

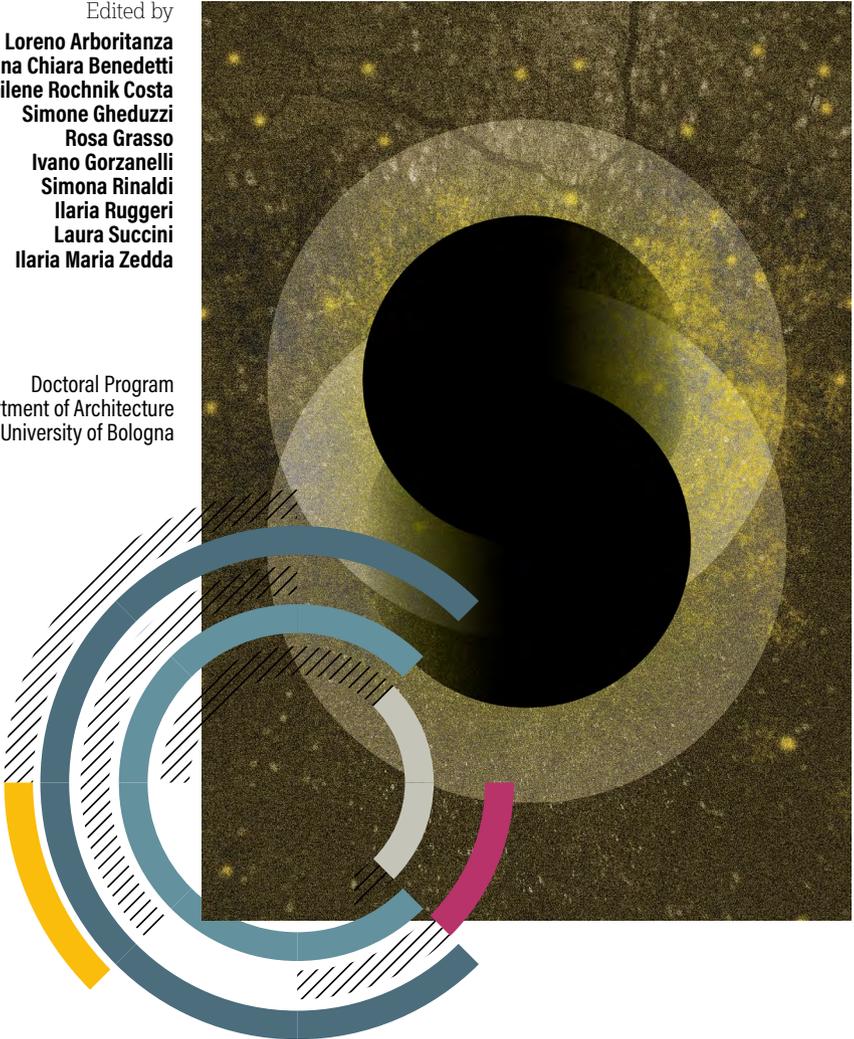
The Ecological Turn

Design, Architecture and Aesthetics
beyond "Anthropocene"

Edited by

Loreno Arboritanza
Anna Chiara Benedetti
Karilene Rochnik Costa
Simone Gheduzzi
Rosa Grasso
Ivano Gorzanelli
Simona Rinaldi
Ilaria Ruggeri
Laura Succini
Ilaria Maria Zedda

Doctoral Program
Department of Architecture
University of Bologna





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Gabriel Alonso
Rachel Armstrong
Stefano Ascari
Luca Barbieri
Marta Bonci
Elena Brea
María Buey González
Oscar Buson
Alessia Cadamuro
Alberto Calleo
Maurizio Carta
Laura Centemeri
Paul Coulton
Giorgio Dall'Osso
Tuğba Deringöl
Federico Diodato
Pablo Ferreira Navone
Paolo Franzo
Gionata Gatto
Rolf Hughes
Craig Jeffcott
Emanuele Leonardi
Marco Manfra

Saverio Massaro
Cecilia Mazzoli
Eugenia Morpurgo
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Davide Prati
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Ludovica Rosato
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Sema Serim
Miriam Tola
Eleonora Trivellin
Davide Turrini
Alessandra Vaccari
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Ilaria Vanni
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Formafantasma



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Architecture Department, University of Bologna

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The Ecological Turn

Designing and representing the Anthropocene:
a challenge for designers, planners and philosophers

Loreno Arboritanza, Anna Chiara Benedetti, Karilene Rochnik Costa, Simone Gheduzzi, Rosa Grasso, Ivano Gorzanelli, Simona Rinaldi, Ilaria Ruggeri, Laura Succini, Ilaria Maria Zedda

October 2019: at the Mast (Bologna) is on display the exhibition *Anthropocene*, a multimedia experience, with the use of augmented reality, to represent “the incredible human footprint on earth” through the photographs of Edward Burtynsky and the films of Jennifer Baichwal and Nicholas de Pencier¹. From our visit, the construction of the *call* began with an interest in exploring the changes that this new geological era brings to our areas of research. On the one hand, the enormous impression made by the violence of human activity in Niger, Southeast Asia and Europe – quarries, mines, oil pipelines, enormous pumping stations – on the other hand, the impression made by the aestheticization of the ‘Anthropocene’ phenomenon, its translation into pleasant

¹ Sophie Hackett and Andrea Kunard, eds., *Anthropocene: Burtynsky, Baichwal, de Pencier* (Fredericton: Goose Lane Editions, 2018).

images. On the crest of this ambiguity and this challenge we wanted to build the call, orienting it in two directions with the intention of breaking with a certain tradition: on the one hand we asked philosophers, architects and professionals to rethink the forms of representation, aware that only by including the complexity of the living in our narrations is it possible to gain a non-anthropocentric vision, on the other hand we questioned designers and planners on the very foundations of planning, of designing, in search of a relationship between space, territory and time, an alternative to the dominant models.

Needed, in the construction of the *call*, to take note of how some tools of the designer have become obsolete: sustainability, the very idea of crisis, reversibility, the idea that nature returns where man has destroyed, preyed upon, suffocated. An attempt that doesn't stem from an environmental crisis, but from the awareness that our representation of the problem is distorted, anachronistic, still indebted to the idea of the map, to cartographic representations, incapable of adopting new models, scales, interconnections.

The rethinking takes place at several levels: in the very definition of Gaia, questioned by Bruno Latour², in the history of the relationship between humanity and the earth by Jean Baptiste Fressoz and Christophe Bonneuil³, in the discussion of representation from above by Sophie Hackett. We tried to discuss the Anthropocene at two levels: as an emergency in its actuality and as a threshold, a possibility to go "beyond the Anthropocene". What the conference hoped for, and what we believe happened in the great interest that the *call* aroused, consisted in a collective effort aimed not at sectorial competences, but above all at relationships. Relationships between new capacities to represent and think about limits, reciprocal dependencies beyond and within an idea of the world centered on the infinite availability of raw materials, on the extraction and continuous use of fossil fuels. Thinking

2 Bruno Latour, *La sfida di Gaia: il nuovo regime climatico*, trans. Donatella Caristina (Milano: Meltemi, 2020).

3 Jean Baptiste Fressoz and Christophe Bonneuil, *La terra, la storia e noi*, trans. Agnese Accattoli and Andrea Grechi (Roma: Treccani, 2019).

therefore about reproductive forces, permaculture, new materials, new ways of designing the territory, of seeing relationships that were previously hidden, of thinking through the multiple reasons for radical and innovative lifestyles, thinking about the same ontological status of things and the professions of designing.

The conference reflected this intention and broadened the horizon of the *call* by questioning the different parties that supported it. Today, more than a year later, the world has changed a lot due to the terrible Covid-19 pandemic, yet the issues and questions that the conference brought to attention have become no less topical, but more urgent.

The future ‘beyond *Anthropocene*’ is all to be imagined.

Selection process

The importance of sounding out the still little-explored lands “beyond the Anthropocene” with the multidisciplinary outlook that distinguishes our Department of Architecture – *Design, Architecture, Aesthetics* – was confirmed by the number of *abstracts* received – about a hundred – as well as by their diversification in terms of research fields and origins: approximately half of the abstracts received were in fact attended by foreign PhD students, architects, designers, philosophers, planners and researchers, mostly from the old continent, but also from more distant lands such as the Asian continent – Israel, United Arab Emirates, China – or the American continent. The variety of interdisciplinary sectors involved made it necessary to group them into macro-disciplines: Architecture, Design, Urbanism and Aesthetics. The main contribution came from the technical field of the disciplines of Design and Architecture, through concrete examples of experimental materials or new architectural paradigms, but there were also more theoretical contributions. The comparison between different disciplines produced a lively debate where new technological proposals for new forms of living – such as the “Microbial Dialogues” proposed by Armstrong and Hughes – alternated with theoretical reflections for new forms of existence – such as the “Geology

of Morals” proposed by Radman – with the common aim of providing alternatives for new forms of living with and for the environment.

The abstracts received were selected after undergoing the *double-blind peer review* procedure. However, given the positive opinion of the reviewers and the high scientific value, due to editorial and organizational limits, it was necessary to ask the selected authors to send the *full* paper, anticipating the delivery date before the Conference, differently from what was initially indicated in the *call*. Thus, also the *full* papers were submitted to the *double-blind peer review* procedure. Once examined the judgments of the reviewers, the Organizing Committee has dealt with the final choice of the papers presented in this publication with a selection method that would encourage as much as possible that multidisciplinary comparison pursued since the *call*.

Research addresses

Analyzing the full papers received, in order to create a structure that could better ensure the interdisciplinary comparison, we identified a series of thematic areas within which the different researches presented could converge. Each area was then associated with one or more keynotes to introduce the theme. Due to the timing of the conference, only some of the authors of the papers selected for each thematic area were invited to present the content of their research, while the publication provided more content to broaden the reflections on the different topics.

Therefore, if initially the *call* divided the analysis of the ecological turn linked to the Anthropocene into two parts, namely the representation of the phenomenon within the cultures of the project and the changes produced in their processes, in analyzing the material received we have mainly identified four areas in which the research is moving. The selected papers have in fact opened a comparison from an aesthetic point of view, especially related to the analysis of political ecology and its repercussions on the design developments within society, as well as on the necessary overcoming of

the dualism man - nature, to open the design culture also to non-human relationships. A large number of papers then focused on material experimentation, both in terms of innovation of production processes, as well as the production of new materials and their sustainability. Finally, another group of researches is focused on the new forms of the urban, from the change in the reading and design of the city, to the overcoming of boundaries linked to a trans / post - urban logic.

The publication is structured following these four multidisciplinary areas, each introduced by the keynote text and followed by the authors of the selected papers.

Subtitle 1: Eco-political narrative diversification

Within the aesthetic research there were four keynotes to discuss the topic, also through the round table Anthropocene and Care, followed by the presentation of their individual researches. According to **Stefania Barca** there is a need to identify counter-hegemonic narratives of the Anthropocene that oppose the hegemonic end-of-history narrative, echoing Mark Fisher's concept of "capitalist realism" and extending it to the current phase of neoliberal environmental governance. **Laura Centemeri** offered an introduction to the practice of caring for the earth and the relationships between living beings called Permaculture, underlining the difference between "permanent" ecosystems and the design of spaces where to "reinhabit", through repairing social and ecological relationships. **Emanuele Leonardi** is in charge of politicizing the concept of the Anthropocene in order to remove the illusion that all of humanity in its breadth and generality is guilty of the climate changes we experience. Through the contribution of Jason W. Moore, Leonardi hypothesizes that the correct definition of the Anthropocene is Capitalocene, that is, the specific relationship between the form of production and land consumption of capitalism and the epoch known as the Anthropocene. Finally, **Miriam Tola**, always in a critical perspective towards capitalism, focused on the terrestrial and extraterrestrial Elon Musk's ambitions and on

the will to save a portion of humanity from environmental disaster by implementing man's colonizing will.

The ability to propose different narrative models is a fundamental theme for the debate on the Anthropocene. **Stefano Ascari** has therefore tried to shift the focus from the unrealistic questions on how to defuse or reverse the transformations produced by man to learning new models of life adapted to the new context. He critically discusses the models of representation of the Anthropocene through a debate on different theoretical and aesthetic proposals, proposing new models of narration. New narratives are thus proposed and, at the same time, consolidated narratives are questioned. This is what **Elena Brea, Pablo Ferreira Navone, María Buey González,** and **Gabriel Alonso** do in their contribution, which moves from questioning the still current, consolidated concepts of hygiene and health in the domestic environment as the result of a necessary exclusion of any microorganism – regardless of whether pathogenic or non-pathogenic. On the contrary, the authors prompt for a post-anthropocenic design approach to the domestic environment, which does not ignore or exclude microorganisms, yet includes them instead. Thereby, the house ceases to be a fortress for mankind and becomes a place where different lives can coexist in symbiosis, mutually benefiting. A further point of view is proposed by **Yael Eylat Van-Essen**, who suggests rethinking the role of architecture in the Anthropocene era through the new set of “ontopolitical” assumptions that shape contemporary socio-political thought. The paper explores how the principles of mapping, sensing and hacking, discussed by Chandler in the context of Governance, can be applied to the architectural domain thereby stimulating new processes for architectural interventions. Finally, **Andrej Radman** placed an “ecological work of art”, the *Habitan Esas Laderas* (2019), by Argentinian artist Flora Reznik, as the object of his analysis, analyzing it as a starting point to discuss not so much the conditions of possibility of knowledge, but rather the “real conditions” in which things and life germinate.

The full paper by Stefania Barca, for editorial reasons, is not included in the publication.

Subtitle 2: Beyond the dualism of man - nature

If on the one hand there is a change in a political and social vision, this also has repercussions on the relationship between man and nature, overcoming dualism to seek new forms of design and coexistence. **Kjetil Fallan's** presentation Deep Ecology as Deep Design introduced the reflection by presenting the concept of "deep ecology" in relation to design, highlighting how the Deep ecology movement can be used to explore the connections between eco-philosophy and Eco design.

Next, **Gionata Gatto** and **Alessia Cadamuro** defined design as a tool to overcome the hierarchical systems between humans and non-humans by fostering the development of multi-species connections and collaborations. Field experimentation, multi-disciplinary collaboration, and more-than-human ontology lead through design to highlight how the participatory dynamics enacted by plants can activate more inclusive participatory practices between humans and non-humans.

From this new relationship it follows that the concept of User itself, as **Tuğba Deringöl** and **Sema Serim** have explained, suffers in the development of its definition the transformation's effects of the human being within this new era.

At the same time, the effects of the Anthropocene epoch, with developments that are often linked to catastrophic phenomena, leads to the need to establish new figures for the relationship between human and non-human. **Alberto Petracchin** introduces the figure of the Ark as a reference architecture for the coexistence and re-foundation of a new post-catastrophe world.

The relationship between human and non-human is also key in **Craig Jeffcott's** contribution, which seeks to define new strategies for speculative design practice to achieve a biodiverse future, i.e. a future in which we take care of the ecosystem and commit ourselves to repair, maintain and protect it. Moving from an ontological reflection and from a critique of speculative design practices with no impact, nor care to biodiversity, Jeffcott calls for new strategies for the discipline

– strategies that are ecological and attentive to queerness and at the same time capable of overcoming diversity and allowing, by means of play, storytelling, and speculation, the questioning of the established past and the imagination of a better, inclusive future.

Another viable strategy is the one related to *big data*, as reported by **Luca Barbieri**, **Alberto Calleo**, **Giorgio Dall’Osso** and **Ludovica Rosato**. The authors explore in the context of the data age, the possible use of *big data* and artificial intelligence as tools for the transition from a utilitarian and anthropocentric dimension towards an anthropocentric design culture, analyzing how such tools can be used as amplifiers of the weak signals of climatic, social and cultural change to create readings, interpretations and narratives of the complex systems we live in. Finally, **Oscar Buson** questions the culture of energy and the closely related concept of petrolscape, and focuses instead on the alternative culture of entropy, which necessarily affects architecture. New types of infrastructures and architectures based on renewable sources and on the concept circular economy are thus envisioned, where production and living return to establish a reciprocal dialogue and that permit rethinking the relationship between energy production and space creation, as well as between individuals and their community. Just as the culture of energy resulted from human creation and has in turn shaped our ways of living, so it is expected to happen in a more conscious culture of entropy.

Fallan’s full paper, due to editorial issues, is not included in the publication.

Subtitle 3 : the turning point of materials

Within the Anthropocene era, the focus on anthropogenic material consumption is primary, being the main feature linked to the geological definition of Anthropocene itself. At the opening of the debate, **Formafantasma** keynotes present the *Cambio* research, commissioned by the Serpentine Gallery and related to the production and consumption developments of the wood supply chain. Dissecting the

ecological and political responsibilities of the design discipline, through a holistic approach, they started from the material's history, passing through the steps of the production process, finally examining the future of the material in relation to human consumption.

Attention to material development also means developing new materials that reflect the principles of ecological development. **Eugenia Morpurgo** investigates how and if it is possible to plan, through the disciplines of design, regenerative production processes to create new bio-based materials starting from poly-cultural and non-extractive cultivation systems. His proposal is Syntropic material Library – a digital archive of bio-based materials, which allows on the one hand to subdivide materials according to their origin and on the other hand the user to have a vision of the materials according to the link with the coexistence of the species, activating new processes for regenerative ecosystems. **Franziska Pilling** and **Paul Coulton** consider a *More-than-Human-Centered* material design approach that presents artificial intelligence (AI) and data as design materials using the non-anthropocentric *Object-Oriented Ontology* (OOO) philosophy and related alien phenomenology thesis, proposing an investigation into methods of making AI operations, functions and impacts legible through the speculative design practice of *Design Fiction*. Also in the debate of experimental research on new materials are **Rachael Armstrong** and **Rolf Hughes**, who invert the paradigm of microbes as negative agents for our survival into ecosystems capable of improving our lifestyle and ecosystem, providing us with concrete examples such as the European Project *ALICE* and opening the door to a new “life-promoting era of microbial design”.

Equally important is the research on the use of existing materials and their necessary change within a development process oriented to an ecological material consumption. On the one hand, the importance of the role of the practitioner, in addition to the material, is of fundamental importance – as explained by **Elisa Zatta** – who made a clear and complete presentation of on-going reuse strategies applied to the built environment in the European context, and enlighten as



the role of practitioners is fundamental to foster a cultural and architectural change. Between material development and strategic use of artificial intelligence, **Cecilia Mazzoli, Marta Bonci** and **Davide Prati** proposed a “green” alternative to design through a parametric approach to prefabrication that makes use of “another plastic”: 100% recyclable elements made of bio-based polymers such as Green *HDPE*, obtained from sugar cane. As a result we’ll have cheap, flexible and reversible temporary structures, designed for new and above all sustainable urban spaces. Finally **Ilaria Vanni, Alessandra Vaccari, Paolo Franzo**, and explored the unique combinations and interdependencies emerging in contemporary Italian *fashion design*, focusing on the encounter between technology and biology to experiment with fabrics and materials for the fashion industry.

Subtitle 4: shifting urban visions

The great changes in vision, as also described above, clearly affect what is our vision of the city. The territorial planning that refers primarily to the urban and determines a strong division between center and periphery is transformed into a broader vision of territory, going to define new urban paradigms. **Maurizio Carta**, keynote of this last part, rethinks in fact radically the model of development of the city, now generator of a sustainable future, in which humanity takes charge of adopting new behaviors to implement an urban revolution of the transition to a generative and responsible Neanthropocene.

The new technologies influence the change and expansion of the new urban vision, as **Federico Diodato** explained later, proposing an alternative use, not aimed at the production of economic value, typical of the smart city narrative, but as a tool to facilitate social relations and to establish an ethical relationship between territory and community. **Saverio Massaro** analyzed how the vision of the city itself must be translated into a circular vision, illustrating strategies and actions to promote a cultural shift for raising the awareness of waste management systems working in European cities

according to the circularity principle. At the same time, as **Matteo Vianello** points out, the need to expand the boundaries of the urban vision leads to repeat western paradigms in non-urbanized environments: through the analysis of *Oceanix*, the author problematizes the replication of terrestrial urbanization in water space. Even within the urban environment it is necessary to reconsider the relationship between man and nature: **Elena Ferrari** illustrates the history of three abandoned burial areas in Berlin and investigates the role of these biodiversity-rich gardens within urban transformations according to ecological social and political aspects. If, on the other hand, we consider the question of visions and narratives, **Elena Vai** proposed an analysis of the change in the relationship between man and territory, leading us to see how advanced design and speculative design can activate a conscious design community to overcome the current crisis and imagine “probable, plausible, possible and preferable futures”. Finally, **Dario Scodeller, Eleonora Trivellin, Davide Turrini** and **Marco Manfra** explored the context of the inner Italian suburbs with the aim of drawing attention to strategic scenarios, theoretical guidelines and examples of good design practices linked to the promotion of eco-literacy, community and *on-demand* social-health services, the promotion of local food systems, the preservation of know-how and craftsmanship, highlighting the contribution that an articulated and multi-scalar design can provide in transforming territorial fragility into social and economic opportunities.

Conference days and results

The richness of the contributions brought to the conference and especially the interdisciplinary way in which the theme of *Ecological Turn* was treated are difficult to exhaust and summarize in a conclusion. During the two days of talks, it became clear how ecological thinking and sensitivity to the environmental transformations that we are experiencing, deeply affects the practice, even daily, of architects, designers, planners and researchers.

In fact, the conference explored in a highly multifaceted way social, biological, political, geographical and purely architectural themes, at different scales, from the molecular one, of environmental beings, to the global one, which concerns flows and metropolises, with the intention of responding to a problem of degeneration of our relationship with the planet.

The contributions reiterate, some more explicitly, some less so, the need to trigger a new era of ecological anthropocentrism in which humanity, instead of being the problem, designs and implements the transition to ecological development, interpreting this change not only as a reconciliation with nature, but as a total paradigm shift and narrative of non-anthropocentric human/urban development.

CALL

The Ecological Turn

Permaculture; Environmentalism; Eco-design; Care; Einhabiting.

How does the ecological thinking affect architects, designers and the design culture itself? The Anthropocene is a geological event, but also a political one that lies in overcoming the idea of crisis. Acknowledging this change means rethinking the very ecology of the project in environmental and atmospheric terms.

The changes we face don't depend on missing balances, but on compromises reached between conservation and exploitation. The Anthropocene is in our suggested reading the time of the end of our representations and the time of the beginning of other narratives that belong to a non-linear dimension.

The ecological mindset understood here will not be a generic reconciliation with nature, but a political project, a clash between narratives, a challenge to designers and architects, their materials and their design practices to rethink the way



in which human beings define themselves, their images and relationships within the world in which they live. In other words, a renewal of conflicts: between classes, between nations and production models, between technological choices.

Anthropocene is a category which has the merit of challenging our conventions in an oblique manner by reconnecting the history of mankind with the history of the Earth. In this respect, design visions can be the tool for activating new relations.

Within this process of change, how do the figures of architects and designers rethink their role, their knowledge, experimenting with new design approaches?

The conference wants to explore these issues from different points of view, in particular the “socio-bio-geosphere in its uncertain becoming by making the disciplines of the project communicate and by varying the scale of analysis, from the molecular scale of the environmental effects on our heritage, to that of the world’s flow of goods and capital organized by the World Trade Organization, passing through the local scenarios of industrial sites or socio-environmental mobilizations” as Jean Baptiste Fressoz and Christophe Bonneuil wrote.

The questions that guide this talk are on two levels of reading:

- 1 - How to represent, imagine, visualize the Anthropocene through the design cultures?
- 2 - How can this political event change the design and production processes?

Track 1

Understanding Complexity: narratives, representations, images

As Franco Farinelli argues, until 1969 the territorial government was adapted to the methodological limits of the geographical map, that is to the rules of the Euclidean metric and to its three fundamental characteristics: continuity, homogeneity and isotropism. Through these three properties the intellectual appropriation of the world of western culture took place, which was so rendered interpretable and therefore governable.

The Anthropocene is the scenario in which the designer is called to overcome the notion of nature as an object, something that can be controlled and disposed of, to explore the possibilities arising from new ways of interpreting, feeling and perceiving relationship between human beings and the territory.

Are non-anthropogenic visualizations possible?

Which visual culture, which narratives, which forms and images can respond to the need to represent the flows, data and relationships of the earth system?

Possible arguments, suggestions are:

- representation models that go beyond the cartographic conception of territory towards narratives and images of non-anthropocentric urban metabolism;
- informative-narrative proposals of complex phenomena through new design approaches.



Track 2

Thinking and designing ecological

Resolutionist and heroic narratives are no longer sufficient to hide behind noble intentions such as “sustainability”, “environment”, “ethics” or “awareness”, design approaches that in reality still pursue selfish paths of destruction, consumption, extraction functional to the dynamics of a growth linked only to logistics capitalism.

Starting from the current demands of our time such as emergencies, climate change and local conflicts, the need for designers to rethink the very meaning of living and to renew the relationships between the shape of an object, the material that constitutes it and the context in which it is located spreads. Designing in the Anthropocene does not mean solving but gaining points of view where different disciplines contaminate and collaborate towards an anthropo-decentralized approach, from design to biology, from architecture to economics, from technology to humanistic knowledge.

Possible areas of reflection:

Time. If until today the contemporary project has responded to the needs of producing and consuming more and more resources, what materials, technologies, production models and processes open up to ecological living? How to rethink the project according to its own reversibility?

Territory. How to rethink the very meaning of living in an era where it is increasingly difficult to rely on consolidated categories and dichotomies, such as subject-object, natural-artificial?

How will the intangible resources of a territory, the identities and relationships between communities be used to make project processes more responsible? In a system of interconnections and interdependencies, how can we imagine urban and rural areas and the relationships between public and private? How can design culture activate ecological design forms and new behaviors?

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S.01

ECO-POLITICAL
NARRATIVE
DIVERSIFICATION

Reinhabiting. Eco-design, Care and Ecological Transition in the Permaculture Movement

Permaculture; Environmentalism; Eco-design; Care; Reinhabiting.

Laura Centemeri

Centre for the Study of Social Movements (EHESS/CNRS/
INSERM), Paris, France
laura.centemeri@ehess.fr

In this contribution, I develop some reflections on the forms currently taken by the permaculture movement in Italy. The environmental activism supported by permaculture rests on the aspiration to “care for the Earth” and “care for people”. Permaculture care-based environmentalism focuses on practices and, specifically, on *eco-design practices*. There is, however, an important difference in practicing eco-design exclusively as the design of “permanent” ecosystems or instead as the design of places where to “reinhabit”, through repairing social and ecological relations. The study of Italian permaculture activists and initiatives shows that it is still a challenge for eco-design activism to combine “technical courage” and “political courage”. According to design thinker Tomás Maldonado, both of these forms of experimental courage are necessary for an ecological society to emerge out of struggles for socioenvironmental justice and emancipation.

Introduction

The starting point of my paper is twofold. On the one hand, I rely on the reading of Tomás Maldonado's seminal book *La speranza progettuale*.¹ As the ecological crisis worsens, this book seems to me still highly relevant in its invitation to recover a “design hope”, which consists of rebuilding “on a new basis our faith in the revolutionary function of applied rationality”.²

On the other hand, since 2015 I have been conducting research on the transnational permaculture movement and its diffusion in Italy.³ This movement exemplifies grassroots eco-design activism, or environmental activism through design. At the same time, permaculture activism is a form of *care-based environmentalism*. By care-based environmentalism I mean a form of environmentalism that considers *environmental care* as a central ethical orientation in the development of alternative value practices and as a justificatory value argument⁴.

Care is understood here, first of all, as a way of engaging with specific humans but also non-human beings, through paying attention to the social and ecological relations of (inter) dependence ensuring their well-being.⁵ Caring implies paying attention to the *singularity* of these interdependencies and the singularity of the beings involved.

In other words, environmental care rests on viewing human and environmental health as related both to systemic conditions of

1 Tomás Maldonado, *La speranza progettuale. Ambiente e società* (Turin: Einaudi, 1970).

2 Maldonado, *La speranza progettuale*, 121.

3 Laura Centemeri, *La permaculture ou l'art de réhabiter* (Versailles: Editions QUAE, 2019).

4 For a similar interpretation see Maria Puig de la Bellacasa, *Matters of Care: Speculative Ethics in More Than Human Worlds* (Minneapolis: University of Minnesota Press, 2017).

5 I refer here to the notion of “engagement” as defined by Laurent Thévenot, “Postscript to the Special Issue: Governing Life by Standards: A View from Engagements”, *Social Studies of Science*, 39 (2009): 793–813.

interdependence and the personal experience of an empathic and “emplaced” connection to other significant beings.⁶

By doing research on the permaculture movement, I became aware of the challenges of care-based environmentalism while also becoming convinced of the importance of this kind of activism for the ecological transition. I argue that the collaboration between social movements, institutional actors (including academia) and care-based eco-design activism can foster the development of socio-ecological and political projects of *reinhabiting* in which “political courage” and “technical courage” (to quote Maldonado) combine to promote local “ecological revolutions”.

The paper is structured in three sections. I first present the permaculture vision (the method and the worldview), highlighting its potential as a form of care-based eco-design activism. I then discuss some of the problems that emerge once this vision becomes the reality of a highly diverse “more than social movement”.⁷ To conclude, I outline some reflections on the key notion of reinhabiting. Reinhabiting is care-based eco-design activism integrated into a larger political project of ecological transition centred on territorial autonomy, co-responsibility, solidarity and cohesion.

Permaculture as design method

The word “permaculture” derives from the contraction of “culture” and “permanent”. This notion became popular in Australia, in Tasmania to be precise, at the end of the 1970s, thanks to the book *Permaculture One* published in 1978 by Bill Mollison

6 On the notion of emplaced see Sarah Pink, *Doing Sensory Ethnography* (London: Sage, 2009).

7 See Dimitris Papadopoulos, *Experimental Practice: Technoscience, Alterontologies, and More-Than-Social Movements* (Durham, North Carolina: Duke University Press, 2018).



(1928–2016) and David Holmgren (1955).⁸ Mollison was then a professor of environmental psychology, with a background as an environmental activist and self-taught ecologist, while Holmgren was a design student at the University of Hobart.

According to some authors, permaculture was the environmental movement that grew the most internationally during the 1990s. Today, permaculture is spread all over the world, and the movement is structured in macro-regional, national, regional and local associations. There are periodic events that bring permaculture activists together including the “International Convergence” which has been their worldwide gathering since the 1980s.

I would like to clarify the meaning of permaculture not as the movement but as the method and worldview first sketched in *Permaculture One* and then developed separately in further writing by Mollison and Holmgren.⁹

The 1970s in Australia, as elsewhere, were traversed by environmental struggles and countercultural movements, including the “back-to-the-land” movement. Permaculture was initially conceived as a support tool to facilitate these returns to the land. It involved providing practical guidelines to individuals unfamiliar with agricultural practice to settle on land in rural areas to develop sustainable local economies, where agricultural production was primarily for self-consumption and small-scale trade.

However, it would be wrong to think that permaculture is just a set of agricultural techniques. Permaculture is an *eco-design method and a care-based worldview*, aimed at promoting the design of productive ecosystems to meet human needs, while also ensuring their perpetuation over time. This involves repairing

8 Bill Mollison and David Holmgren, *Permaculture One: A Perennial Agricultural System for Human Settlements* (Melbourne: Transworld Publishers, 1978).

9 Bill Mollison, *Permaculture: A Designer's Manual* (Tyalgum: Tagari Publications, 1988); David Holmgren, *Permaculture: Principles and Pathways Beyond Sustainability* (Hepburn: Holmgren Design Services, 2002).

and maintaining their capacity of regeneration with a minimum of external energy inputs.

In permaculture, human subsistence activities are considered from the perspective of the socio-ecological systems and patterns they generate. Through reorganising subsistence activities it is then possible to redesign socio-ecological systems and patterns in a “permacultural way”. But what does that mean?

As I already mentioned, it means, first of all, designing them in such a way as to reduce and optimise the need for energy inputs (especially non-renewable energy but also labour energy); it means creating and maintaining diversity in these systems, diversity being seen as conducive to resilience; it means ensuring the possibility for everyone in it to live a worthy and meaningful life, without impairing the possibility for others (human and non-human) to do the same.

The invitation is to draw inspiration from the strategies and patterns observed in healthy ecosystems. Permaculturists often describe this principle as biomimesis but, to avoid confusion, it would be better to speak of ecomimesis.

For permaculturists, in order to generate virtuous processes of human and environmental coevolution, it is necessary to observe how ecosystems work, and to draw inspiration from them when designing technical solutions for productive environments. The idea is to “work with nature and not against it”.

But this is still not enough to design permanent cultures. Permaculture design requires to recover an intimate sense of interdependence and connectedness with the lived environment. In other words, it is necessary to distance oneself from the vision of the human being as the master of nature and to move away from a mere anthropocentric view of utility.

For this reason, the permaculture design method not only sets out technical design principles but, more importantly, also includes ethical principles. Before being a technique, permaculture

is an *ethos*¹⁰, and the technique stems from this ethos. Without this ethos, maybe we can have sustainable technical solutions but we won't have permaculture.

The guiding ethical principles of the permaculture ethos are: *Earth Care*, *People Care* and *Fair Share*, or returning surplus to the system. The principle of “fair share” points to the non-sustainability of forms of socio-ecological organisation that are based on limitless growth and accumulation.

The main technical design principles are, according to Holmgren: observe and then interact; obtain a yield; catch and store energy; use and value renewables; apply self-regulation and accept feedback; produce no waste; use small and slow solutions; integrate don't segregate; use and value diversity; use edges and value the marginal; design from patterns to details; creatively use and respond to change.¹¹

These are not rules to be applied, but principles that guide the design and the choices that are made within this design. These choices concern *how to value* and *what to value* in a given situation.

In general terms, design is all about what to value, how to value and how to turn a mode of valuing into material arrangements. Value is here intended not immediately in economic terms, but in anthropological terms as what a person judges as relevant in guiding her action in a given situation.¹² The designer is always facing a multiplicity of potential modes of valuing and, when designing, she valorises certain modes at the expense of others.¹³

10 Maria Puig de la Bellacasa, “Ethical doings in naturecultures”, *Ethics, Policy & Environment. A Journal of Philosophy and Geography* 13, no. 2 (2010): 151-169.

11 David Holmgren, *Permaculture*.

12 On the link between the anthropological and the economic understanding of value see David Graeber, *Toward an Anthropological Theory of Value. The False Coin of Our Own Dreams* (New York and Houndmills: Palgrave Macmillan, 2001).

13 Laura Centemeri and Viviana Asara, “Per un approccio ontologico alla prefigurazione ecologica”, *Culture della Sostenibilità*, 13, no. 25 (2020), DOI 10.7402/CdS.25.003.

In this sense, one can say that design has implications in terms of ontological politics since it is a way to make one specific reality matter out of a multiplicity of performable realities.¹⁴

In this respect, permaculture design rests on modes of valuation that convey the vision and the experience of human interconnectedness and coexistence with other living beings in an environment which is framed both as part of the biosphere and a specific lived—and also loved—place.

Earth care thus becomes the practical activity of taking care of the soil. Soil in our societies is increasingly impoverished, damaged, neglected, eroded. For permaculturists, taking care of the soil means reconnecting with the soil as a place of vital relations between a complex network of beings (bacteria, fungi, nematodes) and re-establishing good relations between and with these beings. In other words, soil fertility is seen as the result of a successful collaboration between humans and non-humans, in which humans play the role of designers on the basis of cooperation with other living beings.

In creating ecosystems, the human being has a role which is distinct from other living beings, but with some overlapping. The idea is that everybody and everything can generate patterns but only the human being can design. The human being is not simply concerned with adapting to what emerges from the environment: human beings can envision alternatives, they can critically evaluate what emerges according to different representations of what is good. The capacity of imagining that things could be different from the way they are and bringing them into existence is what Enzo Manzini defines as design, intended as an ordinary human capacity.¹⁵

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

15 Ezio Manzini, *Design, When Everybody Designs. An Introduction to Design for Social Innovation* (London-Cambridge: MIT Press, 2015).

Permaculture thus operates a *relative decentralisation* from an *anthropocentric perspective of human action on nature*.¹⁶ That is, the eco-designer is a “humble” designer, who is permeable to the web of vital relationships. The permaculture designer is aware of socio-ecological interdependencies and she is able to put herself in the skin of the other, human and non-human, and think up ever new ways of valuing that prompt diversity and abundance of life.

Moreover, permacultural eco-design takes into account a variety of forms of interdependence, at different scales, including social and ecological interdependencies that go beyond the limits of what is directly experienced. That is why permaculture is not only concerned with designing permanent local productive ecosystems but also supporting the creation of new institutions and new forms of regulation. From this point of view, bioregionalism and municipalism are strong influences in terms of the political permaculture imaginary.

The arduous path of the “humble” permaculture designer

The core activity of the permaculture movement is the dissemination of the ethical view, design methods and design tools, through teaching and practical demonstrations. Permaculture “demo-sites” can span from urban gardens to ecovillages. Consequently, the movement does not engage in an open contestation of dominant value arguments and practices but it supports the creation of networks of local alternative or ‘pericapitalist economies’.¹⁷

There is much to learn in terms of education for sustainability from the interdisciplinary and transdisciplinary approach of permaculture teaching. Different kinds of knowledge

16 Maria Puig de la Bellacasa, “Ethical doings in naturecultures”, 152.

17 Anna L. Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton, N.J.: Princeton University Press, 2015), 63.

(scientific, vernacular, experiential) are all equally valued in the design process.

The emphasis on the diversity of forms of knowledge that are needed in order to design ecosystems in a permacultural way goes hand in hand with the recognition of a diversity of technical solutions based on a relationship of collaboration with, rather than control over, nature and natural processes.

In other words, permaculture does not reject the classical distinctions made in modern thought between theory and practice, or nature and culture. It makes their dialectical relationship productive of an emancipatory social project, not centred on the domination over other human beings and non-human beings but instead on collaboration and mutualism.

The result is a kind of bounded emancipation. Emancipation is limited by the awareness of ecological interdependence and the need to find ways to coexist with other species in a finite world.

In practice, however, this position is difficult to hold. During my fieldwork, along with permaculturists who argue for context-sensitive science and technique acted out of the knowledge of local socio-political and historical specificities, I found both partisans of a purely technical approach to eco-design and partisans of harmony with nature as the only way out of the ecological catastrophe. Both positions erase the generative dialectical tension of the decentred anthropocentrism of permaculture.

More generally, there are two divergent positions concerning social change. On the one hand, there are those who see social change as dependent not only on a practical commitment to direct socio-ecological action, but also on an engagement in the political space. It is in the political space that, according to these activists, a shared vision and a shared strategy are supposed to be elaborated in collaboration with other public and private actors. On the other hand, there are those who see political commitment as unnecessary and divisive and consider that social

change occurs outside the political sphere. Social change then takes place either via the dissemination of technical solutions or via inscrutable interdependencies. In both cases, the idea of social change via collective action based on representation is foreclosed.

When change is seen as an outcome independent of representative political action, the emphasis is on individual choice as the key to change. When, on the other hand, there is a more articulated vision of social change, activists recognise the importance of intervening in the political debate at different levels, from the local level to the global one, and according to different strategies, beyond direct socio-ecological action, including also contestation, denunciation and lobbying. Therefore, the emphasis is on how to connect and coordinate various strategies and forms of engagement that are all considered as essential for a radical ecological transition. Effective political action for change is seen as the result of collaborations, and the design of spaces for collaborations to intensify becomes a central concern for activists.

Reinhabiting

It should be clear by now that permaculture is not only about building edenic communities living in harmony with nature or allowing miraculous harvests with zero working hours and spectacular reforestation projects. The care-based eco-design activism of permaculture aims at supporting projects and processes of reinhabiting.

Reinhabiting means living in a place, becoming an actor of its social, economic, ecological and even political fabric and acting to take care of it and contributing to changing things through caring. It is foremost a question of *repairing relationships*, starting with repairing ecosystems. Repairing does not mean restoring; it means recreating the capacity for autonomous action

in the territories, regenerating “multi-species commons” and “commoning” practices.¹⁸

Repairing also means telling stories to counter the master’s narrative of the Anthropocene.¹⁹ These stories can help to repair epistemic, social and environmental injustices, because they give visibility to a multiplicity of ways to bring naturecultures into existence.²⁰

At the same time, reinhabiting means nurturing socio-ecological relationships while looking to the future, in the awareness of the planetary interdependencies that contribute to shaping local realities. For example, climate change makes it necessary to experiment with new agricultural solutions, to prevent, prepare and respond to new climate-induced risks. This is why environmental activism based on reinhabiting is today more necessary than ever. Because through repairing and nurturing relationships it makes it possible, in the face of global challenges, to trigger endogenous dynamics of change, i.e. not totally imposed from the outside. Reinhabiting then means to contribute to building the autonomy of territories. Autonomy does not mean autarchy but an endogenous capacity to define modes of self-regulation in a framework of co-responsibility, solidarity and cohesion, what Italian political scientist Carlo Donolo defined as the model of regulation of the “sustainable district”.²¹ This, however, is a political project that needs support beyond the local level.

