayer in this sacred space."[42] As Chansley begins, the man to his left doffs his MAGA hat as sign of respect. All the men at the dais follow suit, further cementing the dais as an altar and the men as responding to its solicitation as a place of prayer.[43] Chansley's prayer finishes with a triumphant chorus of "amen!"

I will leave a full semantic analysis of the prayer to others,[44] but I did want at least to mention the way Chansley evokes the ambience of the chamber: "Thank you divine, omniscient, omnipotent and omnipresent creator God for filling this chamber with your white light and love, your white light of harmony." Is it going too far, or not far enough, to note the possible racialized overtones of a "white light" as part of "Trumpian ecumenicalism"?[45]

There's much more to be said about Chansley in terms of what we can call his being swept up into a "stochastic affective ideology" that brought him to the place where the dais could solicit his prayer. For instance, we can't deal with Chansley's ideas alone without tackling his emotional investments; in doing so, we follow Deleuze and Guattari's break from Wilhelm Reich on the question of direct libidinal investment of the social field, a break which requires a notion of "affective ideology."[46] As for stochastic factors, we can't set up impossible demands for exact times in which Chansley imbibed one or another idea from Trump, Q Anon, and so on. Rather we can look to the way in which increased political stresses will reveal those in a population with lowered thresholds for action. In this way, we can see

Chansley as a "socially invaded mind" as opposed to the "socially extended mind" of 4EA cognition.[47]

There's also much more to be said about other actions that day at the Capitol.[48] Let's ask ourselves if there was something about the cold, hard, shiny marble floors that called for shitting, for defilement? The *Daily News* writes, "They took a dump on American democracy – literally. Some of the unhinged pro-Trump rioters who stormed the U.S. Capitol on Wednesday defecated inside the historic building and 'tracked' their feces in several hallways, the *Daily News* has learned."[49]It's unclear whether the insurrectionists shat on the hallways on purpose or if it was just a toilet overflow that was tracked about unintentionally. What is clear is that media attention assumed it was intentional due to its symbolic shock value. But should it have been shocking? If you only get cleanliness by abjecting the accursed share, then shit defiling a clean Capitol could only be shocking to those whose good conscience is achieved by repressing the memory of the enslaved laborers who built the Capitol. Perhaps we should let that shit remind us that the Capitol was already defiled, from the start, by its very construction[50]

Notes

1 For a book-length theoretical work featuring the concepts of JJ Gibson and ecological psychology, see Andrej Radman, *Gibsonism: Ecologies of Architecture* (doctoral thesis, TU Delft, 2012), http://resolver.tudelft.nl/uuid:4035de29-3b68-4dfa-b0fb-668bf69d54b5. For an ecological psychology case study of consumer behavior as shaped by the built environment, see Simon Harrison, "Through the Magical Pink Walkway: A Behavior Setting's Invitation to Embodied Sense-Makers," *Frontiers in Psychology* 11 (2020): 1576.

2 For a portrait of Chansley's motley libidinal politics, a mélange of Trump, Q Anon, and appropriations of Native American and Nordic themes, see Frederick Kunkle, "Trump supporter in horns and fur is charged in Capitol riot," *The Washington Post*, January 9, 2021, https://www.washingtonpost.com/local/jacob-chansely-horn-qanon-capitol-riot/2021/01/09/5d3c2c96-52b9-11eb-bda4-615aaefd0555_story.html

3 Jack Jenkins, "The insurrectionists' Senate floor prayer highlights a curious Trumpian ecumenism," *Religion News Service*, February 25, 2021, https://religionnews.com/2021/02/25/the-insurrectionists-senate-floor-prayer-highlights-a-curious-trumpian-ecumenism/. The contrast case is that many prayers in the American civil religion style have been offered in the Senate chamber by the Senate Chaplain. The classic statement on American civil religion is Robert N. Bellah, "Civil Religion in America," *Dædalus: Journal of the American Academy of Arts and Sciences* 96, no. 1 (Winter 1967): 1–21.

4 Deleuze, Gilles. *The Logic of Sense*. Trans. Mark Lester, with Charles Stivale. New York: Columbia University Press, 1993.

5 Dramatization is something like, though more dynamic than, a Kantian schematism, which is the rule for producing an object consistent with a concept. Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (New York: Columbia University Press, 1994), 218.

6 James Williams, *The Transversal Thought of Gilles Deleuze: Encounters and Influences* (Manchester: Clinamen Press, 2005), 130.

7 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987), 260–61. On the different treatments of events in *Difference and Repetition* and *A Thousand Plateaus*, in which events qua intensive "spatio-temporal dynamisms" are no longer schematism-like dramatizations mediating virtual Ideas and actual objects but are immanent material haecceities, compositions of the movements and affects of bodies, see Alberto Toscano, *The Theatre of Production: Philosophy and Individuation between Kant and Deleuze* (London: Palgrave Macmillan, 2006), 175–80.

8 Deleuze and Guattari, *A Thousand Plateaus*, 262.

9 Ibid., 260–61. Following Spinoza, Deleuze and Guattari define affection as the change in the material relations defining a body by an encounter with another body, while affect is the change in the power of acting of the affected body due to the affection.

10 I present three case studies (of the Columbine school massacre, of the Terri Schiavo "right to die" case, and of Hurricane Katrina) in John Protevi, *Political Affect: Connecting the Social and the Somatic* (Minneapolis: University of Minnesota Press, 2009).

11 4EA had its first landmark text in Francisco J. Varela, Evan Thompson, and Elizabeth Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge MA: MIT Press, 1991). Twenty-seven years later, it achieved something of a capstone as an accepted (but by no means dominant) alternative in *The Oxford Handbook of 4E Cognition*, ed. Albert Newen, Leon de Bruin, and Shaun Gallagher (New York: Oxford University Press, 2018).

12 A noteworthy effort here is Michelle Maiese and Robert Hanna, *The Mind-Body Politic* (London: Palgrave Macmillan, 2018). I will concentrate here on some of the sources on which this book draws.

13 For an overview, see Ezequiel Di Paolo and Evan Thompson, "The Enactive Approach," in *The Routledge Handbook of Embodied Cognition*, ed. Lawrence Shapiro (New York: Routledge, 2014), 68–78.

14 Daniel D. Hutto and Erik Myin, "Going Radical," in *The Oxford Handbook of 4E Cognition*, ed. Newen, de Bruin, and Gallagher, 95–116, 95.

15 Susan Hurley, *Consciousness in Action* (Cambridge, MA: Harvard University Press, 1998), 21.

16 Francisco J. Varela, Humberto Maturana, and Ricardo Uribe, "Autopoiesis: The Organization of the Living, Its Characterization and a Model," *BioSystems* 5, no. 4 (1974): 187–96.

17 Ezequiel Di Paolo, "Autopoiesis, Adaptivity, Teleology, Agency," *Phenomenology and the Cognitive Sciences* 4, no. 4 (2005): 429–52, 437; see also Evan Thompson, *Mind in Life: Biology, Phenomenology, and the Sciences of Mind* (Cambridge, MA: Harvard University Press, 2007).

18 Hanne De Jaegher and Ezequiel Di Paolo, "Participatory Sense-Making: An Enactive Approach to Social Cognition," *Phenomenology and the Cognitive Sciences* 6, no. 4 (2007): 485–507. The key concept here is that the interaction can itself establish an autonomy: we can identify the dynamics of a conversation over and above individual utterances, as the conversation enables and constrains the interactions that unfold within it and make it up. See also Ezequiel Di Paolo, Hanne De Jaegher, and Elena Cuffari, *Linguistic Bodies: The Continuity Between Life and Language* (Cambridge, MA: MIT Press, 2018).

19 The key for the enactivists has always been to engage with neuroscience while resisting a reduction of that experience to an explanation based solely on sub-personal neurochemical processes. Varela's "neurophenomenological" proposal was to use subjects trained in either a rigorous phenomenological practice or in Buddhist meditation practice to allow access to first person direct experience that would not be introspective guesswork nor caught in an infinite regress of objectifying self-reflection;

descriptions of experience by such trained subjects could then be put into a dialogue of "mutual constraints" with findings of correlated neural activity in a way that would preserve the first person experience while still bringing third person neuroscience to bear. See Francisco J. Varela, "Neurophenomenology: A Methodological Remedy for the Hard Problem," *Journal of Consciousness Studies* 3, no. 4 (1996): 330–49.

20 The original extended mind article is Andy Clark and David Chalmers, "The Extended Mind," *Analysis* 58, no.1 (1998): 7–19. Clark and Chalmers propose a "parity principle": if a cognitive process loops into the world in a way that, were the process to occur completely within the brain, it would count as a cognitive act, then the world-involving act should be seen as cognitive as well.

21 Shaun Gallagher and Anthony Crisafi, "Mental Institutions," *Topoi* 28 (2009): 45–51; Shaun Gallagher, "The Socially Extended Mind," *Cognitive Systems Research* 25–26 (2013): 4–12.

22 Shaun Gallagher, *Action and Interaction* (New York: Oxford University Press, 2020): 226–27.

23 Jan Slaby, "Steps towards a Critical Neuroscience," *Phenomenology and the Cognitive Sciences* 9, no. 3 (2010): 397–416.

24 Jan Slaby and Shaun Gallagher, "Critical Neuroscience and Socially Extended Minds," *Theory, Culture & Society* 32, no. 1 (2015): 33–59, 52.

25 Jan Slaby, "Mind Invasion: Situated Affectivity and the Corporate Life Hack," *Frontiers in Psychology* 7 (2016): 266.

26 John Protevi, *Political Affect: Connecting the Social and the Somatic* (Minneapolis: University of Minnesota Press, 2009) and Life, War, Earth: Deleuze and the Sciences (Minneapolis: University of Minnesota Press, 2013).

27 J.J. Gibson, *The Ecological Approach to Visual Perception* (Hillsdale, NJ: Erlbaum, 1986).

28 Varela, Thompson, and Rosch, *The Embodied Mind*, 203.

29 Marek McGann, Ezequiel Di Paolo, Manuel Heras-Escribano, and Anthony Chemero, "Editorial: Enaction and Ecological Psychology: Convergences and Complementarities," *Frontiers in Psychology* 11 (2020): 3176.

30 Kevin J. Ryan and Shaun Gallagher, "Between Ecological Psychology and Enactivism: Is There Resonance?" *Frontiers in Psychology* 11 (2020): 1147.

31 Varela, Thompson, and Rosch, *The Embodied Mind*, 194–96: "The constraints of survival and reproduction are far too weak to provide an account of how structures develop and change... The enormous diversity constantly generated at all levels in the genetic and evolutionary process both shapes and is shaped by the coupling with the environment... Much of what an organism looks like and is 'about' is completely underdetermined by the constraints of survival and reproduction."

32 In other words, the ambient optic array is analogous to viability constraints for enactivism: it provides outer boundaries but under-determines the exact ways in which an organism engages its environment. For the classic work in setting forth Gibsonian affordances in an approach to cognitive science, see Anthony Chemero, *Radical Embodied Cognitive Science* (Cambridge, MA: MIT Press, 2009).

33 Erik Rietveld and Julian Kiverstein, "A Rich Landscape of Affordances," *Ecological Psychology* 26, no. 4 (2014): 325–52.

34 Erik Rietveld, Damian Denys, and Maarten Van Westen, "Ecological-Enactive Cognition as Engaging with a Field of Relevant Affordances," in *The Oxford Handbook of 4E Cognition*, ed. Newen, de Bruin, and Gallagher, 41–70, 45.

35 Harrison, "Through the Magical Pink Walkway," 1576.

36 Carolina A. Miranda, "Yes, the Capitol is a 'symbol of democracy.' One with a really troubled history," *Los Angeles Times*, January 7, 2021, https://www.latimes.com/entertainment-arts/story/2021-01-07/mob-invades-capitol-symbol-of-democracy-troubled-history; see also Justin Davidson, "Can an Armored Capitol Still Be the People's House?" *Curbed*, January 13, 2021, https://www.curbed.com/2021/01/armored-capitol-troops-peoples-house-after-riot.html.