In other words, the environmentalism of reinhabiting needs a critical and political environmentalism engaged in challenging

18 Laura Centemeri, “Commons and the new environmentalism of everyday life. Alternative value practices and multispecies commoning in the permaculture movement”, *Rassegna Italiana di Sociologia* 64, no. 2 (2018): 289-313.

19 Stefania Barca, *Forces of Reproduction: Notes for a Counter-Hegemonic Anthropocene* (Cambridge: Cambridge UP, 2020).

20 Anders Blok and Casper B. Jensen, “The Anthropocene event in social theory: On ways of problematizing nonhuman materiality differently”, *The Sociological Review*, 67, no. 6 (2019): 1195-1211.

21 Carlo Donolo, *Il distretto sostenibile. Governare i beni comuni per lo sviluppo* (Milan: FrancoAngeli, 2003).

current power relations and forms of governance and economic organisation, and vice versa. The environmentalism of reinhabiting is one way out of the technocratic grip of the Anthropocene. But only a systemic change can support its spreading. It is from the articulation between the situated practical experiments of reinhabiting and the movements fighting for structural transformations of the current economic order that the socio-technical imaginary of an ecological society will eventually emerge.



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S.01

ECO-POLITICAL
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The Anthropocene as a Regime of Visibility ¹

Anthropocene; Cognitive Capitalism; Green Economy; Negentropic Work.

Emanuele Leonardi

Università di Bologna, Bologna, Italy

emanuele.leonardi3@unibo.it

Introduction

*Man in the 20th century became emancipated
by nature as that of the 18th by history.
History and nature have become equally foreign to us,
in the sense that the essence of man can no longer be
be understood with their categories.
On the other hand, humanity in the 18th century was not,
in Kantian terms, more than a regulative ideal;
it has now become an unavoidable fact.
[In]the new situation [...] humanity
has effectively assumed the role
previously attributed to nature or history.²*

¹ Originally published, in Italian, as an introduction to Jason Moore's articles on the Anthropocene: Jason Moore, *Antropocene o Capitalocene?* (Verona: Ombre corte, 2017).

² Hannah Arendt, *The Origins of Totalitarianism* (Turin: Einaudi, 2004), 413.

Jason W. Moore's work represents one of the most significant interventions in the debate on the concept of the *Anthropocene*, coined by microbiologist Eugene Stoermer in the 1980s and made famous by Nobel Prize winner for chemistry Paul Crutzen since 2000.³ Lately, the term has become something of a fashion statement, a catchy word, particularly in the social sciences - as evidenced by the launch of three international journals devoted exclusively to it: *Anthropocene*, *The Anthropocene Review* and *Elementa*. The general press has also reacted enthusiastically: *The Guardian*, *The New York Times* and *The Economist* have frequently reported on the subject, which has also been bouncing around in Italy from time to time in *il manifesto*, *la Repubblica* and *Corriere della Sera*.

The overall effect is that of a profound polysemy of the notion of the Anthropocene, which on the one hand produces confusion and misunderstandings while on the other widens the analytical spectrum and highlights the political stakes underlying the interaction and clash between the positions in the field. More than an event, therefore, the Anthropocene seems to us to be a *symptom* of contemporary society, of its conflicts and violence: a condition that, according to the symptomatological perspective proposed by Paolo Vignola,⁴ requires both a radical critique and a practice of collective care in order to be consciously acted upon and transformed. In particular, it is a symptom of the crisis of the social sciences, or rather of the way in which they have focused on the modern - i.e. internally mediated - relationship between nature and society. In particular, as Pierre Charbonnier has effectively shown,⁵ "the fact that moderns perceive themselves as living beings that organise themselves in society *on the basis of nature* is not a matter to be taken for granted, an innocent

3 Paul J. Crutzen and Eugene F. Stoermer, 'The Anthropocene', *IGBP* [International Geosphere-Biosphere Programme] *Newsletter*, 41 (2000): 17-18.

4 Paola Vignola, *L'attenzione altrove* (Naples-Salerno: Orthotes, 2013).

5 Pierre Charbonnier, *Généalogie de l'Anthropocène*, paper presented at the conference *Comment penser l'Anthropocène*, Paris, November 6, 2015.

matter; reflective knowledge is grafted onto it, the aim of which is precisely to make it visible, and possibly to go beyond it". The Anthropocene signals precisely that this act of transcending is now taking place: it implies the crisis of the two main lines of reflection on the modern form of the nature-society relationship - that centred on the *materialism of limits*⁶ and that based on the *constructivism of risks*.⁷ Whether the way out of this theoretical *impasse* lies in overcoming a decades-long mutual indifference between these currents of thought or in the emergence of a new onto-epistemological approach is not (yet) known. What we can say with certainty now, however, is that "the Anthropocene can only become a historical-sociological rationality to the extent that it takes the nature-society relationship as the pivot of its gravitational axis, i.e. as the key to the analysis of the present".⁸ With a further caveat: the new geological epoch sets in motion a curious paradox that will not be easy to get rid of. Accepting the hypothesis of the Anthropocene means catastrophically confirming the Cartesian idea of Man as 'lord and possessor of nature', of *homo sapiens*⁹ as the evolutionary pinnacle and the plethora of hierarchically structured dualisms that have sustained it (culture-nature, human-animal, organic-inorganic, etc.). Indeed, at the very moment when human exceptionalism becomes aware of its geological power and thus celebrates its most crushing victory, the need to dismantle it becomes a question of life and death for the survival of the Earth system.¹⁰ What Miguel Benasayag and Gérard Schmit describe as the "change in the sign of the future"¹¹ is thus taking place: the passage from the *future-promise* to the *future-threat*.

6 Nicholas Georgescu-Roegen, *Bioeconomy* (Turin: Bollati Boringhieri, 2003).

7 Ulrich Beck, *La società del rischio* (Rome: Carocci, 2000).

8 Charbonnier, *Généalogie de l'Anthropocène*.

9 René Descartes, *Discourse on Method* (Turin: UTET, 1969), 175.

10 Catherine Larrère, *Post-capitalist Ecologies*. Keynote speech at the conference Undisciplined Environments, Stockholm, March 22, 2016.

11 Miguel Benasayag and Gérard Schmit, *L'epoca delle passioni tristi* (Milan: Feltrinelli, 2005), 18.

Against this backdrop, the purpose of the following pages is to outline the development of the debate on the Anthropocene and its fundamental issues, in order to provide the reader with contextual elements that we believe are useful for understanding Jason Moore's theses. In Italy, at least up to the time of writing - December 2016 - the echo of this debate of a fully global nature is very weak.¹² With the significant exception of the militant research collective Effimera,¹³ neither the Italian academy nor the countercultural scene has devoted attention to the issue. It seems, however, that the situation is about to change: in 2017, in addition to this book, special issues of important journals dedicated to the Anthropocene are planned. These include *La Deleuziana*, *Cultures of Sustainability*, *Kaiak* and *Azimuth*.

The problem of definition: what is the Anthropocene?

From a geological perspective, the concept of the Anthropocene (a combination of the Greek terms *anthropos* [human] and *cene* [new]) refers to the planetary scale of anthropogenic influences on the composition and functions of the Earth system and the life forms that inhabit it. Crutzen and Stoermer's proposal was based on mainly ecological considerations such as the accelerated rate of extinction of a large number of species, the progressive reduction in the availability of fossil fuels and the increase in greenhouse gas emissions, including carbon dioxide and methane. Although quite recent as a geological force, it is now clear that human activity is a direct cause of these phenomena and has therefore had a profound influence on the

12 part from Crutzen (2005), which has remained largely unheard of, the only important book translated into Italian is that of Elizabeth Kolbert (2014), winner of the Pulitzer Prize.

13 See effimera.org, and in particular the section "Political Ecology" (<http://effimera.org/tag/ecologia-politica/>) whose starting point coincides, as far as we know, with the first philosophical reflection on the Anthropocene in Italian (Mariaenrica Giannuzzi, "Anthropop: filosofie non tristi per pensare il cambiamento climatico", *Effimera* (2015), accessed September 21, 2016, <http://effimera.org/anthropop-filosofie-non-tristi-per-pensare-il-cambiamento-climatico-di-mariaenrica-giannuzzi/>).

transformation of the environment on a global scale (Steffen et al, 2011)¹⁴. The magnitude and duration of human impacts - it is estimated, for example, that wells and drillings will be clearly visible to hypothetical geologists in a million years' time - would therefore seem to suggest that the present time should not be included in the Holocene (a geological epoch that began approximately 12,000 years ago and currently contains it), but rather that it needs an *ad hoc* formalisation capable of highlighting its specificity. Hence the proposal of the Anthropocene.

It has to be said that the idea of a new epoch is not without foundation: decisive in the geological classification of time scales are global transformations in the state of the Earth - due to disparate causes ranging from meteorite impacts to the movement of continents and volcanic eruptions of exceptional magnitude. Now, since there is no doubt that current human activity is to be considered global - as it is the primary cause of environmental changes - it would follow that a new era has begun. It should be noted, however, that the existence or non-existence of the Anthropocene is not a purely scientific matter but, on the contrary, it involves a series of ethical and political considerations. Crutzen himself was convinced that 'humanity' must accept the enormous responsibility deriving from its technological power and act as *guardian of the Earth*,¹⁵ perhaps pointing to geoengineering¹⁶ as the solution to the problem of global warming.¹⁷ It

14 Will Steffen, et al, 'The Anthropocene: conceptual and historical perspectives,' *Philosophical Transactions of the Royal Society A*, 369 (2011): 842-867.

15 Paul J. Crutzen and Christian Schwägerl, "Living in the Anthropocene: Toward a New Global Ethos", *Yale Environment* 360, accessed December 29, 2016, http://e360.yale.edu/feature/living_in_the_anthropocene_toward_a_new_global_ethos/2363/.

16 Geoengineering, or more specifically climate engineering, refers to the application of artificial techniques of human intervention in the physical environment (atmosphere, hydrosphere, lithosphere, etc.) aimed at combating anthropogenic global warming. A now classic reference is planetary engineering techniques to capture and reduce the presence of carbon dioxide in the atmosphere.

17 Paul J. Crutzen, "Albedo Enhancement by Stratospheric Sulfur Injections: A Contribution to Resolve a Policy Dilemma?", *Climate Change*, v. 77, no. 3-4 (2006): 211-220.

seems clear to us, therefore, that the Anthropocene is not only the name of a new geological epoch, but also that of an unprecedented *regime of governance of the global environment*. Critical attention must therefore be paid to the risk of the concept being swallowed up in the post-political vortex of global technocracy,¹⁸ within which disagreement - sometimes open conflict - on how to deal with ecological dangers is not seen as foundational but rather downgraded to a procedural issue, one aspect among many in the practice of (technical) good governance.

As Stefania Barca rightly suggests, in order to grasp the heuristic and potentially liberating core of the *concept of the Anthropocene*, such concept *must be politicised*: whether the term is maintained, destabilising its presumed scientific nature, or its abandonment is proposed - Moore in this text puts forward the *Capitalocene*¹⁹ hypothesis, but as we shall see, other conceptualisations have been proposed - what is important is that the ambiguity of the thesis according to which 'humanity' should take responsibility for ecological degradation is not underestimated.

The disaster that surrounds us cannot be attributed to mankind as such, since the vast majority of mankind has not played any historical role in the increase of greenhouse gas emissions; on the contrary, it is precisely the part of mankind that is paying and is likely to continue to pay the most for the damages of climate change. Global warming is the most obvious manifestation of social and economic inequality on a global scale.²⁰

While maintaining this politicisation, we will now briefly focus on two elements of the debate on the Anthropocene that in our view clarify many of the issues at stake. First, it is important to

18 Erik Swyngedouw, "The Non-political Politics of Climate Change", *ACME*, 12 (2013): 1-8.

19 For a discussion of the concept in Italian see Alessandro Barbero, "Cheap Food. Introduction to the evolution of agri-food regimes in the world-system" (Master's degree thesis in *Communication and Media Cultures, Philosophy and Educational Sciences*, University of Turin, 2015).

20 Stefania Barca, *The Political in Environmental History*. Keynote speech at the conference *Historical Materialism*, London, November 12, 2016.

stress that the proposal that the Holocene should be followed by a new epoch marked by anthropogenic activity as a decisive geological force is neither about to be approved in the immediate future, nor is it surrounded by unanimous consensus. We say this first of all because the *mainstream* media that have dealt with the Anthropocene have described it as a reality,²¹ a given, while within the geological community the discussions continue to be more intense than ever. On the one hand, both the *International Commission on Stratigraphy* and the *International Union of Geological Sciences* have so far refused to recognise the term as a valid category for the subdivision of geological time. On the other, in August 2016 the *Working Group on the Anthropocene* - after seven years of work - officially recommended such a recognition to the aforementioned bureaucratic bodies (by a large majority vote, but without unanimity). In essence, the scientists of the group chaired by Jan Zalasiewicz propose to consider the Anthropocene as a series, the stratigraphic equivalent of an epoch, as much as the Holocene or Pleistocene that preceded it. The golden spike²² identified as the original point would be in the so-called *great acceleration*, i.e. from the last gasps of the Second World War, when the atomic bombs were dropped and dependence on coal and oil infected the whole planet (albeit with very variable intensities). In short, it is certainly possible that in the next few years the Anthropocene will become a convention accepted by the geological community; however, emphasising these scientific disputes remains important because they are accompanied by, and often overlap with, tensions of a purely political nature. This mixture undermines the classical representation of a *single* scientific knowledge dealing with incontrovertible facts, on the one hand, and of a

21 See for example *la Repubblica* of 30 August 2016: 'Too strong a trace of man. Welcome to the era of the Anthropocene. The International Congress of Geology officially declares the end of the Holocene. A passage already enunciated by several researchers' [http://www.repubblica.it/ambiente/2016/08/30/news/Antropocene_era-146873380/].

22 The *golden spike* refers to the geological signal that acts as a boundary between two distinct time intervals.

plurality of ethical interpretations concerning human behaviour and essentially linked to the interests of social actors, on the other. This representation is particularly inadequate if we wish to grasp the contemporary relationship between facts and values, which increasingly interpenetrate rather than being located at separate, hierarchically oriented ontological levels. In the final instance, it is reasonable to state that the geological community agrees that a large amount of incontrovertible data indicates that today, anthropogenic activity influences biospheric balances as never before, and that this transformative capacity leaves geologically significant traces. All the rest - the terminology in the first place, but also the dating, the choice of *the* golden spike (or golden spikes: there is no reason to prevent the Anthropocene from emerging gradually, through several steps), the identification of evidence related to it/them - is the subject of a debate whose solution necessarily passes through the channels of (also) political confrontation.²³

The second element worth considering is the constitutive relationship that links the debate on the Anthropocene to the issue of climate change. All the positions in the field share the assumption that global warming represents not only the crucial event of the last decades, but also the decisive entry point for the interpretation of the present. Although the Anthropocene embraces a very broad phenomenological spectrum, the cornerstone of its conceptual framework is provided by climate change. Talking about one implies that the other is able to catalyse a valid empirical and normative synthesis of the contemporary state of the world. This is a significant notation, because a frequent aspect of climate change discussions concerns the supposed human inability to understand its nature, development and danger - think for instance of denialism, the uncertainty of long-term simulations or the incalculability of potential damages. From

23 Andrew Barry and Mark Maslin, 'The politics of the Anthropocene: a dialogue', *Geo: Geography and Environment*, 3(2) (2016):1-12.

this perspective, Timothy Morton reads global warming as a paradigm of a new form of being that he calls *hyperobjectivity*: it is defined by the impossibility of being understood from a position of epistemological exteriority. The knowing subject does not 'look' at hyperobjects, but is rather 'housed' in them, forcibly bound to them, 'surrounded' by them: it is from this uncanny interiority that we strive to understand them. Morton calls hyperobjects viscous and is very precise in specifying that "such viscosity is the direct product of the proliferation of information. The more we know about hyperobjects, the more we realise that we can never really know them. Yet no matter how hard we try to push them away, we cannot separate ourselves from them".²⁴ We increasingly need climate science to combat global warming, yet information overload risks reducing us to impotence.

Dipesh Chakrabarty captures the point with lucid bitterness:

Climate change, thought through the work of climatologists, shows us the effect of our actions as a species. Species could be the name or symbol for a new and emerging universal story that appears at the moment of danger posed by climate change. But we can never understand this universal. For it is not a Hegelian universal that arises dialectically from historical movement. Climate change asks us a question about human collectivity, aiming at a figure of the universal that exceeds our capacity to experience the world. Rather, it seems to be a universal that emerges from a shared sense of catastrophe. We might tentatively call it 'negative universal history'.²⁵

The question arises whether 'universal negative history' is the only form of politicisation capable of opposing the ecological

24 Timothy Morton, *Hyperobjects* (Minneapolis: University of Minnesota Press, 2013), 180.

25 Dipesh Chakrabarty, "The Climate of History: Four Theses", *Critical Inquiry*, v. 35, no. 2 (2009): 197-222.



technocracy of *green economy* or *carbon trading*.²⁶ We do not think so, which is why we propose a symptomatological perspective to address the problem: diagnosis and prognosis tend to blur - and so do analytical and prescriptive moments. Criticising and caring become inseparable elements of an alternative politicisation strategy. It may seem counter-intuitive, but climate change is less about the quantity of greenhouse gases emitted into the atmosphere than about the particular organisation of the value-nature nexus that characterises contemporary capitalism.²⁷ Resignation is therefore a possible, but certainly not necessary, outcome of global warming; Naomi Klein,²⁸ for example, has effectively shown the revolutionary potential of climate change; Andrew Ross, on the other hand, has highlighted the emergence of new space for the convergence of ecological and trade union struggles:

It's very likely that the impact of the new austerity politics will set back the green-labour cause (and it is intended to do so) but there can also be no doubt now about the political potential of synchronising the movements for social, economic and environmental justice – a potential that has gotten a big boost from the climate crisis. Indeed, and this may seem like a good place to end, if the climate crisis did not exist, it may have been necessary to invent it so that this synchrony could finally occur.²⁹

[...]

26 Emanuele Leonardi, "For a critique of neoliberal *green economy*", *Soft Power*, 5(1) (2017): 169-185. See also Emanuele Leonardi, "Carbon Trading Dogma", *Ephemera*, 17(1) (2017): 61-87.

27 Romain Felli, *La grande adaptation* (Paris: Seuil, 2016).

28 Naomi Klein, *This Changes Everything* (Milan: Rizzoli, 2015).

29 Andrew Ross, "Life and Labor in the Era of Climate Justice", [<http://archivio-uninomade-effimera.euronomade.info/life-and-labor-in-the-era-of-climate-justice-uninomade-2-0/>].

The problem of visibility: how to escape from the Anthropocene?

Whether we opt for the Anthropocene, Capitalocene or some other terminology - and no matter when the supposedly new epoch is supposed to begin³⁰ - there is no doubt that the state of the planet's health is not good and that the need to tackle ecological degradation cannot be put off any longer. On this subject, Agnès Sinai writes:

The Anthropocene, as a period characterised by unprecedented energy expenditure, will only be a stage that will soon have to be declined into the earlier future. The great failure has begun and its emblem is Fukushima. The question that remains is that of its legacy: to what extent will human societies be able to deploy resilience strategies in the face of the three great legacies of the Anthropocene: climate change, widespread radioactivity, and the artificialisation of the world?³¹

In the face of these challenges, it is not uncommon to come across: a) *technocratic* reactions, convinced of the salvific function of markets and/or innovations; b) depressed reactions, generally inspired by Heideggerian *Gelassenheit*; c) *apocalyptic* reactions, more or less refined versions of the lifeboat ethics. Mariaenrica Giannuzzi is right, therefore, to list a number of *philosophies that are not sad about climate change*, i.e. attempts to detach the Anthropocene from its aura of natural necessity and bring it back into the realm of political choices. Her list includes, in addition to Moore's Capitalocene, the critical history of carbon

30 The Italian version of this text contains a section devoted to a literature review of the debate concerning the origin of the Anthropocene. The title of the section is *The problem of the origin: when does the Anthropocene begin?*

31 Agnès Sinai, "Entropy: The Mortal Illness of the Anthropocene", in *Towards a Civilization of Degrowth*, ed. Marco Deriu (Naples: Marotta and Cafiero, 2016), 208.

dioxide by Jean-Baptiste Fressoz and Christophe Bonneuil,³² Rosi Braidotti's post human feminism,³³ and the mythopoeic potential of Amerindian cosmologies discussed by Déborah Danowski and Eduardo Viveiros de Castro.³⁴

In Giannuzzi's list there is also a very special book, *Molecular Red* by McKenzie Wark,³⁵ from which we would like to indicate a research path that seems particularly useful for reasoning about the exit from the Anthropocene. The text tells the story of the *Carbon Liberation Front* - a sort of International of Emissions - and of small pockets of resistance scattered across time (the 1930s and 1980s) and space (the USSR and California). What really matters, however, is that it is 'a book written *for the* theory of the Anthropocene', not 'a book that makes theory, but a communicative practice that gathers voices from a context of defeats of the labour movement but not refugees in dystopian apocalypses'.³⁶ From our point of view, Wark's interesting move is that of assuming the Anthropocene not as a rhetoric to be rejected but as a terrain of struggle on which to build a new "*labour perspective* on the historical tasks of our time".³⁷ A social symptom to be recognised in order to redirect its potential. Therefore, rather than "questioning the Anthropocene [...] it is better to take it for what it is: a *brilliant hack*,"³⁸ it introduces the point of view of labour - in the widest possible sense - *into geology*".³⁹

32 Jean-Baptiste Fressoz and Christophe Bonneuil, *L'événement Anthropocène* (Paris: Seuil, 2013).

33 Rosi Braidotti, *Il postumano* (Rome: DeriveApprodi, 2014).

34 Déborah Danowski and Eduardo Viveiros de Castro, "L'arret de monde", in *De l'univers clos au monde infini*, ed. Émilie Hache (Paris: Dehors, 2014), 221-339.

35 McKenzie Wark, *Molecular Red* (London: Verso, 2015).

36 Mariaenrica Giannuzzi, "Anthropop: not sad philosophies for thinking about climate change", *Effimera* (2015), accessed September 21, 2016. <http://effimera.org/anthropop-filosofie-non-tristi-per-pensare-il-cambiamento-climatico-di-mariaenrica-giannuzzi/>.

37 Wark, *Molecular Red*, xx.

38 The term *hack* refers to the original use of a pre-existing system.

39 Wark, *Molecular Red*, 223.

A good way to think about the specificity of labour in the Anthropocene present is to ask ourselves *how we* see the new geological era, i.e. what regime of visibility it is governed by: on what is the set of rules governing the representation of hyper-objects based? It seems reasonable to us to hypothesise that it is the *General Intellect*,⁴⁰ which has become a real abstraction, hence the organising principle of contemporary production⁴¹ that sets the conditions of possibility for *seeing* climate change. In other words, the regime of visibility that allows us to realise that *we inhabit* the Anthropocene is based on cognitive capitalism, i.e. on the generalised exploitation of labour-knowledge. *This is the symptom*. And it is particularly dangerous because, despite its potential, it does not reduce environmental impacts at all: as Carlo Vercellone argues, “far from emancipating itself from the productivity logic of industrial capitalism, cognitive capitalism subsumes it, reproduces it and extends it, causing a dramatic disruption of the balances necessary for the reproduction of the ecosystem”⁴². It is no coincidence, moreover, that although climate change has been known since the nineteenth century, it has only become a public problem, a politically *visible* issue since the 1980s, i.e. when neo-liberal rationality made it possible to see a development strategy *for* capital within a ‘crisis of reproduction’⁴³ created *by* capital itself. Since then - when global elites can claim that global warming is a market failure (as it is incapable of internalising environmental costs) that can however only be solved by a further wave of marketisation (*carbon trading* and commodification of nature) - the Anthropocene can finally become the horizon of a putatively ‘sustainable’ accumulation.

40 Karl Marx, *Grundrisse: Lineamenti fondamentali di critica dell'economia politica* (Rome: Manifestolibri, 2012).

41 Carlo Vercellone, ed., *Capitalismo cognitivo* (Rome: Manifestolibri, 2006).

42 Carlo Vercellone, “André Gorz: guaranteed social income and political ecology”, *Ethics and Politics*, 19(2) (2017). It’s being published.

43 André Gorz, *Ecology and Freedom* (Naples-Salerno: Orthotes, 2015).

This is a major politico-epistemological shift - encapsulated in the formulas of *cognitive capitalism* and *green economy* - which, however, is not surprising considering the fundamental role played by digital computing in producing data and simulations concerning global warming. As historian Paul Edwards has shown,⁴⁴ no one experiences a 'planetary atmosphere' without the support of climate science. In order to establish a link between a weather event - no matter how extreme - and global warming, a large-scale mobilisation of the *General Intellect* in its various forms is invariably required (i.e. the various knowledge factories: universities, *think-tanks*, counter-arguments by social movements, etc.). Obviously, such a dependence on knowledge does not in any way reduce the concrete materiality of climate change, either with regard to the identification of its multiple causes, or with regard to the destructive impact of its heterogeneous effects. However, the fact remains that, in the words of Matteo Pasquinelli, 'the *political perception of the Anthropocene* is only possible thanks to a (seemingly neutral) global network of sensors, *data centres*, super computers and scientific institutions'.⁴⁵

It follows that an important step in the elaboration of an escape strategy from the Anthropocene is to reflect in more depth on the concept of *labour* in the age of its *geological* relevance. Moore himself, in the conclusion written specifically for this Italian edition, speaks of *work/energy* to indicate the need to overcome the work-nature opposition in the Capitalocene, which "shows the deterioration of nature as a specific expression of the capitalist

44 Paul N. Edwards, *A Vast Machine* (Cambridge MA: MIT Press, 2010).

45 This issue concerns the digital-algorithmic dimension of contemporary capitalism. For an in-depth discussion see Matteo Pasquinelli, "The Eye of the Algorithm: Cognitive Anthropocene and the Making of the World Brain" (2014), https://www.academia.edu/8751480/The_Eye_of_the_Algorithm_Anthropocene_and_the_Making_of_the_World_Brain.

organisation of labour”⁴⁶. *This* kind of labour - the kind taken over by the *energy* theory of labour-value, which over time would take on an industrial-Fordist form and become embedded in a quantitative institutional framework provided by the wage-institution⁴⁷ - is undoubtedly responsible for ecological degradation. This is due to the fact that in this relationship between nature and labour, the former acts as an unaccounted-for limit both at the beginning of the process (raw materials of production) and at the end of the process (waste disposal of production). In short, in this model abstract social nature is certainly internalised (it appears both as a free component of the *input* and as a receptacle, equally free, for waste of the *output*), but only to define the limits of abstract social labour - limits that are not directly involved in the process of valorisation.⁴⁸

However, the situation is quite different when knowledge-work becomes a primary factor of production and brings out, alongside its dimension of environmental damage, an ecologically positive potential linked to caring for the socio-natural commons. The analysis of *this* form of *work/energy* - which is not the one discussed by Moore, more linked to the theory of ‘traditional’ value - seems to us today to be a political task of primary importance, the development of which definitely goes beyond the scope of this introduction. We therefore limit ourselves to pointing out an element that we feel it is important to problema-

46 Infra, 61. However, it should be noted that Moore takes up here the most important outcomes of the feminist critique of political economy and the history of capitalism. For further discussion see Silvia Federici, *Il punto zero della rivoluzione. Domestic Work, Reproduction and the Feminist Struggle* (Verona: Ombre corte, 2014); Carolyn Merchant, *La morte della natura. Women, Ecology and the Scientific Revolution. Dalla natura come organismo alla natura come macchina* (Milan: Garzanti, 1988); Maria Mies, *Patriarchy and Accumulation on a World Scale: Women in the International Division of Labour* (London: Zed, 1986).

47 Federico Chicchi, Emanuele Leonardi and Stefano Lucarelli, *Logiche dello sfruttamento* (Verona: Ombre corte, 2016). [Federico Chicchi, Emanuele Leonardi, “Rethinking basic income”, (2021), <https://www.radicalphilosophy.com/article/rethinking-basic-income>].

48 Emanuele Leonardi, ‘Biopolitics of Climate Change’ (PhD dissertation, University of Western Ontario, Canada, 2012).

tise: the relationship between labour and entropy⁴⁹ in cognitive capitalism, i.e. in the *visible* Anthropocene, and from which it is therefore possible to escape it politically.

The issue of entropy was introduced into economic thought in the 1970s by Nicholas Georgescu-Roegen,⁵⁰ who argued that any process that produces material goods decreases the availability of energy in the future and therefore the possibility of producing other material goods. Moreover, in the course of economic processes, matter also degrades, i.e. its potential for being used again tends to decrease: once the raw materials previously concentrated in underground deposits are dispersed into the environment, they can only be reused in the economic cycle to a limited extent and at the cost of a higher expenditure of energy. As mentioned above, the industrial-Fordist waged labour, being strongly *entropic*, confirms this analysis: it is therefore clear that its decrease is socially desirable. As the degrowth movement has repeatedly emphasised, a reduction of social metabolism on a global level is a necessary requirement to ward off the spectre of ecological catastrophe.⁵¹

This reduction, however, only covers a part of the reflection on the labour-nature relationship in the Anthropocene. The emergence of knowledge-work as central opens up the possibility of

49 In the context of classical thermodynamics, entropy is a state function of a thermodynamic system which, by quantifying the unavailability of a system to produce work, is introduced together with the second principle of thermodynamics [*the entropy of an isolated system far from thermal equilibrium tends to increase in time, until equilibrium is reached*]. According to this definition, it can be said that when a system passes from an ordered state of equilibrium to a disordered one, its entropy increases.

50 Georgescu-Roegen, *Bioeconomy*.

51 Marco Deriu, "La decrescita come passaggio di civiltà", in *Verso una civiltà della decrescita*, ed. Marco Deriu (Naples: Marotta e Cafiero, 2016), 13-55.

thinking and organising a form of *negentropic work*,⁵² inserted in an *informational* labour theory of value and still waiting to find its qualitative institutional architecture (beyond, therefore, the wage relation). It cannot compensate for the ecological damage that has transported us into the Anthropocene; it can, however, indicate some lines of political intervention to inhabit it differently - well beyond both market - and technology fetishism - and finally escape from it. Negentropic work should be based, in our view, on what Nina Power has called '*decapitalism*',⁵³ i.e. a strategy of struggle that attacks contemporary capitalism without accepting the *either/or* between accelerationist optimism and degrowthist self-restriction.⁵⁴ Being fundamentally linked to the *General Intellect*, negentropic work can only be installed on a techno-economic paradigm of a digital kind: only from that perspective does it become possible to politicise sustainability in such a way that non-commodified social knowledge can be put at the service of environmental protection. Again, it is not a question of thinking that ICTs as such can 'solve' the ecological question: as things stand, their energy requirements are not compatible with a healthy planet. However, it remains possible to build relations of production that privilege the auton-

52 Negentropy is the opposite of entropy: by showing the relative validity of entropy with respect to closed systems, it asserts itself as a process of reintegration of order. The two phenomena do not exist in pure form but emerge from an original interaction. For example, in the case of the metabolism of living organisms, there is, on the one hand, catabolism, i.e. the consumption and destruction of organic tissue by the organism, and, on the other hand, anabolism, i.e. the reconstitution of this tissue through the intake of various forms of energy.

53 Nina Power, "Decapitalism, Left Scarcity, and the State," *Fillip* 20 (2015), accessed December 29, 2016, <https://fillip.ca/content/decapitalism-left-scarcity-and-the-state>.

54 There is already evidence of rapprochement - or at least dialogue - between Degrowth and Accelerationism. For example, Aaron Vasingtjan writes: "While Degrowthism does not have an analysis of contemporary socio-technical regimes - and therefore does not know how to deal with them - Accelerationism greatly underestimates the metabolic increase imposed by these regimes. But there is nothing to stop them from starting to communicate in spite of their respective ideological brandings: there is much to learn for both" (Aaron Vasingtjan, "Accelerationism and...Degrowth? The Left's Strange Bedfellows", *Institute for Social Ecology* (2015), accessed December 29, 2016, <http://social-ecology.org/wp/2016/09/accelerationism-degrowth-lefts-strangest-bedfellows/>).

omous development of negentropic work over the imperatives of capitalist accumulation: these relations will have to become the ground on which to build a mode of production increasingly based on *peer-to-peer* networks linked to social commons and environmental sustainability.

This is clearly a programme of research and political action that is still in its infancy.⁵⁵ We would therefore like to conclude with two suggestions that we hope to further explore in the future. The first takes up the pharmacological approach of Bernard Stiegler, who reads the Anthropocene not only as the apex of hyper-industrial society and technological proletarianisation but, at the same time, as a condition of possibility for its overcoming, that is, for a re-direction of entropy towards the production of “negentropic value”.⁵⁶ In the words of Sara Baranzoni and Paolo Vignola,⁵⁷ it is a question of *bifurcating at the root*, that is, of identifying “the hypothetical breaking point where we can pass from a catastrophic and totally entropic epoch to an epoch founded on the inversion of this tendency”. This perspective interests us above all because it extends the concept of proletarianisation to the sphere of social knowledge, showing how the future - including its ecological dimension - of the planet lies in the re-appropriation by workers of the various forms of knowledge that have been taken away from them in cognitive capitalism.⁵⁸ Hand in hand with the Anthropocene as a symptom, the first signs of a possible political therapy are also emerging.

55 However, some recent elaborations both in the field of Degrowth [Giacomo D’Alisa, Federico Demaria and Giorgos Kallis, eds, *Degrowth: A Vocabulary for a New Era* (London: Routledge, 2015)] and of *Peer-to-Peer* production based on commons [David Bollier, *La rinascita dei Commons* (Milan: Stampa Alternativa, 2015)] give hope.

56 Bernard Stiegler, *La société automatique I: L’avenir du travail* (Paris: Fayard, 2015).

57 Sara Baranzoni and Paolo Vignola, “Bifurcating at the Root,” *Effimera* (2016), accessed December 29, 2016, <http://effimera.org/disagi-dell-accelerazione/>.

58 Sara Baranzoni and Paolo Vignola, “Last stop Anthropocene. Accelerating or bifurcating?,” *Kaiak*, 2 (2015): 1-14.

The second suggestion refers to the need, pointed out with particular accuracy by Matteo Pasquinelli, to integrate the energetic labour theory of value, fundamental for understanding *fossil capital*,⁵⁹ with the informational labour theory of value, without which it would be impossible to grasp the specificity of *cognitive capitalism*. Such integration is urgent because without it, the gap between struggles over information (from the hacker movement to the digital precariat, from Anonymous to post-Snowden media activism) and struggles over energy (from anti-nuclear movements to environmental and climate justice, from urban ecology to indigenous struggles for food and land sovereignty) is bound to widen. “To use a classic concept of autonomist Marxism: a new *political composition* of energy and information must be worked out against the technical composition that has bifurcated them since the industrial age”.⁶⁰

We could not agree more. We would just like to point out that, to be honest, we are not starting from scratch: as early as 1977, André Gorz showed in *Ecology and Freedom* how eco-socialism needed simultaneously a radical re-invention of labour, a re-localisation of production and an autonomous re-appropriation of technology.⁶¹ It is therefore a matter of continuing here and now his research on new terrains, of finding new practices of conflict to open the passage to the *civilisation of liberated time*. Always bearing in mind that “social autonomy is the *first* form of resistance to economic entropy”.

59 Andreas Malm, *Fossil Capital* (London: Verso, 2016).

60 Matteo Pasquinelli, “The Automaton of the Anthropocene: On Carbonsilicon Machines and Cyberfossil Capital,” *South Atlantic Quarterly* 116, 2 (2017): 311-326.

61 In this regard, it is worth mentioning the important works of Tiziana Villani (*Ecologia politica: nuove cartografie dei territori e potenza di vita*, Manifestolibri, 2013) and Ubaldo Fadini (*Divenire corpo: soggetti, ecologie, micropolitiche*, Ombrecorte, Verona, 2015) who, connecting Gorzian research to Félix Guattari’s ecosophical analyses, have shown how the re-singularisation of subjectivities, the transformations of the social and the continuous reinvention of the environment are necessary conditions for a questioning of the dominant forms of valorisation of human activities.

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S.01

ECO-POLITICAL
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Improving Mars: Elon Musk and the Promise of Salvation in Outer Space Environments

Outer Space; Multi-planetary Improvement; Geopower; Colonial Habitation.

Miriam Tola

University of Lausanne, Lausanne, Switzerland
miriam.tola@unil.ch

In “Making Humans a Multi-Planetary Species”, a widely circulated essay published in 2017, Elon Musk, the CEO of Tesla and SpaceX, argues that history is going to bifurcate along two directions. Either humans stay on Earth forever, eventually heading toward extinction, or we become a “multi-planetary species”.¹ Musk is not just offering predictions for the future. He promises salvation from the planetary predicament that goes under the name of the Anthropocene. Naming a new geological epoch registering the impact of the human species on Earth processes, this term was popularised by Nobel Prize winner Paul Crutzen in the early 2000s and meant as a call to action to advert the catastrophic consequences of human alteration of the geo- and

1 Elon Musk, “Making Humans a Multi-Planetary Species” *New Space*, 5 No. 2 (June 2017): 46.

biosphere. The Anthropocene evokes man-made apocalyptic scenarios of rising seas, habitat loss, deforestation, drought and desertification that render the Earth increasingly inhospitable to human life. As the COVID-19 pandemic, the increasing spread of wildfires and extreme weather events have made clear, these scenarios reflect the present rather than the future.

Yet as much as the Anthropocene tells a story about extinction, it ultimately conveys the possibility of redemption. Obscuring the differential responsibilities and vulnerabilities that stratify the human across the lines of gender, race, class and geography, it presents *Homo sapiens* as a figure of both disruption and salvation. As the cultural theorist Joanna Zylińska notes, the Anthropocene “brings forth a temporarily wounded yet ultimately redeemed Man, who can conquer time and space by rising above the geological mess he has created”.² Musk uses the secular languages of technological entrepreneurship for illustrating the path for salvation: terraforming outer space.

Fantasies about Mars as space for human settlements are not new, going back at least to Percival Lowell’s speculations about intelligent life on the planet in the early years of the twentieth century. But what makes Musk stand out, is that SpaceX has been developing partnerships and technologies for leaving Earth behind. At the forefront of New Space, a movement and business sector including space engineers, entrepreneurs, planetary scientists and state agencies, Musk’s company has been stretching habitability –and profitability– beyond Earth. According to David Valentine, an anthropologist who has conducted extensive research on US commercial outer space enterprises, space settlement has stopped being SF speculation and is now a real possibility.³

2 Joanna Zylińska, *The End of Man: A Feminist Counterapocalypse* (Minneapolis: University of Minnesota Press, 2018), 15.

3 David Valentine, “Exit Strategy: Profit, Cosmology, and the Future of Humans in Space”, *Anthropological Quarterly*, 85, No. 4 (Fall 2012): 1045-1067.

The developments in commercial and military space technologies, satellite imaging and cosmology have inspired critical scholars in the social sciences, the arts and the humanities to investigate the economies, practices and imaginaries of outer space exploration and settlement, showing how they are relevant for confronting political and environmental problems on Earth.⁴ Important contributions have introduced extraterrestrial environments in conversations about the Anthropocene with the goal of problematising the inner environment/outer environment divide, and draw attention to Earth as situated in dynamic relations with cosmic materials and forces.⁵

Much of this literature invites us to take seriously the large-scale questions raised by the possibility of extraterrestrial habitation. Thus, this essay offers a preliminary exploration of Musk's vision of multi-planetary futures. Rather than dismissing it as the science-fiction fantasy of an extravagant billionaire, it proposes the concepts of *multi-planetary improvement*, *colonial habitation* and *geopower*, as lenses for making sense of its significance. To be sure, Musk makes an easy target for feminist critique: he embodies macho geek culture and the Anthropocene promise of a redeemed (white) Man whose audacity and entrepreneurial vision will reorient the human trajectory away from a doomed planet, toward new uncharted territories. Engaging with this public figure allows to explore important dimensions of prevalent imaginaries of the (hu)man, the Earth and outer space without losing sight of the socio-ecological relations within which these imaginaries are produced.

4 See Denis Cosgrove, *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Baltimore: Johns Hopkins University Press, 2001); De Witt Douglas Kilgore, *Astrofuturism: Science, Race, and Visions of Utopia in Space* (Philadelphia: University of Pennsylvania Press, 2003); Peter Dickens, James Ormond, *Cosmic Society: Towards a Sociology of the Universe* (Abingdon: Routledge, 2007); Valentine, "Exit Strategy", 1045-1067; Lisa Messeri, *Placing Outer Space: An Earthly Ethnography of Other Worlds* (Durham: Duke University Press, 2016); Julie Michelle Klinger, *Rare Earth Frontiers: From Terrestrial Subsoils to Lunar Landscapes* (Ithaca: Cornell University Press, 2017).

5 Valerie Olson and Lisa Messeri, "Beyond the Anthropocene: Un-Earthing an Epoch" *Environment and Society*, 6 (2015), 28-47.

A white migrant from South Africa, Musk made a fortune in Silicon Valley through Internet startups including PayPal. He is widely celebrated in the popular media as an “architect of tomorrow”⁶ walking “the fine line between madness and genius” to “really change the world”.⁷ He cemented his reputation as the tech industry bad boy through social media controversies, publicity stunts, the cosy relationship with Donald Trump and the statements against pandemic lockdown as “fascism.”

The co-founder of Tesla and other clean energy technologies, in many ways Musk epitomises the American cleantech ethos: being emotionally and financially invested in the promises of technologies that can green the planet, thus saving it from impending catastrophe while also achieving incremental gains in already established markets. The key actors of cleantech are the entrepreneurs and the technologists who design innovative, even utopian, solutions for the environmental crisis, and the venture capitalists who invest in innovation with the goal of creating profits.⁸ Sometimes, as in Musk’s case, the same individuals occupy multiple roles.

He advocates a sharp turn away from fossil fuels to sustainable energy and has long been a supporter of the carbon tax. Speaking at the World Energy Innovation Forum in 2016, he called for a revolt against the fossil fuel industry, a heavily subsidised sector that refuses to pay for causing environmental destruction. In 2017, Musk left two White House advisory councils after the Trump administration’s decision to withdraw from the Paris Agreement. His ambition to take a leading role in the survival of terrestrial life extends beyond its increasingly precarious

6 Neil Strauss, “Elon Musk: The Architect of Tomorrow”, Rolling Stone, November 15, 2017, <https://www.rollingstone.com/culture/culture-features/elon-musk-the-architect-of-tomorrow-120850/>.

7 Elon Musk, “Elon Musk’s Mission to Mars”: Interview by Chris Anderson. Wired, October 21, 2012, <https://www.wired.com/2012/10/ff-elon-musk-qa/>.

8 Jesse Goldstein, *Planetary Improvement: Cleantech Entrepreneurship and the Contradictions of Green Capitalism* (Cambridge: MIT Press, 2018).

existence on Earth. It looks at outer space as a new frontier for human settlement and value extraction.

Whereas during the Cold War space colonisation was a matter of public investments, part of a broader mission of national defence, today private initiatives have taken the lead. From Musk to Jeff Bezos, over the last decade there has been a rise of astropreneurs, mainly tech moguls investing hundreds of millions into private space programmes. They have different visions for the future but share the goal of turning outer space into human space. According to *Forbes*, in 2019 private space investments hit a record high with venture capitalists investing \$5.8 billion in over 170 commercial space startups worldwide.⁹ Private actors, however, still rely on publicly funded research and infrastructures for exploring competitive markets. These include communication infrastructures and the mining of rare earth minerals that are scarce on Earth but apparently abundant in other Solar System bodies and essential for electronics manufacturing.¹⁰

For Musk, building a self-sustaining city for 1 million people on Mars is our best hope for staving off extinction. Her argues that, in spite of frigid temperatures, cosmic radiations and dust storms, this resource-rich planet, is still the most accessible for human settlement. In order to reduce the costs of space flights and allow more people to move off Earth, SpaceX has been developing fully reusable space vehicles. Planetary scientists suggest that Musk's plan misses crucial aspects of space

9 Alex Knapp, "Space Industry Investments Hit Record High as Venture Capital Seeks The Next SpaceX", *Forbes*, January 16, 2020, <https://www.forbes.com/sites/alexknapp/2020/01/16/space-industry-investments-hit-record-high-as-venture-capital-seeks-the-next-spacex/>.

10 Eleanor Penny, "Billionaires Want to Be the Gatekeepers of the Solar System", *In These Times*, December 17, 2020, <https://inthesetimes.com/article/space-privatization-future-technology-silicon-valley-elon-musk-jeff-bezos/>.

exploration and the Mars environment but they warn against dismissing it as pie in the sky.¹¹

At the end of May 2020, during the COVID-19 pandemic, SpaceX was the first commercial enterprise to launch humans into space through a public-private partnership with NASA. Nine years after NASA's shuttle programme was retired, the mission marked a new beginning for America's space adventure. As the SpaceX Falcon 9 rocket lifted off from Kennedy Space Center in Cape Canaveral, Florida, the streets of cities all over the United States filled up with people protesting the systemic racial injustice leading to the police killing of George Floyd in Minneapolis. Watching the sky from the space center, Donald Trump celebrated the mission as a milestone toward "fulfilling America's destiny in space". His remarks attempted to convey the pride for a newly found national progress, relying on grandiose visions of technological sublime and references to American exceptionalism. While Trump did not mention the raging pandemic, he addressed Floyd's death, promising the restoration of law and order after the "violence and vandalism" of the "angry mobs". Reading together the space launch and the Black Lives Matter protests, allows to interrogate the stakes of what I call "multi-planetary improvement" and its attendant injustices.

The term "multi-planetary improvement" reworks the concept of "planetary improvement", introduced by Jesse Goldstein in his study of the cleantech entrepreneurial culture in the United States.¹² This notion references the discourse of agricultural improvement that in 17th century England proposed to increase the productivity of nature and labour through the application of scientific knowledge. The goal of improvers such as William Petty and John Locke was to make wasteful land available to

11 Andrew Coates, "Sorry Elon Musk, but it's now clear that colonising Mars is unlikely – and a bad idea", *The Conversation*, August 2, 2018, <https://theconversation.com/sorry-elon-musk-but-its-now-clear-that-colonising-mars-is-unlikely-and-a-bad-idea-100964>.

12 Goldstein, *Planetary Improvement*.

human industry and efficient techniques of cultivation. The improvers targeted the commons in Europe and indigenous land in the New World as unproductive. They defined the people inhabiting them as lazy, savages or incapable of properly “husbandizing” the fruits of the Earth. These primitive modes of living were to be superseded by rightful appropriation and enclosures, integral elements of improvement.

At the global level, 17th century improvement was intertwined with the emergence of gendered and racialised forms of colonial habitation predicated upon the affirmation of the white, masculine property owner as the hegemonic model of the human. This particular form of the human, Man, was entitled to appropriate land and the labour of women and slaves as his right. Improvement articulated the capitalist rationale and racial hierarchies to produce a violent way of inhabiting the Earth, subjugating lands, humans and non-humans to the desires of the coloniser.¹³ By the beginning of the 18th century, improvement had become distinctive of the English effort to enhance the profitability of both national and colonial land. Moving beyond the economic sense, it solidified as a moral concept predicated upon the civilisational superiority of the European way of life.

In the logic of planetary improvement that underlies the cleantech industry, wastefulness is no longer associated with subsistence economies that need to be brought into the orbit of market relations. Rather, it is associated with carbon intensive, polluted industrial landscapes. In other words, industrial capitalism itself is identified as wasteful and in need of improvement. As Goldstein points out, the injunction to save the planet that circulates in the cleantech industry “is fundamentally an extension of this long-standing colonial imperative to develop upon

13 On colonial habitation see Malcolm Ferdinand, *Une écologie décoloniale. Penser l'écologie depuis le monde caribéen* (Paris: Seuil Editions, 2019).

and profit from a productive landscape considered misused and abused".¹⁴

But there is another dimension of contemporary configurations of improvements that is worth noting. In the era of New Space, improvement is a multi-pronged effort that involves Earth and off-Earth territories. In Musk's writings, speeches and media appearances, improvement acquires a multi-planetary dimension. Entrepreneurial risk and technological innovation are presented as solutions for fixing the misuse of planet Earth and safeguarding humankind against catastrophe through off-planet exploration. His assertion that "we have a duty to maintain the light of consciousness, to make sure it continues into the future"¹⁵ suggests that making humans a multi-planetary species is a moral imperative and a continuation of a civilisational mission. It infuses the promise of technological salvation of the species in outer space to improvement's celebrations of industry and profit-making.

Extending improvement to the Solar System requires forms of enclosures. With the rise of New Space, private firms are no longer operating as contractors of state agencies. They have become the leading players in the sector. This shift has gone hand in hand with the revision of international treaties that since the 1960s have banned off-Earth ownership and configured the cosmos as commons. If in 2015 the Obama administration made near-Earth asteroids available to commercial ventures, in 2020 Trump issued an executive order asserting that "Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space". In light of these efforts towards outer space enclosures, it makes perfect sense that SpaceX has forged partnerships with astrobiology research

14 Goldstein, *Planetary Improvement*, 35.

15 Ross Andersen, "Exodus. Elon Musk argues that we must put a million people on Mars if we are to ensure that humanity has a future", *Aeon*, September 30, 2014, <https://aeon.co/essays/elon-musk-puts-his-case-for-a-multi-planet-civilisation>.

teams experimenting with the use of microorganisms for mining rare minerals in simulated Mars and Earth gravities.¹⁶ Outer space, as scholars have noted, is in the process of being reconfigured as a site of resource extraction.¹⁷

The project of turning humans, or some humans, into a multi-planetary species combines the logic of improvement with what Frédéric Neyrat defines as geopower, a power formation that treats the Earth as an object of human knowledge and technological intervention. Geopower aggregates a range of diverse economic, scientific and philosophical positions claiming that the Earth, and everything making up planetary processes and ecosystems, can and must be reconstructed.¹⁸ In the face of the ecological crisis, the project of planetary and multi-planetary remaking presents itself as “general ecological interest”¹⁹, that is, saving the human species, or a portion of it, from environmental disaster. Drawing on the familiar imaginary of the frontier open to colonisation, New Space renders Mars and other planetary bodies as the new virgin land, a site deprived of autonomous materiality to be reshaped in the image of the technocapitalist Man. It “sets up outer space as a passive landscape with no purpose other than human sustenance”.²⁰ In doing so, it spectacularly regenerates the extractive human/environment relation that has been central to capitalist modernity. When SpaceX Falcon 9 lifted off from Cape Canaveral at the end of May 2020, protesters for Black lives were chanting “I can’t breathe”. As this phrase reverberated across the world, it linked the lethal effects of institutional racism with the uneven impact of the pandemic

16 Charles S. Cockell et al., “Space station biomineral experiment demonstrates rare earth element extraction in microgravity and Mars gravity”, *Nat Commun* 11, 5523 (2020).

17 Klinger, *Rare Earth Frontiers*.

18 Frédéric Neyrat, *The Unconstructable Earth: An Ecology of Separation* (New York: Fordham University Press, 2018).

19 *Ibid.*, 2.

20 Lisa Messeri, “We Need to Stop Talking About Space as a “Frontier””, *Slate*, March 15, 2017, <https://slate.com/technology/2017/03/why-we-need-to-stop-talking-about-space-as-a-frontier.html>.

and environmental injustice on black and brown bodies.²¹ Situating the space launch and Black Lives Matter protests side by side points to the outer space extension of geopolitics and the gendered and racialised logics of improvement. But it also suggests something quite different: those who bear the burden of social and environmental injustices are capable of challenging forms of colonial habitation and inventing alternative modes of dwelling on Earth and in the cosmos. They are capable of envisioning modes of world building beyond the salvation of Man. Elon Musk is not the only one looking at the sky and inventing new futures.

21 Whitney N. Laster Pirtle, "Racial Capitalism: A Fundamental Cause of Novel Coronavirus (COVID-19) Pandemic Inequities in the United States", *Health Education & Behavior*, 47 (2020), 504–508; Achille Mbembe, The Universal Right to Breathe, *Critical Inquiry*, April 13, 2020, <https://critinq.oxfordpress.com/2020/04/13/the-universal-right-to-breathe/>.

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S.01

ECO-POLITICAL
NARRATIVE
DIVERSIFICATION

Overlapping Narratives: Self-Representations of the Anthropocene

Anthropocene; Landscape; Weird; City; Narratives; Memory.

Stefano Ascari

Università di Bologna, Bologna, Italy
stefano.ascari2@unibo.it

The exhibition “Anthropocene: Burtynsky, Baichwal, de Pencier” has codified a visual imaginary consciousness of the Anthropocene that demands further discussion to enlighten the peculiarities of the “view from above” that characterises most of the project’s images, and to lift the debate to a more fruitful level. This article takes a new look at this topic in light of the catastrophic narratives, the myth of flight and the intrinsic link with the imagery of the metropolis, opening the debate up to a different point of observation. Therefore, some subtexts of the discourse come into play (such as the sublime, the uncanny – in the dual meaning of weird and eerie – and the multispecies narratives) that broaden the reflection on the agency of the Anthropocene and that can potentially defuse the aestheticising paradox that, by monumentalising the image, compromises its effectiveness.



“Like the moon
 reflecting on the water
 in the hollow of the hands,
 this world we don’t know
 if it is or if it is not”

Ki no Tsurayuki,
 eighteenth day of the fifth month of the eighth Tenjō year (945)¹

To each Anthropocene its own Apocalypse.

The urban phenomenon, seen as the singularity of a structure of relations that expresses the impact of human race on the entire planet, informs the production of imaginaries of its own evolutionary process: it is therefore natural that in terms of language and strategies of representation the visualisation of the concept of Anthropocene is placed in this context.

Starting in 2018, the exhibition “Anthropocene: Burtynsky, Baichwal, de Pencier” (and all related products such as films, augmented reality applications, gigapixel images and publications) codified a visual imagery focused on the representation of the Anthropocene.

Even if the “Anthropocene project” declares itself to be an open process, it is evident that, in particular, Burtynsky’s images constitute a priority imaginary that risks depowering reflection due to the aesthetic paradox according to which “the conquest of nature, having been aestheticised, leads to a loss of perception (aesthesis), which is to say, it becomes an anaesthetic”.²

In fact, more than in the concrete scientific operability of the term, the interest in the definition of *Anthropocene* resides

1 Jisei, *Poesie dell’Addio*, ed. Ornella Civardi, (Milan: SE, 2017), 12.

2 Nicholas Mirzoeff, “Visualizing the Anthropocene”, *Public Culture* 26 (2014): 213-232.

in the occasion of a “prise de conscience essentielle pour comprendre ce qui nous arrive. Car ce qui nous arrive n’est pas une crise environnementale, c’est une révolution géologique d’origine humaine”.³

Bonneuil and Fressoz’s critical contribution on the topic has the merit of accounting for a whole series of concurrent interpretations of the concept of Anthropocene and of distancing itself from a purely environmentalist plan of reflection.

The Anthropocene represents a complex conceptual knot. Indeed, it is a term that was immediately borrowed from biology and interpreted in light of different disciplines (from meteorology to geology), and subsequently acquired a pervasiveness that has not, however, freed it from an original paradox: the species called upon to define the name of an epoch is the same that establishes its characteristics, which are almost exclusively linked to the impact of its own work. If we also consider that the era in question has (perhaps) begun but has certainly not yet ended, the paradoxical picture is complete. *Homo sapiens* (assuming that even this designation is still appropriate) is called to define its present and to evaluate this periodisation on the basis of its (actual or presumed) impact on the environment: an evident paradox that multiplies the influences between observer and observed phenomenon in a much more articulated and complex way than Schrödinger’s classic postulation.⁴

Besides having a dual issue of self-referentiality (in the narration and in the identification of causes and characteristics), the definition of the term *Anthropocene* presents a remarkable degree of arbitrariness that reminds us of the attribution of place names in the newly discovered lands of past centuries.

3 Christophe Bonneuil and Jean-Baptiste Fressoz, *L’Événement Anthropocène. La Terre, l’histoire et nous* (Paris: Editions du Seuil, 2016), XIII.

4 Erwin Schrödinger, “Die gegenwärtige Situation in der Quantenmechanik (The present situation in quantum mechanics)”. *Naturwissenschaften* 23 (1935): 807–812.

The extent of this arbitrariness is testified to by the debate on the exact dating of the beginning of this period and also on the correctness of the name itself and the meanings attributed to it, which oscillate within a wide range of topical areas: from the political level, to the economic level (where the question is about the evolution of current production and consumption systems), and to the biological level (where the question is about our chances of survival as a species in the immediate future).

This last aspect is a fundamental subtext of the Anthropocene. Concern for survival is a distinctive characteristic of the great narratives of human history: the impact of the micro-apocalypse (from the Universal Flood to the Lisbon earthquake of 1755) and the persistence of the narratives connected to them, as well as the pervasiveness of eschatological themes in religions are just a few examples of this.

The reappropriation of the apocalyptic theme in an etymological sense (i.e. unveiling) spurs a possible reactivation of the debate on the Anthropocene, not so much because a narration of the final catastrophe is necessary but rather to make us fully aware that such a subtext is present and deeply informs the views we are analysing.

Collective memory and catastrophe.

“Quelles paroles faut-il semer, pour que les jardins du monde redeviennent fertiles?”, se demandait la poétesse Jeanine Salesse. Quelles histoires faut-il écrire pour apprendre à vivre l’Anthropocène ?”.⁵

Before we even ask ourselves what kind of stories, we should ask ourselves whether it is really the story we are talking about, or whether it is *a* story, a narrative. Halbwachs’s reflection on t

5 Bonneuil and Fressoz, *L’Événement Anthropocène*, 358.

he relationship between history and collective memory helps us in this sense.

“La mémoire collective se distingue de l’histoire au moins sous deux rapports. C’est un courant de pensée continu, d’une continuité qui n’a rien d’artificiel, puisqu’elle ne retient du passé que ce qui en est encore vivant ou capable de vivre dans la conscience du groupe qui l’entretient. Par définition, elle ne dépasse pas les limites de ce groupe. Lorsqu’une période cesse d’intéresser la période qui suit ce n’est pas un même groupe qui oublie une partie de son passé: il y a en réalité, deux groupes qui se succèdent. L’histoire divise la suite des siècles en périodes, comme on distribue la matière d’une tragédie en plusieurs actes. Mais, tandis que, dans une pièce, d’un acte à l’autre, la même action se poursuit, avec les mêmes personnages qui demeurent jusqu’au dénouement conformes à leur caractère.... dans l’histoire on a l’impression que, d’une période à l’autre, tout est renouvelé.... L’histoire, qui se place hors des groupes et au-dessus d’eux, n’hésite pas à introduire dans le courant des faits des divisions simples, et dont la place est fixée un fois pour toutes. Elle n’obéit pas, ce faisant, rien qu’à un besoin didactique de schématisation”.⁶

The concept of collective memory is perhaps more relevant to what the Anthropocene represents: not an abstract periodisation but an ever-changing entity that takes on variable characteristics depending on the group that recognises itself and that in many cases contaminates and mixes with concurrent memories. This understanding gives a better account of the different naming attempts enumerated by Bonneuil and Freson (oligantropocene, thermocene, tanatocene, phagocene, agnotocene, capitalocene, polemocene): each group builds, perpetuates and recognises itself in a specific narration that plausibly requires different representations.

6 Maurice Halbwachs, *La mémoire collective* (Paris: Albin Michel, 1997), 132-133.

Anthropocene's view from above

Burtynsky's work gives us the most representative and popular images of the Anthropocene: we therefore focus on one characteristic of most of his images published in the context of the project, namely the view from above.

From a conceptual point of view, Burtynsky can be placed in a consolidated path through the history of landscape photography. A first reference, made directly in the exhibition catalogue, is to the work of Ansel Adams and Nancy Newhall⁷ on William Garret's images accompanied by texts that have the tones of a dark prophecy: "Hell we are building on earth. Headlong, heedless, we rush: to pour into air and water poisons and pollutions until dense choking palls of smog lie over cities and rivers run black and foul; to blast down the hills, bulldoze the trees, scrape bare the fields to build predestinated slums, until city encroaches on suburb, suburb on country, industry to all, and city joins city, jamming the shores, filling the valleys, stretching across the plains". This text, which in some parts takes up the structure of the ancient chain tales such as the Jewish *Chad Gadya* to "This is the House That Jack Built", signals the union between the image seen from above, the story of the territory and the dialectic of a clash with nature.

Looking beyond more recent references, such as the famous project by Yann Arthus Bertrand (*Earth from Above*, 2004) or the visual approach of Godfrey Reggio in his "Qatsi" trilogy,⁸ the most direct references are certainly to the work of the photographers of the Düsseldorf School (Andreas Gursky, Thomas Struth, and Thomas Ruff among others) who had in turn developed the themes of the 1975 exhibition *New Topographics*:

7 Ansel Adams and Nancy Newhall, *This is the American Earth* (Oakland: The Sierra Club, 1960), 36

8 "Koyaanisqatsi. Life Out of Balance" (1982), "Powaqqatsi. Life in transition" (1988), and "Naqoyqatsi. Life as War" (2002).

*Photographs of a Man-altered Landscape*⁹ (Robert Adams, Lewis Baltz, Nicholas Nixon, and Bernd and Hilla Becher). The minimisation and expulsion of the human figure and the focus on the immersive rendering allowed by digital photography and large format printing technologies are elements of strong visual continuity with Burtynsky's work.

Hackett explicitly addresses the subject of the point of observation in the chapter "The View from Above"¹⁰ where, indicating a path from map tracking to aerial mapping for military use, she reconstructs the relationship between aerial view and the narration of natural phenomena on a continental scale.

Using photos from above as a tool to "document the scale of anthropogenic activity on the surface of the planet"¹¹ is legitimate, but it is important to keep in mind that the view from above is not a pure and simple geometrical data point but rather a way of looking and narrating that is full of implications.

Mirzoeff highlights some of them when he writes "visualizing was and is a hierarchical, indeed autocratic, means of imagining the social as permanent conflict.... In short, Anthropocene visibility keeps us believing that somehow the war against nature that Western society has been waging for centuries is not only right; it is beautiful, and it can be won".¹²

The stratification of this imagery dates to the Impressionist period and to Monet's most famous painting *Impression, soleil levant* "a painting that at once reveals and aestheticises anthropogenic environmental destruction.... The smokiness of the port of Le Havre in Normandy, seen in Monet's picture, was a feature of French visual culture from popular photographs and paint-

9 Jenkins, *New Topographics*, 1975.

10 Sophie Hackett, Andrea Kunard and Urk Stahel, *Edward Burtynsky, Jennifer Baichwal, Nicholas de Pencier, Anthropocene* (Fred ericton: Goose Lane Editions, 2018), 16.

11 *ibid.*, 23.

12 Mirzoeff, "Visualizing the Anthropocene", 216-217.

ings from the middle of the nineteenth century to Maurice de Vlaminck's 1907 painting *Le Havre, les bassins...* The painting is constructed from an unusually high viewpoint... Here the human agents of the Anthropocene look at their creation from its own viewpoint, as it were, and see that it was good".¹³ It is interesting – as we will see later on in our discussion of the Anthropocene agency – that the “human agents” observe the effects of their work from above, and that Mizroeff, with an interesting reversal of meaning, quotes Genesis attributing to them prerogatives of the divine.

In the view from above, therefore, there remains a subtext that reads in terms of the clash between man and the environment but also a childish “idea of control”¹⁴ aroused by the illusion of being in front of a diorama from which, as in Hiroshi Sugimoto's *Dioramas*,¹⁵ someone has omitted the frame.¹⁶ The “super-terrestrial”¹⁷ gaze is an ancient theme that is deeply connected to the dream of flight: it resonates in the story of the Tower of Babel, as well as in the story of Daedalus and Icarus, and is always connected to an expression of power that brings about a break, often unfortunate, with the order of things. The Tower of Babel collapses and Icarus fatally falls into the sea, and even King David's attempt to census his people (to count them “from above” on his throne) is destined to fail. On the other hand, the main prerogative of Superman, semi-divine pop icon of the American metropolis, is flight (or rather the possibility of overcoming a skyscraper, a modern Tower of Babel, with a single leap).

13 *ibid.*, 221-223.

14 Simon Garfield, *In Miniature. How Small Things Illuminate the World* (Edinburgh: Canongate Books, 2018), 15..

15 Hiroshi Sugimoto, *Dioramas* (Bologna: Damiani, 2014).

16 Gianluca Didino, *Essere senza casa. Sulla condizione di vivere in tempi strani* (Rome: Minimum Fax, 2019), 87.

17 Geneviève Azam, “Le temps du monde fini: vers l'après-capitalisme” (Paris: Les Liens qui libèrent, 2012) cit. in Bonneuil and Fressoz, *L'Événement Anthropocène*, 73.

The crowning achievement of these narrations of flight is the conquest of a view of the Earth from space, symbolically marked by the image “Earthrise” taken in 1968 by the astronauts of Apollo 8. The orbital view, according to McLuhan, led to the affirmation of the perception of the Earth as an available artefact. It is no coincidence that the article in question was entitled “At the moment of Sputnik the planet became a global theater in which there are no spectators but only actors”.¹⁸

Concern about the extent of human activity on the planet is visually imbued with the symmetrical ambition of leaving a trace visible from space (from eternity): this dualism implied by the adoption of a zenithal point of view is one of the fundamental elements to reactivate a reflective dynamic and defuse the superficial aesthetic fascination produced by Burtinsky’s images.

Aesthetic seduction also has a natural stabilising function because, as Susan Sontag says, “taking photographs...is a way of certifying experience, [but] also a way of refusing it – by limiting experience to a search for the photogenic, by converting experience into an image, a souvenir.... The very activity of taking pictures is soothing and assuages general feelings of disorientation that are likely to be exacerbated by travel”.¹⁹

The Anthropocene is photogenic, like all catastrophic situations, thanks also to the incessant production of imaginary images employed by science fiction narratives and cinematography, a visual system strongly linked to the urban phenomenon from the early years of the 20th century (with examples ranging from *Metropolis* by Fritz Lang to *Blade Runner* by Ridley Scott) and

18 Marshall McLuhan, “At the Moment of Sputnik the Planet Became a Global Theater in which There are No Spectators but Only Actors”, *Journal of Communication*, vol. 24, no. 1 (1974): 48-58.

19 Susan Sontag, *On Photography* (New York: Farrar, Straus & Giroux, 1977), 177.

that soon embraced a planetary scale, constituting what Musset calls “icônes et géosymboles de l’apocalypse”.²⁰

In the view from above, in the unforeseen geometries produced by human action, one can inevitably recognise, even if only on an implicit level, the images of post-apocalyptic futures or distant planets that science fiction has been producing without interruption for over a century. It should come as no surprise that in an attempt to rationalise its impact on the planet and

exorcise the consequences of its actions, the human race tends to resort to known and to some extent comforting visual codes.

New frontiers of the uncanny: sublime, weird, eerie and tentacular thinking.

Hackett’s notation of how Burtynsky’s work establishes a dialectic between “disorientation and discovery” and that of Baichwal and De Pencier between “familiar and unfamiliar”²¹ is one of the key elements in reopening the imagery of the Anthropocene.

We are dealing with images that, in oscillating between the terms of these dualisms, are less effective on the front of “disorientation” and “unfamiliar”. Indeed, they are images that we are able to trace back to something we know or intuit. It is therefore the case to restore a more effective uncanny or “unheimlich” (unhomely) dimension. The blatant contradiction of wanting to portray the ruins/foundation of the Tower of Babel from the top of the tower itself produces a sort of cognitive stalemate by configuring these scenarios as “automonuments”.²² To reactivate the reflection it is therefore necessary to “go home” and re-enact a more domestic, more grounded dimension of the narrative, that is, to reappropriate the horizontal measurement method used to trace

20 Alain Musset, *Le syndrome de Babylone - Géoconflits de l’apocalypse* (Paris: Armand Colin, 2012), 175.

21 Hackett, Kunard and Stahel, *Anthropocene*, 24.

22 Rem Koolhaas, *Delirious New York. A Retroactive Manifesto for Manhattan* (New York: The Monacelli Press, 1994), 100.

the portolans and position the automatic surveys of the aerial view in the background.

It is necessary to give back to the visualisation of the Anthropocene a procedural and not monumental dimension, and therefore to retrigger the uncanny dimension that in Burtynsky's production is certainly present but weakened by the sense stratifications discussed above.

At a basic level, Burtynsky's images already recall the disturbance associated with the classic idea of Burke's sublime given by the presence of out-of-scale objects or the sudden perception of a disproportionate height (above or below).

Fressoz correctly writes, "au sublime de la quantité, l'Anthropocène ajoute le sublime géologique des âges et des éons, duquel il tire ses effets les plus saisissants... Le discours de l'Anthropocène cultive cette esthétique de la soudaineté, de la bifurcation et de l'événement. Le sublime de l'anthropocène réside précisément dans cette rencontre extraordinaire : une durée infime, quasi-nulle au regard de l'histoire terrienne, aura suffi à provoquer une altération comparable au grand bouleversement qui nous sépare du Mésozoïque.... Les promoteurs de l'anthropocène mobilisent également le sublime de la violence, celui des tremblements de terre, des tempêtes et des ouragans. Le succès scientifique, artistique et médiatique de l'Anthropocène repose évidemment sur cette « jouissance douloureuse », sur ce « plaisir négatif » dont parlent Burke et Kant. L'Anthropocène s'appuie sur un imaginaire de l'effondrement, propre aux nations occidentales qui, depuis deux siècles, admirent leur puissance en fantasmant les ruines de leur futur".²³

The uncanny, as defined by Vidler,²⁴ falls within the domain of

23 Jean-Baptiste Fressoz, «L'Anthropocène et l'esthétique du sublime», in *Sublime, les tremblements du monde, catalogue d'exposition* (Paris: Centre Pompidou Metz, 2016), 3-4.

24 Anthony Vidler, *The Architectural Uncanny. Essays in the Modern Unholy*, (London: MIT, 1992), 21.

the sublime and coincides with a specific condition of cognitive uncertainty. If the perturbing is therefore “the discovery of the singularity through a caesura, the discovery of the extraordinary in the heart of everyday life”,²⁵ we can begin to read some of the landscapes of the Anthropocene as a sort of uninhabited house, a sort of “restless” space, as Brion would say, or a space “that is not occupied by man... a vacant space immediately filled by emptiness, a generator of anguish and vertigo, a fearsome power that takes possession of all the places from which the divine and the human are excluded”.²⁶

The inscription of the perturbing in the sublime opens the reflection towards two further declensions: the *weird* and the *erie*.

According to Fisher’s definition, the weird as a particular genre of perturbation “involves a sensation of wrongness: a weird entity or object is so strange that it makes us feel that it should not exist, or at least it should not exist here. Yet if the entity or object is here, then the categories which we have up until now used to make sense of the world cannot be valid”.²⁷

This is missing in Burtinsky’s images, at least from a first reading. Nothing we observe surprises us on the level of incorrectness: as uncomfortable as it is to admit, everything we see, beyond the formal fascination of the composition of the whole, is painfully familiar. Only the series dedicated to Dandora Landfill,²⁸ with its harrowing mixture of inorganic and organic, activates a deeper question that, far beyond a banal plan of scandalised pietism, questions us about an apparently wrong and alien form of life.

By adopting this interpretation, the sequence in question regains a sense of profound unease that recalls the image of

25 Michele Cometa and Alain Motandon, *Vedere. Lo sguardo di E. T. A. Hoffmann*, (Palermo: duepunti edizioni, 2009), 170.

26 Marcel Brion, *L’art fantastique* (Paris: Albin Michel, 1961)

27 Mark Fisher, *The Weird and the Eerie* (London: Repeater Books, 2016), 15.

28 Hackett, Kunard and Stahel, *Anthropocene*, 62.

the unconscious according to Freud cited by Fisher precisely in relation to the weird: “Now let us, by a flight of imagination, suppose that Rome is not a human habitation but a psychical entity with a similarly long and copious past - an entity, that is to say, in which nothing that has once come into existence will have passed away and all the earlier phases of development continue to exist alongside the latest one”.²⁹

The dramatic overlapping of layers where nothing can be forgotten creates a non-Euclidean, “Escherian” and perturbing space. In this reference to the non-Euclidean extraneousness, Fisher recognises the fundamental significance of Howard Philip Lovecraft’s writings and their relevance in defining the exact meaning of the weird.

“All my tales are based on the fundamental premise that common human laws and interests and emotions have no validity or significance in the vast cosmos-at-large”³⁰: the cold and inhuman cosmic intelligences that populate the stories of the writer from Providence arouse a new kind of terror linked to total indifference to the human.

If read in light of Lovecraft’s work, the title of McLuhan’s article cited above is tinged with disturbing Kafkaesque echoes: if “There are No Spectators but Only Actors” in the theatre we have set up, who does the gaze that observes really belong to? Is Burtinsky’s gaze therefore a failure of presence, a call to an empty agent who observes without looking like a Lovecraftian deity, indifferent and totally foreign to the human?

Including in looking at Anthropocene images the idea that our ability to give a name (or many names) and to explain processes is totally meaningless compared to the actual scope of a geo-

29 Sigmund Freud, *Das Unbehagen in der Kultur* (Wien: Internationaler, Psychoanalytischer Verlag, 1930) translation by James Strachley, *Civilization and its Discontents* (New York: W. W. Norton & Company, 1962), 17.

30 Lovecraft mail to the publisher of the magazine *Weird Tales*, 1927. cit. in Fisher, *The Weird And The Eerie*, 16.

logical time is certainly an important step. This does not mean that the consequences of our actions are negligible or ethically acceptable, but that, if we look at them from a weird perspective, we begin to intuit the relative and disturbing nonsense of trying to explain them (not to mention the illusion of being able to govern them). Accepting this vision serves to defuse the risk that “l’Anthropocène, comme tout autre sublime, est sujet à la loi des rendements décroissants: une fois que l’audience est préparée et conditionnée, son effet s’émousse. En ce sens, désigner une œuvre d’art comme « art de l’Anthropocène » serait absolument fatale à son efficacité esthétique”.³¹

If “the weird is constituted by a presence”, the eerie on the contrary “is constituted by a failure of absence or a failure of presence. The sensation of the eerie occurs either when there is something present where there should be nothing, or there is nothing present when there should be something”.³² Indeed, “behind all of the manifestations of the eerie, the central enigma at its core is the problem of agency. In the case of failure of absence, the question concerns the existence of agency as such. Is there a deliberative agent here at all? Are we being watched by an entity that has not yet revealed itself? In the case of failure of presence, the question concerns the particular nature of the agent at work”.³³ It is a fact that human agency is a fundamental requirement of the whole Anthropocene question, even if dependent on the names we try to give to the same phenomenon (since “Nommer n’est pas dire le vrai, mais conférer à ce qui est nommé le pouvoir de nous faire sentir et penser sur le mode qu’appelle le nom”³⁴). Agency apparently moves from human to capital, for example, human agency always remains behind the scenes. Perhaps we should begin to consider the hypothesis

31 Fressoz, Jean-Baptiste, *L’Anthropocène et l’esthétique du sublime*, 8.

32 Fisher, *The Weird And The Eerie*, 61-63.

33 *ibid.*

34 Isabelle Stengers, *Au temps des catastrophes, Résister à la barbarie qui vient* (Paris: Editions La Découverte, 2009), 49.

that the agency of the show we are witnessing through Burtynsky's images is not exclusively human.

It is Haraway's contribution about the narratives of Chtulucene that completes the categories necessary to conclude our reflections. If accepting the apocalyptic afflatus has unveiled the structure of the Anthropocene imaginary, Haraway suggests (going back to the French etymology of the term *trouble*³⁵) we cloud it again, mixing it with multispecies narratives. The entry into the story (of man on man) of an otherness that comes from the chthonian dimensions of nature conveys an interesting dimension of weirdness and eeriness to the current visualisation of the Anthropocene.

The chthonian reference, the co-implication of the animal kingdom in a "tentacular" form of thinking, which for Haraway has a totemic representation both in the *Pimosa cthulhu* spider and in the terracotta effigy of Potnia Theron, the Lady of the Animals, allows us to include in our narration the "geostories" where "all the former props and passive agents have become active without, therefore, being part of a giant plot written by some overseeing entity".³⁶

In order to escape a cycle of self-fulfilling prophecies, the production of a future that is represented according to intrinsically anthropocentric narratives must open up to a dimension of perturbation and include hypotheses about agency independent from the human.

35 Donna Haraway, *Staying with the Trouble. Making Kin in the Chtulucene* (London: Duke University Press, 2016), XX.

36 Bruno Latour, "The Puzzling Face of a Secular Gaia." Gifford Lectures, Lecture 3. Quotation from lecture manuscript (Edinburgh: University of Edinburgh, 2013), cit. in Haraway, *Staying with the Trouble*, 81.

Findings

“Quelles histoires faut-il écrire pour apprendre à vivre l’Anthropocène ?”³⁷

With great wisdom, Bonneuil and Fressoz pose the fundamental question by shifting the focus from the unrealistic questions on how to defuse or reverse the transformations produced by the human race to learning new models of life adapted to the new context. A design linked to storytelling is certainly a more suitable context to incorporate the categories of eerie and weird necessary to “understand the uncanny that has pervaded our time”³⁸ and face the “intrusion of Gaïa”,³⁹ an intrusive agency that forcibly broadens the field of our narrative. On the other hand, a downward leap in scale capable of bringing the scope of confrontation back to the *bio* before the *geo* could incorporate new, more effective and productive views of the Anthropocene.

This does not mean that the work of Burtynsky, Baichwal and De Pencier is not a fundamental visual contribution in the reflection on the Anthropocene. However, it is appropriate, in order not to waste the most important and fatal discussion of our times, to interpret these images not only for what they represent, but also in light of the reflection that their realisation triggers.

37 Bonneuil and Fressoz, *L'Événement Anthropocène*, 358.

38 Didino, *Essere senza casa*, 19.

39 Stengers, *Au temps des catastrophes*, 47.

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ECO-POLITICAL
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De-Sterilizing Design: Towards Non-Anthropocentric Strategies Beyond the Inert

**Sterilisation; Symbiosis; Domestic Design; Post-anthropocentric;
Co-existence.**

Gabriel Alonso

Institute for Postnatural Studies, Madrid, Spain
info.gabrielalonso@gmail.com

Elena Brea

Institute for Postnatural Studies, Madrid, Spain
elenabrea@hotmail.com

María Buey González

Institute for Postnatural Studies, Madrid, Spain
m.bueygonzalez@gmail.com

Pablo Ferreira Navone

Institute for Postnatural Studies, Madrid, Spain
navonegaslini@gmail.com

In the 19th century, Louis Pasteur and Robert Koch made microbes visible to the human eye for the first time. As pathogens were found to be the direct cause of certain diseases, design gained a new relevance as a form of preventive medicine. Sterilisation, both as a set of laboratory practices and a collective imaginary, became a model for the design of spaces for the colonial enterprise and, in hand with the Hygienist movement, for the European metropolis. Domestic spaces in particular became the battlefield where the war against microbes was waged, as shown in the 1884 London Health Exhibition.

This paper traces the relations between hygiene, microbes and domestic design through the concept of sterilisation, shifting from a one-sided concern with human health to a postnatural perspective in which relationships between species come to the fore. To achieve a post-anthropocentric approach towards contemporary design, we propose looking at contemporary philosophers and scientists such as Donna Haraway, Anna Tsing and Lynn Margulis to stop perceiving microorganisms as a threat in design, and instead see them as our allies for interdisciplinary practices of co-designing.

Introduction

Ever since the discovery of our bacterial companions in the mid-nineteenth century by Louis Pasteur and Robert Koch, their presence has always been associated with hazardous effects to the detriment of human health. The first and only means of battling against pathogens relied on the elimination of all microscopic life. An implementation of highly processed, synthetic materials as well as the narratives and aesthetics which shaped and transformed the collective imaginary, reinforced the idea of separation from the world of the organic as the locus of undesirable organisms. Domestic space became the battlefield where the war against microbes was waged, making it a turning point in the history of design as it constitutes a definitive juncture in the negation of multispecies coexistence.