37 Peter Minosh, "American Architecture in the Black Atlantic: William Thornton's Design for the United States Capitol," in *Race and Modern Architecture*, ed. Irene Cheng, Charles L. Davis II, & Mabel O. Wilson (Pittsburgh: University of Pittsburgh Press, 2020), 43–58.

38 From the website for the Senate Chaplain: "Throughout the years, the United States Senate has honored the historic separation of Church and State, but not the separation of God and State. The first Senate, meeting in New York City on April 25, 1789, elected the Right Reverend Samuel Provost, the Episcopal Bishop of New York, as its first chaplain. Since then, all sessions of the Senate have been opened with prayer, strongly affirming the Senate's faith in God as Sovereign Lord of our Nation. The role of the chaplain as spiritual advisor and counselor has expanded over the years from a part-time position to a full-time job as one of the officers of the Senate. The Office of the Chaplain is nonpartisan, nonpolitical, and nonsectarian." https://www.senate.gov/reference/office/chaplain.htm.

39 Architect of the Capitol, "Senate Chamber." https://www.aoc.gov/explore-capitol-campus/buildings-grounds/capitol-building/senate-wing/senate-chamber.

40 Luke Mogelson (reporter/cinematographer) and Sara Ann Wolansky (producer/editor), "A Reporter's Footage from Inside the Capitol Siege," *The New Yorker,* January 17, 2021, https://www.newyorker.com/news/video-dept/a-reporters-footage-from-inside-the-capitol- siege.

41 For example, Ruth Ben-Ghiat, "Trump, the Coronavirus, and What Happens When Strongmen Fall Ill," *The New Yorker*, October 13, 2021, https://www.newyorker.com/culture/cultural-comment/trump-the-coronavirus-and-what- happens-when-strongmen-fall-ill.

42 A transcript of the prayer can be found at Jack Jenkins (@jackmjenkins), "So @NewYorker has footage of the prayer that was led on the Senate chamber floor by insurrectionists on Jan 6," Twitter, January 17, 2021, https://twitter.com/jackmjenkins/status/1350827561593532418?lang=en.

43 During the prayer, Chansley's companions offer rhythmic gestures of affirmation andsupplication (arms extended, palms up, then clenching in triumphant fists).

44 One interesting task would be to compare Chansley's prayer with the one offered by the current Senate Chaplain at the conclusion of joint session ending on January 7, from the lectern in the House Chamber: "Lord of our lives and sovereign of our beloved nation, we deplore the desecration of the United States Capitol building, the shedding of innocent blood, the loss of life, and the quagmire of dysfunction that threaten our democracy. These tragedies have reminded us that words matter and that the power of life and death is in the tongue. We have been warned that eternal vigilance continues to be freedom's price. Lord, you have helped us remember that we need to see in each other a common humanity that reflects your image. You have strengthened our resolve to protect and defend the Constitution of the United States against all enemies domestic as well as foreign. Use us to bring healing and unity to our hurting and divided nation and world. Thank you for what you have blessed our lawmakers to accomplish in spite of threats to liberty. Bless and keep us. Drive far from us all wrong desires, incline our hearts to do your will and guide our feet on the path of peace. And God bless America. We pray in your sovereign name, Amen." Transcript available at: "Adventist Chaplain Leads Cloasing Prayer at US Senate's Momentous Session," *Adventist Review*, January 8, 2021, https://adventistreview.org/news/adventist-chaplain-leads-closing-prayer-at-us-senates-momentous-session/.

45 Jack Jenkins, "The insurrectionists' Senate floor prayer highlights a curious Trumpian ecumenism," *Religion News Service*, February 25, 2021.

46 John Protevi, "Fractures of the State: Deleuze and Guattari on Ideology," Chapter 5 of *Edges of the State* (Minneapolis: University of Minnesota Press, 2019), 55–67.

47 John Protevi, "The Political Economy of Consciousness," Chapter 5 of *Life, War, Earth: Deleuze and the Sciences* (Minneapolis: University of Minnesota Press, 2013), 111–25.

48 What was the intersection of emotional investment and political affordance that led some to heed the call to climb walls, storm doors, and fight cops? On fighting, see Randall Collins, "Assault on the Capitol: 2021, 1917, 1792," *The Sociological Eye*, January 28, 2021, http://sociological-eye.blogspot.com/2021/01/assault-on-capitol-2021-1917-1792.html.

49 Chris Sommerfeldt, "Pro-Trump rioters smeared poop in U.S. Capitol hallways during belligerent attack," *New York Daily* News, January 7, 2021.

50 On abjection and architecture, see Sean Akahane-Bryen and Chris L. Smith, "The Space of the Lacerated Subject: Architecture and Abjection," *Architecture Philosophy* 4, no. 1 (2019). For a standard social science look at defecation as sign of disrespect, see Albert Friedman, "The Scatological Rites of Burglars," *Western Folklore* 27, no. 3 (July 1968): 171–79. For a classic in the politics of shit, see *Dominique Laporte, History of Shit,* trans. Rodolphe el-Khoury and Nadia Benabid (Cambridge, MA: MIT, 2002).

Bibliography

"Adventist Chaplain Leads Closing Prayer at US Senate's Momentous Session." *Adventist Review*, January 8, 2021, https://adventistreview.org/news/adventist-chaplain-leads-closing-prayer-at-us-senates-momentous-session/.

Akahane-Bryen, Sean and Chris L. Smith. "The Space of the Lacerated Subject: Architecture and Abjection." *Architecture Philosophy* 4, no. 1 (2019).

Architect of the Capitol. "Senate Chamber." https://www.aoc.gov/explore-capitol-campus/buildings-grounds/capitol-building/senate-wing/senate-chamber.

Bellah, Robert N. "Civil Religion in America." *Dædalus: Journal of the American Academy of Arts and Sciences* 96, no. 1 (Winter 1967): 1–21.

Ben-Ghiat, Ruth. "Trump, the Coronavirus, and What Happens When Strongmen Fall Ill." *The New Yorker*, October 13, 2021, https://www.newyorker.com/culture/cultural-comment/trump-the-coronavirus-and-what- happens-when-strongmen-fall-ill.

Chemero, Anthony. *Radical Embodied Cognitive Science*. Cambridge, MA: MIT Press, 2009.

Clark, Andy and David Chalmers. "The Extended Mind." *Analysis* 58, no.1 (1998): 7–19.

Collins, Randall. "Assault on the Capitol: 2021, 1917, 1792." *The Sociological Eye*, January 28, 2021, http://sociological-eye.blogspot.com/2021/01/assault-on-capitol-2021-1917-1792.html.

Davidson, Justin. "Can an Armored Capitol Still Be the People's House?" *Curbed*, January 13, 2021, https://www.curbed.com/2021/01/armored-capitol-troops-peoples-house-after-riot.html.

De Jaegher, Hanne and Ezequiel Di Paolo. "Participatory Sense-Making: An Enactive Approach to Social Cognition." *Phenomenology and the Cognitive Sciences* 6, no. 4 (2007): 485–507.

Deleuze, Gilles and Félix Guattari. A Thousand Plateaus. Translated by Brian Massumi. Minneapolis: University of Minnesota Press, 1987.

Deleuze, Gilles. *Difference and Repetition*. Translated by Paul Patton. New York: Columbia University Press, 1994.

Deleuze, Gilles. *The Logic of Sense*. Translated by Mark Lester, with Charles Stivale. New York: Columbia University Press, 1993.

Di Paolo, Ezequiel and Evan Thompson. "The Enactive Approach." In T*he Routledge Handbook of Embodied Cognition*, edited by Lawrence Shapiro, 68–78. New York: Routledge, 2014.

Di Paolo, Ezequiel. "Autopoiesis, Adaptivity, Teleology, Agency." *Phenomenology and the Cognitive Sciences* 4, no. 4 (2005): 429–52.

Di Paolo, Ezequiel, Hanne De Jaegher, and Elena Cuffari. *Linguistic Bodies: The Continuity Between Life and Language*. Cambridge, MA: MIT Press, 2018.

Friedman, Albert. "The Scatological Rites of Burglars." *Western Folklore* 27, no. 3 (July 1968): 171–79.

Gallagher, Shaun and Anthony Crisafi. "Mental Institutions." *Topoi* 28 (2009): 45–51.

Gallagher, Shaun. "The Socially Extended Mind." *Cognitive Systems Research* 25–26 (2013): 4–12.

Gallagher, Shaun. *Action and Interaction*. New York: Oxford University Press, 2020.

Gibson, J.J. *The Ecological Approach to Visual Perception*. Hillsdale, NJ: Erlbaum, 1986.

Harrison, Simon. "Through the Magical Pink Walkway: A Behavior Setting's Invitation to Embodied Sense-Makers." *Frontiers in Psychology* 11 (2020): 1576.

Hurley, Susan. *Consciousness in Action*. Cambridge, MA: Harvard University Press, 1998.

Hutto, Daniel D. and Erik Myin. "Going Radical." In *The Oxford Handbook of 4E Cognition*, edited by Albert Newen, Leon de Bruin, and Shaun Gallagher, 95–116. New York: Oxford University Press, 2018.

Jenkins, Jack. "The insurrectionists' Senate floor prayer highlights a curious Trumpian ecumenism." *Religion News Service*, February 25, 2021. https://religionnews.com/2021/02/25/the-insurrectionists-senate-floor-prayer-highlights-a-curious-trumpian-ecumenism/.

Kunkle, Frederick. "Trump Supporter in Horns and Fur is Charged in Capitol Riot." *The Washington Post*, January 9, 2021. https://www.washingtonpost.com/local/jacob-chansely-horn-qanon-capitol-riot/2021/01/09/5d3c2c96-52b9-11eb-bda4-615aaefd0555_story.html.

Laporte, Dominique. *History of Shit*. Translated by Rodolphe el-Khoury and Nadia Benabid. Cambridge, MA: MIT, 2002.

Maiese, Michelle and Robert Hanna. *The Mind-Body Politic*. London: Palgrave Macmillan, 2018.

McGann, Marek, Ezequiel Di Paolo, Manuel Heras-Escribano, and Anthony Chemero. "Editorial: Enaction and Ecological Psychology: Convergences and Complementarities." *Frontiers in Psychology* 11 (2020).

Minosh, Peter. "American Architecture in the Black Atlantic: William Thornton's Design for the United States Capitol." In *Race and Modern Architecture*, edited by Irene Cheng, Charles L. Davis II, and Mabel O. Wilson. Pittsburgh: University of Pittsburgh Press, 2020.

Miranda, Carolina A. "Yes, the Capitol is a 'symbol of democracy.' One with a really troubled history." *Los Angeles Times*, January 7, 2021, https://www.latimes.com/entertainment-arts/story/2021-01-07/mob-invades-capitol-symbol-of-democracy-troubled-history.

Mogelson, Luke and Sara Ann Wolansky. "A Reporter's Footage from Inside the Capitol Siege." *The New Yorker*, January 17, 2021, https://www.newyorker.com/news/video-dept/a-reporters-footage-from-inside-the-capitol- siege.

Newen, Albert, Leon de Bruin, and Shaun Gallagher, eds. *The Oxford Handbook of 4E Cognition*. New York: Oxford University Press, 2018.

Protevi, John. *Edges of the State.* Minneapolis: University of Minnesota Press, 2019.

Protevi, John. *Life, War, Earth: Deleuze and the Sciences*. Minneapolis: University of Minnesota Press, 2013.

Protevi, John. *Political Affect: Connecting the Social and the Somatic*. Minneapolis: University of Minnesota Press, 2009.

Radman, Andrej. *Gibsonism: Ecologies of Architecture. Doctoral thesis*, TU Delft. 2012. http://resolver.tudelft.nl/uuid:4035de29-3b68-4dfa-b0fb-668bf69d54b5.

Ramstead, Maxwell J.D., Samuel P.L. Veissière, and Laurence J. Kirmayer. "Cultural Affordances: Scaffolding Local Worlds Through Shared Intentionality and Regimes of Attention." *Frontiers in Psychology* 7 (2016).

Rietveld, Erik and Julian Kiverstein. "A Rich Landscape of Affordances." *Ecological Psychology* 26, no. 4 (2014): 325–52.