“Human nature is an interspecies relationship,”¹ Anna Tsing puts forward in her own assimilation of Haraway’s idea of companion species. According to Tsing, we only analyse different species in terms of co-existence and co-dependency when they inhabit the interior of the human body, in medical and ecological literature concerning illnesses and parasites. When other organisms are located outside the body, the analysis immediately turns to a discourse of control or impact. This discourse that Tsing refers to has its starting point in the mid-nineteenth century, following developments in medicine and technology that allowed for the visualisation of microorganisms. Processes of staining and culturing specimens and the modern light microscope rendered both pathogens and friendly microbes visible to the human eye. Visualising these other species, far from bringing a reassessment of our anthropocentric perception of reality, only served to reaffirm the illusion that the human body could be isolated from other species through pervasive sterilisation. Instead, the discourse inherited from scientific and medical

1 Anna Tsing, “Unruly Edges: Mushrooms as Companion Species,” *Environmental Humanities* 1, (2012): 141.

practice was quickly taken up and significantly promoted by the field of design, and more in particular, domestic design. The home became a privileged space for the promotion of new conceptions around health, disease and our relationship with other earthly inhabitants.

Analysing the connection between the hygiene movement of the nineteenth century and domestic design through the lens of sterilisation implies a shift from a one-sided concern with human health to a postnatural perspective in which relationships between species come to the fore. To achieve a post-anthropocentric approach towards contemporary design, we propose looking at Lynn Margulis and her work on symbiotic microbial living that incorporates microorganisms as allies in interdisciplinary practices of co-designing.

From Pasteur's laboratory to the Victorian home

Between 1860 and 1864, Louis Pasteur developed his germ theory, refuting the widely believed idea that living organisms were spontaneously generated from non-living matter and that diseases such as cholera were caused by miasma or “bad air”. By observing the fermentation process in certain foods and infections in silkworms he was able to demonstrate the causal relation between germs and disease. To do this, Pasteur relied on culturing techniques (growing bacteria populations in a laboratory under controlled parameters) which required a sterilised environment to avoid unwanted bacterial or fungal contamination. Robert Koch then perfected Pasteur's techniques, allowing him to demonstrate the complete life cycle of anthrax, establishing a direct relation between a specific disease and its microorganism. These contributions were fundamental to demonstrate that we could influence our health by acting upon our environment, which had far-ranging implications in the economies of European colonial powers. Controlling diseases in the colonies made the imperial enterprise significantly more profitable, which



in turn fed back into European economies. Sanitary devices became a new market for the middle-classes concerned about the hygienic conditions of their homes [Fig. 1].

The colonies. A design laboratory of sterilisation

For his investigations, Pasteur depended on the laboratory which extended beyond its spatial dimension into a set of practices deployed throughout the French colonies.² Colonial spaces

Fig. 1

Pasteur's experiments demonstrated that spatial design had a major role in the control of microorganisms. Louis Pasteur performing an experiment. Credits: Wikipedia Commons.

² Bruno Latour, *The Pasteurization of France*, (London: Harvard University Press, 1998), 140-145.



Fig. 2

The sterilised aesthetics of laboratories and infirmaries influenced the design of domestic interiors in Victorian homes. Wellcome Historical Medical Museum, Wigmore Street, London: reconstruction of the Lister ward in the Royal Infirmary, Glasgow. Credits: Attribution 4.0 International (CC BY 4.0)

were constructed following the characteristics present in the laboratory, “a space of somatic control and closure organised around the avoidance of contamination”. In this way, “the laboratory became the exemplary locus of colonial modernity”.³

Strictly medical criteria which Pasteur had developed would be taken up in the colonies to design domestic spaces.

As Latour states, “in the colonies they [the Pasteurians] could construct public health from scratch. This is not a metaphor. They often preceded the towns, which they could therefore build according to the strictest recommendations of hygiene. [...] If all the houses had to be rebuilt, then they could.”⁴ Furthermore, the parasites in the tropics could not be dealt with at the laboratory stage as Pasteurians did on the continent. Instead, they had to be eradicated by interrupting their life cycles through life-sized

3 Anderson, “Excremental Colonialism: Public Health and the Poetics of Pollution”, 652.

4 Latour, *The Pasteurization of France*, 143.

interventions. “Malaria or yellow fever were to be destroyed not with vaccines but by ordering the colonists and natives to build their houses differently, to dry up stagnant ponds, to build walls of different materials, or to alter their daily habits.”⁵

The houses of white colonisers in the tropics became spaces that functioned as laboratories, where white women were in charge of preserving hygienic conditions, isolated from contact with exterior pathogens.⁶ Sterilisation became in this way a biopolitical project inextricably linked to the economic and political interests of colonial powers and to the design of their spatial and social control systems, also at the domestic scale [Fig. 2].

The London Health Exhibition. Consuming sterilisation for the home

Simultaneously, the spatial configuration of sterilisation started to take hold in Europe as the Hygienist movement gained strength. In 1884 the London Health Exhibition, with Pasteur among the attendees, gathered in one place the multiplicity of devices and practices that were emerging around the idea of sterilisation. From pasteurised milk to ventilation and drainage systems, from spotless white furniture to models of hygienic living rooms and even the first Chinese menu, were all introduced to London society. Designs for the home had a prevalent place in the exhibition, as the main attraction was a life-size reconstruction of the medieval old London street brought into contrast with Victorian buildings furnished with modern drainpipes and ventilators.⁷ The exhibition was in a way a kind of hygienist IKEA of the 19th century where middle class families walked around the isles looking for gadgets to ensure the cleanliness

5 Latour, *The Pasteurization of France*, 144.

6 Warwick Anderson, “Excremental Colonialism: Public Health and the Poetics of Pollution”, *Critical Inquiry* 21, no. 3 (1995)

7 Annmarie Adams, *Architecture in the Family Way: Doctors, Houses, and Women 1870-1900* (Montreal: McGill-Queen's University Press, 1996), 204-205.

of their homes, not only out of concern for their health but also “as a talisman against downward social class mobility”.⁸ A visit to the London Health Exhibition would show how the sanitation movement turned domestic design into a form of preventive medicine.⁹ Furniture was lifted from the ground, ornaments faded and furry mats turned into sleek and smooth surfaces illusioning our homes as domestic laboratories.

Sealing the interstices. How sterilisation has influenced design to our days

Developments in science, architecture and design over the last hundred years have seen the biopolitical project of sterilisation become so widespread and refined that we have become unaware not only of the presence of microbes but also of the strategies that have allowed their invisibilisation. We have entered what Sennett calls the “politics of indifference”¹⁰, in which microbes remain outside our daily concerns and consequently of the interests of design.

An example of the insidiousness of the borders and protections that we have built around us is the use of rubber in pipe seals and window joints. Natural rubber, which was imported from the colonial campaign, started being used in 1894 for the design of surgical gloves in England following the bacteriological research of Pasteur, Koch and Lister.¹¹ Through later treatments of the material, natural rubber —originally obtained from rubber tree (*Hevea brasiliensis*) — became increasingly synthetic, lowering costs and expanding its production capacities which prompted its use for many functional elements of everyday design. The same rubber that was used for surgical gloves has facilitated the

8 Hayes, “The Aesthetic Interior as Incubator of Health and Well-Being”, *Architectural History* 60, (2017): 287.

9 Adams, *Architecture in the Family Way*, 37-39.

10 Richard Sennett, *Flesh and Stone: The Body and the City in Western Civilization*, (New York: W. W. Norton & Company, 1994), 350-370.

11 Ira M. Rutkow, “The Surgeon’s Glove”, *Arch Surg* 134, no. 2 (1999): 223.

perfecting of the Victorian obsession with hermetic homes by sealing the building's "skin". Responding to the omnipresent, invisible threat of undesirable microorganisms, rubber seals also become invisible and omnipresent in the design of our houses. Rubber infiltrates itself in the in-between spaces of buildings, filling any possible spaces of interaction with its barren materiality. The current interior aesthetic of white finishes and polished surfaces is sustained by the perfectly-designed pieces of rubber behind it. Beyond their unquestionable functionality, these contribute to our feeling of confidence and comfort which we get from the idea that our spaces are protected and conveniently isolated from any penetration from the outside. This feeling comes to be taken "as a guarantee of individual freedom and action,"¹² as if we could live and act separately from other organisms. In this way, rubber becomes a facilitator of the biopolitical project of sterilisation, along with its practices and imaginaries.

Since the times of Pasteur, microorganisms have been recognised within architecture and design only as pathogens. The forms, materials and technologies of design have been selected and developed to eliminate anything microbial through methods that are non-selective; they not only kill pathogens, but also all other microbes which are beneficial to human health and to whole ecosystems. The sterilisation of the built environment has brought it out of balance and disabled its capacity to self-regulate. Beyond its material consequences, the narrative of sterilisation has resulted in the creation of a series of dichotomies for the classification of bodies and spaces: inside/outside, pure/contaminated, wild/domesticated. Such dichotomies become both ontological and physical borders leaving companion species inside and those deemed uncontrollable and undesirable outside. According to Tsing, "with the fetishisation of the home as a space of purity and interdependence, extra-domestic inti-

12 Sennett, *Flesh and Stone: The Body and the City in Western Civilization*, 310.

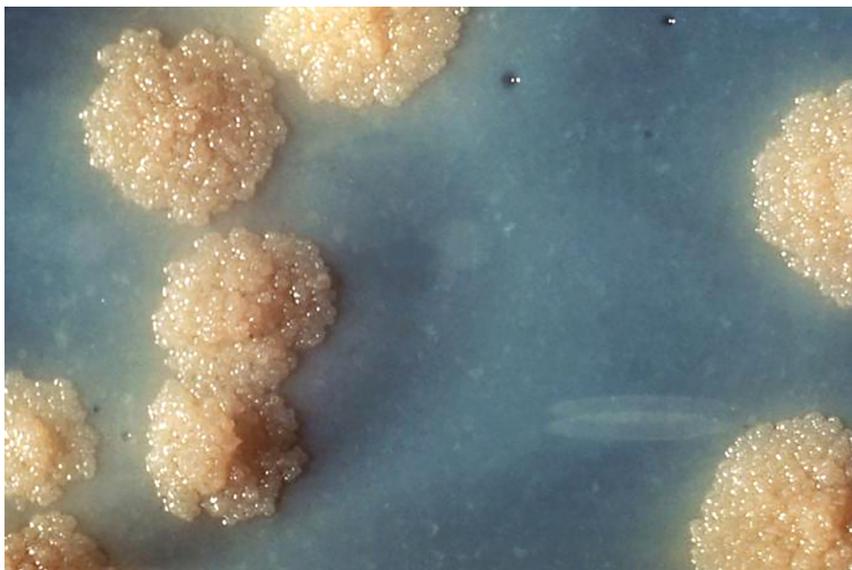
macies, whether within or between species, seemed archaic fantasies.”¹³ In this way, architectural spaces and in particular “the home cordon off inter- and intra-species love,”¹⁴ preventing our appreciation of the complex relationships that we as human beings establish with other non-human agents constituting our bodies and our environments. We argue that to overcome this binary heritage of design and to understand how relations between organisms may allow spaces to self-regulate, we have to look at the behaviour of the microbial cosmos through a different microscope.

Lynn Margulis. A different look into the microcosmos

If Pasteur and Koch gazed through the primitive lenses of their primitive microscopes at invisible “enemies”, Lynn Margulis saw a very different picture when staring through the improved electron microscope. Looking closely at the eukaryotic cells which make up animal and plant biology, she hypothesised that their small organelles came from long-term relationships of coexistence. Margulis’ theory of the origin of eukaryotes led to a new hypothesis for evolution which she called symbiogenesis, claiming that the origin of new forms of life was primarily the result of symbiosis. Bacteria, our fundamental symbionts, infiltrate all our ecosystems, including our own bodies. Healthy underarms, clean mouths and functional guts all enjoy unconscious symbiotic relations with all sorts of bacteria. Rather than self-contained individuals, we are “walking assemblages” of different kinds of organisms. This turns on its feet the simplified and biased perception of microbes as enemies we inherited from the 19th century. Margulis’ findings pose a challenge to the notion of the individual and the human species and therefore to all the disciplines founded on anthropocentric principles. What are the consequences for domestic design when its unit of meas-

13 Tsing, *Unruly Edges: Mushrooms as Companion Species*, 150.

14 *Ibid.*, 141.



urement is no longer only the human figure but its tentacular, sticky and flamboyant associations with microbes? [Fig. 3]

Looking at microbes. Allies for co-designing spaces

Microbes are neither inside nor outside but rather function as a continuum between organisms and the environment. Through their metabolic flexibility, they colonise our bodies and our homes establishing relationships of symbiotic exchange and co-dependency. Microbes thrive and proliferate precisely within the limits that had previously enabled the separation of such imaginaries, blurring the smooth, shiny black lines that represented the perimeter of domestic spaces. Following these microbial logics, design is today facing the challenge of creating new openings. Donna Haraway describes how it is in “the tunnels, caves, remnants, edges, and crevices of damaged waters, airs, and lands” where “the symbiogenetic and sympoietic

Fig. 3

The discovery and visualisation of tuberculosis by Robert Koch in the 19th century was one of the events that contributed to the biased perception that all microbes are enemies to human health. Image of a culture plate of *Mycobacterium tuberculosis*. Credit: Dr George Kubica.

earthly ones” make their living.¹⁵ Interstices which were previously filled with rubber become cavities where microscopic life can grow. The ubiquitousness and insidiousness of the sterilising strategies is substituted by invisible companions which work to promote our mutual health and regulate the environment. They infiltrate the in-between spaces of our homes, destabilising the general aesthetic of purity and cleanliness in favour of more three-dimensional, complex and colourful patterning. Microbes, rather than something to eliminate or a passive element, become our allies for thinking through the dichotomies that have shaped the materials, aesthetics and imaginaries of design.

Taking Margulis’ ideas of symbiogenesis means opening up design to the possibilities of the unpredictable. Different materialities and agents generate new forms when they respond to one another’s presence over time. Design has a lot to gain from the generative and creative potential of the relationships between different kinds of organisms present in built environments. The domestic interiors of the nineteenth century and the strategies developed in the colonies show how architecture and design have always dealt with living microorganisms. What has changed is what we now know about them. Just as Margaret McFall-Ngai says that “human bodies can no longer be seen as fortresses to defend against microbial onslaught but must be reenvisioned as nested ecosystems,”¹⁶ so neither can buildings continue to be constructed as impenetrable strongholds. Future forms and materials will not result from the designs imposed by humans but rather from unexpected collaborations between forms of life. Designing in symbiotic times also means looking at mycelium growing over strips of wood or algae proliferating overnight inside foam structures. The flexible, the unpredictable,

15 Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, (London: Duke University Press, 2016), 71.

16 Margaret McFall-Ngai, “Noticing Microbial Worlds: the Postmodern Synthesis in Biology”, in *Arts of Living on a Damaged Planet. Ghosts and Monsters of the Anthropocene*, ed. Anna Tsing et al. (Minneapolis: University of Minnesota Press, 2017), 65.

the unstable and the permeable which characterise symbiotic forms of microbial living should stop being suppressed in design to become opportunities for moving beyond anthropocentric conceptions of inert spaces.

The bioreceptive turn. The challenge for interdisciplinary symbiosis

Today, investigations carried out inside scientific laboratories continuously inform design strategies. Cutting-edge research teams in architecture and design schools around the world become increasingly interdisciplinary, including biotechnologists, synthetic biologists, ecologists, biochemical engineers, etc. Some examples moving away from sterilisation include probiotic design such as wall tiles or even infant toys, bioreceptive architecture and materials, research into the use of biomaterials including mycelium, bioluminescent bacteria or photosynthetic garments, or the profiling of the home microbiome. New bioreceptive structures and materials become ecosystems whose parts work together to self-regulate and find their own balance.

While teams working on these projects are interdisciplinary, a contribution from a socio-behavioural and philosophical point of view is missing. Biotechnological advances in design have to be developed hand in hand with critical and speculative thinking, addressing not only the transformation of materials but also of the collective imaginary. Each field of knowledge explores its relationship to nature (and its microbes) from a different point of view, which is why interdisciplinary forms of creation are an imperative today. We see these methodologies becoming symbiotic processes of working in the in-betweens.

Conclusion

As Donna Haraway says, “Truly nothing is sterile. And that reality is a terrific danger, basic fact of life, and critter-making

opportunity.”¹⁷ The reality of this danger has become patently clear today, as we are forced to stop and notice those other forms of life which make their living alongside us. In the encounter with other organisms, “resistance is a fundamental and necessary experience for the human body”,¹⁸ which compels us to reassess our position in the world. The challenge that humans are facing today is not altogether that different from the one experienced at the time of Pasteur and there is a risk that design will respond with the same solutions. An alternative landscape of initiatives is growing which seems to have realised that contemporary spaces have to become ecosystems that host life, rather than build borders. These new strategies also have to contribute to the redefinition of domestic spaces which have recently gained a new relevance. What we have learned from Margulis is that houses with a complex and diverse microbiome are healthier ones. We have the opportunity of using design to bring a different awareness about the ways in which we live entangled with one another. We believe that at this critical time, design must move away from fantasies of polished white bunkers and impermeable concrete walls to messy, kaleidoscopic, hybridised homes where different but connected forms of life can co-exist.

17 Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, 64.

18 Sennett, *Flesh and Stone: The Body and the City in Western Civilization*, 324.

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Mapping, Sensing and Hacking Rethinking Architecture in the Era of the Anthropocene

Anthropocene; Mapping; Sensing; Hacking; Artificial Ecology.

Yael Eylat Van Essen

HIT - Holon Institute of Technology, Holon, Israel
yaeylelat@gmail.com

In his book *Ontopolitics in the Anthropocene: An Introduction to Mapping, Sensing and Hacking*, David Chandler (2018) suggests referring to the Anthropocene debate as a reflection of a shift from modernist assumptions of 'command and control' and from the top-down, towards discursive framings of contingency, complexity, non-linearity and entanglement. He claims that, with this affirmative shift, the realisation that the Anthropocene cannot be secured, governed or engaged within traditional ways, should emerge. This paper suggests rethinking the role of architecture in the Anthropocene era with the challenges that it poses, through the new set of ontopolitical assumptions which inform contemporary social and political thought. It will explore how the three principles of mapping, sensing and hacking, discussed by Chandler in the context of governance, can be applied to the architectural domain and stimulate novel processes for architectural interventions. In order to show how architecture can activate a new relationship between human beings and their environment, based on these three typologies, the following paper will explore the relationship between ecological thinking and architecture in the Israeli context, in light of the unique history of the land which, since the establishment of the state in 1948, has been going through a comprehensive process of "re-design".

In the introduction to her book *Architecture in the Anthropocene* (2013), Etienne Turpin refers to architecture as a practice that takes place in the organisation of spatial adjacencies. Based on evolving traditions, architecture designs organisational patterns that can leverage or diminish distinctions between categories, such as inside and outside, nature and culture, sacred and profane, sick and healthy, and define the relationships between them. As these categories are used to manage what she considers “the assemblages of habit and settlement that we call societies,”¹ architecture challenges their basic premises by generating historical, geographical and speculative strategies. In this respect the Anthropocene, with the urgencies that it generates, confronts architects, theorists and historians with the need to reconsider the priorities given in the organisation of space, while granting the required attention to achieve greater social and environmental justice. She refers to architecture not as buildings but as “an active connection, a practice which activates a relation between material spaces and their inhabitation”² - as such, it configures not only the relations between space and polity, but also polity itself.

Following these acknowledgements, this text refers to David Chandler’s analysis of the concept of the Anthropocene from the perspective of political thought. In his book *Ontopolitics in the Anthropocene: An Introduction to Mapping, Sensing and Hacking* (2018), Chandler suggests referring to the Anthropocene debate not only by addressing the problems of climate change and the disruption in the ecological balance, but rather as an opportunity to signify the end of the modern condition and to open up a new era of political possibilities. Following Latour he suggests referring to the Anthropocene not as a geological period but rather as “a philosophical, religious, anthropological and ... political concept yet produced as an alternative to the very

1 Turpin, “Introduction”, 4.

2 Ibid, 16

notion of ‘modern’ and ‘modernity’.”³ The affirmation of the Anthropocene reflects a shift from liberal or modernist understandings, based on assumptions of ‘command and control’ from the top-down, towards discursive framings of contingency, unpredictability, complexity, non-linearity and entanglement. He claims that with this affirmative shift, the realisation that the Anthropocene cannot be secured, governed or engaged in traditional ways should emerge. He analyses the ontopolitical assumptions of the Anthropocene through three distinct modes of governance: mapping, sensing and hacking, replacing the rationality based on a linear approach and the culture/nature divide of modernity with alternative principles.

This paper will show how these different modes of governance can be applied to the architectural domain and outline ways of operating in the world with regard to the condition of the Anthropocene and its political and social consequences. It will explore how these three concepts can stimulate both critical and practice approaches for architectural interventions in existing ecological systems and urban environments. It will address projects planned for the Israeli reality, which is an interesting test case in this context considering the massive intervention in the natural fabric of the country, given that since the establishment of the state in 1948 a comprehensive process of “re-designing” the land has been taking place.⁴ This process, reflecting modernist conceptions of progress and control over nature, which was also strongly politically motivated,⁵ was then considered a manifestation of the state’s innovative capabilities.

3 Latour, 2013, 77. In his book *We Have Never Been Modern*, Latour refers to modernity as being constituted by two contradicting concepts: purification and hybridity. He claims that the separation between these concepts does not actually exist and never has, and therefore he asserts that moderns and, indeed, modernity itself, have never existed.

4 Eylat Van-Essen, “LifeObject,” 15-16.

5 The forestation of the land was intended, *inter alia*, to buy a hold on the land in the face of ownership claims from the Arab population. (Biger & Lifshitz, 102) and for concealing the traces of the Palestinian villages which were deserted during the war and subsequently demolished. (Braverman, 351).

Through national planning projects the geographical surface of the country was changed from the north of the country to its south: An intensive forestation project by the Jewish National Fund transformed the barren landscape in many areas of the country to expanses of green, as an expression of the Westernisation of the country, which had succeeded in distinguishing itself from the “cultures of the Arab Palestinian landscape”.⁶ In the southern part of the country, agricultural settlements were established in desert areas and transformed the naked land of the Negev Desert into oases, in an unprecedented manner. In addition, many cities were rapidly inhabited with the large waves of immigrants coming to Israel in the early 1950s. Some of the interventions in the land’s natural fabric as well as the enhanced urban development have proved through the years to have had devastating ecological effects.⁷

In referring to the Israeli space, this paper will address architectural speculative projects that were shown at the Israeli Pavilion in the Venice Biennale for Architecture in 2016. These projects exemplify different strategies implied by architects to challenge the local conditions in the era of the Anthropocene. Based on collaborations between architects and scientists, mainly from the life sciences, the different projects spanned from environmental and urban projects to nano-scale material manipulation.

Mapping

Chandler refers to mapping as a possible form of governance based on the non-modern assumptions of the Anthropocene. As such, it is characterised as autopoietic, based on causality, non-linearity and immanence - giving priority to adaptation as the preferred strategy for facing risks and threats posed by the Anthropocene condition. Although mapping has also been a

6 Tamir, *Agro-Art*, 136.

7 See: Rothschild, From “*Improving Landscape*”, 2019.

mode of governance in modernity,⁸ the concept of mapping in the Anthropocene era is fundamentally different. While modernist mapping was based on a flat two-dimensional universal space, mapping in the framework of the Anthropocene is perceived as a product of inter-rationality based on the recognition that full understanding of the world, comprehended as a complex and multidimensional heterogeneous system, is not possible.⁹ Mapping presents new forms of causality, reflecting emergence processes which are a product of complex and non-linear interactions. Based on these assumptions, mapping can be perceived as a form of governance that relies on the premises of the Anthropocene condition, characterised by contingency and unpredictability. As such, mapping omits the nature-culture divide, taking into account different dimensions of the complex reality of the interactions. In this way it can provide an answer to why some societies can better deal with conflicts, disasters and social and environmental changes in relation to others¹⁰ and generate more complete and qualitative life forms on daily conditions. Therefore, relationships that were previously considered “natural” and therefore excluded from the analysis of political and societal networks, are now seen as part of a more complex system that connects factors that were previously unrelated to non-linear path dependencies or assemblages of more-than-human interactions.¹¹ Thus, the ability to include both human and environmental factors within the mapping process has the potential to contribute to the creation of a just, equitable and sustainable world.¹²

Mapping played a role as a generative practice in twentieth century architecture, providing a quantitative and analytical survey

8 Bratton, *The Stack: On Software and Sovereignty*, 24.

9 Chandler, *Ontopolitics*, 34

10 Ibid, 44.

11 Bratton, *The Stack*, 11.

12 Bryant, *Onto-Cartography*, 257.

of existing conditions.¹³ Digital technologies, especially with the extensive use of computer simulations, parametric tools, big data and sensing technologies has, in the last decades, added new possibilities for architectural design.¹⁴ *The Urban Crystals project*¹⁵ (Kalish Rotem and Shechtman) was a research study that took three low income neighbourhoods in the city of Haifa, characterised by their heterogeneous urban layout and their population diversity, as test cases. The project harnessed Shechtman's Nobel Prize winning research in crystallography towards the field of urban planning, in order to create new tools based on the ability to recognise and analyse spatial behaviour patterns through the synthesis of big data. The research was based on the Fourier transform (diffraction pattern) tool, used by Shechtman in his research, to enable scientific analysis of urban crystals (fabrics) in the process of urban planning. This planning methodology relied on the potential of integrating any kind of mapped data: from the physical typography of the area, to building properties, behavioural patterns retrieved through big data analysis and environmental parameters. Using the metaphor of the kaleidoscope that shows different realities in various situations, the project strived to identify and reveal concealed performative patterns within the urban fabrics and discover in what ways these patterns relate or should relate to the physical world that accommodates them.

This project makes a noticeable contribution to the “scientification” of urban planning and in providing the possibility to integrate multi-layered parameters of urban tissues with behavioural patterns of any kind. It maps the different correlations between them in order to enable adaptive mechanisms for urban development and takes advantage of the complexity and distributed agency unfolded by this process. Yet, as a planning

13 Corner, “The Agency of Mapping”, 90.

14 Schumacher (ed.), *Parametricism 2.0*.

15 Kalish Rotem and Shechtman, “Diffraction of Urban Crystals”, 55-61.

strategy, despite its ability to comprehend the complex interplay between the urban layers, it still maintains the immanent interplay between equilibrium and emergence that conserves existing societal and political models.

Sensing

Unlike mapping, which addresses in depth phenomena based on internal relationships within a system, sensing deals with phenomena that on the surface can relate to Manuel DeLanda's concept of 'flat ontology'¹⁶ and to Bruno Latour's Actor-Network-Theory (ANT).¹⁷ Sensing is based on the recognition that in the age of the Anthropocene where uncertainty is an integral part of being, not much can be done to prevent situations of risk and danger except for trying to minimise their potential consequences. Thus, the practice of sensing and the response that follows it, focuses on the actual: on the ways in which relational understanding can be effective in the present through an appropriate response to processes of emergence within a homeostatic system. Therefore, it does not aspire to understand the factors that cause the phenomena to happen in the way they occur, or prevent their occurrences in the future, but rather focuses on treating their outcomes. Sensing, in this context, embodies what Giorgio Agamben refers to as the transition from a concern with causation to that of effects,¹⁸ which means shifting the focus from the political and legal spheres to the ability of systems or societies to respond to changes and to their consequences in given contexts.¹⁹ In this way, processes are not based on political decision-making, but rather link social processes with various parameters that operate within the system. Agamben refers to the potential consequences of such transformation stating that

16 DeLanda, *Intensive Science and Virtual Philosophy*, 46-47.

17 Latour, *Reassembling the Social*.

18 Agamben, "For a Theory of Destituent Power".

19 Chandler, *Ontopolitics*, 87-88.

“if government aims to the effects and not to the causes, it will be obliged to extend and multiply controls.”²⁰ Thus, as causes are not being traced anymore, monitoring, checking and controlling evolve to become the dominant modes of operation. Yet, although sensing systems lose touch with the political, they rely more and more on the politics and ethics ‘embedded’ within the systems’ algorithms.

Sensing is a major practice in current architecture and urban planning using “smart” platforms. One of the major uses of sensing in this context is related to the phenomenon of overcrowding in cities which presents a big challenge for urban planners: this global problem has a major impact on ecological space and quality of life in the city and poses the great threat of an emergent state of insufficiency of the urban infrastructures. *The Urban Angiogenesis - BIO Smart City 3.0* project (Klimor, Satchi-Feinaro)²¹ is a conceptual proposal addressing this challenge. It refers to cities as ‘ecosystems’, environments marked by a fragile balance between ‘biotic’ living organisms and the non-living ‘abiotic’ factors of their environment. The project does not trace the reasons for the emergence of overcrowding but actively reacts to prevent the potential collapse of the urban system. It is based on a study conducted by cancer researcher Satchi-Feinaro on angiogenesis, a physiological process used for healing and reproduction, which refers to the growth of new blood vessels from pre-existing ones. With the analogy to treatment of abnormal angiogenesis, in the case of cancer, which is based on the use of nanometer-sized smart carriers operating selectively on target tumours, Smart City 3.0 aims at using the evolving and accumulated data and information to provide targeted solutions for local situations of urban overcrowding in order to prevent the collapse of the city’s infrastructures [Fig. 1].

20 Agamben, “For a Theory of Destituent Power”.

21 Klimor and Saatchi Feinaro, “The Urban Angiogenesis Project”, 137-142.



In contrast to mapping which relates to space, sensing is eventually temporal as it touches on the responsive competencies of a system through interactivity and fluidity. Big data technologies connected to smart infrastructures in the city enable real-time responses to changing situations that allow existing balances to be maintained. In the context of sensing, conflicts or problems can undergo normalisation. As a form of governance it has much in common with how Deleuze defines the “society of control” as based on a perception of a constant temporality in which problems are postponed through continual modulation of responsiveness.²² Indeed, this project does not offer a solution to the problem of urban overcrowding but rather presents a response mechanism for the onset of its symptoms.

Fig. 1

Urban Angiogenesis,
Knafo Klimor
Architects

The project is referred to the city of Tel Aviv, whose master plan

22 Deleuze, “Postscript on Societies of Control”, 4

from 1929 designed it as a garden city, but which grew to be the main metropolitan area in Israel. As a result, the local housing market has not been able to keep up with the increasing growth of population. The platform suggested by this project makes it possible to facilitate its responsiveness towards the city's further development.

Hacking

Hacking is conceived as an experimental mode of action that can provide a framework for open and future-oriented interventions that overcome the limitations of mapping and sensing. Instead of trying to preserve current ways of being, hacking encourages a rethinking of what it means to live in the Anthropocene by unfolding the new potentialities for “a relational and interactive process which constitutes subjects and objects in ever changing ways”.²³ Unlike the “goal-directed subject of modern forms of governance”,²⁴ the subject in hacking mode is experimental, aware of his/her limitations in understanding the causality of the world functioning in states of uncertainty and contingency. Hacking in the context of the Anthropocene rejects the attempt to “fight” against threatening consequences deriving from the Anthropocene condition, in place of finding creative solutions to the existing situation. Thus, it has the potential to empower the subject and the communities in which it takes part, as well as turning crisis situations into opportunities.²⁵ This approach towards hacking echoes Donna Haraway's prioritisation of the concept of sympoiesis²⁶ as a creative form of engaging with the present, over responsiveness that reacts to the situation in a way that can lead to stagnation.²⁷ [Fig. 2]

23 Chandler, *Optopolitics*, 141.

24 Ibid, 142.

25 Ibid, 142.

26 Donna Haraway's replacement term for Maturana and Varela's concept of autopoiesis, which she objects to on the grounds that no 'thing' makes itself.

27 Haraway, *Staying with the Trouble*, 1.



In the architectural context, the strategy of hacking finds different creative trajectories grounded on the premise that new forms of inter-relations with nature should be considered. The approach that we should let nature “take the lead” is the motto of the *Live-It* project (“Commons”, Shavit, Katz)²⁸, which suggests to redefine a new balance between the natural and the artificial in the never-ending conflict between natural processes and urban life. This project referred to the degradation of the sandstone cliffs along the Mediterranean seashore in the city of Netanya which has placed coastal infrastructure, buildings and human lives at risk. As the prevailing consensus is that protecting the cliff dictates overriding its natural processes through the artificial interventions which have taken place through the years, sometimes with unpredictable results, this project uses new technologies in order to take a controlled step back.

A different attitude can be found in *The Dead Sea Resurrection Project* (ELR/ARC, Tadmor)²⁹ which takes proactive approach in coping with the consequences of human exploitation of local resources. This projects refers to the ecological crisis in the Dead

Fig. 2

The Carmel Hotel,
Netanya, “Live-it,”
photo: Or Hadar

28 Commons and Shavit, “Live It,” 72-75.

29 ELR/ARC and Tadmor, “Dead Sea Resurrection Project”, 39-44.

Sea in which water levels have dramatically receded, separating the sea into two degraded lakes of water and creating thousands of sinkholes in the surrounding land which has become uninhabitable. This project suggests a spine of floating islands in the northern part of the lake, functioning as 'life systems' in a new evolving ecology. By exploiting new technologies, the creation of 'new tissues' in the 'amniotic fluid' of the lake become a sustainable substitute for the surrounding land of the lake that cannot be amended.

While these two projects have taken a stand based on the acceptance of the existing condition as a 'given', the next project has presented a more proactive attitude based on a material approach to hacking. The *Nanocellulose Desert Shelter* project (NCArchitects, Austern, Shoseyov)³⁰ explored the architectural potential of nanocellulose, a state-of-the-art material composed of recycled natural fibres to make substantial change in the built environment in a way that would have impact on both ecology and social structure. By 'hacking' the material with the use of nanotechnologies, different compositions of nanocellulose can provide diverse material qualities: material strength for the supporting structure of a building, insulation for changing weather conditions, and transparency for fenestrations that naturally monitor incoming light. All nanocellulose layers can be bonded together naturally using the material's intrinsic self-assembly behaviour in a way which revolutionises the building process and its overall structure. The shelter designed to be built in the framework of this project was intended to serve as a cultural centre for the Bedouin community in the Negev desert, which, for political reasons,³¹ has over the last decades been

30 NCArchitects, Austern and Shoseyov, "Nanocellulose", 149-154.

31 Since the establishment of the state, the Israeli government has pursued a policy aimed at restricting Bedouin settlement to limited areas, making space for the distribution of Jewish settlements and for military training areas in the Negev Desert. Over the years there have been many conflicts around the Bedouin claims in relation to land ownership, recognition in existing settlements and the improvement of insufficient living infrastructures which should be provided by the state.

deprived of its ability to maintain its traditional way of life as the population has been moved into modern dwellings. This project was designed to offer an alternative architectural structure to the traditional portable structures while preserving the spatial and nomadic character of the Bedouin habitus, providing an empowering solution for the population and a sustainable solution for the environment.

These projects, each in their unique way, emphasise the characteristic of hacking as a sympoiesis process which is grounded on linkage, feedback and synergetic behaviour and not confined by boundaries and borders. As such, they can give space to local expressions of the actual and address effects as the raw materials of the world that can be reorganised through different kinds of interaction.

Concluding remarks

In his book *The Terraforming*, Benjamin H. Bratton claims that “the responses to the anthropogenic ecological crisis must be equally anthropogenic”³² and therefore within the condition of the Anthropocene, the “planetary to come” will be more than ever before artificially constructed and dependent on human intervention. He further claims that with the emergence of technologies in ecological and geological contexts into concrete manifestations of forms and things in the planet, “‘Polity’ emerges from a particular technical arrangement and scope of available media.”³³ The various modes of governance that Anthropocene ontopolitics engender, as well the architectural strategies deriving from them as shown in the examples above, are largely supported by digital technologies and by the ability to connect agents originating in different domains of existence. In this respect, the meanings derived from the use of big data

32 Bratton, *The Terraforming*, 14.

33 Ibid, 18.

and the sophisticated sensing technologies in the political realm have significant consequences.

As architecture plays a key factor in the artificialisation of the world by changing its physical and material properties, the need to develop “new attributes for attentiveness, adaptation, responsivity, sensitivity, surprise and wonder”³⁴ that underlies governance thinking for architecture, is becoming more and more essential. Approaching the architectural discipline through the three modes presented here makes it possible to develop new approaches towards living in the Anthropocene condition incorporating social and political factors with sustainability and the responsibility for our planet. Yet they have to be critically examined by their contribution to achieving greater social and environmental justice.

34 Chandler, 214.

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S.01

ECO-POLITICAL
NARRATIVE
DIVERSIFICATION

How to Fold Uncanny Valleys into Inhabitable Mountains

Affect; Ethico-aesthetics; Ethology; Sensibilia; Territory.

Andrej Radman

Delft University of Technology, The Netherlands
a.radman@tudelft.nl

The chapter is devoted to an ecological work of art; the proof that senses, inventions and worlds are not to be considered in isolation. It examines the process of folding an 'uncanny valley' into an 'inhabitable mountain' across seven points. First: *Amor fati*, the Nietzschean call to be worthy of what happens to us. Second: Decoding and Reterritorialisation, the emergence of sensibilia as expressive features. Third: Superjects and Objectiles, the primacy/exteriority of relations. Fourth: Isomorphism without Resemblance, the vital asymmetry between the virtual capacities and actual properties. Fifth: Schizoanalysis, the non-entailment of material inference, a.k.a. abduction. Sixth: Mutation of Boundary Conditions, the downward causation of enabling constraints. Seventh: Geology of Morals, recasting ethics as a problem of power, not duty. To quote Le Clézio, "Perhaps one day we will know that there wasn't any art but only medicine."



Introduction: Epiphylogenesis

The chapter draws a cartography that no longer considers technology and culture as being apart. Technicity as a mode of existence circumvents the myopic fixation on invariant properties and functional attributes in favour of an ethological double bind between ‘environ’ and ‘mentalities’.¹ The goal is not to rediscover the eternal or the universal, but to find the singular conditions under which something new is produced.² The Nietzschean ‘plastic principle’ stipulates that the condition is not to be wider than the conditioned.³ From such a ‘superior empiricist’ perspective, the Ecological Turn aims not at stating the conditions of knowledge qua representation – conditions of possibility – but at finding and fostering the *real* conditions of creative production. The injunction is: bring into existence, do not judge.⁴ The problem with judgment is that it perpetu-

1 Hélène Frichot, *Creative Ecologies: Theorizing the practice of architecture* (London and New York: Bloomsbury Visual Arts, 2019), 29.

2 Hanjo Berressem, *Félix Guattari’s Schizoanalytic Cartographies* (Edinburgh: Edinburgh University Press, 2020), 221.

3 Gilles Deleuze, *Nietzsche and Philosophy*, trans. Hugh Tomlinson (New York: Columbia University Press, 2006), 50.

4 Gilles Deleuze, *Essays Critical and Clinical*, trans. Daniel W. Smith and Michael A. Greco (Minneapolis: University of Minnesota Press, 1997), 135.

Fig. 1

Haban Esas Laderas, silicone © 2019 Flora Reznik

ates the status quo and prevents the emergence of the new. By contrast, the anthropotechnical evolution – whereby the organic becomes dependent on the non-organic – ceaselessly creates new boundary conditions and, by the same token, new enabling constraints.⁵ Hence, new modes of existence, new forms of life.

The chapter is devoted to an installation by Flora Reznik, an Argentinian artist based in the Netherlands, titled *Habitan Esas Laderas / Change In Y, Change In X* (2019). The mixed media piece is based on the artist's sibling's medical condition. Her brother's leg had been developing at a slower rate of change from the rest of his body and had to be artificially extended. The result was a substantial scar, a consequence of multiple surgeries. The artist made a mold of the scar as a point of departure. Through a topological transformation of relief and scale, the scar became a mountain ridge (*laderas*). To address artificial and extended sensibility, she employed various tools like the contour serigraphy line maps, Google Earth-like images, silicone sculptures, a contraption that tracks the rising water, and a 3D animation. The *Unheimlich* was transformed into the *Heimlich*. In the words of Deleuze and Guattari:

If nature is like art [sic], this is always because it combines these two living elements in every way: House and Universe, Heimlich and Unheimlich, territory and deterritorialisation, finite melodic compounds and the great infinite plane of composition, the small and large refrain.⁶

5 Stiegler articulated three different forms of memory: *genetic* (programmed into our DNA); *epigenetic* (acquired during lifetime and stored in the central nervous system); and *epiphylogenetic* (embodied in machinic systems such as architecture). See: Bernard Stiegler, *Technics and Time, 1: The Fault of Epimetheus*, trans. Richard Beardsworth and George Collins (Stanford, CA: Stanford University Press, 1988).