Rietveld, Erik, Damian Denys, and Maarten Van Westen. "Ecological-Enactive Cognition as Engaging with a Field of Relevant Affordances." In *The Oxford Handbook of 4E Cognition*, edited by Albert Newen, Leon de Bruin, and Shaun Gallagher, 41–70. New York: Oxford University Press, 2018.

Ryan, Kevin J. and Shaun Gallagher. "Between Ecological Psychology and Enactivism: Is There Resonance?" *Frontiers in Psychology* 11 (2020).

Slaby, Jan and Shaun Gallagher. "Critical Neuroscience and Socially Extended Minds." *Theory, Culture & Society* 32, no. 1 (2015): 33–59.

Slaby, Jan. "Mind Invasion: Situated Affectivity and the Corporate Life Hack." *Frontiers in Psychology* 7 (2016).

Slaby, Jan. "Steps towards a Critical Neuroscience." *Phenomenology and the Cognitive Sciences* 9, no. 3 (2010): 397–416.

Sommerfeldt, Chris. "Pro-Trump rioters smeared poop in U.S. Capitol hallways during belligerent attack." *New York Daily News*, January 7, 2021.

Thompson, Evan. *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Cambridge, MA: Harvard University Press, 2007.

Toscano, Alberto. *The Theatre of Production: Philosophy and Individuation between Kant and Deleuze*. London: Palgrave Macmillan, 2006.

United States Senate, Office of the Senate Chaplain. https://www.senate.gov/reference/office/chaplain.htm.

Varela, Francisco J., "Neurophenomenology: A Methodological Remedy for the Hard Problem," *Journal of Consciousness Studies* 3, no. 4 (1996): 330–49.

Varela, Francisco J., Evan Thompson, and Elizabeth Rosch. *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge MA: MIT Press, 1991.

Varela, Francisco J., Humberto Maturana, and Ricardo Uribe. "Autopoiesis: The Organization of the Living, Its Characterization and a Model." *BioSystems* 5, no. 4 (1974): 187–96.

Williams, James. *The Transversal Thought of Gilles Deleuze: Encounters and Influences*. Manchester: Clinamen Press, 2005.

Technicity as the Montage Production of the Mundane

Marc Boumeester

Of all potential coalescences – both actualized and virtual – the perceptible mundane is the most improbable to transpire. Perception as an act brings a multitude of impressions which cannot be placed under the umbrella of everything already known or being knowable, forcing the individual to rethink and redevelop "basic" modes of thought and understanding. Therefore we limit the actualization of the mundane perceptible, equal to the way a montage produces cinema by the elimination of the majority of events and the privileging of certain impulses and viewpoints. Taking the premise of exception (rather than that of surplus) as the starting point to examine a percept clarifies why its definition is always translucent and plastic, producing an area that has no fixed boundaries or delineations, at best its definition is autoreferential: that which is its percept is the definition of its percept, thus it always contains more and less than the elements that are contained in its definition. Within the act of "affording perception," a second process of selection will be occurring: that of the individuation of percept. This process involves the combination, recombination, interpretation and reinterpretation of all somatic stimuli, both actualized and virtual, privileging information stemming from the present, past and future, which is produced by a double helix of existence: one strand of actuality twisting around another strand of virtuality, both producing each other, folding into each other.

The production of perception is part of the technicity of the construction of urban life, in which expectation plays a major role. Expectation is an agency with no predefined magnitude: its force arises from the preciseness of its fulfilment, not from the scale of its impact. Much of what is considered to be the expectation of a

built environment can be called its exo-identity. An exo-identity is a mental projection or an image of a place, with its specific aesthetics, localized culture, social behavior, economic status, situational moxie and so on, that only exist on a meta-level. Exo-identities are created and consist of expectations that need to be met, but will never truly fit their premise. Therefore they do not contain a presence in the here and now, but create a set of values that can only be filled with transferred experiences, not with embodied perception. The image of the built environment is formed "on top of" it and we are most eager to actualize this by our own interventions, imaginations, and "imagings." That does not mean that these images are not real – they are of great influence and possess significant agency – yet they are images by proxy: images that are a mere embodiment of a predefined expectation, rather than an expression of original thought or concept. Expectation can be seen as a communal-to-individual form of the formal logic *if then*, whereas sensorial affordance of perception in daily life follows the pathway of the indetermined heuristics of *what if.* The difference between these two vectors leave a void that creates the technicity of the montage production as an exceptional instrument in the creation of mundane perception within the built environment. Out of all latent coagulations, everyday life is the most unlikely to occur: statistically every other (yet non-designated or specified) outcome is close to infinitely more likely to occur than the one that we (species) can detect and perceive.

Even so, this is followed by a second process of selection: that of the individuation of perception. It might seem artificial to insert a division between actualization and perception: there is no ontological ground on which to claim that the actualization takes place without its perception, as this perception is never objective. Yet to avoid getting drawn into the discourse on the (im-) possibility of unperceived existence, we need to reverse the argument: when dealing with everyday life, what is perceived is caused by a percept – actualized or virtual. Perception is thus the qualifying hurdle for existence, although this does not need to be actualized or objectified. In this process an unlimited finity is produced by the addition of new dimensions, that in themselves produce a limited number of outcomes. This process works as a cinematographic machine which constructs our individual experience of an actualization known as everyday life. Its cinematographic character is gained by the combination and recombination of information, sounds, visions, smells, tactile and haptic perceptions (in short: the full somaesthetic perception) and many more stimuli. After all, to speak with the editors of this book, the emphasis is on "the production of sense, which is never given, but always made."[1] The reason to involve the allegory of cinematographic machinery lies in the potential fallacy of flattening the relation between the virtual and the actual to a system of cause and effect.

Daily life (which is, as argued, an exceptional state of occurrences) is not a fixed outcome of cross-referenced potential in a deterministic way. It involves many elements of anticipation, expectation and stimulation which find their origin in the virtual, without having to become part of the actualized. Hence we experience both more and less than what is actually there. Daily life is the product of potential, assemblages – or in the words of the editors – it is a product of immanence.[2] Brian Massumi argues that affect is a threshold experience, a conceivable transition in everyday life, in which it is inevitably embodied.[3] A simple example is the anticipation of an upcoming holiday that charges one's last days before summer with a special aura of excitement and energy, and in doing so charges the everyday situation in such a way that work is done more efficiently and pleasantly, in its turn affecting others as well, who react positively to this energy, making work go faster and more smoothly, affecting oneself again, etcetera. This despite the fact that the holiday might never actually occur because of some unforeseen event.

Slavoj Žižek introduced the trope of the "third pill," as an agency arising from the moving image itself, which empowers it to act as an autonomous entity rather than having a foundation in the actualized or in the illusion of a narrative.[4] The third pill exposes the underlying fabric of the choice between pills, that is, that cinema or any other illusion could be far more real, than reality itself. The construction of perception relies heavily on cinematographing realism, in which reality is composed of and edited from the elements in the actualized and the past, present and future virtual. Elsewhere, I have named this the cinematographic machine, a trope to describe how elements that construct our perception of the daily life are being mapped by our somaesthetic perception.[5] If this machine is the process, then the agency that drives it would be the technicity of cinematographing perception. I will elaborate on this construct and explore the continuously shaping and reshaping of its own definition, as the forces themselves can only be sensed and described in terms of their effects, rather than on grounds of their ontology or properties. The act of cinematographing thus has a self-describing magnitude (its autopoiesis), yet by acting it also dismantles that which has created in the same time (its entropy), which – as a system – can be placed into forces of signification, as a balancing act between getting too close or too far from "the mundane". Additionally I will address the correlation between identity-making (exo-identity) and the fulfillment of the expectation that arises from it, which – in itself and on a population scale – is also part of the same identity-making (the image by proxy) and how this is embedded in the system of cinematographing perception.

Cinematographing

Cinema subsists. This strikingly simple, yet metaphorical remark is not by any means meant to start an elaboration on the ontology of cinema, nor on any qualification in terms of its pedagogical capacities in the formative tradition, phenomenological impact or signification in any given semiotic order.[6] Rather it is an attempt to steer away from these taxonomies and descend into the crucial conditions that allow for its existence. For this, one must draw on two premises.

Firstly and most obviously, reality consists of two parts, the virtual and the actualized, whereby the virtual is not seen as a technologically enhanced expansion of the sensory; rather it is interpreted as the sum of all potential (past, present and future) of all that could be actualized, and of all potential (past, present and future) that could not be actualized. Yet making a distinction between "virtuality's potential" to be actualized or not is a simulated and therefore counterfeit action: the virtual is (an) event in itself and acts in affective ways regardless of its actualization into a physically perceivable entity. Therefore, the virtual is potential that is already actualized through its affective capacities. Virtuality is a way of producing reality beyond the limitations of time, space and sequence. Brain Massumi summarizes:

> Deleuze and Guattari, following Bergson, suggest that the virtual is the mode of reality implicated in the emergence of new potentials. In other words, its reality is the reality of change: the event. ... If the virtual is change as such, then in any actually given circumstance it can only figure as a mode of abstraction. For what is concretely given is what is – which is not what it will be when it changes.[7]

To flatten this concept into an example, we could think of a journey by train. During our (in this case international) train ride, there are certain elements of actualization that are hard (and useless) to dispute: the train is moving at a certain speed, it has departed from so-and-so, called at several stations, there are a distinct number of people on board, the tickets have been checked once, and so on. We find ourselves in the midst of these conditions and they act on our presence, in physical and mental ways. Yet when it comes to our perception of this situation there is a large number of virtual elements at play that are far more important to the building of our sense of reality. Without taxonomizing these fully, we could at least see elements that are grounded in the past (producing questions like "Will we be searched at the border again?"), present ("I hope this guy will not sit next to me") and future ("I am looking forward so much"), elements that are grounded in our physical ("It is a little hot in here") or mental state ("I really needed this break"), illusionary elements that are grounded in reality; fantasy ("Imagine staying on this

Fig. 1: Interior International Train, 2021. Photo: author.

train all the way to Istanbul") or that are projected in reality; phantasy ("Imagine if this train took off like a plane") or elements of affection ("I love the smell of these old trains").[8] On top of these virtualities there is a continuous (literal and metaphorical) shift in our cognitive receptibility: we gaze, un-focus (figure 1), filter sounds, add sounds (conversation, talk, music), add words (read), add tastes (eat), add thoughts (remember) add emotion (expectation), and so on. All these actions include both actualized and virtual elements and they create a highly subjective perception of the journey.

Secondly, the *act* of cinematographing follows the same path as the trope of the third pill, which deals not with the reality *behind* the illusion, nor that *of* the illusion, but the reality *within* the illusion. A synthetic division between actualization and perception is as useless as the artificial division between the actual and the virtual, since there is no ontological ground on which to claim that the actualization takes place without its perception and there is no ontological ground to claim that the actualized has more influence on the creation of reality than the virtual, as perception is never objective. The creation of this perception is done by the cinematographic machine, which makes no distinction between actualized and virtual and can only be described in terms of it effects, not its properties. Therefore, the act of cinematographing is the way to produce reality, and there is no other way. This is not the same as claiming that reality is more than the sum of its facts in some transcendental meaning; it lays the emphasis on the inclusion of affect as part of factuality. This resonates heavily with Gilles Deleuze's concepts of difference (there is no identity) and repetition (nothing is ever the same); our perception of the embodied event itself occurs through a continuous process of repeating and differentiating dimensions. Deleuze: "I make, remake and unmake my concepts along a moving horizon, from an always decentred centre, from an always displaced periphery which repeats and differentiates them."[9] This process produces a "limitless limitation" by the accumulation of an unlimited number of new dimensions that produce a limited number of results, which I will discuss in the next paragraph. The process of cinematographing is the ultimate embodiment of Žižek's third pill, which shifts the claim to factuality (the edit) from the actualized (*behind* the illusion) to the domain of the (all-inclusive) reality which can be only and always be subjectively perceived (the montage). In doing so it is not the illusion that has been replaced by a form of reality (reality *of* illusion), it is a reality that has become an inseparable illusion of the perception of that reality, anchoring its agency *inside* the illusion without any possibility to detect this agency in any other way. Thus, if the agency subsists, then the illusion must be reality.

Autopoiesis

Having established the two major premises that underlie the concept of cinematographing perception, the next phase will be to examine how the act of cinematographing is on the one hand constantly guarded and petrified where possible, and on the other hand continuously dismantles whatever it has itself created or enabled, its entropy. The distinction between these effects cannot be found in a classification of its production: both create and destruct simultaneously. Rather, we could frame them as a distinction between the form of content and the form of expression, building on a diagram created by Deleuze and Félix Guattari.[10]

The autopoiesis of cinematographing enables us to speak of an entity without knowing its properties or its magnitude. Autopoiesis defines an agency-body that is both "autonomous yet related to its world"[11] and set against "allopoietic" systems[12] that produce something other than there are themselves. In a different context, autopoiesis has been named impredicativity: it is defined by that which it has defined; it is produced by that which it has produced.[13] This is a form of content: as argued earlier; it produces (by inclusion) and eliminates (by exclusion) elements, actualized and virtual, that are all affective in the production of perception. The entropy of cinematographing is a form of expression: it arranges, rearranges, discards, selects, modulates, interprets and dismantles existing elements. The reason to use different wording to describe these actions in relation to cinematographing, is to prevent syllogistic fallacies: not all forms of content are autopoietic, yet autopoiesis is always a form of content; not all forms of expression are entropic, yet all entropy is a form of expression.

The autopoiesis of cinematographing is fully individuated, to the extent that it never has an identity. It is part of what Simondon calls individuation, part of his theory of becoming, as Steven Shaviro explaines:

> The individual, as (continually) produced in a process of individuation, is never an isolated Self. It is always coupled or coordinated with a milieu; the individual can only be understood together with its milieu, and cannot subsist as a unity without it. The contact between individual and milieu is mediated by affect. Affectivity comes in between inside and outside, just as it comes in between sensation and action. Just as sensation gets oriented along a series of gradients in order to become perception, so (unconscious or preconscious) affect gets oriented along a series of processes of becoming in order to become (conscious) emotion.[14]

In order to understand the workings of this autopoiesis, we can draw (albeit through a knight's move) on the concept of *dérive* (drift) mainly developed by the founding member of the psychogeographic movement, Guy Debord: "One of the basic Situationist practices is the *dérive*, a technique of rapid passage through

varied ambiances. ... Chance is a less important factor in this activity than one might think: from a *dérive* point of view cities have psychogeographical contours with constant currents, fixed points and vortexes that strongly discourage entry into or exit from certain zones."[15] In the "game" of psychogeography, the aim is to convert a subconscious system of collection, based on attraction and repulsion of certain areas, into a formalized cartography. Psychogeography has a political character; the act of preferring affect over logic is to let one type of thinking prevail over another, a type that normally has little or no place at the table in formal decision-making. Voicing another mode of thinking serves as an entry point for diversifying thought other than that of the powers in place. In this physical *drift* through an urban setting, any preference based on conscious knowledge or logic is suppressed in order to favor the subconscious force of affect in the act of mapping the territory. In this way a translation can be made from the information stemming from the factual realm (how a city is constructed) into information about how this city is constructed to the individual (how I experience the city). To exemplify this one could think of a "stolen moment" in transit from a place one left, not yet being expected at the next, suddenly drawn by a touch of winter sunlight hitting a "formally unattractive" resting place (figure 2). The decision to stop there for a moment is not based on much logic, but is purely driven by the senses: on no other occasion would there be a coagulation of elements alluring enough to pause at a few recycling containers, had it not been for the surplus of time provided by the moment, the angle of the sunlight, the route taken, the jacket worn, and so on (the affordance of the assemblage). All these elements are thus defined by the event and the event is defined by the elements. This is also where the analogy between *dérive* and cinematographing part ways, hence the aforementioned knight's move. Cinematographing is not a conscious act of disuniting formal logic and the affective drives, and certainly not an instrument of registration (cartography) in itself. Yet the way how our perception is built is very much akin to these types of decisions. Seen from a certain distance, in retrospect, there is always a cartography to be drawn of experiences, lines, tendencies, that are all grounded in choice based on affect, rather than on ratio. Affect produces an unlimited number of dimensions, yet the combination of dimensions rapidly limits the potential outcomes. Cognitively and affectively navigating through this landscape is the act of cinematographing perception, turning into a cartography without physical properties: a mediumless medium.

Entropy

The entropy of cinematographing is a form of expression. All elements included in this process, or that it includes, are filtered, selected, ordered, sorted and connected. This is a progressive system reducing the dimensions created by the

Fig. 2: Recycling containers, 2022. Photo: author.

somaesthetic stimuli that make an event, whereby every previous event, and the anticipation of future events, become part of these same stimuli. It is progressive in the sense that by every choice that is made, several other potential choices are rendered extinct. The filtering process itself is caused by many systems that operate simultaneously. One of those systems is what psychologist Leon Festinger called 'cognitive dissonance'. He argued that humans strive for internal consistency in processing cognitive stimuli; the mind is more likely to compensate for information that does not match what is expected, than that mismatch leading to a change of mind. There is thus an *outgoing* force in the processing of information: the mind itself takes action in blocking certain information if it does not meet the expectation. This is the exact moment the formation of an exo-identity starts. An exo-identity is a mental projection or image of place, culture, behavior, social status, that only exists on a meta-level. It does not contain a presence in the present, but it creates a set of values that can be filled with transferred experiences. Exo-identities are created over time and consist of expectations that need to be met, but as these expectation are themselves built on the expectations of themselves (and thus create a loop of expectation), no perception will ever fit the promise. Paris, for example, has a strong exo-identity – as do many other cities – and although many have a clear image of what this city offers, we will not find any beret-wearing citizens carrying baguettes under their arms there any time soon. Neither is the city of love filled with joyful couples flirting alongside the banks of the Seine, unless we ourselves are these couples. The image of the city is placed "over it" (it is an exo-identity) and we are most eager to actualize it by our own "imaging," steered by the image that we impose upon the place and actualized by the production of images that underpin that imaging.

A romantic long weekend in Paris will most likely be experienced in that way, because if the expectation is set, we are likely to be cognitively biased to register our experiences to fall within that expectation. The image of place creates a biased perception that largely goes undetected because of the expectation that is created by its exo-identity. The meta-image that arises from the expectation of an exo-identity can be called the image by proxy. The term *by proxy* relates to the condition in which images are produced individually, yet are in fact mere recreations of already existing (concepts of) images, which gives them a sense of (proximate) signification. A visit to a tourist destination (exo-identity), for instance, will create several expectancies that are created by images representing that place, yet in order to validate the actualization of the actual visit, the visitor produces an individual set of mostly similar (snapshot) photographic images. The collection of these individually produced photographic images create an identity that is feeding the expectations of other visitors, especially when used in (social) media. On a larger scale, exo-identities that are created in this way cause majors

effects on population mobility (for example, the American dream), the formation of worldviews (information bubbles) and opinion-forming (information biasing). The recursive rotation of imaging, expectation and perception create an individual reality both in mental (image-expectancy) and physical (image-perception) ways, although the making of this individual reality is steered by the collected imaging of that reality in a systemic way. This particular system of imaging goes under the name *image by proxy*. Our couple visiting Paris would be much more inclined to recognize event-images that underscore the image they have of the city and they are likely to classify non-expected event-images as elements alien to the city. One event-image of a Parisian with a baguette under the arm would be fully absorbed, probably recorded and reproduced in media and narrative, whereas three encounters with the event-image of a branch of McDonalds would be discarded or classified as intrusions and are unlikely to be featured in the history of their trip.

The exo-identity is thus continuously reaffirmed and recreated over and over again by those who are in need of seeing their expectations met. These expectations are most strongly produced by systems of codification, situation, commodification and signification.[16] Known examples are frequency bias (also known as the Baader-Meinhof phenomenon, suddenly seeing a specific brand/color of, for instance, a car everywhere once it has come up in discussion), brand bias (attaching special value to a product once the brand is known), and melancholy bias (being affected by a seeing a specific object that is associated with a special person or occasion). There are many more of these systems, which are complex and ubiquitous and play a major role in the perception of information.

Alongside these *outgoing* forces of selection, another type of filtering is based on *incoming* forces of selection, where one type of information overrides another. Here we can detect (at least) two layers: the apparent and the complex. The apparent level has a predominantly physical nature: if a loud sound enters the field of cognition, all softer sounds will be "pushed out"; or if sight is limited by an overbearingly intensive light source, it pushes out more subtle visual information, such as hue, contour and detail (Figure 3). The complex system is a consecutive system: it takes over after the apparent system has made a first selection. Unlike the outgoing forces of selection (which are mainly based on learned cognizance), the complex incoming system attaches stimuli directly to their affects. This does not mean that they will have the same effect on everyone, quite the contrary. Having the capacity to affect is not the same as causing affect, in the same way that the ability to perceive is not the same as perceiving. The complex system draws on a set of deep layers in our perceptive abilities, which are not known to us, until they are known. Affects trigger automated reactions in the body, they evade consciousness and work directly on the nervous system. Although these responses can be aided by knowledge (if the context is known, the object can

change it affective effects), they can never be unlearned, but at best repressed. The effects of these reactions have a range of implications, varying form the "innocent" ("You can't argue about taste") to the more severe ("I faint when I see blood"). The interplay between incoming and outgoing systems of selection cause each perception to be individualized to such a degree that comparison between perceptions is of little use. This is why this part of cinematographing perception has an entropic nature: it disperses, bounces and modulates information constantly, thereby disrupting all known categorization that has brought this information together (autopoiesis) under the same umbrella of percepts. What remains is the cartography that has been written in the process of perceiving, which is the unique and singular mapping of experiences consisting of learning, understanding, narration, affection, anticipation and reflection. The constellation of forces of selection, rejection, addition, subtraction, interpretation and prioritization that brings together (impredicativity) and disperses (entropy) stimuli from the actualized and virtual into our modes of perception (Figure 4).

Technicity

Now that we have examined the workings of the cinematographic machines, we can start placing them in the phylum that constructs the interplay between non-anthropocentric agency and human perception.[17] Their capacity to act stems from a recursive function consisting of inclusions or anamorphisms (a process of unfolding an unlimited range of outcomes that do not have any shared central logic or overarching concept) and exclusions or catamorphisms (the process of folding random or seemingly unconnected outcomes into a new concept). Based on cinematographic percepts and agencies, I will address both 'phisms' in depth later. As I have argued elsewhere, within this intensive and continuous process, coagulations of actualizations arise that the human sensorium can detect as densities.[18] In this context, the city shows a certain "iridescence" of its urban agency: often densities (effects) are perceived as causes, and vice versa, whereby the elements perceived are not the elements that act by default.[19] In this light, Jonathan Raban's oft-used quote should be interpreted rather literally: "The city as we imagine it, the soft city of illusion, myth, aspiration, nightmare, is as real, maybe more real, than the hard city one can locate on maps in statistics, in monographs on urban sociology and demography and architecture."[20] Elements that construct our perception of the (built) environment) can be measured categorically, cartographically, volumetrically or in any other type of analytical scheme, yet they are surpassed by the most important elements that are being mapped by our soma-aesthetic perception. Not only the mental angle of perception, which shows the iridescence of the city, but also the salience of particular elements in that city gain considerable influence, despite being insignificant on an analytical scale.[21]

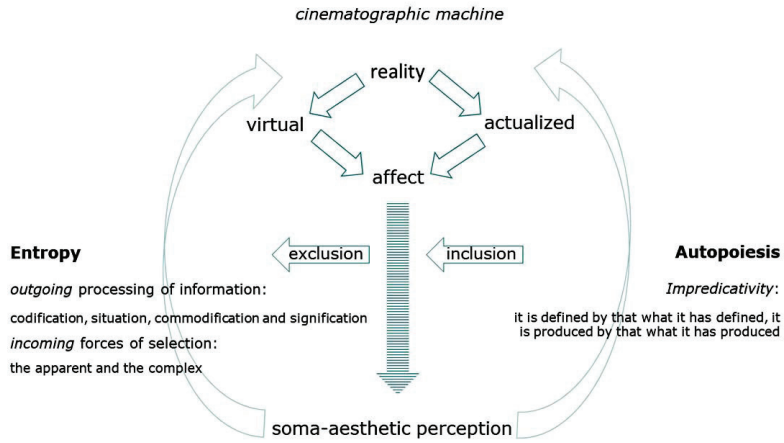


Fig. 3: Ferris wheel I, 2022. Photo: author.
Fig. 4: Cinematographic Machine. Diagram: author.