6 Gilles Deleuze and Félix Guattari, *What Is Philosophy?*, trans. Hugh Tomlinson (New York: Columbia University Press, 1994), 186.

Amor Fati

In the words of the artist's brother, his whole being is the answer.⁷ According to the poet Bousquet, the brother's scar had existed before him, he was born to embody it.⁸ In spite of its high specificity, *Habitan Esas Laderas* is not to be mistaken for an (auto)biographical work of art. It requires the affirmation not only of one's entire life, but every past event implicated in the aleatory moment leading to the scar.⁹ Psychosocial types may belong to history, but aesthetic figures belong to becoming, as a result of geography rather than historiography.¹⁰ Furthermore, by moving from interpretation to experimentation, and thus rethinking the issue of production without reproduction, the artist's ambition is to rethink our ethology.¹¹ Ethics = Ethology.¹² Her audience does not come ready-made either. The piece makes it: "One does not think without becoming something else."¹³

Decoding and Deterritorialisation

In the realm of architecture, it was Antoni Gaudí who cherished heuristics over hermeneutics. To think is to experiment.¹⁴ Through experimentation with models made of strings with small weights hung from a ceiling he discovered a way to transform traditional masonry techniques.¹⁵ The resulting catenary

7 An excerpt from the conversation between the artist and her brother: <https://www.florareznik.com/#/change-in-y-change-in-x>

8 Deleuze and Guattari, *What Is Philosophy?*, 159.

9 John Sellars, "An Ethics of the Event: Deleuze's Stoicism", *ANGELAKI Journal of the theoretical humanities* 3 (2006): 157–71.

10 Deleuze and Guattari, *What Is Philosophy?*, 96–97.

11 Anne Sauvagnargues, "The Wasp and the Orchid: On Multiplicities and Becomology" in *Aberrant Nuptials: Deleuze and Artistic Research* 2, ed. Paulo de Assis and Paolo Giudici (Leuven: Leuven University Press, 2019), 177–81.

12 Gilles Deleuze, *Spinoza, Practical Philosophy*, trans. Robert Hurley (San Francisco: City Lights Books, 1988), 17–29.

13 Deleuze and Guattari, *What Is Philosophy?*, 42, 176.

14 *Ibid.*, 111.

15 Mark Goulthorpe, *Gaudí's Hanging Presence in The Possibility of (an) Architecture...* (London and New York: Routledge, 2008), 85–8.

curve distributes the load in pure tension. When the model is flipped vertically, the load becomes compressive and thus optimal for a complex but structurally sound arch. In the case of Reznik's piece, the uncanny valley is turned from a microscopic concave to a telescopic convex and thus transformed into a *Heimlich* territory. The territory implies the emergence of sensibilities that become expressive features before any new causalities and finalities can be extracted from them.¹⁶ In the Neo-Lamarckian words of Elisabeth Grosz:

Territory is produced, made possible, when something, some property or quality, can be detached from its place within a regime of natural selection and made to have a life of its own, to resonate, just for itself.¹⁷

Superjects and Objectiles

The change in the abscissa 'X', indicating the degree of anthropomorphism, is not linearly proportional to the change in the ordinate 'Y', which traces the positive visceral response or likeability. The dip in the diagram may be qualified as the 'uncanny valley', evoking the strangely familiar feeling of eeriness and revulsion.¹⁸ It is often difficult to figure out where exactly the material ends and sensation begins, a zone of indetermination.¹⁹ We have to bear in mind that there is no such thing as the fully constituted subject supposedly acting on the fully constituted object. Subjects and objects are only ever derivative. As counterintuitive as it may sound, relation is prior to its terms.²⁰

16 Deleuze and Guattari, *What Is Philosophy?*, 183–4.

17 Elizabeth Grosz, *Chaos, Territory, Art: Deleuze and the Framing of the Earth* (New York: Columbia University Press, 2008), 69.

18 I have generalised the concept of the uncanny valley. In its original (narrow) sense, it is defined as a hypothesised relationship between the degree of an object's resemblance to a human being and the emotional response to such an object. https://en.wikipedia.org/wiki/Uncanny_valley

19 Deleuze and Guattari, *What Is Philosophy?*, 166.

20 Gilles Deleuze and Claire Parnet, *Dialogues*, trans. Hugh Tomlinson and Barbara Habberjam (New York: Columbia University Press, 1987), 41–42, 65.

Brian Massumi explains:

It is only because relation is virtual that there is any freedom or creativity in the world. If formations were in actual causal connection, how they effectively connect would be completely determined. They might interact, but they would not creatively relate. *There would be no gap in the chain of connection for anything new to emerge from and pass contagiously across. There'd be no margin of creative indeterminacy. No wriggle room. Or to borrow Whitehead's expression, there'd be no 'elbow room' in the world.*²¹

Isomorphism without Resemblance

The possible is opposed to the real, whereas the virtual *is* fully real albeit incorporeal.²² Moreover, the possible is but retroactively hypostasised (the abstract made in the image of the concrete). In contrast, every quality of experience exceeds its empirical conditions because the virtual does not resemble the actual.²³ Concretion takes place by difference, *not* representation. As Michel Serres put it: "The world [...] is not the product of my representation; my knowledge, on the contrary, is a product of the world in the process of becoming. Things themselves choose, exclude, meet, and give rise to one another."²⁴ Given that the actual terms never resemble the singularities they incarnate,

21 Brian Massumi, "The Thinking-Feeling of What Happens" in *Interact or Die*, ed. Joke Brouwer and Arjen Mulder (Rotterdam: V2 Pub./NAi, 2007), 70–91 (84) [emphases added]. By contrast to virtual relations, 'algorithmic governmentality' is about optimising the current state of affairs (actual occasions). See: Antoinette Rouvroy, "Algorithmic Governmentality and the Death of Politics," *Green European Journal* (2020), <<https://www.greeneuropeanjournal.eu/algorithmic-governmentality-and-the-death-of-politics/>>, [accessed 15 January 2021].

22 Elizabeth Grosz, *The Incorporeal: Ontology, Ethics, and the Limits of Materialism* (New York: Columbia University Press, 2018).

23 Brian Massumi, "Virtual Ecology and the Question of Value" in *General Ecology: The New Ecological Paradigm*, ed. Erich Hörl with James Burton (London and New York: Bloomsbury Academic, 2017), 345–73 (349).

24 Ilya Prigogine, Isabelle Stengers and Serge Pahaut, "Dynamics from Leibniz to Lucretius", Afterword to Michel Serres in *Hermes: Literature Science, Philosophy* (Baltimore: Johns Hopkins University Press, 1982), 137–55.

individualisations are always genuine creations.²⁵ So are faces and landscapes, “from dermis to earth”.²⁶ Deleuze and Guattari:

The event is not the state of affairs. It is actualised in a state of affairs, in a body, in a lived, but it has a shadowy and secret part that is continually subtracted from or added to its actualisation: in contrast with the state of affairs, it neither begins nor ends but has gained or kept the infinite movement to which it gives consistency.²⁷

Schizoanalysis

Aptly, Reznik’s surname is derived from the Czech word ‘řezník’ (one who cut and sold meat, a butcher), or in Yiddish, ‘reznik’ (borrowed from Slavic languages, meaning Jewish ritual slaughterer). It brings to mind Karan Barad’s ‘agential realism’, whereby the only viable way of finding one’s bearings in the real is to cut into its causal fabric:

I propose “agential realism” as an epistemological-ontological-ethical framework that provides an understanding of the role of human and nonhuman, material and discursive, and natural and cultural factors in scientific and other social-material practices, thereby moving such considerations beyond the well-worn debates that pit constructivism against realism, agency against structure, and idealism against materialism.²⁸

Rez = Schiz. This modus operandi goes under the name of ‘abduction’, the non-analysable and non-deducible material inference where the hands-on *what-if* attitude supersedes the

25 Deleuze and Guattari, *What Is Philosophy?*, 33.

26 Bernard Cache, *Earth Moves: the Furnishing of Territories* (Cambridge, MA: The MIT Press, 1995), 73.

27 Deleuze and Guattari, *What Is Philosophy?*, 156

28 Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2007), 26.

logocentrism of *if-then*.²⁹ In the words of H el ene Frichot:

Moving in a slow experimental manner amidst things, making surprising discoveries here and there, commencing to formulate what are still inadequate ideas, building on these ideas, for instance, by coming together with others to share concept-tools.

She continues to describe the cascade from inadequate ideas to common notions:

Forming common notions, making something that is sufficiently durable and might be shared, passivity slowly transforms into activity and greater liberty when it comes to one's material and sense-making compositions.³⁰

Consequently, what may appear as a conscious de-cision ('rez'), or circumscribed perception (snapshot), constitutes an abundance of complex duration, an autonomy of affect replete with potentials.³¹ Art in this sense creates the finite so as to restore the infinite. Neither art nor sensation has ever been representational.³²

Mutation of Boundary Conditions

Morphology is to the a priori *class* what morphogenesis is to the molecular notion of *mass*.³³ It is not about what happened (tracing), but about what is going on in what happens (cartography). All individuation is based upon movement and rest. Deleuze

29 Charles Sanders Peirce, "Abduction and Induction" in *Philosophical Writings of Peirce*, ed. Justus Buchler (New York: Dover, 1955), 302–305. Cf. Lorenzo Magnani, *Abductive Cognition: the Epistemological and Eco-Cognitive Dimensions of Hypothetical Reasoning* (Berlin Heidelberg: Springer-Verlag, 2009).

30 Frichot, *Creative Ecologies*, 213–14.

31 Andrej Radman, "Deep Architecture: An Ecology of Hetero-Affection" in *Architectural Affects after Deleuze and Guattari*, ed. Marko Jobst and H el ene Frichot (London: Routledge, 2020), 63–80.

32 Deleuze and Guattari, *What Is Philosophy?*, 193, 197.

33 Raymond Ruyer, *The Genesis of Living Forms*, trans. Jon Roffe and Nicholas B. de Weydenthal (London: Rowman and Littlefield International, 2020).

takes the distinction between speeds and slownesses from Spinoza.³⁴ From such a rhythmic perspective, it is intensities that constitute a body's capacities to affect and be affected, not to be confused with the movements across the Cartesian extensive space.³⁵ Affects thus remain irreducible to simple digits or units of computational code.³⁶ It gives primacy to the mutation of boundary conditions as the 'lure' of the virtual.³⁷ In the words of Didier Debaise:

It is as if the universe, in its creative advance, never ceases to create new constraints, which are the existents themselves, canalising how they inherit what is possible, in a new way.³⁸

Growth must tessellate space-time in non-Euclidean ways. If genetically the local epigenetic forces are not properly tuned to nonlocal constraints, as in the case of the artist's sibling, then they must be so tuned locally.³⁹ This is a matter of applying force on force, action upon action, and not force on object.⁴⁰ After all, the limit of something is the limit of its action and not the outline of its figure. In an anticipatory mode, a medical surgeon measures the effects of treatment against the desired objective, i.e. the boundary conditions to be conserved.⁴¹

34 Gilles Deleuze, *Foucault*, trans. Sean Hand (Minneapolis and London: Minnesota University Press, 1988), 123.

35 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus*, trans. Brian Massumi (London, New York: Continuum, 2004), 254, 261.

36 Peg Rawes, "Non-Human Architectural Ecologies" in *Graham Harman: Is there an Object-Oriented Architecture?*, ed. Joseph Bedford (London and New York: Bloomsbury, 2020), 111–40 (115).

37 Terrence Deacon, *Incomplete Nature: How mind emerged from matter* (New York and London: W.W. Norton & Company, 2012), 426

38 Didier Debaise, *Nature as Event: The Lure of the Possible*, trans. Michael Halewood (Durham and London: Duke University Press, 2017), 66.

39 The epigenetic structure of inheritance and transmission is, as the very term suggests, external and non-biological.

40 Deleuze, *Foucault*, 28.

41 Peter N. Kugler and Robert E. Shaw, "Symmetry and Symmetry-Breaking in Thermodynamic and Epistemic Engines: A Coupling of First and Second Laws" in *Synergetics of Cognition* (Heidelberg: Springer-Verlag Berlin, 1990), 296–331, in particular Section 4: 'Perceptual Information as the Critical Set of Morphological and Growth Gradient Sets' (320–327).



Conclusion: Geology of Morals

In the final analysis there is actually – or better said virtually – an immanent ethics in *Habitan Esas Laderas*. It involves abstract machines and concrete rules.⁴² In other words, the virtualities as incorporeal effects, like Nietzsche's Will to Power, are also the quasi-causes.⁴³ They striate the real and, in so doing, produce enabling constraints. Truth and falsity are not values that exist outside the constitutive problematic fields that give them sense. As Rosi Braidotti argues, the enabling (active) power as potentia needs to be distinguished from the 'hindering' (reactive) power as potestas:

I do not think it acceptable [...] to raise any issues related to ethics or to morality independently of considerations of power and power relations. [...] At times contemporary moral

42 'Concrete Rules and Abstract Machines' is the title of the concluding chapter of *A Thousand Plateaus* (238–39).

43 Andrej Radman, "Involuntary Architecture: Unyoking Coherence from Congruence" in *Posthuman Ecologies: Complexity and Process after Deleuze*, ed. Rosi Braidotti and Simone Bignall (London: Rowman & Littlefield International, 2019), 61–86

Fig. 2

Habitan Esas Laderas, silicone © 2019 Flora Reznik

philosophy comes across as comfortably installed in a consensus about the *context-free* nature of its deliberations. As a materialist nomadic feminist philosopher, I want to stress the urgency of rewriting issues of power [...].⁴⁴

When pondering the issue of whether there can be a material ethics, one has to acknowledge that the source of critique cannot come by way of a transcendental intrusion.⁴⁵ It needs to operate at the level of production. The conditions of critique and creation collapse to debunk the genesis of thinking in thought itself: “Ask not what’s inside your head, rather what your head’s inside of.”⁴⁶ Ethics, framed in this way, is a problem of ‘response-ability’ or (degrees of) power, not duty.⁴⁷ One cannot *decide* to think differently. In order to think differently one has to *feel* differently.

The classical schism between the essence and the *appearance*, which gives way to the conjunctive couple of *sense/appearance* in Kant, is to be superseded by the *virtual/actual* coupling.⁴⁸ This two-sidedness, the simultaneous participation of the virtual in the actual and the actual in the virtual, as one arises from and returns to the other, is due to the capacity to affect and be affected. The process of individuation is thus only contingently necessary or quasi-deterministic. Reznik’s *Habitan Esas Laderas* provokes us into thinking-feeling that there is no object or

44 Rossi Braidotti, *Transpositions: On Nomadic Ethics* (Cambridge: Polity Press, 2006), 30.

45 Andrej Radman, “Double Bind: On Material Ethics” in *Schizoanalysis and Ecosophy: Reading Deleuze and Guattari*, ed. Constantin V. Boundas (London: Bloomsbury, 2018), 241–56.

46 William M. Mace, “James J. Gibson’s Strategy for Perceiving: Ask Not What’s Inside Your Head, but What Your Head’s Inside of” in *Perceiving, Acting and Knowing: Toward an Ecological Psychology*, ed. Robert Shaw and John Bransford (Hillsdale, NJ: Lawrence Erlbaum Associates, 1977), 43–65.

47 Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016), 29.

48 According to Deleuze, Kant as the true champion of Phenomenology created completely new philosophical conceptual coordinates. The concept is no longer the essence of the thing, but the meaning of the apparition. What disappeared is the problem of creation, replaced by a completely different problem of founding (Romanticism). See: Gilles Deleuze, “Kant, Synthesis and Time”, Cours Vincennes (14 March 1978), <<https://www.webdeleuze.com/textes/66>>, [accessed 15 January 2021].

subject of movement separate from the movement, and that subject-object relations are effective 'illusions' arising from 'gaps' in movement. Herein lies perhaps the sole secret of the Ecological Turn: the world is but a relation of movements not excluding the movement-effect of stasis itself.



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S.02

BEYOND THE
DUALISM OF
MAN - NATURE

Agency and Participation in a More-Than-Human Anthropocene: Designing Interactions with Vegetal Others

Agency; Participatory Design; More-Than-Human; Environment Design/
Science.

Gionata Gatto

Dubai Institute of Design and Innovation, Dubai, United Arab
Emirates

gionata.gatto@didi.ac.ae

Alessia Cadamuro

Open University, Milton Keynes, United Kingdom

info@alessiacadamuro.com

The Anthropocene is urging us to reconsider the critical function of design as an instrument for rediscussing the position of the human and foster multispecies engagements that can question the socio-political, economic and environmental implications of his dominancy. Design, in this sense, can serve as a tool for reasoning through non-dichotomous, non-western and unfamiliar connections, guiding us to opportunities of encounter with different others, and allowing us to appreciate emergent territories and ecosystems in light of the forces which actively populate their settings. By drawing on more-than-human ontology, participatory design, and design work from the authors, this paper reflects on possible ways to consider issues of plant agency and participation through design, developing practices that are more inclusive towards plants. The presented study highlights how the collaborative effort of designers and biologists can anticipate experiences of encounter with flora and help forge possibilities for a contact zone that consider different modes of expression and 'being in the world'. We argue that by exploring procedural participatory

dynamics enacted by multiple plant species, we can unveil ways for facilitating multispecies collaboration and resilience in a more-than-human Anthropocene. Ultimately, this should lead us to learn how design can serve to discuss and subvert well-established expressions of power, power relations and hierarchical separations between beings.

Design as Encounter

During the last decade, the Anthropocene opened new opportunities for art and design, becoming an almost ubiquitous statement for design practices that touch on ecological themes. Yet, critique around those praxis is still poor and at times even worsened the discourse about the actual environmental crisis (Anderson 2015). Most of the present environmental problems are inextricably tied to the centrality of the Anthropos on the planet, and to the inequalities determined by capitalist and colonial systems. The Anthropocene is thus urging us to reconsider the critical function of design as an instrument for rediscussing the position of the human and foster multispecies engagements that can question the socio-political, economic and environmental implications of his dominancy. In this sense, design can serve as a tool for reasoning through non-dichotomous, non-western and unfamiliar connections, guiding us to opportunities of encounter with different others (Gatto 2019), and allowing us to appreciate emergent territories and ecosystems in light of the forces which actively populate their settings (Gatto and McCardle 2019).

In this paper, we use an ethnographic reading of the term 'encounter', referring to the ensemble of meaning flows that happen when one (or more) human actors try to forge a contact zone with one (or more) biodiverse others. This form of encounter does not rely on mechanisms of communication reciprocity (e.g., verbal, gestural, or auditory), nor is it defined a priori. Instead, it is seen as a human movement toward other-than-humans that is intuitive and unanticipated, made possible by observations and



meaning-making processes performed across different research sites. This way of reading the encounter is context-specific, and entails in-depth analysis of phenomena according to the perspective of those who directly experience them.

Plant agency and participation

In the humanities, since the last century particular attention has been drawn to the idea that the capacity to act is not just a human prerogative, but it also belongs to entities of different biological nature. In its simplest form, the concept of agency indicates the capacity to creatively and autonomously act and transform. Yet, when venturing beyond the human and into the vegetal universe, the issue of agency gets more intricate. First, the ways in which we understand flora is determined from biological and physiological differences that inherently exist between us and plants, which result in different ways of perceiving and acting. Second, plants ‘act’ in their places according to their own ways and times, which are different from ours.

Following Deleuze and Guattari (2000) and the multispecies turn in the humanities, Alain (2017) suggests that in order to witness the agency of plants we need to explore the singularities of situated engagements, “bounding assemblages around specific events” (Alain 2017). Similar is Hitchings and Jones’s call to explore the human-vegetal relationships empirically, that is, directly from the field (Hitchings and Jones 2004), as a way of understanding how plants contribute to configure the environment and learn to inhabit its issues. Together with people, plants are some of the most “influential co-producers of the biosphere, and their mutual futures depend on collaborations and conflicts of many kinds” (Head et al. 2014). In their account of trees as agents in the co-constitution of places, Jones and Cloke (2008) addressed the original contribution provided by plants to the configuration of relational processes. In seeking to give non-human others “their due” (Owain Jones and Cloke 2008;

citing Thrift 1996, 26), they propose four ways in which trees can be regarded as having significant forms of agency:

1. *routine actions*; a plant's biological processes of growth, reproduction, fructification, spread and colonisation;
2. *transformative actions*; the ways in which a plant creates new directions, formations and fields of relations, which are linked to the transformation of a place. Self-seeding and spontaneous growth are transformative actions: when remixed with the social, they create transformative effects;
3. *purposive action*; a tree exerts purposive agency when it influences future courses of action. For instance, the DNA of a plant embeds instructions that, when executed, determine certain physiological functions. A purposive action is the capacity of the plant to execute those genetic instructions;
4. *non-reflexive action*; a plant's capacity to engender affective and emotional responses from the people who dwell amongst it;

Those features, according to Jones and Cloke (2008), can be used to account for creative agencies that are usually assumed to belong only to humans, and to explore how plants can influence social life. For this purpose, their work introduces the concept of "tree-place" (Owain Jones and Cloke 2008), that is, the growing site from which plants co-construct processes and social relationships in collaboration with other agents, and across time and space. Although trees are normally bounded to one physical place, they do act as threads, connecting the temporally distant era of politics and economics and continuously re-assembling the social. Jones and Cloke suggest that the tree-place is a fundamental milieu for understanding the agency of plants and unveiling patterns of trajectories that settle into temporary local forms (Owain Jones and Cloke 2008).

The notion of plant agency provides here further inputs to rethink the position of plants as active design participants. Lawson (2005) claims that participation can be read as a conversation between different users (Lawson 2005); however, when participants are not people, we have to consider post-human methods that can help us engage with the perspectives of different others and ultimately understand “who benefits, *qui bono*, when species meet?” (Kirksey, Schuetze, and Helmreich 2014). Participatory design (PD) is seen here as an approach that can help us engage with such viewpoints, thus considering the value of non-normative communication abilities as an opportunity for designing more inclusive more-than-human worlds. Akama’s and Light (2012) argue that PD is an approach configured by the participants, practices, places and structures with which it is entangled (Light and Akama 2012), rather than advocating universal standards for participation. Building on this, PD can be identified as a set of methods and practices of engagement, and a commitment to a particular set of values, all enacted through design (DiSalvo and Lukens 2011, 179). A participatory approach with other-than-human plants, for instance, is mostly mediated by non-normative and non-verbal interaction modes. Bastian (2017) argues that such research approaches should enable the researcher to ask ‘what matters’ to nonhumans (Bastian 2017). This is a key question for Participatory Design researchers that seek ways to work with “different others”.

Our methodological position in this paper acknowledges that non-normative communication is valuable communication and consequently contains cultural values (Cadamuro 2020). This understanding is supported by an inclusive and non-normocentric perspective towards those, humans and otherwise, whose abilities or ways of being do not conform with anthropocentric norms. In acknowledging that, we build and learn from the diversity of situated experiences embodied within different living species, inspired by Haraway’s notion of situated knowledge (Haraway 1991). Haraway argues that through situated

knowledges, subjects become complex contraptions made of biological vision and personal will (Haraway 1991). Based on this, we do not aim at perfect translations, comprehensions and communications, but we rather open to the exploration of complex contraptions (Cadamuro 2020). Furthermore, we envision the diversification of abilities as starting points to support, through design, alternative narratives about novel modes of more-than-human relationship.

Prelude to Vegetal Rescuers

Vegetal Rescuers (Gatto and Cadamuro 2020) is an ongoing design research project that we initiated in October 2018 on occasion of the “Art Meets Science” residency, a trans-disciplinary initiative promoted by the University of Wageningen (WUR). For the event, invited artists and designers were asked to collaborate for two months with scientists from WUR on theme-specific innovation projects, exploring opportunities of cross-contamination and “enriching their respective fields of expertise” (Wageningen University & Research 2018a). This specific project involved a collaboration with biologists from the Environmental Sciences group of WUR; together, we were asked to work on a theme of evolutionary sciences, exploring ways to “harness evolutionary processes to increase resilience in the face of accelerating global change” (Wageningen University & Research 2018b).

The team approached the topic through unconventional exploratory lenses, posing questions related to evolutionary processes, yet moving beyond just scientific readings of ‘resilience’ and towards a more-than-human understanding of its ramifications. The project explores the theme of soil pollution from a hyperaccumulator eye view. Hyperaccumulators are particular species of plants, capable of growing in soil or water with very high concentrations of metals, absorbing those metals through the roots and concentrating them in high levels inside their tissues, as a way of surviving and reproducing in complex environments

(Rascio and Navari-Izzo 2011). *Vegetal Rescuers* asks in what ways a contaminated site could open to alternative modes of human/plant interaction, and whether this could lead to multispecies forms of resilience and dwelling. Building on Guattari's notion of "ecosophy" (Guattari 2000), we assumed that resilience to contamination and its material by-products can only occur if we merge together three main registers of ecological thinking: the environmental, the social, and the mental. The contaminated site exemplifies one of many consequences of capitalism and from a sociological perspective it is a socially constructed milieu, whose processes and materialities are linked to the public perception of risk. Toxic contaminants assemble blasted landscapes, which are at the origin of emotional concerns (Grasmück and Scholz 2005) and biases related themselves to the very notion of contamination. Furthermore, contamination is invisible and visually untraceable unless by means of lab analysis. This generates concerns and neglected spaces, which prevents those territories from becoming socially actionable. The high cost of remediation processes (e.g. mechanical excavations and ex-situ treatment of the substrate) usually leads to economically impractical investment projections, unless in presence of real estate development plans. As a result, the majority of contaminated sites remains unused, unless designated to the construction industry (Haninger, Ma, and Timmins 2012).

Vegetal Rescuers looks at the contaminated territory as an opportunity to develop novel formats of Multispecies Design (Gatto and McCardle 2019), where remediation is not seen as a technocratic soil practice, but more as an experiment in plant participation, multispecies cohesion and cultural resilience. During the residency, the team of designers and biologists explored hyperaccumulators as active participants in the negotiation of new forms of interaction between human communities and territories affected by toxic contaminants.

Discussion of the design process

In October 2018, during the residency at WUR we organised a one-day workshop, hosted by our team (two designers and one biologist) in collaboration with another designer, two environmental scientists and two social scientists. The activity format was a transdisciplinary conversation between the different team members, with two main objectives. The first was to ideate possible services dedicated to the restoration of polluted territories through the active participation of hyperaccumulating flora. The second was to cogenerate ideas and new knowledge with scientists, using scenarios as a way of speculating about possible multispecies futures for post-industrial landscapes. This section reports and reflects on how the workshop led to conceptualise a participatory experiment of multispecies design.

The workshop activities (Figure 01.a – 01.d) [Fig. 1] involved the use of speculative scenarios addressing three stories of sites affected by different kinds of contaminant. One scenario concerned possible futures for London Dockland's contaminated waters. Another involved the soil of a contaminated allotment situated within a German town. The last scenario involved an Asian metropolis affected by air pollution. This approach motivated



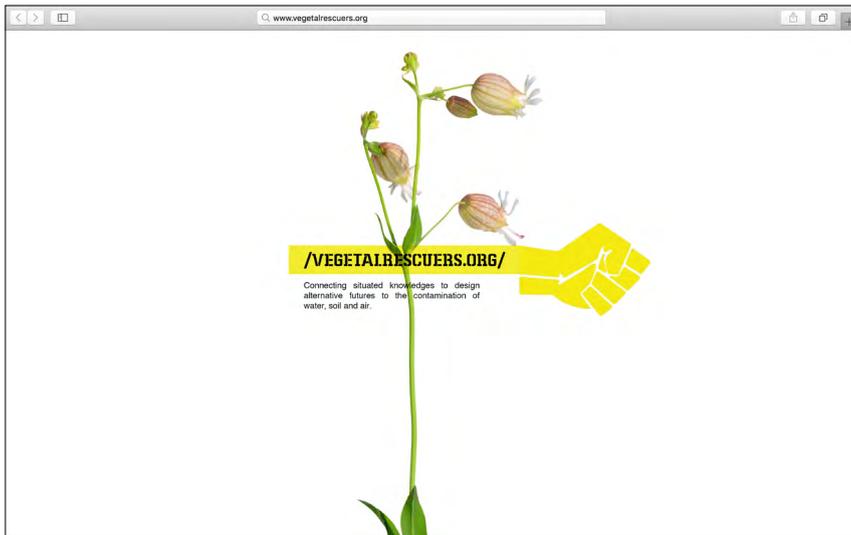
Fig. 1

Phases of the workshop at WUR

an in-depth discussion with the different team members, providing outcomes that advanced the design process.

Together, we conceptualised possibilities for a participatory design practice involving hyperaccumulators, oriented to facilitate the expression of their agentic power. In the second scenario, for instance, our efforts focused on discussing issues of legitimisation: specifically, by what means the contaminated territory could be regulated and acted upon? An interesting element of the conversation concerned the interpretation that was given to hyperaccumulating flora as performative artworks, whose forms and expansion would change over time. One social scientist described this as a way of “transforming contaminated land into cultural land” (Figure 01.b). This opened up two important themes. The first concerned ways to achieve an active participation of hyperaccumulators, including their role and positionality within the project. The second, more concerned with an understanding of the power relations and dynamics that could emerge from an active participation of plants to the final design outcomes.

The results of the workshop led us to design the foundation of Vegetal Rescuers. The project was conceptualised around two interconnected elements. The first is a digital database, whose aim is to connect situated knowledges about hyperaccumulators. At the core of the database is the importance of sharing expertise (ecological, technological and environmental) and provide opportunities for understanding what plants might actively participate in experiments within different ecosystems, according to criteria of endemism. The website vegetalrescuers.org [Fig. 2] was conceptualised by the team as a trigger for multispecies modes of environmental and social activism; on the one hand, it represents a way for human communities to engage with the ecology of nearby contaminated sites; on the other, we saw it as a way of portraying the hidden value of local endemic flora.



During the workshop, we discussed the use of a yellow ‘raised-fist’ symbol for the database, with the intention of mediating a message of support to hyperaccumulating flora, acknowledging at the same time their creative presence on the land and their ability to survive in extremely complex environmental conditions.

From the idea of the database we conceived the second element of Vegetal Rescuers, which consists of site-specific interventions on polluted sites. Building on our discussion, we entailed that hyperaccumulators, by flourishing on contaminated territories, might guide human communities to reconsider the ecological significance of those places and legitimise their existence. Contaminated areas, however, are usually extended, not easily accessible and often abandoned private places. To cover the vastness of such territories, we envisioned the use of drones, pre-programmed to follow specific air paths. By adding a special sawing module to the drones, the devices would function as plant printers, hence the possibility of sprinkling seeds even in areas that are, by default, inaccessible. During the residency, we speculated on possible areas where to initiate the research

Fig. 2

Homepage of the online database

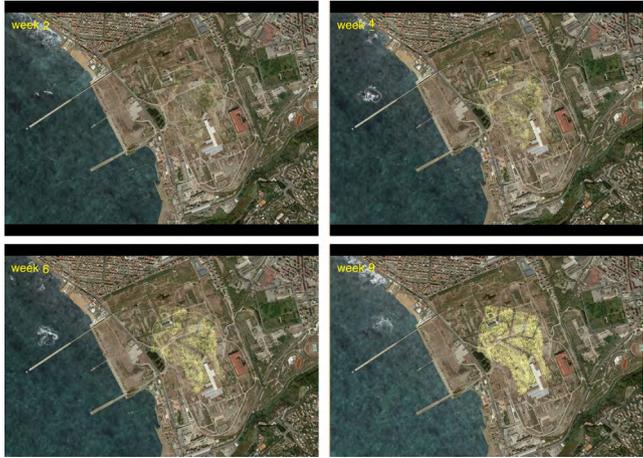


Fig. 3

Series of speculative representation of possible printed plant artwork in the area of Bagnoli (Italy)

process, printing plants as multispecies artworks; this included a first analysis of the sites of Bagnoli in Italy [Fig. 3]; Lellingen in Belgium; and Almere and Rotterdam-West, both in the Netherlands.

In this drone sowing experiment, we saw several meanings and opportunities. First, that of motivating new forms of public engagements with polluted territories; second, that of accounting for plant growth as a performative multispecies design process, partially dependent on predesigned air paths, and partly on the “routine actions” (Owain Jones and Cloke 2008) of the printed seeds. Last, we saw a possibility for exploring novel means of interaction between people and minerals, mediated by a reading of plant metabolism that moves beyond the simple biological act and towards its social and ecological implications. The tree-place advanced by Jones and Cloke (2008) would thus become not just a site for the co-construction of intra-species relationships (that is, a place for exploring the emotional response of humans who dwell amongst plants), but also a place for experiencing the multiple effects of the “transformative actions” (Owain Jones and Cloke 2008) of hyperaccumulators. In acknowledging the need to provide participatory space for plants to express their agency, we imagined the design process as a performative vegetal

act where the condition of participation would be the result of those plants' capacity of "becoming with" (Haraway 2007, 244) their territory. Becoming with, in this case, emphasises the condition of constant interconnectivity of those plants, which determines opportunities for a contact zone between human and nonhuman others.

Hence, our objective was to grant plants extensive ownership and control over the artwork and its aesthetic appearance, in their own peculiar, biological way: at each stage of the project, plants would perform their routine and transformative actions independently, liberating the process from human control. With *Vegetal Rescuers*, we attempted to reinterpret the contaminated site through Guattari's ecosophical lenses. This approach departs from technocentric readings of the post-industrial site, to provide instead a space of encounter that intersects Guattari's three ecosophical registers. In the *Three Ecologies*, he argued that "despite having recently initiated a partial realisation of the most obvious dangers that threaten the natural environment of our societies, [the human] is generally content to simply tackle industrial pollution [...], whereas only an ethico-political articulation between the three ecological registers (the environment, social relations and human subjectivity) would be likely to clarify these questions" (Guattari 2000). In this project, Guattari's ecosophical spheres intertwine, giving us the opportunity to experience the contaminated site not as a passive, disconnected entity, but rather as an entirely novel, unanticipated multispecies milieu.

Conclusions

In this paper, we accounted for an exploratory journey that led us to anticipate opportunities for a participatory design with plants, aimed at imagining multispecies modes of reinhabiting post-industrial territories. We examined this process through two methodological lenses, that is, Agency and Participation,

and used them to speculate about ways of engaging with such futures. Although the project we presented is still ongoing and, at the time of writing, only partially implemented, reflecting on the process provided a means to analyse how other-than-human participation can be envisioned since the initial research stages and by means of transdisciplinary interactions. We addressed agency as a concept that supports understandings of plants as actors that frame the social, and the design process as a performative vegetal act, where the condition of participation is the result of those plants' ability to perform routine and transformative actions on their territory.

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The User in the Anthropocene

Anthropocene; Architectural Theory; User; Posthuman; Species

Tuğba Deringöl

Abdullah Gul University, Kayseri, Turkey
tderingol@gmail.com, tugba.deringol@agu.edu.tr

Sema Serim

Erciyes University, Kayseri, Turkey
serims@erciyes.edu.tr, smserim@gmail.com

This study is aimed to understand the transformation of human in the Anthropocene and its effects on the concept of user in architecture. Species, transhuman, and posthuman concepts are used to understand the transformation and perceive the human condition in the new epoch. It is claimed that the definition of the human for the three concepts will affect the user concept in architectural theory with different ways. Critical approaches developed against the standard ideal user created by the mind of enlightenment and objectivity in the 20th century thought; the human or user transformation determined by human mind, scientific and technological developments, the place of other people, other living things and the earth as users in architecture constitute the scope of this study. Eventually, scientific and philosophical approaches and architectural theory that can be used as a tool for conceptualization of the user and can be promised alternatives are examined and discussed in the context of the Anthropocene.

The Anthropocene term is acknowledged as a geological period when human is a geological force. The domination of human over nature has caused irreversible destruction of the earth. Since Enlightenment, nature has shifted towards objectivity, and as human authority increases, it alienates to what it dominates. Every attempt to prevent natural pressure causes degradation of nature, and then results in further increase of natural pressure. In this cycle, both the earth and human become objectified, alienated and disappeared (Adorno and Horkheimer, 1995). Human considered the agent of the Anthropocene is redefined in many disciplines on a planetary scale because, anthropocentrism is necessarily displaced and species hierarchy is mixed (Braidotti, 2013). According to Braidotti, the foundation of humanities is based on humanism and it loses this foundation with concepts such as thinking of human beings as a species, as an animal, and together with the earth (Braidotti, 2019). According to this approach beyond any other species human being is the most actual part of the environment and architecture as built environment. However it can be said that human as one of the basic constitutions of architecture is not defined in accordance with this relationship. Conceptualizing human as user and following to define other creatures as user are needed to reevaluate through actual anthropocentric perspective. In other words rethinking of human is necessary to understand how the user has transformed and who the user is. In this study, three different concepts, species, transhuman, and posthuman, will be used to redefine human. And redefinition of human is going to be activating to understand and reposition the user in architecture. The motivation of this study is improving the thinking of creating nonhuman user for architectural ecologies and claiming the need of expanding the user scale to understand the crisis of the Anthropocene. For this purpose, some specific architectural theories and practices are instrumentalized to prove the assertion about the user.

The Concept of Species Deepens Standardization of the User

Scientists such as Wilson and Crutzen mention about people as a species, suggesting that the way of thinking will be useful in realizing human profits to understand the nature of today's crisis (Chakrabarty, 2009). However, Chakrabarty has two criticisms of this proposition. Firstly, thinking about "species" is linked to deep history issues. Talking about the species serves to conceal the reality of capitalist production and imperial domination. Secondly, the species may be a concept used for a universal new history of human beings. But we may never understand this universality. It requires a global approach in politics because, unlike a Hegelian universal, it cannot cover specificities (Chakrabarty, 2009).

In order to understand the Anthropocene in the context of the built environment, it is not necessary to go back so far as to discuss human beings in natural history. We only need to review the mechanisms that form the nature-culture duality and hinder our relationships with the natural environment. One of the factors that constitute this duality is the agricultural revolution. Human could only be thought as species before this period, because they saw other living things as equal (Harari, 2015). Despite the agricultural revolution that makes humans superior to other species, the built environment development was largely in harmony with nature. Because, human interacts directly with nature and tries to create balance while it struggles for life. But after the Enlightenment, the human mind became important and the human-oriented perspective deepened. Human dimensions and symmetry began to be reflected in architecture, but standard user has emerged depending on production mechanisms. So, the standardized and easily controlled human is separated from the nature that cannot be kept under control. It pushed nature out of the city. Eventually, the duality arises when culture is being formed because it is not formed as a result of interaction

with nature. Human designs eventually redesign the human. Humans are gradually redesigned by their tools (Colomina, Wigley, 2017). This situation puts the built environment production in a vicious circle. Therefore, the architect only produces forms within the built environment. Architecture could not overcome its ideological crisis by only producing alternatives through form (Tafuri, 1976). Tafuri's claim is still valid today. Architecture cannot overcome the environmental crisis by producing alternatives through form. Consequently, the need to understand the human as a species was to understand environmental crises. But the evaluation of human as a species strengthens the universal user understanding that capitalism has put under pressure as nature is under pressure. This situation weakens the experience based perspective.

According to the second criticism of Chakrabarty, in the context of the user, the concept of species can lead to global uniformity. Species ontology accepts human as a biological community and does not differentiate. It is a radical human description like producing *Modulor* by Le Corbusier in 20th century. In early modern period, the organic structure of the physical environment that cannot be broken down is resolved. The organic is replaced by the mechanical. It makes the modern user independent, standardized and individualized. Understanding of flowing and freedom in the space saved the elements from being interdependent each other. Le Corbusier was reassembling his separation and forming a new pattern. However, this pattern went beyond the boundaries of daily life and perception and assumed abstract and systemic character. The user, who is a part of the whole, cannot grasp how it is attached to the whole, how it is a part of the functioning and flow, from its own experience and practice. Corbusier's dream was reciprocated in society as prismatic blocks and standard users (Bilgin, 2002).