These elements can be actualized, whether consisting of matter (whereby time and space are material), or virtual, meaning potentiality (whereby time and space are potential). Both types of element have a strong affective agency and their influence on perception (incoming force of selection) depends on their (conditional) salience. Whereas the iridescence 'shows' that which is looked for (exo-identity), the salience modulates the impact of what is shown; yet both are recursively connected, depending on the observer and the observed. Hence the same event (city) can produce a multitude of perceptions simultaneously. In this context, the use of the terms past and future seems less relevant than the affective effects events have: past events and the expectation of the future can greatly influence our perception of the present, in either an actualized or virtual state. This "area of operation" has no fixed or quantified demarcation; its definition is self-referential: it always contains more and less than the elements that are contained in its definition. Its "impredicativity" thus simultaneously never and always defines what the area of operation is. The use of the cinematographic machine aids us in that understanding, as it filters or polarizes the field of potential by adding a plenitude of dimensions, reducing the number of outcomes dramatically. Machinic systems thus act without the need to establish their position in any ontological constellation. The fact that they act is sufficient to prove their position in the assemblage, the focus is not on the actors (senders or receivers), but it centers around the change of the "information organism" itself.

In this light, the concept of *folding* can be interpreted as the production of a cinematographic machine without any type of signification upfront: it is only the result that signifies the events. For Deleuze and Guattari, organizations of signification reinforce expression on one side and reinforce content on the other side. This is not a metaphorical enterprise, as Deleuze and Guattari emphasize: "The diagrammatic or abstract machine does not function to represent, even something real, but rather constructs a real that is yet to come, a new type of reality."[22] The signification itself takes place when the folding forms a multiple helix which constitutes the emergence of the exceptional state of being (both actualized and virtual) that we call the everyday. Laying emphasis on perception as an act, rather than on its signification, enables the process of directly perceiving the impredicativity of the urban fabric. However, laying the emphasis on the machine that performs the perception exposes the fragile and unstable middle ground called the everyday without being diverted by its iridescence. The mundane human signifying observer can perhaps only witness this process if we keep an equal distance from both strands, neither getting too close nor too far away from the exceptionally mundane signification of the everyday. The playground of signifying urban daily life consists of a subjectively balanced, yet precise and subjective critical distance between, on the one hand, approaching life too closely (with

keywords such as perversion and melancholia), and on the other hand, going too far away from it (utopia/dystopia and indifference). Ironically, this would seem to entail that drifting away from the ultimate exceptional state of daily life is far more likely to occur than staying "in the middle": after all, the number of combinations grows rapidly when the prerequisite "only one" is abolished. But this is the wrong way of seeing things.

Perception as an act brings a multitude of impressions that cannot be placed under the umbrella of everything already known, forcing the individual to rethink and redevelop "basic" modes of thought and understanding. Following Festinger's concept of cognitive dissonance, which focuses on how humans strive for internal consistency, this rupture could cause a massive internal friction. Festinger argues that perceptions that are not expected are very likely to be "compensated" by the mind rather than to cause a change of the mind.[23] I would call this part of an *anamorphism*, as it is the sheer production of new thought, affect, perception, somaesthetic experience, especially as it is not yet understood by the mind. The resistance of the mind to except these new stimuli, is the reversed proof of its newness: had it been known, then it had not been rejected. Anamorphisms differ from the process of deterritorialisation developed by Deleuze and Guattari, in the sense that they do not necessarily work on any predetermined or defined body: the territory.[24] This concept of cognitive dissonance might be applicable on an individual level, yet that would not account for the collective development of our relationship with (mediated) experiences. Despite the potential of individuals to compensate for internal friction caused by conflicting information, as Festinger argued, seen at the scale of the population, it is clear that changes can and will occur. This is a force I would call a *catamorphism*, which connects events by a new definition and in doing so creates a new collective stability. This can best be measured by the affective qualities these outcomes produce, which are affective chains that are highly significant, yet signify nothing. Such chains can also be found, for instance, in the formation of (domestic) traditions or rituals. In a highly simplified example, at first, random elements are incidentally produced (anamorphism): we have gone swimming, we walk home because the bicycle has a flat tire, it starts raining heavily although sun was predicted, we find a discarded yellow umbrella, seek shelter under a big tree, hear slivers of a specific song floating through the park, eat falafel to strengthen the soul and envision a warmer destination for the next holiday; in the end, it was a beautiful day. This highly affective and anamorphic chain of events can be remembered and cherished for a long time.

Therefore, these elements are later "catamorphized" and folded into a ritual: from now on, we always discuss the next holiday after swimming, under the special umbrella, while eating falafel and listening to that specific song (the exo-identity of the event). Obviously, the original affective elements were connected randomly

and perhaps any substituted element could have had the same effect, or not at all. Any perception of "what was crucial" on that day could differ completely, and that would be only the smallest part of it. All non-actualized agencies, such as anticipations, connotations, aspirations, connections (to thought, memory or imagination) had an effect on the event as well. This assemblage defined itself by unfolding, and it could never be repeated. Its catamorphism into a ritual is an attempt to preserve the un-preservable; at best, the repetition of the ritual would produce a new set of non-actualized agencies. Any definition is always more and less than the set of its elements (its impredicativity). In any case, in daily life, many of these affective chains are formed unnoticed; they do not stand out, because they are not separate from daily life, yet they are the very fabric of the everyday.

The events in the last example are utterly cinematographic by nature; they recombine, add and subtract different percepts in order to create a specific perception. These chains are produced, induced, absorbed and reflected in a nebula of both human and non-human forces, equally displaying their affections and desires in a recursive complexity with no internal hierarchy. The process is highly cinematographic because it is an edit of events, movements, visuals, sounds, atmospheres, percepts and somaesthetics generating affective perception. It is for this reason that the cinematographic machine is at the core of the building of our everyday life: everything within our experience is a montage, it is an edited technicity and signified through the addition of a multitude of dimensions: connecting two or more unrelated events, the reversal of cause and effect, the transposal of affect (music while riding a bike, for instance), fastforwarding or skipping events, the loss of memory or gain of imagined potential (daydreaming), combining several affects in an a-synchronized way, combining the far and the near (through media, for instance), recombining the actualized and the actual (through imagery, for instance), and so on. We thus limit the actualization that is called everyday life, very similar to the way a montage (not edit) of film produces cinema by the limitation of most of the events.[25]

This technicity (the cinematographic machine) works autonomously and provokes encounters with the forces and desires of other elements (human, non-human, non-biological, non-actualized) in the area that it itself defines. As we have seen before, potential does not have to be actualized to have an effect; there are many forces in daily life that draw their strength from potential without ever having to be actualized; among them chance, risk, leverage, anticipation, longing, and so on. These forces can be grounded in moral and religious codes, traditions, laws, memory, or other "distant" yet present actors that create a fear of retaliation or exclusion (the Lacanian Other, *der Andere*); but perhaps even more often, they emerge from the individual psyche (the Freudian other, *das Andere*).[26] It is probably precisely because these forces are not actualized that they are able to gain

significant strength and impact. And it is exactly this formation and non-formation of properties that we call daily life. This definition of the everyday is buoyed by the element of time. In daily life, the use of a four-dimensional system is still the basis of our navigation through events.[27] In this specific context, the virtual can allegorically be regarded as a "place" in which events are not subject to chronology, literally waiting to happen.[28] The position of static and non-linear time is called aion, which is time before its unfolding in some type of chronology. Philosopher John Mullarkey explains:

> Deleuze talks of the paradox of the present as the need for a time in which to constitute or synthesise time (as the succession of past, present, and future): "there must be another time in which the first synthesis of time can occur". This time, moreover, cannot be time understood as succession, as change or tensed, for this would just bring us back to the question of how and where such a time was constituted, how did it flow. Rather, it is empty, the time of eternity – what Deleuze calls the Virtual or Aion.[29]

Within this potential of events waiting to happen, we can see two psychological directions that are both infinite in distance and finite in perceptibility. They are significant, because pondering in either direction too far causes the cinematographic machine to spin out of control. One direction is the movement towards nihilism, with stops at utopia, dystopia, indifference and absurdism. Travelling here will reduce all value to nil, as the scale of thought becomes much bigger than the scale of our individual lives. It is a self-destructive road, as any progress undoes the previous advances.

The other direction is towards the minute, towards the ultimate perversion of understanding, which is destined to end in a type of self-imposed fascism. Along this track we encounter fetishism, melancholia, religion, and other bifurcations of control, causing a loss of scale ultimately based on a conflict within *das Andere.* The question arises how far one needs to go on either road in order to disrupt the cinematographic machine and produce other things than the everyday, but this is a fallacious reversal of the concept. The everyday is defined by *what is left over,* the area that is not exploited and dominated by either of the directions, as both directions are capable of producing violence and destruction. It is the "unlimited finity" produced by perception through the cinematographic machine that is bearable and sane, because it is liberatingly limiting and comfortably claustrophobic. The number of components involved is (in contrast to the fold) no longer infinite, but involves a "finite number of components produce an infinite number of combinations."[30] The everyday is thus a balance between exceptionally powerful forces, yet is itself the exception; it is the catamorphism of perception in order to perceive a logic that in itself is not logical. And that is what keeps us sane.

Conclusion

I argue that in everyday life, the technicity that produces unlimited finity is the cinematographic machine. It is a technicity that is capable of both limiting the number of potential outcomes without any predestination (unlimited finity) as well as producing affects that construe (not represent), the area in which human sensibility and non-anthropocentric agency meet (the affordance of the assemblage). Through the introduction of an area that is a contingently meta-stable product of exceptional actualizations of an overwhelmingly greater field of potential, called everyday life, we have been able to detect the workings of the allegoric cinematographic machine that filters and forms the perception of that area, and by doing so, establishes that area all together. From the tensions and frictions that these cinematographic machines produce, new and unprecedented events (anamorphisms) emerge that indicate an existence of a non-essentialist smallest denominator (the catamorphism). The influence of these forces is non-linear, yet radical, and rests on non-local causalities and contingencies. These systems are meta-stable and indicative, and can be called a folding of actualized and non-actualized forces that act in correlation with each other's actions. In the middle of this meta-stable force, the balances shift from a significance on the basis of codification, situation, commodification and signification to a significance of affects and capacities.[31] Hence, the cinematographic machine is a non-anthropocentric trope that is engrained in human perception in order to produce the extraordinary state of everyday life. The initial statement "cinema subsists" has hopefully gained some new perspectives. Cinema – as a material art form – can, from the light of cinematographing perception, be seen as a sketch of how perception is created. Film, sound, the theatre are limited dimensions, perception is unlimited. This could be likened to the difference in the sensation of *riding* a Ferris wheel and *seeing* an "objective" image of it (figure 5). Yet the way our personal narrative (cartography) is constructed has similarities to the construction of cinema, even to the extent that cinema itself could not be constructed without our ability to filter, add and discard information. From the perspective of cinema, life in all its dimensions would be an illusion; cinema – as a sketchy mirror of that life – would be the reality. The cartography drawn by cinematographing perception could not be understood without understanding cinema, and though I am aware that I have treated cinema rather instrumentally, it is with the utmost admiration for this medium that I have been able to do so. After all, what bigger compliment can be given than verbing a discipline as the basis of understanding how the world works. That is why cinema subsists.

Fig. 5: Ferris wheel II, 2022. Photo: author.