On the other side, in species ontology, human and other species are independent, irreducibly equal parts. There is not

anthropocentric approach and knowing subject. It sees human beings as a total and homogeneous community. This ontology teaches how these communities relate to their physical environment in order to save the Planet. The standardization of the user whose boundaries are narrowed deepens, because human is also an agent.

Goldhoorn advocates standardization and sees the standardization as a way to bring good design to more people. He cares about this standardization, as the consumer has more choice today than ever before (Goldhoorn, 2009). The user is explained directly as a consumer and by offering options to the user; this view reduces its needs and expectations. However, although the standardization system is very necessary for shoes, cars or small kitchen appliances, the standardization of life cannot be appreciated. In addition, one of the tricks of the modern is user participation. Architect Alejandro Aravena, trying to propose a solution to contemporary social problems, made the Villa Verde Housing (Web-1) design in Chile to low-income people who lost their homes in an earthquake. In order to prevent slums, the state has allocated a certain budget for housing and determined the project area. Interior design, facade design and unfinished part of hundreds of identical houses of 40 square meters are left to the user. However, the boundaries are defined and the limited area has not been achieved with original results in the project. This example is given to show that architectural practice could not prevent standardization despite the effort to minimize the passivity of the user.

Stripping people from their social and spiritual identity deepens the problem of standardization of the user. Individuals should be formed both in solidarity and by differentiation (Guattari, 2000). It should be noted that people and their environment are not a standard subject, but like Certeau's pedestrians, Benjamin's flaneurs (Latour and Yaneva, 2013), living as a part of the world in a flow. Consequently, it is thought that the species view can

reproduce the user similar to the standard user profile in the early modern period and does not based on experience.

Transhuman Distinguishes Human from the Environment

According to idealist science or modern thought, mental superiority is important beyond the physical body belonging to nature. The singularity will allow us to overcome the limitations of our biological bodies and brain (Kurzweil, 2005). Transhuman wishes to overcome its weaknesses, to live eternally, to eliminate the derogatory flaws that connect human with nature by maintaining the idealistic thought. Non-ideal features and non-ideal things become other. The current architectural production and user profile seems to reflect the primitive form of this expectation. The user is detached from the context in different ways. Living and working spaces are similar to each other, the same room temperature in different seasons, the cactus, which is not affected much by environmental factors, is more involved in interior spaces, grass in every climate region, pets that look like a human rather than a cat or dog, technologic, non-traditional, uniform and increasingly perfect items, apartment sites that are the same and a world of their own, break off the context of people. Moreover, transhuman uses technology against environmental problems. It takes precautions to minimize the effects of the environment and develops itself in order not to be affected by the agents.

Transhuman is a different narrative of posthuman theory. This cyborg excites Haraway with the thought that she can remove the borders between living things and change the order, creating a world without ontology (Haraway, 2006). According to Harari (2015), this superior person will maintain the hierarchy. Transhuman is at the top of the species hierarchy, and there is not ideology at this view. If there are not people, the existence of the environment has not a meaning. In the twentieth century Le Corbusier's public housing projects like Unité d'habitation

that are detached from the ground and their gardens or common areas are located on the upper floors as a vertical environment (Colquhoun, 2002). In the second half of the 20th century avant-garde projects such as Archigram, Metabolism, spaceship, and biosphere projects were developed a different view for the city, against narrow bureaucratic views and elite aesthetics; ignored subjectivity and created their own controllable environment without being dependent on the environment. The Archigram emerged as a reaction to modern architecture and criticized uniformity using popular images. It created its own user profile. Metabolism has fitted the planet, which is an organism, into the living spaces it has designed as a metabolic structural structure (Colquhoun, 2002). They have established their own lifestyle and environment.

There is not practice of social revolution in the utopia after 1960. According to Tafuri, architecture had a political and social word and an ideal is over, only empty architecture remains (Tafuri, 1976). Here we can think of the transhumanism view of the user as a deeper form of anthropocentrism but not humanist. The development of technology and science directs the human and the user instead of human values. This approach does not just ignore context like the early modernist view. It creates its own context, environment and culture. It doesn't use the ideal human, it creates the superhuman. It creates living, walking, and floating buildings and cities. It claims to save the planet or create its own planet. The space produces the user and the user produces the space. As Tafuri mentions the transhuman creates its user and environment as an empty architecture.

Posthuman Philosophy, Anti-anthropocentric Humanism

Post-anthropocentrism displaces the notion of a single, standard male human being as the measure of everything and an interspecies hierarchy (Braidotti, 2013). But almost all tendencies of architectural theory of twentieth century define the standard

human. Almost nowhere in Modulor has the historicity of the human body, evolution of the species, geographical distribution, anthropometric and cultural differences (Şentürk, 2007). Certain proportions of male human standardize the people and neglecting other-than-human in early modern architecture. Moreover, the human body was not shaping the design; it was the design aimed at sculpting and correcting the human body. The Anthropocene perspective requires us to reconstruct the user definition that we describe today from inside of design.

Unlike species and transhuman concepts, posthuman philosophy has a vital, experimental and materialist perspective. To redefine the standard user, we must look at posthuman philosophy and experimental architecture. As Deleuze said the experimentation that lies in the passions and their fictitious of expressions allows us to go beyond our identities and see society as an experiment, not a contract (Rajchman, 2000). We can see a kind of experimental empiricism in Aldo van Eyck's playground designs. The Users of Aldo van Eyck are children; its space is right inside the city. It has no boundaries separating the playground from the rest of the city. And further Van Eyck designed and created game spaces, accepting and taking advantage of all restrictions on the city's neighborhoods (Lefaivre and Tzonis, 1999). He did not use standard playground equipment, because the emphasis on functionality in the playgrounds was killing children's creativity. Therefore Aldo van Eyck was creating parks that allow for experience instead of standard functional design. Similarly, a city with a functional standard kills the creativity and differences of people, makes them look like each other and the city, and standardizes them. As a result, we may instrumentalize the experimentation that Aldo van Eyck provides to the child user, enabling the user to experience, find itself, express itself, let it ask questions and produce answers.

Other species and the earth surround people in an experimental place. In this place coexistence replaces anthropocentrism

in the Anthropocene. Therefore, it is necessary to expand the definition of the user. As establishing new relationships, the elements of this new construction, as Deleuze tells it, will not be like puzzle pieces with boundaries, but like the add up stones without plaster of wall (Deleuze, 1998). The person is a singular piece (Deleuze, 1998); the tree, the stray cat and the pet dog are also singular pieces. These singulars come together with random encounters and joyful passions. It is unclear who the user here is. The spaces are intertwined. In order to construct this intertwined space, we have to take the user with an empirical materialist perspective and get ahead of the priority of ideal human consciousness. Empirical thinking can also be noticed in Peter Zumthor's architecture. Zumthor deliberately ignores the duality between body and consciousness and only tries to create living spaces (Füzesséry, 2013). Zumthor thinks the user's perceptual abilities are far beyond signs and symbols. According to him, it is very difficult to focus on consciousness when we enter a space; instead we apply to our experiences and senses. Zumthor has no worries thinking about the environment or other species deeply, but his empirical understanding of design can be instrumentalized. Thus, when we do not put human consciousness in the foreground, we will overcome the barrier between us and other-than-human. Harrison, with a concern for posthuman architecture, includes other species directly into the design. Harrison's project, *The Birds and the Bees*, involves cement panels with texture and cavities as housing for pollinators. She recommends using the façade panels to think about the living space of other creatures and to make an interaction with them. She sees the environment as a problem and field of work of architect, and suggests changing the focus and understanding other living beings rather than being human-oriented (Harrison, 2017). In this way the boundaries between the other-than-human and the building are blurred. Such approaches should be adopted to establish the relationship between the people inside the building and the outside.

In the Anthropocene, people, cities and buildings can no longer be viewed as isolated objects. They should be seen as part of a whole, an environment or milieu. Colomina (2016) says in support of this view, the architect should perceive design not through the city but through geography. The concept of critical regionalism within architectural theory can be instrumentalized to understand design through geography, because Frampton suggests understanding local belongings, understanding universal contexts, and synthesizing them. Frampton (1992), while describing the critical regionalism concept, talks about architecture without boundaries and certain rules. This concept overlaps with posthuman being local and embracing technology and not being traditional. However, critical regionalism makes this debate through the duality of culture and nature. Critical regionalism can be recovered by removing this duality. In this way, the user of the geography or the region is tried to be understood in this context. PRES Constitución Masterplan (Web-2), Alejandro Aravena designed in Chile, does not make artificial set to be protected from tsunami. He designs the forest as a natural set or he just retreats and allows nature to continue living in its harmony. Waves, inhabitants of the forest and people became common users of the forest. He offered a geographical solution to geographical problems. It is thought that it may make a contemporary contribution to critical regionalism by expanding the user definition and not only harmonizing with the environment, but also including the environment in the coastal design of Aravena. He does not treat the environment with an external definition. Architecture should continue to look for ways to be united with the environment and to give it the opportunity to be a user. We must expand the user scale, design with experience and build for more-than-human.

Conclusion

When human is accepted as a geological factor and a biological entity, it is disconnected from social, economic, geographical and emotional ties. The species concept threatens to deepen the standardization of the user and dictates its boundaries. The concept of transhuman threatens to detach the user from the environment and while reproducing the user; it chooses a focus according to the functioning of technology and science. The concept of posthuman proposes to expand the concept of user.

Understanding this transformation is essential for the architecture, cities and the planet. Thinking the other and the environment becomes more important than ever. The thought that a singular architecture, discipline or concept could understand the complexity of today's built environment is invalid. And the conceptual frame of the user in architecture tried to decode mentions that we need to expand the user definition and remove our borders with the environment.

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Web-1, Villa Verde Housing in Chile, designed by Aravena,

<https://www.archdaily.com/797779/half-a-house-builds-a-whole-community-elementals-controversial-social-housing/580897ebe58ece3c66000190-half-a-house-builds-a-whole-community-elementals-controversial-social-housing-image>

Web-2, PRES Constitución Masterplan, <https://arquitecturaviva.com/works/plan-urbano-pres-constitucion-1>

S.02

BEYOND THE
DUALISM OF
MAN - NATURE

Arks. Architectures of Retention

Ark; Prevision; Retain; Coexistence; Refoundation

Alberto, Petracchin

Politecnico di Milano, Milan, Italy
albertopetracchin@polimi.it

The essay considers the figure of ark architecture as a possible strategy for crossing those territories that today are undergoing transformations caused by natural entities after years of apparent stability. The text therefore develops as a triptych: the first part gives an account of an idea of the Anthropocene as an apocalyptic time where the future is uncertain and living is made possible only by suspending space and time, thus designing a coexistence between the human and non-human; the second speaks of the ark as a figure that emerges from this situation, reasoning on its actions and its content through cases from history and the contemporary; while the third concerns the three moments that the ark strategy designs to cross today's catastrophes with the aim of refounding a new world.

End Before the Beginning

Architectures, cities and territories are now crossed by transformations out of control. The advancement of forests, the intrusion of animals, floods, earthquakes and fires are changing the “territory of architecture” after years of apparent stability: the modernist certainty of a bright tomorrow gives way to unpredictable futures¹. Unprepared, therefore, in the face of the loss of the condition of order, we need strategies that by acting in advance and working over a long period of time can save those materials that could be destroyed but at the same time could be useful for designing new beginnings, as the earth could undergo a zeroing. The immersion in what Timothy Morton calls “Dark Ecology” questions architectures and tools able to anticipate the present while at the same time reviewing some positions of architecture from its foundations in the face of contexts defined no longer by the static data but by the emergence of natural entities which claim for space². We are therefore witnessing today the return of an ancient figure called the ark, seen as architecture to accumulate necessary treasures and ferry them to other destinies by suspending their use. The ark stands as a closed but ephemeral and defenceless architecture able to retain precious materials and block their ageing until they are released when necessary. Therefore, the Vitruvian notion of *utilitas* undergoes a twist in the sense of its possible suspension: architecture, which has always been built for the immediate, is instead designed in advance, to be put “on hold” and then “used” in a distant future. Living in the Anthropocene therefore becomes an expectation, literally a “tension towards”, a journey towards a destination,

1 On catastrophes and the apocalyptic dimension of the Anthropocene see Anna Tsing, Heather Swanson, Elaine Gan, Nils Bubandt (eds.), *Arts of Living on a Damaged Planet*, (Minneapolis: University of Minnesota Press, 2017).

2 “The Anthropocene doesn’t destroy Nature. *The Anthropocene is Nature* in its toxic nightmare form. Nature is the latent form of the Anthropocene waiting to emerge as catastrophe”. Timothy Morton, *Dark Ecology. For a Logic of Future Coexistence*, (New York: Columbia University, 2016), 59.



a look to what is yet to come, based on the future³. We find ourselves, to quote a drawing by Massimo Scolari, at “The end of the Story”, inside an “apocalypse” where “all is lost”⁴, suspended between the old and the new world: it is therefore the time of a new foundation cycle.

Everything is Ark

Considering the etymology of “ark”, its nature of guardian appears, of architecture that is secluded but that controls the existing keeping it within itself: originally the ark is a box to store valuables, so an architecture placed in the background, that is closed, that keeps its contents and frees them only when needed⁵. The relationship that the ark builds to coexist with today’s change is marked by restraint and no longer by

Fig. 1

Into the Storm.
Frame of *La mesure végétale*, 2015. Image by Fabien Giraud & Raphaël Siboni.

3 See the etymology of the Italian word “attesa” in www.etimo.it, consulted in 2020.10.25, and the text by Ugo La Pietra, “Architettura dell’attesa”, in *Argomenti per un dizionario del design*, (Quodlibet: Macerata 2020), 227-231.

4 See Aldo Rossi, *A Scientific Autobiography*, (Cambridge Massachusetts: The MIT Press, 1981).

5 “The concept of ark – from the Latin *ark*, box; compare *arcanus*, closed, secret – reveals the thought of the spherologically more radical space that men on the threshold of civilisation were able to conceive: that is, the internal world, artificial and closed, can become, in certain circumstances, the only possible environment for its inhabitants. With this, a new project is brought into the world: the idea of self-protection and self-circulation [*Selbstumgebung*] of a group with respect to an external world that has become impossible”. Peter Sloterdijk, *Spheres II. Globes*, (Cambridge Massachusetts: The MIT Press, 2014), 223.

the deployment of forces because of its principle of introjection. The position that the ark seems to assume with respect to the real is therefore a “behind the scenes” one, not so much a staging as other objects or architecture, but it can only fulfil its function by remaining hidden and thereby protecting its content. For thousands of years, rocks, earths, plants have encapsulated viruses, energy, gas and now they are certainly releasing them: everything is ark⁶. Consequently, what the ark designs is a backstage, a mystery at work, thus providing a different use of architecture and contexts.

At the same time, the ark is an ancient figure, an archetype that has always been the same. The violence that its return exerts on the idea of the “project” marks a reversal of the trend. The ark speaks of a project that takes us back to the beginning when the project is always a “throw ahead”, intervening rather than tampering with the timeline because some things that happened and were recorded can be deleted or changed; we can tell another story with the fragments modified by us or by time.

The ark has its roots in mythology but keeps together the remote past with tomorrow, the extremely old with the future, and somehow seems to precede the notion of architecture⁷. Its first appeared in the *Bible*, where all its characteristics are already present both in terms of its construction and process, strategy and context. Athanasius Kircher’s translation of the biblical story into an architectural treatise reiterates the moments that the ark goes through to act within the flood, describes its content,

6 Our houses are today called to protect us from threats that come from outside, or from an outside that is no longer breathable: therefore, not only, as Hans Hollein stated, “everything is architecture” but “everything is ark”. On the multiplication of the arks and their pervasiveness see also Emanuele Coccia, “The Astral Ark of Tomás Saraceno”, in *Aria*, (Venice: Marsilio, 2020), 31; on the construction of closed worlds and immunological bubbles see the trilogy *Spheres* by Peter Sloterdijk.

7 “The alphabetical order of the Encyclopédie that called for the entry ‘Ark’ to come just a bit before the entry ‘Architecture’ was, in the end, neither fortuitous nor arbitrary. Architecture could only find its place after the Flood – or rather, in its stead”. Hubert Damisch, “Noah’s Ark”, in *Noah’s Ark. Essays in Architecture*, (Cambridge Massachusetts: The MIT Press, 2016), 23.

and at the same time emphasises its mystical root, its ability to produce prophecies⁸. Populations have always used this architecture to save materials or to accumulate basic necessities: for example, granaries, storage cities and iceboxes responded to a need for survival, to preserve what could deteriorate⁹; sometimes the content is sacred and is put on hold for religious reasons as in the case of Shrinath Gaushala in India, the temples where the sacred cows are protected. During the Second World War the practice of hiding works of art inside architectures or hollow spaces like mines was recurrent. The Sassocorvaro fortress designed by Francesco di Giorgio Martini, for example, was used to save some works of art from the advance of the Nazis, in view of better times. Architecture must save a precious content while at the same time depriving territories of their presence, in essence to make space and simulate an untraceable disappearance. The works were sealed inside the fortress, in a controlled atmosphere, for more than five years, except to be released at the end of the war. In this case the very absence of the context contributes together with the absence of an exit to hide the position of an architecture that should not be known¹⁰.

Similarly, during modernism the *Ville Verte* is designed by Le Corbusier as “first ecology” where the environment is freed from architectures and people locked inside them, while in postmodernism the accumulation is made up of fragments and architecture is a metaphorical ark used by different authors not to collide with the reality’s storm¹¹. The radical architecture, with

8 See Athanasius Kircher, *Arca Noè*, (Amsterdam: Janssonium, 1675).

9 You can find traces of these ark architectures coming from the world of folklore in Bernard Rudofsky, *The Prodigious Builders*, (First Harvest: Harcourt Brace Jovanovich, 1979), in particular in the chapter *Storehouses, cereal and sepulchral*, regarding deposits and reserves of assets useful for survival.

10 The story is documented in Salvatore Giannella and Damiano P. Mandelli, *L'Arca dell'Arte*, (Milan: Editoriale Delfi, 2009).

11 “Il tuo sottile intuito ha permesso a Paolo Portoghesi di costruire alla Biennale di Venezia la nostalgica ‘Via Novissima’, quell’enorme arca di Noè dove sembrano saliti tutti gli architetti prima della prossima tragedia: che paesaggio troveremo quando, finita la tempesta, torneremo a frequentare il mondo?”. Alessandro Mendini, “Lettera a Charles Jencks”, in *Progetto infelice*, (Milan: Ricerche design editrice, 1983), 103.

the experience of Superstudio, has also been confronted with the problem of the ferrying into the future entire cities, in particular with *Salvataggi dei centri storici italiani (Italia vostra)*¹² a vision that precedes the projects of large-scale engineering arks such as Mose in Venice. However, it is Massimo Scolari who takes up the figure and builds it literally, even if reduced in scale, at the Triennale di Milano in 1986, with the title *The Collector's Room*. Scolari's ark is immersed in still, windless, icy landscapes, waiting for a near catastrophe, or immediately after it. Together with the glider, which flies high in search of distant signs like the dove freed by Noah in the biblical story, the ark is a figure fleeing from a tragic and apocalyptic condition, a certain announcement of a cataclysm but also and above all of another world, of a new promised land¹³.

Considering the contemporary, a certain idea of the future returns after the end of utopias¹⁴. Some architectures today are indeed arks, because they try to capture something dangerous to keep it inside forever, like a landfill, sometimes setting up conservation in reverse. The construction of the sarcophagus of Chernobyl, or bunkers like those under construction today in America or Switzerland, question this ancient figure, an archetype, necessary to build a story in places where it is missing or that could lose it, and at the same time to propose projects built on the future and capable of acting in the long term¹⁵. The

12 See Superstudio, *Opere 1966-1978*, edited by Gabriele Mastrigli, (Macerata: Quodlibet, 2016), 322-347.

13 About Massimo Scolari's Ark see for example Rafael Moneo (ed), *Hypnos: Massimo Scolari, Works 1980-1986*, (New York: Rizzoli, 1986).

14 "From this perspective, only a return to explicitly utopian thinking can clarify the minimal conditions for the preservation of human solidarity in face of convergent planetary crises. I think I understand what the Italian Marxist architects Tafuri and Dal Co meant when they cautioned against 'a regression of the utopian'; but to raise our imaginations to the challenge of the Anthropocene, we must be able to envision alternative configurations of agents, practices and social relations, and this requires, in turn, that we suspend the political and economic assumptions that chain us to the present". Mike Davis, "Who will Build the Ark?", in *New Left Review*, 61 (2010), 45.

15 For projects based on long-term actions see Benno Albrecht, *Conservare il futuro. Il pensiero della sostenibilità in architettura*, (Padua: il Poligrafo, 2012).

Svalbard Global Seed Vault, for example, is an architectural and political project, the result of a security decree issued by the FAO in 2001 to safeguard natural genetic heritage¹⁶. This ark, designed by architect Peter W. Söderman and built in 2008, takes its name from its location, the Svalbard Islands archipelago, chosen to increase the degree of security of the architecture: the territory itself is safe due to the lack of earthquakes, tsunamis, wars and is used as a shell of the architecture itself and to protect its contents. The entrance, the only visible part of the entire structure, is marked by the presence of a cavity in the reinforced concrete structure, a cantilevered tunnel with a constant rectangular section, connected to the adjacent land by a steel drawbridge. The ark itself is hidden, consisting of a tunnel excavated entirely in the permafrost, about 200 metres long and with variable sections in thickness and height, which leads to a further tunnel connected to the three seed deposits, 10 metres wide and 30 metres deep, sealed and closed by two reinforced concrete walls and steel cages. The space available for seed collection is 1000 square metres in total, maintained at a constant temperature of -18° thanks to the permafrost. Here, the architecture's mission is to protect something strictly necessary and in case of climate crisis, famine or war, to intervene to replace a shortage of resources. Despite its size and location, this architecture therefore reasons on a large scale, stores the necessary material inside and then pervades the existing becoming a device of garrison. There are times when it is necessary to suspend the use of some things, as a result of which space is freed, and other times when a liberation of content occurs and the space is occupied, refounded as in a new genesis.

16 You can find trace of the project in Cary Fowler, *Seeds on Ice*, (New York: Easton Studio Press, 2016) and in the film by Fabien Giraud e Raphél Siboni, *La mesure végétale*.



Prefigurations, suspensions, releases

The strategy of the ark involves a temporal dynamic that consists on a triad composed of anticipating reality, suspending time and pervading the existing, with the final objective of refoundation.

Anticipating reality deals with the foundation of the ark starting from a prediction of a tomorrow expected to be tragic. We need to ask ourselves about possible forecasting practices because in the absence of instruments we could remain unprepared in the face of catastrophes¹⁷. Data centres are, for example, a particular type of ark because they serve both to save something in literally vacuum-sealed spaces (files, codes, lost worlds on the net, etc.) but also to predict the future thanks to the content within (weather forecasts, upcoming earthquakes, etc.). At the same time, Mike Davis' question "Who will build the ark?"¹⁸ with what remains of our world today is at the centre of the foundation of this figure: it is a question of choosing things not to be missed for the future, and then to deprive ourselves of them today.

17 For forecasting tools and methods see Charles Jencks, *Architecture 2000. Predictions and Methods*, (London: Studio Vista, 1969).

18 "Left to the dismal politics of the present, of course, cities of poverty will almost certainly become coffins for hope; but all the more reason that we must start thinking like Noah. Since most of history's giant trees have already been cut down, a new Ark will have to be constructed out of the materials that a desperate humanity finds at hand in insurgent communities, pirate technologies, bootlegged media, rebel science and forgotten utopias". Mike Davis, "Who will Build the Ark?", in *New Left Review*, 61 (2010), 30.

Fig. 2

A Waiting Land.
Frame of *La mesure végétale*, 2015. Image
by Fabien Giraud &
Raphaël Siboni.

In Davis' idea, the ark is a collection of waste materials, of forgotten things that we want to save. We are talking about architectures built starting from choices of what is necessary, that reveal their strength in the sense of restraint, of a wait that is a choice of time in which to act, therefore a project of coexistence to establish alliances with the new reality. Of course, what remains to be considered is how this prediction will be realised, if it is reliable, if what is predicted will happen, but what is interesting is that the ark is planned with a possible future ahead of it, a possible destiny. To do this, two forgotten terms of architectural design return to the scene: "choice" and "necessity"¹⁹. The choice of what to bring in the future, its selection, is a mechanism of participation: who chooses what to put in the ark is the author of the project, certainly then the memory will change that object and the authors will lose track. The architectural project is always a selection of the real, a choice that collects the necessary tools for its realisation, to bypass the present with what is available.

The second moment of the ark is the crossing of those contexts that are changing. The ark is called to interact with even traumatic changes of places. The seal, the total absence of an exit defines the importance of what is housed inside but of course during the "flood" the shipwreck is always possible. As Damien Hirst tells us in his 2017 Venice exhibition "Treasure from the Wreck of the Unbelievable", it is always possible, even after losing treasures and memories, to start drawing another story in which those found fragments become an architecture that is different from what was designed. The ark is submerged but its contents can be collected when the time distance has changed its memory and value: "what has been lost", or that has remained secret for years, can return to upset the already known coordinates. At the same time, what is housed in the arks must

19 See Alberto Bertagna, Sara Marini, Giulia Menziotti (eds.), *Memorabilia. Nel paese delle ultime cose*, (Rome: Aracne, 2015).



be “frozen”: like the “enclaves in time” that Lynch talks about in his *What Time is This Place?*²⁰, the ark goes through the places while they change, remaining “suspended”, sealed but defenceless, retaining its contents.

The third stage is finally marked by the progressive opening of the architecture. The trauma is over, the ark is dismantled, and its content is freed to pervade and change the existing.

Today, the ark is also a very normal architecture. Everything we have built is transformed by catastrophes into this ancient figure of survival: spaces, once common places, build distances as new forms of community. Perhaps we need a new pact with science to investigate how architecture can cultivate within itself the life to be carried towards other destinies. It is therefore a matter of suspending “the use of the bodies”²¹ to “abandon spaces” to bring in the future those treasures that will serve to refound future new worlds [Fig. 3].

20 In the chapter “The presence of the past” the author shows the example of Robert Scott’s Antarctic hut, unused since his death during an expedition, which still survives intact after a hundred years in the polar cold: the papers, the food, the objects are exactly as they were. See Kevin Lynch, *What Time is This Place?*, (Cambridge Massachusetts: The MIT Press, 1972), 32.

21 See Giorgio Agamben. *L’uso dei corpi*. (Vicenza: Neri Pozza, 2014).

Fig. 3

Entering the Ark.
Frame of *La mesure végétale*, 2015. Image
by Fabien Giraud &
Raphaël Siboni.

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S.02

BEYOND THE
DUALISM OF
MAN - NATURE

Biodiverse Futures: Strategies for an Ecological Speculative Design Practice

Speculative Design; Biodiversity; Ecosophy; Queer Ecology; Queer Futures.

Craig Jeffcott

UNIDCOM/IADE, Lisbon, Portugal
craig@biodiverse-futures.org

This paper presents some of the early research of a doctoral research project that aims to locate an ecological and more-than-human speculative design practice in the futuring strategies of non-normative and ecological communities. The project takes as a starting point criticisms of speculative design practice that it lacks impact and diversity of practice, alongside the biodiversity crisis which is itself a deficit of diversity: the hope is that by drawing on ecosophy, queer ecology and queer futurity, new approaches for speculative design that can take action against the biodiversity crisis can be found. This will take the form of situating new design tools and techniques within existing futuring strategies of communities outside of the cultural mainstream or who are engaging with environmental and biodiversity issues. This paper discusses some of the ontological framings that underpin this research, in terms of temporality, materiality and relationality, the strategic goals of care and activism, and strategies that draw on play, storytelling and speculation to potentially imagine new and more diverse worlds through novel speculative design practices.

Ecological Speculative Design

Speculative design isn't a design discipline as much as it is a subjunctive gesture, the use of design to imagine and materialise alternative presents and unexpected futures, to ask, answer and debate "what if?"¹. It shares this gesture with its sister practice of speculative fiction, but with a materiality that speculative fiction in literature lacks and that speculative fiction in film deploys in the service of a narrative; speculative design doesn't tell stories, so much as tell worlds².

Speculative design has been criticised for the lack of diversity in the way that it is practiced, often with proposed futures originating from privileged, normative practitioners (human, white, wealthy, male, straight) that are insensitive to the lived realities of other beings³. This resonates with an environmental crisis where biodiversity is being destroyed through privileged human activity, leading to a monoculture that is unsustainable, and unsustainable, to continued life on earth⁴.

An ecological speculative design should act to transcend this monocultural future, and to do this it needs to draw on strategies of care and activism that come from less privileged categories that blur or even deny that such category divisions exist, and that radically reframe the relationships between individuals and the natural world; in return, speculation, in fiction and design, can be a tool to situate and explore these outsider futures in rewarding ways⁵, and as a design practice can materialise futures that are often fleeting and ephemeral.

1 Dunne and Raby, *Speculative Everything*.

2 Sterling and Bosch, Sci-Fi Writer Bruce Sterling Explains the Intriguing New Concept of Design Fiction.

3 Prado de O. Martins, 'Privilege and Oppression: Towards a Feminist Speculative Design'.

4 Brondizio et al., 'Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services'.

5 Lothian, *Old Futures: Speculative Fiction and Queer Possibility*.

Such strategies can be found in communities outside of the mainstream and different from the human-centric ‘normal’ (or non-normative), and those that are engaged in environmental practices and activism; this research aims to locate such approaches within ecological and queer discourses (queerness representing in a narrow sense the experience of people outside of the relational and subjective norms of heterosexual and cisgendered society, and in a wider sense a general ‘resistance to the regimes of the normal.’⁶). It draws on Felix Guattari’s Ecosophy, that argues that the subjective, cultural and natural worlds are a singular world in crisis, to which the only response can be a collaborate radical rethinking of the ways in which we relate to each other ⁷; on Timothy Morton’s *Queer Ecology*, where he argues that the queer gesture is to challenge and transcend cultural limitations and dichotomies, and that such a gesture should be applied to the unnatural category of nature, worrying away the distinctions between all living beings, the technological and the inanimate ⁸; and on José Muñoz’s conception of concretely utopian *Queer Futures*, in which queerness is itself a futuring gesture, a way of imagining and enacting a better world—a queer future—that is contemporaneous with the normative present from which queer beings are largely excluded ⁹.

Worlding

In orienting to this new territory of queerly ecological speculative design, it is necessary to consider on what ontological terms that territory is defined: to ask, what is the world? Arguments can be pulled together across theoretical texts to show the particular worldview in which this work is situated, in material, relational and temporal terms.

6 Warner, *Fear Of A Queer Planet*.

7 Guattari, *The Three Ecologies*.

8 Morton, ‘Queer Ecology’.

9 Muñoz, *Cruising Utopia*.

What is matter, and what matters about it? Mackenzie Wark suggests that we can consider matter as molar, as discrete entities, or we can consider it as molecular, as continuous. A molecular view of matter is to consider flows and gradients, to consider an ecological whole—the transfer of molecules from place to place, from form to form. By viewing the contemporary crises, environmental and otherwise, through this lens, we can see them as a sort of “molecular rift”, where these flows have become seriously imbalanced.¹⁰

Timothy Morton picks up this thread, considers what it means from a queer ecological perspective. A world of flows challenges the notion of clearly delineated bodies, places, abstract concepts, binaries and divisions: this is at heart a queer gesture, to challenge assumed binaries and prescribed ways of being. And it is also a fundamentally ecological one, where divisions between organisms break down at all levels, and where any sense of demarcation between nature and the human or artificial is meaningless. He invokes the term ‘strange stranger’ to describe the multitude of beings and the way in which they meet each other in a mutual state of strangeness.¹¹

So, moving from matter to beings, then - what is it to be a being, in this world of flows of matter into forms? If matter is continuous, and sharp demarcations are illusory, what does it mean to be? This answer may be entangled with what it is to relate to other beings. Karen Barad draws a radical perspective out of Niels Bohr’s quantum theory: beings emerge out of their encounters with one another and do not pre-exist their encountering. She describes these encounters not as interactions (actions between) but intra-actions (actions within); rather than two pre-existing beings having an encounter external to their being, it is

10 Wark, *Molecular Red: Theory for the Anthropocene*.

11 Morton, ‘Queer Ecology’.

the encounter of particular flows and configurations of matter that are internally configured into being by each other.¹²

These encounters and intra-actions have a temporal dimension: they possess duration—a transition from one state to another. The temporality of this world has a particular character of flatness, the sense of the future and the past coexisting in the present. This idea has been described as the long now, or the thick present; that since all that is accessible to us is the present moment, the past and the future exist within that present—as memories, as ideas, as possibility.¹³ There isn't a single future, but multiple possible futures; and equally, the past isn't simply a singular objective historical record of all prior events, but a plurality of experiences, memories and stories. The full past history of the universe, or the sum of potential futures, is not accessible to our lived experience as beings in and aware of time; what we know of time is ultimately the meaning and context it gives to our lives. As such, we don't exist in a perfect present moment, but as F Scott Fitzgerald suggested, “we beat on, boats against the current, borne back ceaselessly into the past”¹⁴—and on, ceaselessly, into the future.

The flow of time, then, can be thought of not perhaps as an objective, ordered progression of seconds into hours into years, but as something more subjective, flexible, where the things that happen are more important than when they happen; time as measured by events, not seconds.

Strategies

A strategy, as it is usually defined, is a plan for achieving an overall goal; in effect, for achieving a particular future. In the framing of this world, and the challenges it faces, the future in

12 Barad, *Meeting the Universe Halfway*.

13 Michael, 'Futures of the Present: From Performativity to Prehension'.

14 Fitzgerald, *The Great Gatsby*.

question is one with a biodiverse and culturally diverse ecosystem: a thriving, living planet. Strategically, that implies two reciprocal goals: to take care of the ecosystem as it is, and to take action or work towards repairing, maintaining and protecting it.

It is a question then of strategies of care, and strategies of ecological activism. What care is and what it implies is a topic that is beyond the scope of this paper, and has been well treated in the critical literature, most notably, in Bellacasa's *Matters of Care*¹⁵. Strategically, the focus here is slightly more practical; what are the ways in which the world can be cared for? Some of these will be explored in the strategies to follow.

Taking action for biodiversity—biodiversity activism—can be framed as the work that needs to be done in order to protect the diversity of our communities and ecosystem. Wark views work in the Anthropocene as a framing of the traditional Marxist labour perspective in terms of a material nature, where nature is simply that which labour encounters, and where “the challenge ... is to construct the labour perspective on the historical tasks of our time. What would it mean to see historical tasks from the point of view of working people of all kinds?”¹⁶ In effect, she argues that the collective labour of mankind is to manage the molecular rift—the imbalances in the flows of matter in the world—to take action to protect the ecosystem.

Guattari and Muñoz both consider the importance of such collaborative working and being together in their strategies for survival. Muñoz puts the concrete utopian ideas of Ernst Bloch at the heart of his queer futurity; utopias that aren't abstract thought experiments of perfect futures, but better worlds and futures that are hoped for, and that can be manifested in the present through collective, incremental action.¹⁷ Donna Haraway echoes this with her invocation of “lives that are relentlessly

15 Bellacasa, *Matters of Care*.

16 Wark, *Molecular Red: Theory for the Anthropocene*.

17 Muñoz, *Cruising Utopia*.

engaged in making living and dying work.”¹⁸ – in the sense, perhaps, that living and dying is something that we must make meaningful and functional, but a more playful reading circles back to Wark and Muñoz, that the work that all beings are relentlessly engaged in is living and dying.

What then are the strategies of care and work or action that may be useful to a speculative design practice that can intervene in community environmental? A particularly helpful orienting text has been “Tools for Multispecies Futures”, a discussion between Donna Haraway and Drew Endy, where they discuss the ways in which we might take better care of the world and the beings within it; they identify the tools or strategies of narrative and play as especially important;¹⁹ to these I also include speculation itself.

Storytelling is an important aspect of this framing of the world, drawing together material interactions, beings, time and place. A story is an account of matter and beings interacting in a particular place, over time. It locates beings in a context, but is in itself a participant in the ongoing context and story; it can tell worlds and shape worlds, and can be a powerful tool for engagement.

Haraway and Endy discuss the importance of both storytelling and storylistening as multispecies caretaking activities. Haraway argues that sharing stories generates a reciprocal ethical responsibility; that by finding joy in hearing a story we then have an ethical responsibility to the story and the storyteller. They talk about how stories are the way that people give meaning to their lives, and that taking care of your people and your land starts with taking care of stories.²⁰

18 Haraway and Endy, ‘Tools for Multispecies Futures’.

19 Haraway and Endy.

20 Haraway and Endy.

Another strategy of taking care is play. Returning to Barad's conception of beings that emerge from their intra-actions²¹, Donna Haraway has described these sorts of processes as essentially playful: encounters as processes of composing and decomposing, a mutual discovering that leads to new forms and beings, and that is essentially a caretaking process, "taking care of their connections in the world".²² This central role of playfulness is present in Muñoz's discourse, where he suggests that the process of queer future making is essentially a form of play, or performance, and that new and better futures can be manifest in playful acts and gestures. This queer playfulness can often have a sexual quality to it, a way of taking care through tending to the most intimate connections between beings.²³ Morton also emphasises these radical intimacies: the Anthropocene era forces us into a 'politicised intimacy with other beings ... such intimacy necessitates thinking and practicing weakness rather than mastery, fragmentariness rather than holism, and deconstructive tentativeness rather than aggressive assertion."

Finally, speculation as a strategy hovers somewhere between storytelling, time, and possibility. It is storytelling in the subjunctive mode, telling rich narratives of the possible presents, pasts and futures. This gesture is central to Muñoz's queer futurity, where queer subjects, being outside of the mainstream and a present that is not designed for them, must enact and imagine better futures within that present; it is a gesture on the one hand speculative and ephemeral, and on the other, material and practical.²⁴ There is a parallel here to Afrofuturism, another non-normative speculative practice: Ytasha Womack explains that it is a speculative fiction form that imagines an alternative history for black people, in which the traumas of slavery and prejudice do not figure within black culture; within these alterative pasts the

21 Barad, *Meeting the Universe Halfway*.

22 Haraway and Endy, 'Tools for Multispecies Futures'.

23 Muñoz, *Cruising Utopia*.

24 Muñoz.



possibility of cultural healing in the present is offered as well as the potential of more hopeful futures.²⁵

Ongoing Work

In this doctoral research project I aim to explore and trace out these strategies across the three domains of critical discourse, speculative fictions, and community practices, with each offering a contrasting perspective on this topic. From critical discourse comes an ontological perspective—a particular way of framing and defining the world—and a discussion of the sorts of goals and strategies for ecological action. From speculative fiction I anticipate an animation of these goals and strategies in a rich and multifaceted way, evoking other possible worlds or futures as ideas to be played with, and from community practices I hope to find material, practical and contextual examples of people and other organisms making and being in the world.

As the research project progresses, I hope that new tools for an ecological speculative design can be rooted in these non-normative strategies of care and action, and that they can help to materialise some of the community and speculative strategies that are described here, helping communities to take effective action against the biodiversity crisis.

Conclusion

This is an ongoing and evolving work, and through participative and desk-based strands of research a loose taxonomy of strategies is starting to emerge. With the non-categorical, blurred distinctions ethos of the project, this taxonomy is not one of discrete categories of strategies, but of broad qualities that intermingle and cross-pollinate each other. Emerging strategies exhibit temporal, narrative, relational, caretaking and playful

25 Ginsberg et al., 'Future Shaped By Pasts That Could Have Been'.

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S.02

BEYOND THE
DUALISM OF
MAN - NATURE

Natural Glitch

Anthropocenic Design; Georeferenced Data; Data Visualisation; Natural Factor; Speculative Design.

Luca Barbieri

Università di Bologna, Bologna, Italy
luca.barbieri17@unibo.it

Alberto Calleo

Università di Bologna, Bologna, Italy
alberto.calleo@unibo.it

Giorgio Dall'Osso

Università di Bologna, Bologna, Italy
g.dallosso@unibo.it

Ludovica Rosato

Università di Bologna, Bologna, Italy
ludovica.rosato2@unibo.it

The era of data has been built: every single particle is an elemental description of a fact. Data produced by a large number of devices and sensors contribute to the constant accumulation of information. The morphology of our planet has been mapped by overlapping satellite images and GIS data. The built environment has evolved into the space of flows in which the digital dimension is a new interface that allows us to experience the city and the relation it offers us.

In this dataist context, this paper investigates the possible use of big data and artificial intelligence as tools for the transition from a utilitarian and anthropocentric dimension towards an anthropocenic design culture.

The scope of the article is to analyse how such tools can be used as amplifiers of the weak signals of climate, social and cultural change in order to create readings, interpretations and narratives of the complex systems in which we live.

With natural glitch we hypothesise a metamodel for future experimental research which combines citizen sciences, environmental sciences and humanities. The *overground agorà* is the substrate that allows the genesis and evolution through time of the natural glitch while the activators and interfaces already present in the environment are the touchpoints through which it manifests.

Data pervasiveness and data in the anthropic space

The continuous production, storage and processing of data is an ever-accelerating global phenomenon that is having a transversal impact on human activities and the ecosystem. In recent decades, the morphology of our planet (and beyond) has been mapped by overlapping satellite images, aerial photographs and GIS data and made available online through numerous virtual globes. In these digital models, numerous levels of information are stratified, covering fields ranging from the infrastructural network to climate data. The design and management tools of the cities and environments we live in are now also data and metadata collectors that parameterise the components of the architectural and urban project¹. Integrating sensors into objects and means of transportation, the spread of wearable devices and IoT devices, together with their networking, contribute to the constant accumulation of information². It is estimated that by 2025 there will be more than 150 billion connected devices

1 Savage, Adam. "How China Cloned Shanghai".

2 Jenkins, *Cultura Convergente*, XXV.

exchanging data in real time which will account for the 30% of the whole datasphere³.

The model theorised by Bruce Sterling of SPIME⁴, which is an object whose position in space and time can be determined at every moment of its life cycle through research in the cloud, is an increasingly shared reality thanks to the spread of CAD to CAM, RFID, GPS, IoT technologies and research in the context of Life Cycle Assessment⁵.

The influence and importance of data transform economy, society and experiences. In the big data economy, market operators mine value from data to enhance processes, products and services⁶; the perception of global phenomena narrated by *infographic design*⁷ and *visual & data journalism*⁸ through big data influence the behaviour of communities and individuals⁹; the communicative experiences that are achieved through the transmission of data modify the emotionality with which they were expressed¹⁰.

Equally relevant is the impact on the environment of the technological infrastructure necessary to keep digital networks active. Energy-consuming servers¹¹ and the demand for ever more performing hardware has an impact on the environment in terms of electricity production, extraction of new raw materials and disposal of e-waste. Furthermore, if the current pandemic crisis is

3 Reinsel, Gantz and Rydning. "The Digitization of the World From Edge to Core".

4 Sterling, *Shaping Things*.

5 McFedries, "The Age of Spimes".

6 European Commission, "Communication on Building a European Data Economy".

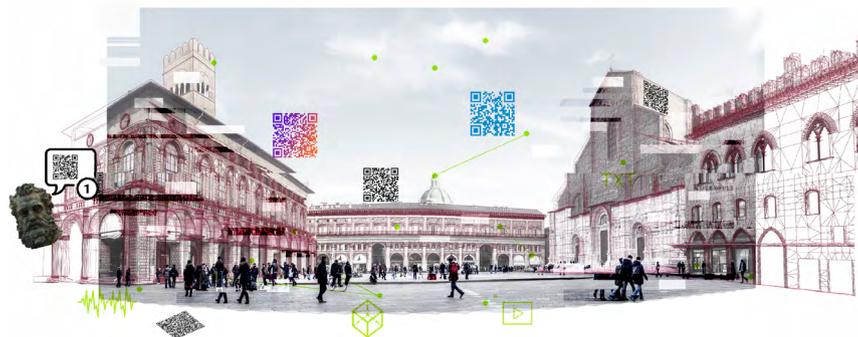
7 Lima, *Visual Complexity: Mapping Patterns of Information*.

8 Per Mollerup, *Data Design. Visualising quantities, locations, connections*.

9 Grandi and Piovan "I pericoli dell'infodemia. La comunicazione ai tempi del coronavirus".

10 Rovers and van Essen, *HIM: A framework for haptic instant messaging*, 1313 – 1316.

11 Trueman, "Why data centres are the new frontier in the fight against climate change".



triggered by a natural virus, the next one could be the work of a computer virus and hit digital infrastructures¹².

However, the arrival of the Internet, with the networking of communication systems, use and creation of data, has not eliminated the human need to experience physical space. Rather, the latter has evolved by transforming itself into the space of flows¹³ in which the digital dimension is a new interface that allows us to experience the city, its services and the possibilities of connection and relation it offers us.

The GPS systems widely present on the devices with which we record, create and communicate information allow to enrich the data structure of the information relating to the geographical position in which it is created. Together with the other metadata that can be collected, the data is linked to the physical space in a precise manner, creating what Zannoni¹⁴ defines as the *overground agora* [Fig. 1]. An example is the SACHER platform¹⁵ which effectively demonstrates how the continuous stratification of digital information, georeferenced in real space, makes the

Fig. 1

This image represents data of the overground agora referenced in the city. Use the QR codes to explore some of the data that emerge in Piazza Maggiore, Bologna. Image Credit: © Barbieri, Calleo, Dall'Osso, Rosato

12 Carlo Bagnoli, "Fabbrica Futuro".

13 Ratti and Claudel, *La città di domani. Come le reti stanno cambiando il futuro urbano*.

14 Zannoni, *Progetto e interazione. Il design degli ecosistemi interattivi*, 33.

15 Apollonio, Rizzo, Bertacchi, Dall'Osso, Corbelli, Grana "SACHER: Smart Architecture for Cultural Heritage in Emilia-Romagna", 142 – 156.

virtual dimension of the data tangible while generating profound innovations in the management processes of cultural heritage.

In this dataist context, which identifies in the collection, possession, analysis and use of data the equivalent of ownership of the means of production¹⁶, and in which information is at the centre of a new technological revolution, it is worth considering if big data and artificial intelligence can become tools for the transition from a utilitarian and anthropocentric culture towards an anthropocenic dimension capable of changing the current paradigm of which man is the author¹⁷. Tools that, as already happens, can measure, analyse and analytically predict the anthropic impact but that can also be used as amplifiers of the weak signals of climate, social and cultural change to create readings, interpretations and narratives of the complex systems in which we live and will continue living.

Research objective: A new ecological consciousness through data.

This article aims to identify the foundation basis of a possible research path with the capability to merge the instances of researchers, municipalities, designers and other stakeholders. This line of research attempts to influence the awareness of individuals and communities in terms of their ecological behaviours by means of technologies capable of displaying such data flows in urban spaces. This reflection is aimed at finding investigation tools that allow designing to be placed in an anthropocenic context, which looks to the post-Anthropocene era and which overcomes the limits and paradigms of the anthropocentric approach.

Starting from the emerged contextualisation, in the following paragraphs the state of the art of designing tools used for

16 Harari, Yuval Noah, *Homo Deus: A Brief History of Tomorrow*, 450-546.

17 Celaschi and Casoni, *Human Body Design. Corpo e progetto nell'economia della trasformatività*. 12.

the narration of data flows in public spaces will be analysed. Afterwards, we define the characteristics of the natural glitch model and a proposal for it to become the foundation for future research.

Designing with data and space

Data driven design is a valuable understanding for deciphering the complexity of large data archives and systems. From the aggregation and graphic organisation of the data, models of reality are created that are suitable for highlighting otherwise hidden information, often not understandable if expressed exclusively through a numeric data.

A macro subdivision of the types of digital data generated and stored sees on the one hand the environmental data, linked to the measurements of the physical-chemical parameters of the ecosystem, and on the other hand the cultural data, generated as an expression of the social and creative action of the populations.

Climatologist Ed Hawkins, through the *ShowYourStripes* project¹⁸, identifies an effective language to communicate environmental data related to climate change to a wide audience. *ShowYourStripes* is a website capable of returning views of global temperature variations through the design of patterns that link colour to data. The succession of lines in the patterns creates an effective and universally understandable display of temperature variations over time.

This and other representations have become iconic instruments of denunciation for global movements of environmental activism; artists and creatives manipulate and apply these visualisations to artifacts of different nature as tools for a dialogue¹⁹.

18 ShowYourStripes. Accessed November 10, 2020. <https://showyourstripes.info>

19 Mark Hanson has painted his Tesla with colours representing average global temperature variation from 1850 to 2017. The *Enther Shikari* rock band used data visualisations made by Ed Hawkins for their concert stage design.

Another way to represent data in immersive reality is offered by *The Great Animal Orchestra* project by United Visual Artists. The partnership set out to celebrate the work of Bernie Krause, a soundscape ecologist who for 45 years has recorded the sounds of animals in their natural habitat, totalling 5,000 hours of sound from 15,000 species. United Visual Artists have made possible the visualisation of this amount of audio data through the creation of a museum video and audio installation where sounds are represented through spectrograms (the graphic representation of the intensity of a sound as a function of time and frequency) projected on to walls with references to the space and time in which the recording took place. The projection on to all surfaces of an environment has created a three-dimensional immersive experience.

The sound data related to the environments are also used in Topher White's *Rainforest Connection*²⁰ project. The project involves the deployment of old smartphones within the rainforests connected to a central data processing unit. Each smartphone collects audio data that is discriminated by artificial intelligence allowing it to identify chainsaw noises, animal sounds, gunshots. The data are then used to protect abuses in the territory and to study its characteristics.

Lev Manovic's research project studies the evolution of global cultural phenomena by exploiting the tools of data science together with those of media theory. With the term *geo media* it defines those *media objects* linked to a specific place through GPS coordinates²¹. This information, which we help to produce with our devices, becomes the object of investigation of cultural data analytics that allows cultural dynamics to emerge which, as happens with the processing of big environmental data, would remain hidden if not studied through this methodology. An

20 Rainforest Connection. Accessed November 8, 2020. <https://www.rfcx.org>

21 Manovich, "Hybridization". Software Takes Command.

example is the *On Broadway project*²² in which photos collected by some social networks and data on the use of taxis are used to give an interpretative and metaphorical reading of the social and economic dynamics of a complex and diverse portion of the city.

Sharing is a central theme in the *Building Hopes*²³ project of the *Accurat* collective co-founded by Giorgia Lupi, creator of the *Data Humanism Manifesto*²⁴. The study, in collaboration with Google Trends, aims to investigate the hopes of individuals and the community both from a cultural and environmental point of view, through an unprecedented collection and visual representation of data. Users who access *Building Hopes* see a digital space augmented by the built environment in which they can create geo-referenced virtual sculptures that represent their personal dreams. The sculptures are recorded in a specific time and space and are accessible to each user of *Building Hopes*. In addition to promoting the integration into the project of the subjective and authorial nature of the data also concerning the impact of humans on the ecosystem, it creates a stratification of data linked to the territory both physically and temporally. Permanent and accessible sculptures are the materialisation in a digital place of the emotional immaterial data²⁵.

The surfaces of the urban landscape are increasingly invaded by dynamic communicative artifacts. It is not just a prerogative of the advertising operations that become an integral part of the identity of the city, building an architecture of symbols rather than an architecture of spaces²⁶. It is also an expression of the research of data and media artists who, as in the case

22 On Broadway. Accessed November 8, 2020. <http://www.on-broadway.nyc>

23 Building Hopes. Accessed November 10, 2020. <https://buildinghop.es/>

24 Giorgia Lupi. "Data Humanism. The Revolution will be Visualized".

25 Similarly, the NormanAR project let users georeferenciate digital graffiti in a virtual space. Paterson, Alvarado and Jongejan. "NormanAR".

26 Venturi, Scott Brown and Izenour, *Imparare da Las Vegas. Il simbolismo dimenticato della forma architettonica*, 30.

of Refik Anadol's work for the Walt Disney Opera House²⁷, use architectural surfaces as supports for their visual installations elaborated with machine learning techniques starting from big data. Reminiscent of how Pop Art artists have reworked the old and the existing of the *commercial vernacular* to create new operas²⁸, the layering and historicisation of data in the *over-ground agorà* lets designers and contemporary data artists draw from the *digital vernacular* for their works.

Diegetic speculative investigation tools

The abundance of data to which it is possible to have access, for example through open data archives, and the ease of producing georeferenced data, also through bottom-up and open source projects, by means of service design, allow to create value from information linked to territories and collective memory through three approaches: generative, aggregative and narrative²⁹. The narrative approach is configured as an authorial reading and interpretation of the data and allows to contextualise the information in a complex and multidimensional scenario.

Design can have many faces and different goals, as suggested by Dunne and Raby in "Speculative Everything"³⁰. It can become a tool of investigation and be used to pose doubts and propose alternative answers to today's questions. Speculative design allows you to create narratives around ideas, suggestions and reflections on how the ecosystem, technological evolution and the human impact will shape the environment in which we will live. Cinematography can be used for this purpose. Examples can be

27 Walt Disney Opera House. Accessed November 8, 2020. <https://refikanadol.com/works/wdch-dreams/>

28 Venturi, Scott Brown and Izenour, *Imparare da Las Vegas. Il simbolismo dimenticato della forma architettonica*, 27.

29 Zannoni and Formia, "Geo-media", 126.

30 Dunne and Raby, *Speculative Everything. Design, Fiction, and Social Dreaming*, 2.

found in the work of speculative architect Liam Young³¹ and the scenarios designed by critical designer Keiichi Matsuda³².

The use of narrative devices to outline future scenarios is a practice typical of design fiction. Like the literary, cinematographic and video game medium, in Sterling's definition of design fiction³³ the diegetic prototype acts by means of suspension of disbelief. Although Sterling rightly emphasises attention to the word diegetic, and therefore to all aspects that contribute to giving shape and life to the scenario object of the designer's speculation, we would like to highlight another word that he uses in his definition and that it is typical of the designer's lexicon: prototype. The sphere of action of design fiction is between the space of ideas (of scientific theory and data) and that of their materialisation³⁴, a dimension in which the prototype is the main instrument of investigation and verification.

Designing through a narrative process is very useful when we become aware of the non-predetermination of the future, its unpredictability and the possible and incalculable repercussions that our actions (and lack of them) have on what will happen³⁵. It is in this perspective that the diegetic prototype allows us to evaluate unpredictable impacts, responses and solutions which, although not exhaustive of all scenarios, enable us to develop alternative visions to the deterministic and anthropocentric ones and more consistent with the demands of the Anthropocene dimension.

In 2012 Sterling claimed that the most effective medium of design fiction was the video³⁶ while earlier, in 2010, Lev Manovich

31 Young, "City Everywhere".

32 Hyper-Reality. Accessed November 8, 2020. <http://km.cx/projects/hyper-reality>

33 Bosh, "Sci-Fi Writer Bruce Sterling Explains the Intriguing New Concept of Design Fiction".

34 Bleecker, "Design Fiction".

35 Sinni, "I plausibili futuri del visual design".

36 Bosh, "Sci-Fi Writer Bruce Sterling Explains the Intriguing New Concept of Design Fiction".

noted how interactive media had become one of the most relevant mediums of the contemporary world³⁷. It is therefore important to emphasise how the technological evolution of the media, in terms of both accessibility and innovation, can have an impact on the understanding of data visualisation and make it the object of an innovative diegetic representation.

Building an anthropocentric design using data: the natural glitch

The idea that the environmental and cultural data settled in the digital *agorà* can be recalled and used to create immersive and interactive narrative experiences or, in turn, be the activators of sudden events and manifestations, is the basis of the natural glitch. The idea of using data fluxes within the urban space is suggested as a metamodel for future experimental research which combines citizen sciences, environmental sciences and humanities.

The process on which the natural glitch is based can be exemplified in the work of artist Moon Ribas. The cyborg activist⁸ has implanted sensors in her body allowing her to perceive the earth's seismic vibrations. Using the seismograph data transmitted to her body through activators, she creates performances and choreographies that allow to visualise the data through movement and dance. An extreme way of expressing numerical information in a more effective narrative way, where the sudden event of an earthquake is expressed through the medium - the artist's body - by means of a technological chain that starts from the global network of seismographs up to the activator implanted in her elbow.

The sudden manifestation of a signal linked to an ecosystem datum (but which our senses would not be able to perceive because it is too weak or too far away) suggests new ways to

37 Manovich, Lev. "Language of tomorrow".

activate alternative narrative dynamics. The environmental and cultural data therefore manifests itself as an anomaly, an alteration, a perception glitch. Therefore, a glitch that manifests itself through a design intervention on an electronic and digital system in the real and natural dimension of sensory perception.

In this sense, the *overground agorà* is the substrate that allows the genesis of the natural glitch and the activators and interfaces already present in the environment (or created for specific installations) are the points of contact through which it manifests itself. The authorial data will then be shown through sounds, projections or programmed movements of the objects belonging to the public space. Similarly to the cycle with which humans enjoy the seasonal landscape or the rhythms of the city they pass through³⁸, citizens will repeatedly and unexpectedly come into contact with manifestations of the mutant city³⁹.

Besides the spatial component, the research on natural glitches allows reflections on the relationship between data fluxes and time. In this way, the idea of the natural glitch carries with it the theme of synchronism: the activation of the natural glitch in the real space happens when selected parameters of the real space meet specific values simultaneously; they are parameters indicated by the author and of multiple types: environmental data, space crowding data, time of day.

The misalignment of the parameter values will cause the interruption of the natural glitch which will return to manifest itself only when these values are realigned. The spatial variable in the natural glitch model is linked with the intervention of artificial intelligence (AI). AI will play an active role in modifying the occurrence of the natural glitch, contributing to the narrative by making it sensitive to the Anthropocene context. In a complex system of this type, unforeseen patterns and evolutions may emerge.

38 Lefebvre, *Elementi di Ritmanalisi*, 38 – 50.

39 Celaschi, *Formia and Vai*, "Mutating City", 323 – 337.

Conclusions

The ever-closer relationship between physical reality and geo-spatial data fluxes leads to question how such dimensions, often disconnected, may find a possible design expression. A proper integration between them may act on the perception of reality and on the behaviour of individuals and communities. The identified characteristics of the presented natural glitch model are the foundation of future research and projects. Using narrative expedients based on the data fluxes and natural geodata parametrisation, the natural glitch merges within the urban context, and actively participates in telling us about the impact of human action and possible futures that await us by transforming reality into an immersive real-time diegetic prototype.

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S.02

BEYOND THE
DUALISM OF
MAN - NATURE

Energy Landscape, Escape the Petroscape

Energy; Matter; Space; Landscape; Consciousness.

Oscar Buson

Raum404, Zurich, Switzerland
o.buson@raum404.ch

Cesare Maffioli describes the culture of energy as an obsession in increasing the production and consumption of matter and energy. He argues that this obsession is at the heart of our contemporary environmental issues. Urbanisation linked to the exploitation of coal caused the upheaval of a thousand-year-old ecosystem where human settlements and landscapes co-existed. Now, what we like to call "*petroscape*" is an anthropic landscape mostly shaped by oil: oil products but also oil society. This petroscape is now the majority of inhabited areas on earth. Living in a fragmented city and moving along infrastructures required a lot of energy. Improved energy performances can't be seen as a purely technical achievement. Modernity has created a deep detachment between humans and nature, in a world that belongs more to the objects than the subjects it serves.

The architecture of globalisation is an architecture of infrastructures. We must challenge the idea that infrastructure is concealed and doesn't define our space. Moreover, infrastructures dedicated to energy supply that fragment our space have the potential to provide a consistent reading of the globalised world. Giving a shape to the energy flows helps to provide a clear reading of synergies between energy and the environment.



Switching from the culture of energy to the culture of entropy requires a change in architectural language. This new architecture doesn't aim to provide responses to a problem (a problem-solving, logic-based approach), but to convey the end of the vision of the world as an infinite object through architectural language.

This article is based on the research work of the “Energy Landscape” team¹, carried out within the framework of the international consultation of Greater Geneva.

Our work is centred on the relationships between energy, matter and space of the city landscape. Our research has been supported in particular by targeted in-situ analyses, with student projects from the University of Mendrisio, but also by the elaboration of an ambitious vision for the Geneva territory. I would like to take the opportunity of the conference “The Ecological Turn” to synthesise the key elements of this study and to launch avenues of reflection in favour of a holistic thinking of the world that we have built, and which has shaped us in turn, as part of an energy landscape. This text is divided into three parts: the first touches on the relationship between matter, energy and space. The second aims to highlight a broad dimension of architecture that integrates natural resources, lifestyles and human infrastructure as an inseparable whole to form a world in transition. The last part proposes images of architecture that offer new ways of inhabiting the world in full awareness of the finiteness of its natural resources.

1 The team consists of: Oscar Buson and Lucile Ado (Raum404), Giulia Scotto (Department of Social Science, University of Basel), Sascha Roesler, and Lorenzo Stieger (Università della Svizzera Italiana), Guido Rindsfuser and Guillaume Privat (Emch+Berger Bern), Thiébaud Parent (Drees&Sommer), Lorenz Eugster (Lorenz Eugster Landschaftsarchitektur und Stadtplanung)

1 Matter - energy - space

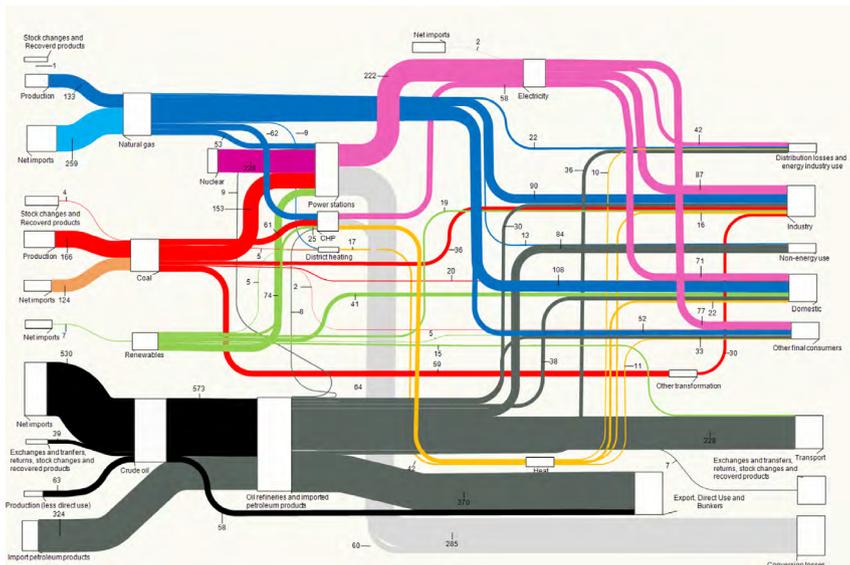
1.1 Inhabiting the oil space

Historically, for both Vitruvius and Alberti, the link between energy, matter and architecture is obvious. As Galliano quotes in “Fire and Memory”, the parable of Reyner Banham’s (Banham, 1971) hut and bonfire illustrates this very well: “The tale tells of a primitive tribe that has just come across a clearing in the wood where it plans to spend the night - an archetypal tribe that, as the author reminds us, has so many antecedents in architectural criticism from Laugier to Le Corbusier. There are fallen branches and some wood in the clearing. The tribe has a dilemma: whether to use the wood to build a small shelter or as firewood for a bonfire. An entire theory of architecture is encapsulated in this simple question”. (Fernández-Galiano, 1991)

Just as wood was the material with which classical architecture was built, whose language will remain faithful to it until modernity, today it is petroleum products that are at the heart of the material-energy-space relationship in contemporary cities.

Combustible and building materials, fossil fuels and petroleum derivatives are omnipresent in contemporary cities. Bituminous surfaces make up the asphalt of roads and many public spaces, polymers, insulators, paints, resins, synthetic fabrics, polystyrenes, Plexiglas and plastics of all kinds are everywhere. Our food system also depends on petroleum products, from the gasoline that powers agricultural machinery to the manufacture of pesticides and fertilisers.

In addition to having been the fuel for its production, the modern city is now dependent on fossil fuels to function. The hegemony of petroleum products is particularly evident in transportation. It is in the very functioning of modern life and in the way urban neighbourhoods are connected together that dependence on fossil fuels is most significant. The Sankey diagram of European energy flows shows that 75% of gross energy consumed is of fossil



origin (coal, oil), of which nearly a third is used for transportation [Fig. 1]. The movement and exchange of goods depends considerably on fossil fuels. Roads, highways, pipelines, airport areas, as well as monofunctional industrial, commercial and artisanal zones accessible only by motorised transport, could not exist without and are completely dependent on fossil fuels. Therefore, these spaces can be considered as the ramification of a geography linked to fossil energies: a sprawling network that connects the places of extraction to the places of transformation and consumption by machines (cars, trucks, buses, trains etc.) that themselves both transport and consume fossil energies. We can thus say that today, the architecture of oil is an architecture that goes far beyond the scale of a building or a group of buildings. The architecture of oil is on the scale of our globalised world and it is fundamentally an architecture of infrastructures, and the very infrastructure of the organisation of our societies.

Fig. 1

Energy balance flow for the European Union, 2018. Image credit: Eurostat ©

2 Energy Landscape

2.1 Rupture with the energy hinterland

For a long period, societies were limited by local natural resources. The contribution of fossil fuels has enabled the rapid growth of many cities around the world. A new balance between city and countryside is the living environment for most of humanity now, but there is still no common definition. One recognises the “Zwischenstadt”, the “Città Diffusa”, the “Rurbanité”, but what is certain is that the clear boundary between city and countryside has been lost. Cities no longer depend on a local energy hinterland, but on the extraction of natural resources at a global level. The modern city has been a major promoter of lifestyles in a society strongly linked to oil, and as Michael Watts suggests, “much of what is modern in the modern city is the by-product of oil” (Stiegler, 2020). Conversely, the return to local renewable energies, which we see as an axiom for getting out of oil with a view to reducing greenhouse gas emissions, will have an impact on the architecture and society of the transition. Acting on the energy component means modifying a balance between a specific way of life and infrastructures that are their own. In urbanised areas, nature and technology are increasingly intertwined: historian Thomas Hughes speaks of “overlapping natural and human systems in cities”. The “Energy Landscape” figure of thought describes the fruitful interaction of “energy commons”, “energy infrastructure” and their specific lifestyles.

In “Los Angeles, the architecture of Four Ecologies” Banham recounts four diverse and complex examples of overlapping systems of infrastructure, commons, and natural forces. The ecologies known as “Surftopia”, “Foothills”, “The Plains of ID”, and “Autopia” provide us with a beautiful glimpse of the interaction between lifestyles, specific infrastructure, natural forces, and energy sources. These ecologies can be likened to a global ecology related to oil.



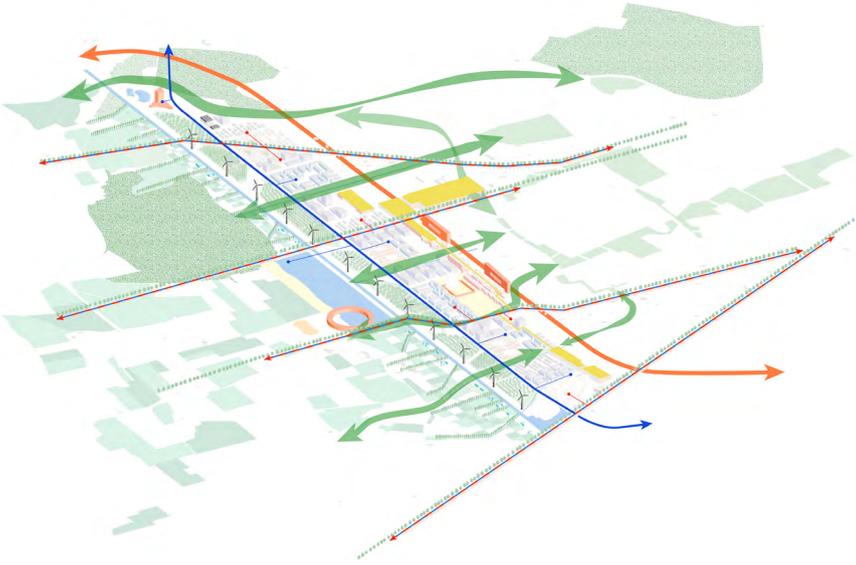
The shift from fossil fuels to renewables heralds the transformation of petroleum ecology. A new architecture of the transition, which will be a global palimpsest of modernity, will need to connect the places of production and consumption of local renewable energies. The infrastructure will thus emancipate itself as the matter-energy-space of a post-oil society, drawing on the earth and with the earth a network of natural forces coordinated with new ecologies and ways of life (sun, wind, water, etc.).

2.2 Natural forces as a tool of transformation in the geography of oil

While natural energy networks have participated in the production of the vernacular and classical architecture and landscape (forests, aquatic networks, wooded cordons, plains, reliefs, etc.), the networks linked to the thermo-industrial city and “modern” energies are hidden and buried underground (grey water pipes, pipelines, electric cables, computer networks, etc.). The superimposition of these two types of networks, with the juxtaposition of spaces specific to modernity with historic sites, have defined a fragmented territory that hinders the vital movements of species and biodiversity and has disenchanting the world.

Within the framework of the Greater Geneva Consultation, we propose a visionary project on the most representative site of the consumption of fossil fuels: Geneva Airport. This site is currently the largest consumer of fossil fuels and the largest emitter of greenhouse gases in the area, as well as a major emitter of noise and ambient pollution. The site impedes any migration of fauna and flora and has a significant impact on the surrounding microclimate.

The framework of this project is based on renewable energy networks (water, wind, earth, biomass) whose synergies between infrastructure, natural forces and the operating mode of



a transitional society, have a positive and zero-carbon impact on local energy production, on the urban microclimate and on biodiversity. Energy distribution infrastructures are part of the network of soft mobility on a territorial scale. For example, the arches of St. Luke, similar to the eponymous portico in Bologna, have been integrated into the green climate corridors that connect forests and agricultural fields to the heart of the metropolis. A wooded cordon planted above the infrastructure reinforces the air conditioning function on an urban scale.

The infrastructure thus participates in the conscious definition of the territorial space, and becomes an architecture of space, which now speaks its own language [Fig. 2].

3. An architecture of transition, an architecture of consciousness

Fig. 2

View of the former Geneva Airport as an energy landscape, 2020. Image credit: Raum404 ©

3.1 From energy split to existential spleen

The energy revolution we are facing will have an impact on the way we inhabit the earth. It becomes imperative to rethink an

architecture of living that can respond to this, without falling into postmodern nostalgia. This architecture will need to accompany a frugal way of life that is aware of the finiteness of the natural resources available on earth.

The “radicalisation” of modernity, which tends towards the super-specialisation of science and an objective view of the world, has taken us, as subjects, permanently away from the earth. The abstraction necessary for scientific thought has detached the inhabitant from the cosmos and has split an abyss between the human and the natural environment. The Cartesian *res extensa* expresses itself on the flattened spaces of Geneva Airport, unable to weave any link with the place. It is now a question of renewing an ontological link to the Earth, so that the spaces of modernity can be inhabited again. An epistemological consideration of architecture, taken to its extreme in the modern Western world by the functional specialisation of urban sites, whose leading examples are to be found in Russian Microraisons or American housing estates, has exacerbated the separation of vital functions in the territory. Urban zoning separates production spaces from housing districts and recreation areas. The inevitable consequence has been detachment from the fruits of a common territory, which have become abstract consumer products with which it has become impossible to identify. The modern programmatic trilogy is still the basis of contemporary urbanisation and is even the measure of the European energy split.

Guy Debord already shouted 50 years ago: “Man separated from his product, more and more powerfully produces all the details of his world himself, and thus finds himself more and more separated from his world. The more his life is now his product, the more he is separated from his life” (Debord, 1967). Beyond quantitative questions, it is essential for us to give meaning to the programmatic cohabitation aimed at in contemporary urban planning discourse. To make tangible the process of making

the objects that surround us is to give them meaning. Sharing the place of the transformation of matter is to participate in a common architecture. Giving space to a circular economy is to build the economy of the inhabited place (οικονομία) and thus to build an appropriable and identifiable matter-energy-space. The sites conducive to this dialogue will be able to germinate in the abandoned geography of oil, in the most fragile sites, and are the most capable of change because they are the least anchored in history and are manifest of oil infrastructures, industrial zones and monofunctional areas. A local anthropogenic productive nature will give consumers an ontological reading of the transformation of matter and energy necessary for this purpose.

3.2 Produce food for your body

The architecture of the transition will need to reveal the food production chain, where roofs arranged as greenhouses combined with translucent photovoltaic panels and above-ground agriculture and livestock farming is optimised. Furthermore, food production could be in closed circuit, by collecting water containing unabsorbed fertilisers and reusing it in short circuits. Yields can be very high in relation to the surface area required, and the agricultural land currently occupied by above-ground agriculture will be freed up. It will therefore be possible to produce locally in large quantities by reducing energy consumption for transport. The photovoltaic sheds will be able to power a lighting system for intensive crops and for the neighbourhood by making visible the reality of the local food chain. Productive platforms will be able to accommodate food processing sites.

3.3 Redefining common spaces and changing the concept of comfort

Will local natural resources have the power to replace the 200 energy slaves who work continuously for every average European inhabitant? The truth is that it is impossible to replace fossil fuels

in equal measure without destroying ecosystems and having a negative impact on biodiversity. The key to the transition lies in the need to reduce the consumption of matter-energy-space and to consume consciously. But are we ready to leave the comfort that modernity has given us? In what built framework will the transitional society be able to inhabit the earth in a resilient manner? To answer this question, it is time to synthesise the clues of a contemporary architectural scene that tends towards a conscious and transitional way of life.

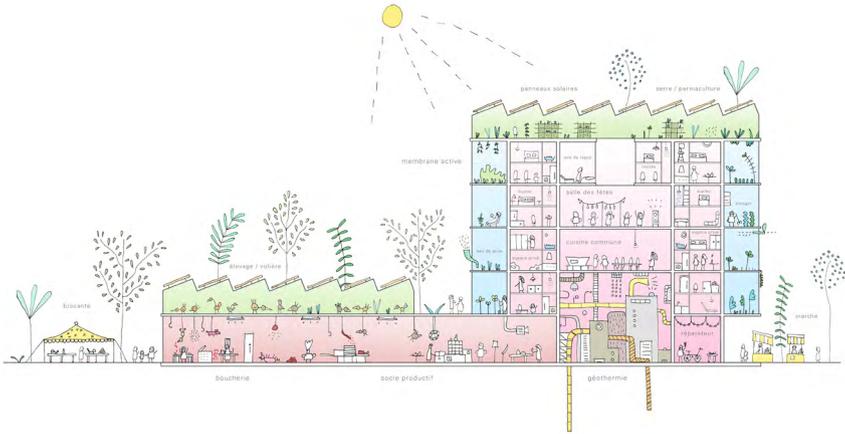
3.4 Substitute the individual by a new common

Shared spaces anchored in an intermediate and benevolent social ladder can replace individual energy-consuming spaces. It is possible to reduce private spaces by offering residents more common services.

At the heart of thick volumes, spaces such as leisure spaces, generous shared kitchens, rooms for visitors or even cinema, music or health rooms, can offer new comfort in a local social fabric. In the health emergency in which we find ourselves, the need to constitute a new scale of the domestic has become even more relevant. In the emerging era of telework, these shared spaces offer a new shared comfort and also respond to a growing need for intergenerational social cohesion. Ground floors will be active with programmes that engage sociability, such as laundries, repair workshops or public microequipment.

3.5 Raw spaces that can be appropriated

Raw and double height volumes are positioned above the productive halls. These spaces will be designed as Russian dolls of three strata of which only the intermediate one, housing the individual spaces, will be part of the calculation of the energy reference area. An industrial-type load-bearing structure will be able to accommodate individualised light constructions on the



mezzanine floor. A central block with access from the heart of the volume will include sanitary facilities and a cooking area open to the living room. The upper floor assembles an intimate space that can be subdivided as needed. Storage spaces will act as sound and heat insulation between the individual spaces and the common areas, with access to the storage also possible from the central spaces [Fig. 3].

3.6 Living in the boundary of the environment

From modern times to the present day, the limits between inside and outside have become energy-efficient boundaries. Thanks to technical prowess, it is now commonplace to live in a tropical indoor climate at any time of the year. The massive use of plastic insulation defines the edge between our living spaces and the outside world. Rethinking thermal comfort means setting up differentiated spaces according to needs and restoring a constant dialogue with the environment. It is necessary to imagine an architecture that breathes, capable of reacting to the flow of time, seasons and uses. Membrane spaces, comparable to winter gardens, will complement the reduced spaces with a controlled climate. Climatic performance and spatial qualities will be even more interesting in the case of duplex housing. In

Fig. 3

Conceptual section of the architecture of consciousness, 2020. Image credit: Raum404 ©



this case, the membrane space can be up to 5 metres high and thus offer variable natural air conditioning throughout the year. These large winter gardens will be able to host exchange programmes between the climate and the inhabitants, playing the role of a garden in winter and a living room in summer, functioning as a recreation area and communal living space.

3.7 From culture of energy to culture of entropy

The quantitative obsession into which the contemporary energy transition discourse plunges us, where fossil fuels must be replaced in equal quantities by renewable energies, does not call into question the modern culture based on the exploitation of the Earth (Georgescu-Roegen, 1976). The outcome of an ecological transition will have to pass through a collective awareness of the need for radical change and a new way of conceiving a reflection of humanity in the world. Moving from a culture of energy, whose obsession is based on the growth and exploitation of natural resources, to a culture of entropy, conscious of the finiteness of the world, implies a change in the energy-matter-space principle, of which we must now become aware and formulate, through the disparate fragments of emerging projects, a new architecture of consciousness.

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S.03

THE TURNING
POINT OF
MATERIALS

Cambio

Formafantasma

Design Academy Eindhoven, the Netherlands
info@formafantasma.com

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Design as an act can be defined as the innate propensity of humans to conceive and perform desired changes to their habitat, but design as a discipline is a historical phenomenon formed in relation to the Industrial Revolution and its paradoxical ideology. This manifestation of design introduced the notion of the universal human and the satisfaction of their needs through the visionary institutions of mechanisation, logistics, and mass media. In particular, the borderless reach of capitalist production seemed to offer a benevolent future of democratised middle-class affluence, the antidote to the atrocities of national and religious strife in modern warfare. But this vision was premised on the accelerating and infinite extraction of resources and their conversion into financial wealth, the externalisation of waste and environmental damage from the richest nations to the poorest, as well as the reinvention of the human as an assimilated consumer-labourer, as standardised and replaceable as the products they made and purchased. Design has been both the greatest emancipator and implicitly supported the exploitation of communities around the world, at times improving the lives of citizens and at times subjecting them to the interests of the dominant economic and political forces.

The tension between the transformative power of design and its participation in consumption is in fact not a new debate; the confluence of artists, scientists and philosophers brought together by Tomas Maldonado at the College of Ulm, Germany, in the 1960s, was created with the aim of establishing a multi-disciplinary debate on the social function of design. If on one side the programme was supporting the reconstruction of West Germany after the war, on the other, it was also busy escaping the product-centred conception of design as a fundamental tool for the expansion of mass consumption. These early reflections are as relevant as ever today, when the idea of democratic design has been abused for decades to serve economic interests, and at a moment when planned obsolescence is so shamelessly assimilated with design culture.

The exhibition, and by extension also this catalogue, acknowledge the legacy of industrial production as the fundamental source for the expertise and agency of the designer in contemporary society, as well as addressing the historic contribution of the designer's role to environmental and social instability and its incompatibility with models of sustainable or even survivable futures. The exhibition does so by taking as a subject of research and reflection the timber industry, a hyperobject that because of the scale of its evolution over time and space, is difficult to describe, understand or even regulate. The industry's tentacular supply chain has grown out of the bioprospecting that took place throughout colonial territories during the nineteenth century and has become one of the largest in the world, both in terms of the corporate revenues involved, and in terms of its impact on the biosphere. Clothing, furniture, paper, fuels, fertilisers, are just a few of the thousands of products sourced from trees, many of which have been felled in some of the most biodiverse and fragile ecosystems in the world.

The title of the exhibition, *Cambio*, references the membrane that runs around the trunk of trees, the function of which is to produce wood (xylem) on the inside and bark (phloem) on the outside. The vascular cambium also plays a fundamental role in helping plants and trees to adapt to climate instabilities and thus to transform themselves. When a tree is felled for the production of timber, the branches and roots are cut and the bark removed. This is the moment in which a living species becomes a product. But the word 'cambio' in Italian also means 'change', and the show is named after it precisely because of the polysemic nature of this. We hope in fact that the exhibition could participate in shifting the common perception of design as a tool for styling to an approach that can effect real transformation in a time of climate and social instabilities.