Notes

1 Robert Gorny, Stavros Kousoulas, Dulmini Perera, Andrej Radman, introduction to the present volume.
2 Ibid.
3 Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham, NC: Duke University Press, 2002), 195.
4 Sophie Fiennes, *The Pervert's Guide to Cinema* (Virginia: Amoeba Films, 2006).
5 Marc Boumeester, "City and the Cinematographic Machine," in *AMPS Proceedings* 24.1 (London: AMPS, 2022).
6 Christian Metz, *The Imaginary Signifier: Psychoanalysis and the Cinema*. (Bloomington: Indiana University Press,1997).
7 Brian Massumi, 'Sensing the Virtual, Building the Insensible', *Hypersurface Architecture*, ed. Stephen Perrella (Profile no. 133) 68, no. 5/6, (May–June 1998): 16–24.
8 A distinction is made here between fantasy, which is an imagination grounded in reality and phantasy, which is an imagination projected into reality.
9 Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (London: Continuum, 2012).
10 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* 2, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1980).
11 John Protevi, "Under the Dome:The Events of January 6," in the present volume.
12 Bruce Clarke, "Shells: Lynn Margulis, Natural Technicity, and the Technosphere," in the present volume.
13 Andrej Radman and Marc Boumeester, "The Impredicative City: or What Can a Boston Square Do?" in *Deleuze and the City*, ed. Hélène Frichot et al. (Edinburgh: Edinburgh University Press, 2016), 46–63.
14 Steven Shaviro, "Simondon on Individuation," on his blog, January 16, 2006, http://www.shaviro.com/Blog/?p=471.
15 Guy Debord, "Theory of the Dérive," in *Situationist International Anthology*, ed. and trans. Ken Knabb (Berkeley: Bureau of Public Secrets, 2006 [1958]). Dérives involve playful-constructive behavior and awareness of psychogeographical effects, and are thus quite different from the classic notions of journey or stroll. In a dérive one or more persons during a certain period drop their relations, their work and leisure activities, and all their other usual motives for movement and action, and let themselves be drawn by the attractions of the terrain and the encounters they find there. Ibid., 12.
16 Marc Boumeester, *The Desire of the Medium* (Arnhem: ArtEZ University Press, 2016).
17 Ibid., for an extensive theorizing of the concept of the desire of the medium.
18 Marc Boumeester, "Un-Framing Reality: Sets of Intensities as Smallest Common Denominator in Film and Architecture," in *Making Visible: Architecture Filmmaking Volume 1*, ed. Igea Troiani et al. (Bristol: Intellect Publishers, 2020).
19 Iridescence or goniochromism is an optical effect that causes the surfaces of objects to change color with the viewpoint of observation and the slant of illumination. Marc Boumeester, "Iridescence of Perception: A-Signification through Preemptive Desecration of the Visual Urzustand," in *What Images Do!* ed. Henrik Oxvig et al. (Aarhus: Aarhus University Press, 2019).
20 Jonathan Raban, *Soft City* (London: Hamish Hamilton and E. P. Dutton & Company, 1974).
21 The salience of elements that are perceived is caused by a number of effects. For instance, elements that are placed out of context tend to stand out (cognition rupture), as do elements that have recently gained significance or that are deeply rooted in our previous experience (affective recognition). In the same way that the human eye is most receptive to light at a wavelength of 555 nanometers (bright green) in the daytime and to yellow at low light conditions, the salience of perceived elements is conditional.

22 Deleuze and Guattari, *A Thousand Plateaus*, 142.
23 Leon Festinger, *A Theory Of Cognitive Dissonance* (Redwood City: Stanford University Press, 1957).
24 Gilles Deleuze and Félix Guattari, *Anti-Oedipus: Capitalism and Schizophrenia*, trans. Robert Hurley, Mark Seem and Helen R. Lane (Minneapolis: University of Minnesota Press, 1983).
25 Montage in cinematography stands for the entire process of creating the moving image, including its political/societal positioning and signification and the production of affect to that end, whereas the process of editing relates to the aesthetical and technical part of (digitally) cutting and ordering of image and sound. A montage thus always includes an edit, but not the other way around.
26 Jacques Lacan, *Écrits*, trans. Bruce Fink (New York: W.W. Norton, 2006).
27 Sean Carrol, *From Eternity to Here: The Quest for the Ultimate Theory of Time* (New York: Dutton Publishing, 2010).
28 Marc Boumeester, "Eight Avatars of Time: An Affective-Temporal Taxonomy of the Epistemology of Time Beyond Chronology," *Parse* no. 4 (Autumn 2016).
29 John Mullarkey, "Thinking Time Beyond Philosophy: On Widder's Nonsense of Time," in *Parrhesia* no. 9 (2010): 52–54.
30 Gilles Deleuze, *Foucault,* trans. Sean Hand (Minneapolis: University of Minnesota Press, 1988), 131.
31 For an extensive exposé of the system of codification, situation, commodification and signification, see Boumeester, *The Desire of the Medium*.

Bibliography

Boumeester, Marc. "City and the Cinematographic Machine" in *AMPS proceedings* 24.1. London: AMPS, 2022.

Boumeester, Marc. *The Desire of the Medium*. Arnhem: ArtEZ University Press, 2017.

Boumeester, Marc. "Un-Framing Reality: Sets of Intensities as Smallest Common Denominator in Film and Architecture." In *Making Visible: Architecture Filmmaking Volume 1*, edited by Igea Troiani et al. Bristol: Intellect publishers, 2020.

Carrol, Sean. *From Eternity to Here: The Quest for the Ultimate Theory of Time*. New York: Dutton Publishing, 2010.

Debord, Guy. "Theory of the Dérive," in *Situationist International Anthology*, ed. and trans. Ken Knabb (Berkeley: Bureau of Public Secrets, 2006 [1958]).

Deleuze, Gilles. *Foucault*. Translated by Sean Hand. Minneapolis: University of Minnesota Press, 1988.

Deleuze, Gilles. *Difference and Repetition*. Translated by Paul Patton. London: Continuum, 2012.

Deleuze, Gilles and Felix Guattari, *Anti-Oedipus: Capitalism and Schizophrenia*. Translated by Robert Hurley, Mark Seem and Helen R. Lane. Minneapolis: University of Minnesota Press, 1983.

Deleuze, Gilles and Felix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia* 2. Translated by Brian Massumi. Minneapolis: University of Minnesota Press, 1980.

Festinger, Leon. *A Theory Of Cognitive Dissonance*. Redwood City: Stanford University Press, 1957.

Fiennes, Sophie. *The Pervert's Guide to Cinema*. Virginia: Amoeba Films, 2006.

Lacan, Jacques. *Écrits*. Translated by Bruce Fink. New York: W.W. Norton, 2006.

Massumi, Brian. *Parables for the Virtual: Movement, Affect, Sensation*. Durham, NC: Duke University Press, 2002.

Metz, Christian. *The Imaginary Signifier: Psychoanalysis and the Cinema*. Bloomington: Indiana University Press,1997.

John Mullarkey, "Thinking Time Beyond Philosophy: On Widder's Nonsense of Time." In *Parrhesia* 9 (2010): 52–54

Raban, Jonathan. *Soft City*. London: Hamish Hamilton and E. P. Dutton & Company, 1974.

Radman, Andrej and Marc Boumeester. "The Impredicative City: Or What Can a Boston Square Do?" In *Deleuze and the City*, edited by Hélène Frichot, Catharina Gabrielsson and Jonathan Metzger, 46–63. Edinburgh: University of Edinburgh Press, 2010.

Shaviro, Steven. "Simondon on Individuation." On his blog, January 16, 2006, http://www.shaviro.com/Blog/?p=471.

Simondon, Gilbert. "The Genesis of the Individual." Translated by Mark Cohen and Sanford Kwinter in *Incorporations*, edited by Jonathan Crary. New York: Zone Books, 1992.

Žižek, Slavoj. *The Plague of Fantasies*. London: Verso, 1997.

Afterword:
The Elbow Room of the Universe: Technicity, Diegesis, Force

Barbara Prezelj and Gregory Seigworth

In this book's introduction, the editors draw out some of the fundamental coordinates that unite the contributors' chapters. The words 'elbow room' show up three different times in their opening pages. The first appearance sets the stage effectively: "It [technicity] implies that any evolving system has, within its constitutive constraints, a built-in transformative elbow room for things to unfold". Elbow room is, they go on to say, the product of immanent forces, a virtual (not actual) space, and, as a designer, one must allow for or create sufficient elbow room so that enabling constraints (which both stabilize and modulate) never cease evolving. Making elbow room is a balancing act between becoming too deterministic – and, thus closing down malleability – and falling into utter incoherence and relativism.

Here is the most pertinent thing about elbow room as we find it in the words of Alfred North Whitehead: "The vast causal independence of contemporary occasions is the preservative of the elbow room within the Universe. It provides each actuality with a welcome environment for irresponsibility."[1] Notice Whitehead does not say that elbow room affords a "welcome environment" for "potentiation" or "vitality" or "joy" or "positivity," or their inverse. That is, while elbow room is "welcome," it is without guarantees or telos, beyond good and evil, beyond joy and sadness. Elbow room is the space of temporal processes where responsibility is suspended while also bearing its residues and recursive tendings. Elbow room is where experience dwells – the expanding or contracting space-time where force or intensity takes up neutral residence or resonance: the collective meanwhile(s) and elsewhere(s) for prehending the arrival of yet another actual occasion. In the rhythmic before and after of any or every event, we might understand elbow room

as a wedge of maneuverability where the force of an actual occasion gathers itself in, serving as a singularly inflected monadic pocket within the universe.

If this all sounds a bit opaque (no doubt it might), then think of 'elbow room' as what, in film theory, is known as the spatiotemporal realm of narrative, namely, diegesis – the means by which knowing is converted into telling.[2] That is, diegesis is *how* narrative moves – and, not entirely coincidentally, it is also what makes narrative moving, e-motional or affecting. Whether it is film or literature or architecture or theory itself, diegesis is where force goes, where it gathers and accrues between actual occasions: not unlike a built-in transformative elbow room for things to fold and unfold. As cinema scholar Bill Nichols defined filmic diegesis, it "marks the coalescence of numerous codes, such as lighting, costume, décor, camera angle, camera height, composition (framing), camera movement (reframing), mise-en-scène (movement or staging within the frame), editing, graphics, music, sound effects, and the aspects of verbal sound."[3] In relation to the narrative and exposition-proper, the diegesis is the supplementary and quasi-imaginary or virtual space-time (evolving contextual backdrop) within which the elements or phases in an argument, a story, or a spatial ordering are set out, combined, and demonstrated. The diegesis offers a welcome environment for the irresponsibility of concepts, images, and affordances to move through as they are put into practice. This becomes a way to conceive of the transition or movement between a narrative's (or designed space's, or theory's) more straightforwardly expository level and the often subtle swath of intensities that traverse its diegetic plane.

An analogous understanding of narrative, diegesis, and travel is proposed by Michel de Certeau. In the "Spatial Stories" chapter of his *The Practice of Everyday Life*, Certeau writes that – as opposed to the "map" which partitions and, thus, structures space, the "diegesis ... establishes an itinerary (it 'guides') and it passes through (it 'transgresses'). The space of operations it travels in is made of movements: it is *topological*, concerning the deformation of figures, rather than *topical,* defining places."[4] Whereas the first function of narrative activity, Certeau explains, is the founding of place and the demarcation of boundaries, the diegesis literally raises the stakes: lifts the markers, builds bridges, redefines the frontier. Within stories of movement or travel, the narrative (as map) sets apart a specific locality while the diegesis (as tour) moves across space and time, accumulating the tiniest and most immense details or atmospheres (both singularly delineated and sludging into one another). It must be emphasized that the diegesis does not work at odds with the meaning found at the explanatory level (although sometimes it can); instead, it contributes to and extends the affectual or eventual space-time of an actuality (a particular scene, a room, a concept) as its situated or saturated but ultimately unlocatable feeling-force. To reiterate, the force (in its

fullest irresponsibility) of theory, of narrative, of architecture is found in the elbow room of its diegesis. An elbow room opens not only on the actual as its anchoring in the space-time of lived existence, but, also, from the other side, so to speak, onto the universe.

Hence, the reader finds, for example, in Agnieszka Anna Wolodźko's chapter in this collection, an account that calls attention – at the level of argumentative exposition and of diegetic theoretical maneuver at once – to "the demonic ground" inhabited by immigrant (often Polish) bodies laboring in greenhouses in the Netherlands. She maps the actual occasions of their lives within these garden spaces, but also asks the reader or theorist to transform and shift their own territories, "to contaminate their academic narratives," "to multiply and muddy the waters that feed the ground." Throughout the piece, with each actuality offered, the elbow room of the universe expands and contracts, indeed growing ever more muddy, opaque, contaminated: "Resistance from the glasshouse in which we all live, if unevenly, starts thus from the realization that we are already part of the infrastructure of violence." As Katherine McKittrick (whose "demonic grounds" is the first framing in Wolodźko's diegetic ensemble) says: "The work of liberation does not seek a stable or knowable answer to a better future; rather, it recognizes the ongoing labor of aesthetically refusing unfreedom."[5] The affective force of Wolodźko's chapter is located in the plastic greenhouses tended by immigrant laborers but, even more so, in the transformative diegetic spatiotemporality that refuses to treat the greenhouses as a mere tool (a point on a map) in the theorist's auto-ethnographic toolkit but as a tour of "our condition," one that we live and die in.

Another chapter that takes us on a tour is Heidi Sohn's diegetic cartography across spatial and temporal scales of the Mayan universe. Just like the realms of *xa'ak'*, Sohn's arrangement of resonating fragments refuses the easy flow of time. Multiple spacetimes intertwine and rub elbows, with each fragment carrying its own temporality, its own tempo, its own story. Traveling across these coexisting worlds, the chapter makes clear that the destination is not the point, and that *one* destination, the one imposed by Western civilization, is untenable. The narrative moves, unrestrained, in many directions at once yet is anything but loose. As Sohn points out, this too is a form of world-making – "the exploration of other narratives and storytelling experiments that contribute to the construction of worlds that exist, although not equally, in a pluriverse." The piece recognizes that the academic writing tools at hand are limited and always already playing catch-up, which makes "attempts to capture a swirling, moving, twisting constellation using theoretical methods ... stifling and ultimately, in vain." Anyone who has ever attempted to capture and relay the onflow of experience knows that the struggle is real, and yet, as Samuel Beckett instructs: "Ever tried. Ever failed. No

matter. Try again. Fail again. Fail better."[6] To fail better is to compose with both actual occasions and with force, to allow diegetic currents to move through even while we "construct rafts to float over to calmer shores." Sohn's chapter takes us on just such a journey, mapping out territories of provisional stasis which can always only incompletely chart the contours of the Mayan's fluid world.

This is not to say that temporary stabilizations, such as rafts, narratives and mappings, or what Certeau adeptly calls "narrative operations of boundary-setting,"[7] do not matter. On the contrary, it is to emphasize that they matter very much. The elbow room remembers. Inventive variation builds on the previous actual occasions of change and is, as the editors write in the introduction, "itself designed depending on the system's past evolution." Past orderings keep an evolving system in tension by conditioning future transformations of the diegetic plane which, in turn, determines how and when those orderings shift. In *Ordinary Affects*, in the fragment entitled "Still Life," Kathleen Stewart provides a similar take on how such an ordering is always both force and form: "A still life is a static state filled with vibratory motion, or resonance. A quivering in the stability of a category or a trajectory, it gives the ordinary the charge of an unfolding."[8] To imbue a still life with resonance is to occupy the diegetic margin – the threshold between past and future, stasis and movement, concreteness and abstraction – the unsteady middle of interlocking relations that moves and is moving as it affects and is being affected. Always together, always both.

Such supple architecture for folding out the movements of theorizing itself – the actual occurrence plus its virtual elbow room as diegesis – can reveal how theories of affect can contribute to our understanding of academic practice (across a range of disciplinary genres) and offer purchase on the urgencies of the contemporary moment. It follows that theories directly engaged with the potentials of architecture and design are well positioned – when conceptualizing a spatially (re) formulated relation with the world – to focus on built surfaces as highly charged sites for experiential exchange. Present-day spatial design, however, is largely known as a data-driven spatio-temporal practice and much less as an explicitly experiential creative endeavor that modulates *felt* qualities of a particular material environment. The diegetic *how*, the key to its performance of irresponsibility, is easily side-stepped, with priority granted to the more manifestly *what* of the epistemological actual register.

But experience is just as real and just as (if not more) capable of bridging gaps, mending fences, opening and closing doors. How, for instance, is the diegetic space-time of a building enacted by a body that traverses, connects, drifts, disrupts, slips in and out of oscillatory modes of attention and distraction? As Walter Benjamin famously conjectured in his essay "The Work of Art in the Age of Mechanical Reproduction":

> Buildings are received in a twofold manner: by use and by perception. Or, better: tactilely and optically. Such reception cannot be understood in terms of the concentrated attention of a traveler before a famous building. On the tactile side, there is no counterpart to what contemplation is on the optical side. Tactile reception comes about not so much by way of attention as by way of habit. The latter largely determines even the optical reception of architecture, which spontaneously takes the form of casual noticing, rather than attentive observation. Under certain circumstances, this form of reception shaped by architecture acquires canonical value. *For the tasks which face the human apparatus of perception at historical turning points cannot be performed solely by optical means – that is, by way of contemplation. They are mastered gradually – taking their cue from tactile reception – through habit.*[9]

Here we grasp how a distraction-borne diegesis can unfurl through the automaticity of second nature, across the tactile activation contours that inhere within the accumulative relationality of bodies or surfaces in contact, in motion. Whereas optical reception quite regularly sets to work at the contemplative arms-length distance of, say, maps or blueprints, Benjamin reminds us how what comes more immediately to hand or otherwise presses close to skin operates in the flexible elbow room by which history gathers and rounds a corner, responsibly or not.

Experimenting with bodily reception or the sensorial and the patterns of habit is an aesthetic or diegetic undertaking. While it is oriented towards potential, it is just as firmly grounded in the physical world and, as such, makes use of determinative concrete practices. Relational techniques, vital to practices such as choreography and curation, are therefore equally key to how a (spatial) composition comes to manifest different qualities of movement and habituation, to how a (spatial) formation is kept in tension – never fully resolved and uneasy, or as McKittrick writes, "persistently unsatisfied."[10] Similarly, one sees this tension at play in what Marc Boumeester, in his chapter, calls "cinematographing" – an apperceptually-inflected filtering process made from among the cognitive dissonances and sideways spacetimes of everyday interactions and distractions.[11] Akin to the material yet auratic production of filmic diegesis, "cinematographing" gradually assembles the diverse elements from the innumerable force-encounters of existence – both actual and potential – in such a way that they become the elbow room for those enabling constraints that perpetually (re)(de)compose a singularly lived, immanent plane of the mundane. Residing in adjacency to the more dominant meaning-driven narratives of existence, Boumeester understands the cinematographic "machine" as composing a corporeally-crafted diegesis of banal affectivity: the kind of excess-spatiotemporality found in such minor moments

as when you listen to "music while riding a bike" or "fastforwarding or skipping events, the loss of memory or gain of imagined potential" or "combining several affects in an a-synchronized way, combining the far and the near." He adds that "the cinematographic machine is at the core of the building of our everyday life: everything within our experience is a montage" and this (diegetic) montage is, as Maurice Blanchot writes in his essay "Everyday Speech," where the everyday escapes.

> This makes its strangeness – the familiar showing itself (but already dispersing) in the guise of the astonishing. It is the unperceived, first in the sense that one has always looked past it; nor can it be introduced into a whole or 'reviewed,' that is to say, enclosed within a panoramic vision; for, by another trait, the everyday is what we never see for the first time, but only see again, having always already seen it by an illusion that is, as it happens, constitutive of the everyday.[12]

The cinematographic is, thus, this sensing of the unperceived and the agglomeration of nonconscious percepts that, over time (through a mix of routine and surprise), come to afford an opening onto an elbow room where force-potential goes to churn and perhaps also to lend contour and texture to the coming into existence of the next actual occasion – a process producing liberating limitations that, as Boumeester observes, are "what keeps us sane." And yet, it is important to emphasize that elbow room holds no particular promise: constraining the creative actualization of everyday life can just as likely lead to non-productive tendencies and imbalance.

It was just this question – What makes everyday life unbearable? – that, in 1969, led Japanese filmmaker Masao Adachi to shoot *A.K.A. Serial Killer* and, with it, probe the diegetic space-time of a crime. The film works backwards from a clearly defined actual event – teenager Norio Nagayama's killing spree across Japan, which, between 11 October and 5 November 1968, took the lives of four people. In attempting to discover what led Nagayama to commit the crimes, Adachi set out to trace his footsteps and document his life and journey by directing a camera exclusively at landscapes that Nagayama encountered along the way. The result is a cinematic cartography of an event, an affective drift consisting of mundane stultifying landscapes that provide the backdrop to Nagayama's travels. Adachi's intent was explicitly political and should be viewed in connection to the emerging film discourse of *fūkeiron*, or landscape theory, whose main concern was the ease with which dominant power relations came to establish themselves over space and time. In the view of *fūkeiron* proponents, as Yuriko Furuhata writes, "the very uniformity of the landscape of rural and urban cities throughout Japan corresponds

to the serial mass production and standardization of commodities, which, in turn, reproduce unskilled manual labourers like Nagayama Norio."[13] Thus, the seemingly clear-cut argument put forward by the film is that the uniformity of the built environment, itself an extension of state power, produced Nagayama and provoked his violent acts. Such determinism – quite different from the kind of elbow room or welcome environment for irresponsibility that Alfred North Whitehead had in mind – is a characteristic feature of late 1960s Japanese activist filmmaking and is as powerful as it is flawed. In 2017, in the aftermath of the Bataclan attacks in Paris, filmmaker Éric Baudelaire applied Adachi's cinematographic approach to his film *Also Known as Jihadi* and commented on *fūkeiron*'s reductionism and its shortcomings: "I use the landscape theory as a foil because I accept the notion that it fails, that it is inexact, that it raises questions instead of giving answers, and this is the only position I feel capable of adopting for a film like this."[14] In its desire to explain, films like *A.K.A. Serial Killer* and *Also Known as Jihadi* treat our inner landscapes as entirely separate from outer landscapes; their alienating semiotic set-ups are designed to eradicate thought. The exchange between an individual and milieu is characterized as one-sided, as if an objective and actualized outside tendency (as an irresponsible and disabling constraint) were simply imposed upon an individual whose agency was diminished, capacities disregarded: any response turned purely automatic. Such experiential determinism results in the film's inability to address Nagayama's motivation through its visible landscape arrangement, and yet it is precisely in this illegibility where the film's affective force lies. Some acts defy straightforward explanation, and as Boumeester shows, "there are many forces in daily life that draw their strength from potential without ever having to be actualized." *A.K.A. Serial Killer*'s (diegetic) montage stages this gap, perhaps somewhat inadvertently, drawing attention to thought and action as always originating in affect as a relationally formed power. Experience, as an exchange, is always more than two-sided and other than unidirectional. The film, in its failure to explain, hones our senses by giving the viewer a feel of the cinematographic – of the elbow room of experience in its continuous (ir)responsible unfolding. *Fūkeiron* does not (directly) demonstrate this, but its root word, *fūkei*, provides a clue. This Japanese word for landscape is of Chinese origin and combines Chinese characters for both "wind" and "light." *Fūkei*, not unlike diegesis, is a force that *moves through* landscapes or bodies and gives them their vitality. It is what fills the everyday with vibratory resonance, or what, to repeat Stewart, "gives the ordinary the charge of an unfolding."[15] *Fūkei* is the movement within *fūkeiron* – an immanent capacity of becoming otherwise in a new relationality, also known as a way out.

Life is richer and messier than contemporary architecture's technical proficiency ordinarily affords, which results in a recurrent flattening of experience.

What this collection demonstrates is that in order to get us out of such an impasse, technical proficiency should not be confused with (mere) acquisition of digital and algorithmic skills but rather that "a novel technical literacy of spatial-environmental technologies" requires a practice that sits within the aesthetic register of experience. Making elbow room is a continuous practice, a perpetual affective styling that folds or at least dimples the spatiotemporal seam along which the force of scenes-of-encounter gathers. The more one attends and attunes to the affective currents passing along this seam, the more one is able to actively bend or shape their potentials. While elbow room's "welcome environment for irresponsibility" provides no guarantees, this does not imply that we should give up on treating our senses as intuitive-experiential theoreticians to always be further refined and sharpened. This means gradually acquiring the capacities to discern, from among an infinite number of engagements and occasions, what might be generative from what might prematurely arrest the accumulation and relay of intensities. The everyday, the landscape, the tactile surface (and more) are the sites where technicity appears as cinematographic diegesis and where force is inscribed as it communicates: from the actuality of a plastic greenhouse in Rotterdam to flows of the Mayan universe to... the page (*this* page, *these* pages) and to what stretches non-diegetically outside the frame. Making elbow room is, most simply, making room for *what* experience holds and *how* experience becomes – sensation moving and being moved, forever opening to immanence's welcome environment for irresponsibility.

Notes

1 Alfred North Whitehead, *Adventure of Ideas* (New York: The Free Press, 1933), 197.
2 Gregory Ulmer, *Teletheory* (New York: Routledge, 1989), 106.
3 Bill Nichols, *Ideology and the Image* (Bloomington: Indiana University Press, 1981), 82.
4 Michel de Certeau, *The Practice of Everyday Life*, trans. Steven Rendall (Berkeley: University of California Press, 1984), 129.
5 Katherine McKittrick, *Dear Science and Other Stories* (Durham, NC: Duke University Press, 2021), 61.
6 Samuel Beckett, *Westward Ho* (London: John Calder Publishers, 1987), 7.
7 Certeau, *The Practice of Everyday Life*, 129.
8 Kathleen Stewart, *Ordinary Affects* (Durham, NC: Duke University Press, 2007), 19.
9 Walter Benjamin, "The Work of Art in the Age of Its Technological Reproducibility (Third Version)," in *Walter Benjamin: Selected Writings Volume 4: 1938–1940*, ed. Howard Eiland and Michael W. Jennings, trans. Edmund Jephcott and others (Cambridge, MA: The Belknap Press of Harvard University Press, 2003), 268; emphasis in original.
10 McKittrick, *Dear Science and Other Stories*, 48.
11 It is no coincidence that Henri Bergson, who developed and explored so many facets of the virtual (and was also a considerable influence on Benjamin, Deleuze, and Whitehead), found himself productively distracted by the arrival of cinema and its mechanisms for feeling-thought-in-motion.

12 Maurice Blanchot, *The Infinite Conversation*, trans. Susan Hanson (Minneapolis: University of Minnesota Press, 1993 [1969]), 239.
13 Yuriko Furuhata, "Returning to Actuality: Fûkeiron and the Landscape Film," *Screen* 48, no. 3 (2007): 354.
14 Éric Baudelaire and Anna Gritz, "Empathy and Contradictions: Éric Baudelaire," *Mousse Magazine*, February 2017, https://www.moussemagazine.it/magazine/eric-baudelaire-anna-gritz-2017/.
15 Stewart, *Ordinary Affects*, 19.

Bibliography

Baudelaire, Éric, and Anna Gritz. 'Empathy and Contradictions: Éric Baudelaire.' *Mousse Magazine*, February 2017. https://www.moussemagazine.it/magazine/eric-baudelaire-anna-gritz-2017/.

Beckett, Samuel. *Westward Ho*. London: John Calder Publishers, 1987.

Walter Benjamin, "The Work of Art in the Age of Its Technological Reproducibility (Third Version)," in *Walter Benjamin: Selected Writings Volume 4: 1938-1940.* Edited by Howard Eiland and Michael W. Jennings, translated by Edmund Jephcott and others. Cambridge, MA: The Belknap Press of Harvard University Press, 2003.

Blanchot, Maurice. *The Infinite Conversation*. Translated by Susan Hanson. Minneapolis: University of Minnesota Press, 1993 [1969].

Certeau, Michel de. *The Practice of Everyday Life*. Translated by Steven Rendall. Berkeley: University of California Press, 1984.

Furuhata, Yuriko. "Returning to Actuality: Fûkeiron and the Landscape Film." *Screen* 48, no. 3 (2007): 345–62.

McKittrick, Katherine. *Dear Science and Other Stories.* Durham, NC: Duke University Press, 2021.

Nichols, Bill. *Ideology and the Image*. Bloomington: Indiana University Press, 1981.

Stewart, Kathleen. *Ordinary Affects*. Durham, NC: Duke University Press, 2007.

Ulmer, Gregory. *Teletheory*. New York: Routledge, 1989.

Whitehead, Alfred North. *Adventure of Ideas*. New York: The Free Press, 1933.

List of Contributors

Lila Athanasiadou is a cultural worker, researcher and architect whose practice spans visual and audio essays to teaching encounters and cultural activism. Her work explores feminist and queer pedagogical practices and intersections of digital data with human and territorial bodies. She acted as the curator of the Corporeal Discourse program for the Master of Interior Architecture at ArtEZ University of the Arts, and is currently teaching within Social Practices at Willem de Kooning Academy.

Dr. Marc Boumeester is an experienced tutor and researcher in the fields of media philosophy, art theory and the overlapping area of film and architecture. His research focuses on the liaison between perception, socio-economic conditions and the affective capacities of media and objects. Having founded several new educational departments, and having acted as dean of AKI Academy of Art and Design, Boumeester is currently researcher at ArtEZ University of the Arts. His recent publications include *The Desire of The Medium* (2017).

Bruce Clarke is Paul Whitfield Horn Distinguished Professor of Literature and Science in the Department of English at Texas Tech University and the Baruch S. Blumberg/NASA Chair in Astrobiology at the Library of Congress. His research focuses on modern literature, cybernetics and systems theory, narrative theory, and Gaia theory. Aside from co-editing the book series *Meaning Systems,* Clarke's monographic works include *Gaian Systems: Lynn Margulis, Neocybernetics, and the End of the Anthropocene* (2020).

Robert A. Gorny is a lecturer and researcher at the Faculty of Architecture and the Built Environment, TU Delft, where he has been teaching and coordinating courses focusing on theory and research methodology since 2015. Combining historically-grounded scholarship with an assemblage-theoretic extension of genealogical accounts, his transdisciplinary research studies built environments, their organization, and worlding dynamics. As a member of *Footprint*, he recently co-edited an issue on Stiegler's related concept of Epiphylogenesis (2022).

Gökhan Kodalak is a theorist, teaching philosophies of architecture, nature, and cities at Pratt Institute; an architect, directing design studios at Parsons School of Design; and a historian, teaching architectural history seminars at Cornell University. Most recently, Kodalak served as the Theories of Architecture fellow at TU Delft and developed a multi-issue editorial project at *Log* (2020–21), unpacking the understudied thinking of Spinoza, Whitehead and Simondon to explore alternative approaches to the interfused questions of nature, philosophy, and design.

Stavros Kousoulas is Assistant Professor of Architecture Philosophy and Theory, and research coordinator of the Theories, Territories, Transitions research section at the Faculty of Architecture and the Built Environment, Delft University of Technology. His research focuses on the irreducibility between architecture, technology and culture. He is the author of the book *Architectural Technicities* (Routledge, 2022) and the edited volumes *Architectures of Life and Death* (RLI, 2021) and *Design Commons* (Springer, 2022).

Dulmini Perera is a lecturer and researcher at Bauhaus University Weimar. She works at the intersection of design and systems/cybernetics research. She is the recipient of the Heinz von Foerster Award 2021. Her current DFG (Germany)-AHRC(UK) funded research focuses on the complex relationships between the questions of ecology, technology and practices.

Alina da Porciuncula Paias holds a bachelor's degree in architecture and urbanism from the University of São Paulo (2018) and a master's degree cum laude in architecture from Delft University of Technology (2022). She is a researcher and designer and has worked as an architect, researcher and assistant curator for RADDAR in Brazil, and as a guest lecturer at TU Delft.

Barbara Prezelj is a landscape architect and a PhD candidate at ESALA, Edinburgh College of Art, Scotland. She holds a MSc in landscape architecture from TU Delft and a BSc from the University of Ljubljana, Slovenia. She currently teaches theory seminars and design studios at ESALA and has previously worked professionally as a landscape architect in London, Amsterdam and Ljubljana.

John Protevi is Phyllis M. Taylor Professor of French Studies and professor of philosophy at Louisiana State University. His research focuses on the intersections of dynamical systems theory; the cognitive, life, and earth sciences; and contemporary French philosophy.
He is the editor of *The Edinburgh Dictionary of Continental Philosophy* (2005), and his recent publications include *Life, War, Earth* (2013), and *Edges of the State* (2019).

Andrej Radman is Assistant Professor of Architecture Philosophy and Theory, and coordinator of the Ecologies of Architecture research group at the Faculty of Architecture and the Built Environment, Delft University of Technology. Over the past two decades Radman's research has focused on the nexus between Architecture and Radical Empiricism. His latest publication is *Ecologies of Architecture: Essays on Territorialisation* (2021).

Gregory J. Seigworth is a professor of digital communication and cultural studies at Millersville University. He is co-editor, with Melissa Gregg, of *The Affect Theory Reader* (2010) and a managing editor of the open-access journal *Capacious: Journal for Emerging Affect Inquiry*. Greg has recently completed co-editing *The Affect Theory Reader II* (all new contributors and more than twenty chapters) with Carolyn Pedwell (2023).

Heidi Sohn is a theorist and architect; she is associate professor of architecture theory at TU Delft. After receiving her doctoral degree on architecture theory in 2006, she has acted as leader and academic coordinator of the Architecture Philosophy and Theory group. Her research interests are multiple and eclectic, ranging from the turns and shifts in postmodern theoretical (and spatial) landscapes to monster theory. Her heart beats to the vibrancy of new materialist rhythms.

Sha Xin Wei is professor at the School of Arts, Media, and Engineering and the School of Complex Adaptive Systems, and directs the Synthesis Atelier for Transversal Art, Philosophy, and Technology at Arizona State University. With his research centering on poiesis, play and process, Sha's interdisciplinary work ranges from gestural media, movement arts, and responsive environments through design to critical studies and philosophy of technology. His publications include *Poiesis and Enchantment in Topological Matter* (2013).

Agnieszka Anna Wołodźko is a lecturer and researcher at AKI Academy of Art and Design ArtEZ. After receiving her PhD dissertation from Leiden University (2018), she initiated a biolab space at AKI where she runs BIOMATTERs, an artistic research program that explores how to work with living matter. Her research focuses on post-humanism, ecocriticism, affect theory and new materialism at the intersection of art, ethics and biotechnology. Her latest publication is *Affect as Contamination: Embodiment in Bioart and Biotechnology* (2023).

Desperate times demand optimistic transdisciplinary measures. This volume unites a select group of thinkers who courageously traverse disciplinary boundaries. What brings them together is the least stratified 'component': a shared problem. It is a widely recognised that a problem gets the solution it merits. However, only a few acknowledge that a problem seldom neatly fits within a single discipline, nor does it conform to the principle of general equivalence. Handling its irreducibility and non-entailment is a skill possessed by very few. Even fewer take the quasi-causal capacity of what we term the 'space of technicity' seriously.

The space of technicity, the shared problem of this volume, is a consequence of immanence. Each configuration of surfaces comprising the built environment produces an intangible effect, acting as a quasi-cause. It can be referred to as downward causation or the timely rediscovery of (neo)finalism.

In this volume it is approached from the perspective of axiology. The space of technicity allows us to evade techno-determinism without adopting an anything-goes attitude. That which has become manifest could have individuated differently. However, the potential of a body cannot be discerned before intervening in the causal fabric of agential reality to extract the singular points that make certain outcomes more likely than others, surpassing mere probability.

When operating within the ethico-aesthetic paradigm, where sense becomes intricately dependent on sensibility, and vice versa, the volume's attitude might be said to approximate the Spinozian third kind of knowledge that intuits design (and its space of technicity) beyond mere imagination or reason.

Ecologies of Architecture Book Series

TU Delft OPEN

JAP SAM BOOKS