While taking such a diverse and expansive subject risks generalisation, we firmly believe in the necessity to read and understand

design within its larger context, one that includes extraction, refinement, production, distribution and afterlife of things and materials. For too long, design has based its development on essentially one big narrative; the idea of human wellbeing and its function as a solution to human desire. This indulgence of human aspirations has debased design and narrowed down its scope of intervention, and where it has looked beyond the production of objects, it engages only with the transformation of half-finished materials into desirable products more than questioning the infrastructure that facilitates this process.

The development of a holistic and inclusive perspective is, we believe, the only way to take the design discipline forward to more responsible and critical levels of engagement. In Cambio, the inclusion of the works and voices of practitioners never, or rarely, considered as part of the design conversation, is a way to recognise design and production as part of a complex ecosystem not separate from the 'natural' ecosystem, both of which can be transformed for the better only with the convergence of different knowledges and approaches. It is a method of simultaneously enriching design culture and making the discipline more inclusive of narratives that have been too often overlooked.

Our aim is in the first place to better understand the level of complexity we are all working and living in, while at the same time offering clear reflections and design questions: How can the practices of observation and care toward plants — tuning into their lives, features, behaviours and necessities — shed light on our ecological and entangled lives? What can we learn about climate change by analysing the anatomical features of trees? How would wood production change if we took into consideration their ability to sequester CO₂ from the atmosphere? How can we as designers make more informed choices when deciding to select a wood-based material over another, beyond its aesthetic and functional properties? And perhaps most importantly, how can the imagination and 'elastic' approach of design be helpful

in translating today's emerging environmental awareness and scientific knowledge into informed, collaborative responses?

This trans-disciplinary approach is not only a way to increase the scale and depth of research, but is also an ethical position that respects the expertise, skills and lived experience of individuals and institutions in other fields and other cultures. These interrelations ask designers to address responsibility, politics and other issues arising from design's complicity across multiple industries, communication networks, and aesthetics.

While this catalogue has been conceived in relation to the show and many of the contributors are also part of it, we see this as an opportunity to further elaborate on some of the ideas of *Cambio* while introducing new reflections and practitioners that could not be part of the show because of the limitations of the medium of the exhibition. The book alternates more extensive texts that touch upon some of the issues addressed by the show with a selection of interviews we conducted over the last year and a half. The interviewees include members of the scientific community, activists and scholars preoccupied with the survival and the conservation of arboreal resources on the planet.

Over the years, the interview has become our favourite way to engage with the work of highly-specialised individuals or institutions, because it allows both the interviewer and the interviewee to freely elaborate on their ideas, and to create links and analyses that might be edited out of a written text. This is particularly true with academicians and scientists, who are rarely asked to speculate about the implications of their practices. Nevertheless, it is exactly when attempting to understand and appreciate a discipline or area of knowledge in terms of its relation to others that a more cohesive, effective and expansive narrative can be established. This catalogue and the exhibition have, among others, the function of creating a conceptual umbrella under which a diversity of ideas and expertise can be collected. This will, we hope, contribute in the development of

a more responsible understanding of the complex relationship between materials sourcing, design, production and the larger implications that these actions have on planet earth.

Last but not least we see *Cambio*, the exhibition and its diverse outcomes not as the outcome and end of a period of research, but rather as the beginning of an ongoing investigation. We will extend the approach and principles of *Cambio* into the GEO-DESIGN Masters course that we are going to lead at the Design Academy in Eindhoven, the Netherlands, and which will commence in September 2020. The Masters programme, just like the exhibition, aims to develop research and communication tools to facilitate a deeper understanding of today's reality and to make transformative interventions through design and its material, technical, social, and discursive possibilities. We believe that the designer can be a critical agent in global systems, but their skillset and perspective must expand rapidly beyond isolated, self-referential processes of artistic making and subjective intuition. Design must be radically rooted in an expansive understanding of reality — but a reality that acknowledges how 'real world' problems are easily reduced to briefs for well-funded design solutions with negligible benefit to their intended users. Education, in this sense, is probably one of the few contexts where this more radical approach to design can be investigated, and where fragile but crucially important new narratives can be fostered.

Syntropic Materials. Designing Forests to Design Natural Materials

Polyculture; Regenerative Agriculture; Plant/Animal-Based Materials; Indigenous Knowledge, Material Innovation.

Eugenia Morpurgo

Independent researcher, Venice, Italy
eumorpurgo@gmail.com

Design, which concerns the fields of fashion, product design, interior design and architecture, has increasingly sought sustainable alternatives to oil-based materials in response to the looming 'climate catastrophe'. This has led to the creation of a wide spectrum of bio-based materials. Looking for renewable resources, among other solutions, researchers started developing materials from industrial agriculture leftovers, also motivated by the necessity of not stealing land from food production.

Despite giving birth to a richer biodiversity of resources, however, these researches are not questioning the agricultural system that generated them in the first place, which is monocultural industrial farming. A farming practice promoting standardisation to the detriment of ecological and cultural biodiversity. It appears, therefore, necessary to identify alternative agricultural practices and explore their potential.

How can we design regenerative production processes for plant/animal-based materials based on nurturing and polycultural systems instead of extractive and monocultural ones?

With the development of a digital library which archives materials according to the species they derive from and which allows users to browse through materials under the logic of species co-existence, Syntropic Materials hopes to foster a polycultural approach to bio-based materials development.

The research project Syntropic Materials attempts to design regenerative production processes for traditional and innovative plant/animal-based materials using agricultural by-products from regenerative, polycultural and agroforestral agriculture.¹

The project investigates if the great innovation in the field of materials that we witnessed in the past ten years can open new possibilities for the development of polycultures, and vice versa, if the choices taken in designing polycultures can define new directions in new materials development, with the objective of shifting the natural material production process from an extractive, monocultural, entropic one to a nurturing, polycultural, syntropic one.

In the following paper, after introducing the state-of-the-art of materials production which presents the urgency for the research, the methodology and current state of development of the work will be presented.

Climate crisis and design.

The current environmental crisis has proven to be a total one, affecting biodiversity, soil, water and air. Loss of biodiversity is happening at a rate so high that what we are witnessing has been defined as the sixth mass extinction. More and more evidence is demonstrating the anthropogenic responsibility for the current extinction rate.²

1 For some theoretical references to the approach used in the development of the project please see:

T. J. Demos, *Against the Anthropocene: Visual Culture and Environment Today*, (Berlin: Sternberg Press 2017)

Robin Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*, (Minneapolis: Milkweed Editions 2013)

Julia Watson, *Lo-TEK, Design by Radical Indigenism*, (Cologne: Taschen GmbH 2020)

2 Gerardo Ceballos, Paul R. Ehrlich, Anthony D. Barnosky, Andrés García, Robert M. Pringle and Todd M. Palmer, "Accelerated modern human-induced species losses: Entering the sixth mass extinction", *Science Advances* (2015), 1-5.

Design, which concerns the fields of fashion, product design, interior design and architecture, has different implications on the environmental crisis, from land and energy use related to production processes, to waste and pollutant dispersal in water systems, oceans and soil.

This analysis focuses on the entanglement between materials, used for fashion, products and architecture, and the current environmental crisis.

The case study of fibre production is examined with the awareness that the resulting observations can easily apply to many other material typologies.

For the sake of brevity, this analysis focuses only on the environmental impact of materials, putting aside their economic, cultural and social ones.

2. Current materials production.

2.1 Synthetic fibres: Polyester.

Currently, the most used fibre is polyester, an oil-based fibre.

In 2018, with 66.6 million mt, synthetic fibres accounted for 62% of global fibre production. Polyester dominated the market, accounting for 90% of the world's synthetic filament production and 70% of the world's synthetic staple production.³

It is 100% recyclable, but if we look at the data, only 10% of clothing waste ends up being recycled, while 57% ends up in landfills, 25% is incinerated and only 8% is reused.⁴

3 Terry Townsend, 2019, "Natural Fibres and the World Economy": <https://www.scribd.com/document/432643129/7c-Natural-Fibres-and-the-World-Economy-2019-pdf>

4 *Pulse of the Fashion Industry 2017*, Report to the Copenhagen Fashion Summit, 2017, by Global Fashion Agenda & The Boston Consulting Group: https://developmenteducation.ie/app/uploads/2019/12/Pulse-of-the-Fashion-Industry_2017.pdf

But one of the major issues related to polyester, and in general clothing made from synthetic fibres, is connected to the actual use of the garments. Each time an item is washed, it releases thousands of microfibrils, plastic particles less than 5mm in diameter which find their way through waste waters to the ocean. It is estimated that washing synthetic textiles releases almost 35% of the microplastics that are accumulating in marine habitats around the world.⁵

Once microfibrils are in the ocean they act like sponges and absorb chemicals present in polluted waters. They are also so small that they end up being eaten by small animals and find their way into the food chain, carrying with them all the chemicals they absorbed.

And if we think that avoiding eating fish could be a solution, we should be aware that research shows microplastics and microfibrils in about 90% of the table salt brands sampled worldwide. The impact on human health is still to be understood but the consequences they are having on the environment are already very visible.⁶

2.2 Natural fibres: Cotton.

Significant investment has been made into alternative renewable, biodegradable or compostable materials.

Renewable materials are those which can be manufactured or generated quickly enough to keep pace with how fast they are used up, and biodegradation is the naturally occurring breakdown of materials into carbon dioxide, water and biomass by microorganisms such as bacteria and fungi.

5 CO DATA. "Fashion and Waste: An Uneasy Relationship, in Mapping the Fashion Industry. Part Four: Impact on Planet" (June 2018): <https://www.commonobjective.co/article/fashion-and-waste-an-uneasy-relationship>

6 Diogo Peixotoa, T. et al. 2019, *Microplastic pollution in commercial salt for human consumption: A review*, in "Estuarine, Coastal and Shelf Science" (219), 161-168.

So when we look at renewable biodegradable fibres we are mostly looking at natural fibres. And considering that cotton accounted for 81% of natural fibre production by weight in 2018, this analysis will look into the actual impact of its production.⁷

Of the four cotton species cultivated for fibre, the most important is *Gossypium hirsutum*, which originated in Mexico and produces 90% of the world's cotton. It is mostly grown in monoculture.⁸

Cotton is often also grown from genetically modified grains such as Monsanto BT cotton, supplied to 93% of Indian cotton farmers.

Consequently, what we are witnessing is not only a monoculture in terms of land management but also in genetic terms, which increases the risks of exposure to pests and creates an ecosystem even more sensitive to changes in climate.

The correlation between monoculture and biodiversity loss, water pollution, soil depletion, lack of resilience to climate changes and pests which create a higher dependency from fertilisers, pesticides and herbicides has been studied and proven. See the Food and Agriculture Organization of the United Nations report "More people, more food, worse water? A global review of water pollution from agriculture", published in 2018.⁹

The cotton industry is just one example. The same dynamics can be seen in the production of many other natural materials currently produced on an industrial scale, such as the most common bioplastics produced from corn or sugar cane.

7 Terry Townsend, *Natural Fibres and the World Economy*.

8 Yara Knowledge "World Cotton Production" <https://www.yara.us/crop-nutrition/cotton/world-cotton-production/>

9 Javier Mateo-Sagasta, Sara Marjani Zadeh, Hugh Turrall, (edited by), "More people, more food, worse water? A global review of water pollution from agriculture", Colombo, Sri Lanka: Food and Agriculture Organization of the United Nations (FAO) and International Water Management Institute. (2018)

2.3 Agricultural by-products: circular materials.

Parallel to this, in the past 10 years we have been witnessing an attempt to look into alternative sources for plant/animal-based materials.

Motivated by the necessity of not stealing land from food production, and supported by a growing interest in circular economy principles, which shift from a linear to a circular model that see natural waste as resources, companies, material engineers and designers started looking into the use of industrial agriculture leftovers.¹⁰

Based strongly on local bioregional economies, these researches are creating an expanding landscape of natural materials. We have seen bioplastic produced with potato skins in England; leather, insulation materials and hard boards developed from sunflowers in the south of France; threads created from orange peels in Italy; plastics and leather made out of Barbary figs in Mexico; plastics, fibres and paper composed of sugar cane in Brazil; and non-woven textiles obtained from pineapple leaves in the Philippines.

Despite giving birth to a richer biodiversity of resources, these researches are not questioning the agricultural system that generated them in the first place, which is monocultural industrial farming.

As a result, these innovations have had end of life issues but have rarely presented solutions that address the impact of materials sourcing. They are not providing real alternatives to the environmental impact of these materials, and in some ways they are even contributing to confusing people regarding the difference between renewable and extractive resources.

10 Guglielmo Carra, "The urban bio-loop growing, making and regenerating" (2017) <https://www.arup.com/perspectives/publications/research/section/the-urban-bio-loop>

3 Regenerative agriculture.

This initial analysis highlights the shortcomings of the agricultural system from which the by-products are sourced, and also points toward the necessity of looking into alternative agricultural models as potential sources of biomass for the production of plant/animal-based materials.

In the wide spectrum of practices defined sustainable and belonging to the agroecological approach, this research focuses on regenerative agriculture.

Regenerative agriculture is a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services.

Specific attention has been given to syntropic farming: an agroforestry model developed by the Swiss farmer and researcher Ernst Gotsch.

Agroforestry is an agriculture practice which incorporates trees with crops and sometimes animals. Syntropic farming, in particular, mimics a forest's interdependent plant relationships, replicating and accelerating natural processes.

Processes such as ecological stratification, the vertical layering of a habitat and ecological succession, the ongoing process of change in the species structure of an ecological community. It is a polyculture that fosters biodiversity and establishes highly productive agricultural areas, which tend to be independent of inputs and irrigation, transforming depleted land into a rich self-sufficient forestal ecosystem over time.¹¹

11 "Agenda Gotsch" <https://agendagotsch.com/en/>

4 Syntropic materials.

Contrary to monoculture, which allows us to produce a high quantity of one resource, we know that a syntropic field will produce a smaller amount of resources of a greater diversity.

In this model, plants are selected for their ability to enrich the ecosystem but also according to the need of offering a balanced diet. When we look at materials, though, we need to take into account that, unlike food, raw materials need to undergo transformation processes.

From the cotton ball on the plant to the threads and the garment, many things happen.

Farmers are rarely the subject of the transformation process, so they usually sell the raw materials they produce. If their land would produce a smaller amount of random resources of a greater diversity they would have to rely on different transformation partners and by the economy of scale it would easily become economically unsustainable.

So it appears that when designing a syntropic field for material production, we need to add as a new variable the transformation process, and when designing a syntropic field for materials, species can be selected for their ability to enrich the ecosystem, under the condition of belonging to the same production process.

Moving away from monocultures to polycultures necessitates being comfortable with change and flux as constants in the production process. While this method will yield a reduced quantity of materials, it will make up for it in terms of the diversity of materials produced. This, I suggest, is a potential asset, as species change translates to the consistent production of innovative materials and their integration in novel ways as composite materials.

This method draws from the richness of biodiversity, enhancing the productive capacity of and nurturing non-human nature.

4.1 State of development of the research.

In order to begin testing these assumptions the project developed in two parallel directions:

- A systematic analysis of known polycultural, successional agroecosystems and the materials they can potentially produce.
- The construction of a digital library which archives plant/animal-based materials categorised through species and their material characteristics.

This approach draws from a tradition of “transition design”, design which is intended to “develop design solutions that protect and restore both social and natural ecosystems through the creation of mutually beneficial relationships between people, the things they make and do, and the natural environment”.¹² It also shares, with theoretical strands within ‘women’s indigenous knowledge systems’, an attention to the necessity of privileging diversity as a structuring principle, diversity which, as Shiva argues, “[biodiversity] can only be protected by making diversity the basis, the foundation, the logic of the technology and economics of production”.¹³ This necessary shift will inaugurate fundamental change across various areas of production: from the basic relationship between farmers and materials manufacturers, to wider ideological and imaginative domains concerning productive spaces and transformative processes, and finally to larger practical concerns over materials standardisation and their regulation in the market.

12 Terry Irwin, “Transition Design: A Proposal for a New Area of Design Practice, Study, and Research”, *Design and Culture. The Journal of the Design Studies Forum* (2015)(VII, 2), 229-246.

13 Vandana Shiva, “Women’s Indigenous Knowledge and Biodiversity Conservation”, *India International Centre Quarterly* (1992)(XIX, 1/2), 205-214.

4.2 Polyculture analysis. From polycultures to materials.

The first polyculture analysed was the Maya Forest Garden.

“Domesticated crops and useful weedy herbs are cultivated annually over approximately four years, while woody shrubs, fruit trees, and hardwoods sprout and grow in the shade of the tall maize, progressing toward the next stage in the cycle. Some perennial crops are established at this time as well. When the woody shrubs and trees have grown enough to shade annuals, the field advances through successive stages of guided reforestation, transforming from an open field into a managed forest”.¹⁴

The Maya Forest Garden is the traditional Maya orchid plot that evolves from the milpa, a traditional Mesoamerican and Maya agricultural field that employs a system of land use which cycles from closed forest canopy to a field dominated by annual crops to an orchard garden, and from an orchard garden back to the closed canopy.

The Maya Forest remains the second most biodiverse place in the world, second only to the Amazon forest. The milpa cycle is the conservation method of farming and managing the Maya forest. It goes through four main stages over the course of approximately 20 years.

The Milpa Forest Garden system had been selected as the first case study because of the rich availability of scientific and non-scientific documentation and analysis of each growing phase. It presents a circular finite model which frames the research timewise. It is a successional, polycultural, agroforestral system, which allows the research to analyse a variety of diverse species, from annual to perennial, from weeds to trees. To facilitate the initial steps of the research, 13 species of flora were selected among the most recurrent in literature, even if it has

14 Anabel Ford, Ronald Nigh, *The Maya Forest Garden. Eight Millennia of Sustainable Cultivation of the Tropical Woodlands*. London: Routledge. (2015)

been documented that more than 90 species can be found in the Milpa Forest Garden.

Out of the 13 species (maize, bean, squash, tomato, amaranth, chili, sweet potato, banana tree, papaya, mango, avocado, cedar and mahogany), 7 material typologies have been identified (colour, paper, plastic, textile, particle board, timber and veneer).

Each species and associated material typology has been mapped in relation to the duration of the milpa cycle, giving us an overview of what is potentially producible from a polycultural biomass throughout the 20 years of the Maya Forest Garden.

See the following illustrations.

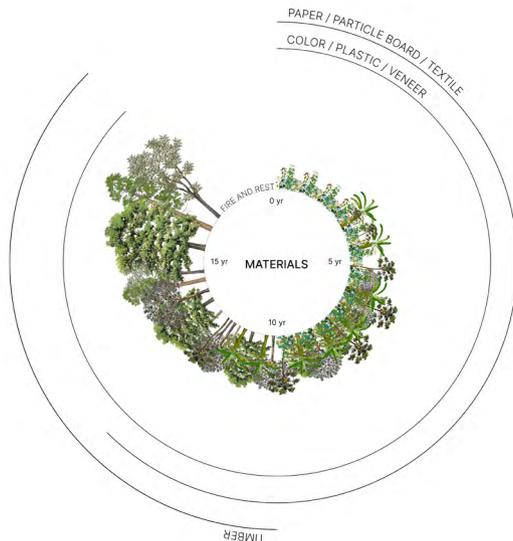


Fig. 1

Overview of potential materials producible in the Maya Forest Garden during the 20-year cycle. Eugenia Morpurgo. Illustration by Eugenia Morpurgo.

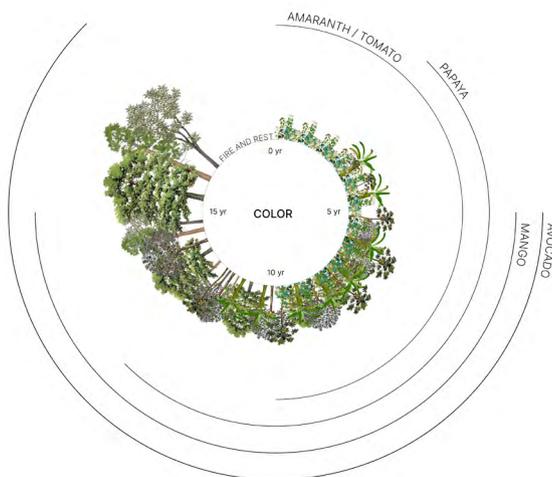


Fig. 2

Potential colours, such as dyes, pigments and inks, producible in the Maya Forest Garden during the 20-year cycle. Illustration by Eugenia Morpurgo.

Fig. 3

Potential textiles producible in the Maya Forest Garden during the 20-year cycle. Illustration by Eugenia Morpurgo.

It is important to note that although this analysis focuses exclusively on the agricultural and productive aspect of the milpa cycle, the values of this model go way beyond this. As Ronald Nigh says, “The making of milpa is the central, most sacred act, one which binds together the family, the community, the universe... [it] forms the core institution of Indian society in Mesoamerica

and its religious and social importance often appear to exceed its nutritional and economic importance.”¹⁵

Milpa moves beyond the economism and instrumentalisation of nature and human relationships that characterise neoliberal and late capitalism. For this reason, I am influenced by this holistic ontology without claiming it as my own, nor reifying it as a piecemeal pedagogic influence to mitigate the disasters of capitalism.

4.3 Syntropic Materials Library. From materials to polycultures.

The Syntropic Materials Library, accessible online at the URL <https://syntropicmaterials.eumo.it/library>, has been conceived as an open platform, an archive of plant/animal-based materials categorised through species and their material characteristics. The library allows the user to browse through the stored information under the logic of species coexistence. When accessing the library, users will be asked to begin their search by selecting a hardiness zone, which is a geographic area defined to encompass a certain range of climatic conditions relevant to plant growth and survival.

This selection will show the user a list of potential materials producible with species growing in the same climatic conditions. From here, users can filter the content presented by deselecting materials or species which are not of interest.

We can imagine that the library could help users to enlarge the spectrum of species taken into consideration while designing polycultural fields for material production, or foster the creation of new briefs for material design based on the combinations of plants that create regenerative ecosystems. Rather than being a simple repository of data, the platform functions as a filter

15 Ford, Nigh, *The Maya Forest Garden*.



and redirect to information already published on and offline. Its primary objective is to centralise this information allowing us to create novel and meaningful connections.

The online library currently accessible is the basic infrastructure on top of which further information and filtering tools will be added with the development of the research.

Conclusions

Syntropic Materials recognises the potential that innovation in materials and the rediscovery of traditional technologies can play in the quest for finding sustainable alternatives to oil-based materials and attempts to bridge the existing gap with sustainable agricultural practices.

It is an ongoing research project developed as part of an independent design practice and is funded by a fellowship at the American Academy in Rome (Sept - Dec 2019) and a fellowship at the Akademie Schloss Solitude (Nov 2020 - April 2021).

At the time of writing this paper, the research has just started dealing with real case studies.

Acknowledgments

I am an Italian designer, educated in hegemonic European schools of art and design. That said, I am sensitive to the responsibilities and forms of power tied to my positionality as a white European designer with significant institutional support. The ideas herein are polyphonic, reflecting the sustained reading and conversations I have had with post-colonial and indigenous scholars, activists, thinkers and writers. They are not the exclusive preserve of my own authoritative voice but the outcome of heterogeneous influences.

In privileging indigenous knowledge, I situate indigeneity not as radical alterity but as a form of world building at odds with our contemporary extractivist moment, in which ecological crisis can only be confronted through pluralistic, open and dynamic traditions.

This openness and the presumed parity between different ontological and epistemological systems is what allows me to experiment with the promises (and failures) of Western science and indigenous relationships to land and environment. This is part of an effort to think ourselves out of the quagmire that environmental crisis portends.

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Carpentered Diegetic Things: Alternative Design Ideologies for AI Material Relations

Artificial Intelligence; Object-Oriented Ontology; Design Fiction; Legibility; More-Than Human-Centred Design.

Franziska Pilling

Lancaster University, Lancaster, United Kingdom
f.pilling@lancaster.ac.uk

Paul Coulton

Lancaster University, Lancaster, United Kingdom
p.coulton@lancaster.ac.uk

This paper considers a More-than Human Centred design approach that presents Artificial Intelligence (AI) and data as materials for design by utilising the non-anthropocentric philosophy of Object-Oriented Ontology (OOO) and the related thesis of Alien Phenomenology. This paper also explores methods of making AI operations, functions and impacts legible through the speculative design practice of Design Fiction by adopting a perspective that acknowledges the independent perspectives and interdependent relationships of human and non-human actants. The structure of this paper is as follows; first, we will give a brief account and understanding of AI technology, with reference to our philosophical guinea pig - Amazon's AI assistant Alexa and Skills service. Second, we will unpack the theory of OOO detailing the related theories to develop an alternative perspective of AI technology. Further, it will posit how adopting a More-Than Human Centred design approach can assist in negotiating the complexities of AI and move towards possible implementation solutions. Third, and finally, we demonstrate this alternative approach by utilising the philosophical theories of OOO, and a Design Fiction as World Building approach to philosophically carpenter a Diegetic Thing - Amazon's AI assistant Alexa which speculatively transcends Alexa's current skills into functions of legible AI.

Thinking about AI requires us to think ecologically as everything is interconnected¹. This type of thought requires us to ‘join the dots’,² embedding and meshing together complex interdependent relationships and independent perspectives of both human and non-human things³ as active actants of power and efficacy.⁴ To adequately design for and represent the emergent complexities of AI necessitates a break from the ethos that we, as human beings, are the primary things to consider, and thereby question and critically examine the limitations of Human-Centered Design (HCD). This alternative design approach responds to what is currently an obscured and multiplicitous system that hinders the understanding and legibility in AI technology by users and designers alike. The emergence and proliferation of both the Internet of Things (IoT) and AI technology have brought about a complex network ecology, described as the ‘*electrosphere*’.⁵ Therefore, expanding and unfolding contemporary ecologies of virtual and physical beings; adding a ‘layer of code to much of the physical world’ forming an ecology of ‘Atoms and Bits’ and thereupon a design challenge of ensuring user perception and legibility of the things under consideration.⁶

A Brief AI Encounter

AI has its roots in Turing’s seminal question - “Can machines think?”.⁷ The field of AI has since experienced many peaks and troughs in terms of popularity and technological development. In the current era, the sociotechnical landscape has become more infused with AI, driven by the growth in the availability

1 Morton, *The Ecological Thought*.

2 Morton, 1.

3 Coulton and Lindley, ‘More-Than Human Centred Design’.

4 Bryant, *Onto-Cartography: An Ontology of Machines and Media*.

5 Dunne, *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*.

6 Coulton, ‘Sensing Atoms and Bits’.

7 Turing, ‘Computing Machinery and Intelligence’.

of large data sets, significant progress in cheap computational power and developments in data science. These advancements have permitted powerful algorithm-based technologies and methods which are dubbed AI but are implemented through Machine Learning (ML), Deep Learning and Neural Networks. AI and data collection are integral activities within the cloud-based services enabling smart thermostats, streaming services and AI assistants such as Alexa. These services facilitate detailed monitoring of user behaviour through data, often without explicit consent or knowledge⁸ - thus diminishing user agency. Furthermore, the data collected is used to train these systems, which can imbed biases that may be present in the data,⁹ which then appears in the subsequent predictions and decisions of these systems.¹⁰

Natural Language Processing (NLP) is the foundation of Alexa's operation and is a merger of ML and computational linguistics. NLP enables Alexa to analyse, understand and generate a response using data sent to Amazon's services for analysis. Located on the cloud, the Skill Service is coded by a developer to determine what actions to take in response to a user's request. The NLP that enables the skill is 'abstracted' from the developer, and their task is to define 'Intents' – answers expected from the user and 'Utterances' which predict the varying responses of anticipated intents. An expected intent triggers the 'intent handler' and returns a planned vocal response and output to the Echo device, which runs the Alexa programme. This is by no means a comprehensive explanation of the operation of Alexa's AI, which is beyond the scope of this paper; however, it highlights why design solutions for AI legibility are required as current AI functions are often black boxed behind corporate firewalls.

8 Zuboff, *The Age of Surveillance Capitalism*.

9 Amershi et al., 'ModelTracker: Redesigning Performance Analysis Tools for Machine Learning'.

10 Angwin, et al., 'Machine Bias: There's software used across the country to predict future criminals. And it's biased against blacks'.

Several factors further thwart an understanding of AI by users, most notably the various evolving expert definitions of AI. In particular the definitional dualism of AI; the reality of narrow AI juxtaposed with the inflated expectations of general-purpose AI, which is often presented in science-fiction as visions of sentient machines. AI based on ML exponentially expands through training data and its interrelation with thousands of weights and variables, eventually evolving beyond human intelligibility and accessibility. This opacity and subsequent lack of legibility within AI technology complicates the reality that there is no sense how or why a particular classification has been a product of the data inputs.¹¹ Furthermore, there are additional and distinct forms of intentional AI illegibility, which include corporate concealment of technological property for protection, coding being a specialist skill, deliberate user deception,¹² products falsely advertising the technological advancements of AI,¹³ and lastly but not limited to, significant device activities intentionally obfuscated in the name of HCD as practiced in Human-Computer Interaction (HCI).¹⁴ To formulate a response to the current lack of understanding, legibility, and the increasing prevalence of AI, we turn to questions of ontology.

Object-Oriented Ontology towards Alien Phenomenology: The Non-Anthropocentric Turn

To develop an alternative design approach for AI, this section provides an overview of our characterization of OOO. OOO is a fledgeling philosophy which emerged from Speculative Realism - the reality outside of the mind existing independent of human experience. This is a rejection of correlationism – the view that

11 Burrell, 'How the Machine "Thinks"':

12 Zuboff, *The Age of Surveillance Capitalism*.

13 Commonly referred to as AI snake oil.

14 Coulton and Lindley, 'More-Than Human Centred Design'.

being only exists as a correlate of the human mind.¹⁵ Through this rejection, OOO seeks and validates the ‘molten core’¹⁶ of objects. This theoretical stance is the defining momentum for our adoption of OOO as an alternative design approach to AI, thus challenging the preconceptions of HCD. However, there are several philosophical interpretations and much debate about the nuances of OOO,¹⁷ for our purposes an object is ‘any self-contained construct’ be it discursive, physical, organic, technological or inorganic.¹⁸ Despite variances in the theoretical stances, we have amalgamated OOO perspectives to formulate our understanding of OOO for design research. This may seem the undoing of any sound methodology, though as Law states ‘if the world is complex and messy, then at least some of the time we’re going to have to give up on simplicities’.¹⁹

OOO is constructed with and from the notion of phenomenology, particularly in challenging Heidegger’s theory from *Being and Time* (1927) that ‘things’ or objects only make sense related to their purpose and human use. Harman’s counterpoint to this is that things are not defined through human use alone but through any use, including object to object situations. The OOO fulcrum is that all things are equal in existence. A flat ontology or tiny ontology²⁰ recognises the existence of everything where humans are not the monarchs of being²¹ but do exist in the interconnectedness ‘*mesh*’ of all living and non-living things²².

With an understanding of OOO’s uncustomary ontological positioning, we can start to theorise how non-human entities

15 Meillassoux, *After Finitude: An Essay on the Necessity of Contingency*.

16 Harman, *Guerrilla Metaphysics: Phenomenology and the Carpentry of Things*, 254.

17 Harman, ‘Object-Oriented Ontology’.

18 Bryant, *Onto-Cartography: An Ontology of Machines and Media*.

19 Law, *After Method: Mess in Social Science Research*, 2.

20 Bogost, *Alien Phenomenology, or, What It’s like to Be a Thing*, 19–22.

21 Bryant, *The Democracy of Objects*.

22 Morton, *The Ecological Thought*, 28.

experience the world around them, to offer a non-anthropocentric perspective for designing solutions for AI legibility.

Alien Phenomenology

The philosopher-programmer Bogost introduced the theory of Alien Phenomenology (AP) or what's it like to be a thing²³ to represent his OOO thinking, expanding traditional phenomenology to investigate non-human ways of encountering the world. This practice is comparative to other exploratory methods of experience such as Second Order – to observe how the world is presented to another thing,²⁴ and Ethology with Uexküll's theory of Umwelt - seeking to observe the world as experienced by animals.²⁵ However, as AP stems from the board church of OOO, the practice has the opportunity to explore any being from trees, bits, atoms, games, institutions and how they encounter the worlds about them.²⁶ For this reason, it can be argued that OOO is 'rated high' in a taxonomy of non-anthropocentric theories as its viewpoint is all-encompassing, encouraging experimentation and appropriation with the ability to nest other theories without undermining either position.²⁷

Nevertheless, being presented with the idea of attempting to understand what it is like to be an AI, in our case Alexa, will be met with objection similar to Nagel's stance that we cannot know the 'subjective character of experience' for a thing.²⁸ Bogost's AP accepts that the experience of a thing can never be fully known, rather the only way to perform AP is via analogy, for example, the bat can be considered to operate like a submarine.²⁹ Bryant

23 Bogost, *Alien Phenomenology, or, What It's like to Be a Thing*.

24 Luhmann, *Social Systems*.

25 Uexküll, *A Foray into the Worlds of Animals and Humans: With A Theory of Meaning*.

26 Bryant, *Onto-Cartography: An Ontology of Machines and Media*, 62–74.

27 Coulton and Lindley, 'More-Than Human Centred Design'.

28 Nagel, 'What Is It Like to Be a Bat?'

29 Bogost, *Alien Phenomenology, or, What It's like to Be a Thing*, 64.

expands upon this idea towards making an *inference* about what ‘flows’ a thing is structurally open to, with our knowledge of ‘flows’ growing daily with the invention of instruments to detect flows invisible to us such ultraviolet radiation³⁰ and WiFi receivers. AP goes a step beyond the epistemic closure of human aims to investigate the aims, if any, of non-human things. Though it is not a call in denying our own aims and goals, as ultimately, by adopting AP our aim is to design the best results for humans using AI technology. To change the influence and interactions we have with AI, AP can provide an alternative perspective of how things encounter the world to devise strategies and design leverages within and in the remit of the thing in question. The call to action, once we have practiced AP, is how do we map a thing’s world?

Constellations with a side of Onto-Cartography

Bogost encourages us to ‘understand objects by tracing their impacts on the surrounding ether’.³¹ To trace objects and their ecological relations using OOO has previously been framed metaphorically for designers using the concept of ‘constellations’ for considering contexts like the IoT³² and AI.³³ Metaphorical terms are commonly used to evoke the ‘shapeless and faceless, everywhere and nowhere’³⁴ of things like AI³⁵ and the IoT³⁶ in design, which is also emulated in Bogost’s thesis of AP. The metaphor ‘constellation’ originated from the notion ‘ideas are to objects as constellations are to stars’³⁷, describing how the perspective of things changes depending on the observer’s perspective,

30 Bryant, *Onto-Cartography: An Ontology of Machines and Media*.

31 Bogost, *Alien Phenomenology, or, What It’s like to Be a Thing*, 33.

32 Coulton and Lindley, ‘More-Than Human Centred Design’.

33 Pilling and Coulton, ‘What’s It like to Be Alexa? An Exploration of Artificial Intelligence as a Material for Design’.

34 Pierce and DiSalvo, ‘Dark Clouds, lo&#!+, and [Crystal Ball Emoji]’.

35 Dove and Fayard, ‘Monsters, Metaphors, and Machine Learning’.

36 Cila et al., ‘Products as Agents’.

37 Benjamin, *The Arcades Project*, 34.

magnifying and changing scope dependent on influences such as culture and awareness. Individual aspects of constellations can be out of view, such as a 3rd party's influence on data collection. Just because one cannot see a thing, it does not mean it has a significant impact on another thing's operation. Aperture and depth of field for constellations can be modified to include objects that are of importance for any context or situation, though in practice, context-specific perspectives are the focus in constellations to remain a beneficial insight for design purposes.³⁸

Constellations can be considered a form of Onto-Cartography, developed in Bryant's homonymous thesis where the practice attempts to map the way assemblages, and relations of and between things organise social relations or ecologies. In other words, Onto-Cartography highlights power structures, functions and derived formations, to provide an ontological framework to consider political and ethical questions. Without attentiveness to these things, we are unable to consider the manifestations of things and interactions within a constellation thoroughly.

In summary, by observing an AI constellation (Figure 01), designers can speculate different interactions required to make Alexa's operations more apparent, such as notification of personal user data monitoring. The role of OOO through the scope of constellations brings forth multiple perspectives and power structures to highlight the interdependent relationships and independent perspectives within the Alexa assemblage.

Carpentry: Revealing the Phenomenology of Things through Design Fiction

Another of Bogost's neologisms is Carpentry – the 'making of things that explain how things make their world'.³⁹ A practical philosophical method to reveal the phenomenology of things.

38 Coulton and Lindley, 'More-Than Human Centred Design'.

39 Bogost, *Alien Phenomenology, or, What It's Like to Be a Thing*, 93.

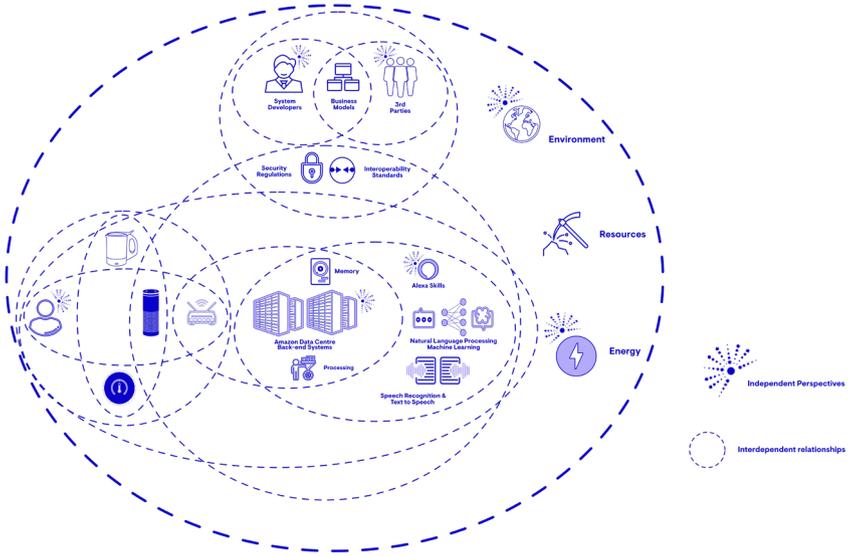


Fig. 1

An example of the many possible Alexa constellations noting some of the possible independent perspectives and interdependent relationships. Image by the author Franziska Pilling

An intuitive method for design given its tangible, hands-on approach to a problem. Carpentry fabricates artifacts as a ‘mediator’⁴⁰ between things to expose the thing’s ontology. For example, software can be ‘hacked’ into and code written to expose the unit operations or being of that software.

A tool to hand, for Carpentry to be enacted, is the practice of Design Fiction (DF), defined by design theorist and science-fiction writer Sterling as ‘the deliberate use of diegetic prototypes to suspend disbelief about change’.⁴¹ There are many interpretations of what and how to practice DF. The one we adopt is DF as World Building – ‘a collection of artefacts, that when viewed together build a fictional world’,⁴² or in this case, an ontological sandbox. Here we also view DF as a type of engine to kindle a speculative reality to perform Carpentry on Alexa’s skill service, our appropriated *Diegetic Thing*.

40 Harman, *Guerrilla Metaphysics: Phenomenology and the Carpentry of Things*.

41 Bosch, ‘Sci-Fi Writer Bruce Sterling Explains the Intriguing New Concept of Design Fiction’.

42 Coulton, Sturdee, and Stead, ‘Design Fiction as World Building’.

The constellation [Fig. 1] was an important means of identifying the relevant actants and focal points from which to consider the material relations, their potential impact and gather intel for an accurate representation of Alexa's operations for our DF. Such as the Amazon Web Services (data centres), back-end AI services such as Automatic Speech Recognition, and the existence of various providers' business models. The constellation also provided the means to highlight the unknown ambiguous qualities of things that are unlikely to be established, or solutions that would provide greater legibility and agency for the user. In a generative manner, the process of mapping the constellation catalysed the idea to appropriate the skills function and utilise the already established voice interaction, thereby facilitating the speculative application of communicating salient and consequential information to the user. An act recognised through OOO of balancing the practical constraints against possible 'better' design choices.⁴³

From the overview of the constellation, we were able to progress our DF world by devising entry points utilising an advertisement campaign and how-to manual for the Alexa skill [Fig. 2] providing a palpable means to explore and attempt to answer the question – if it were possible to converse with Alexa's being, what would it say about its ontology?

The figure represented here is the entry point into this speculative world where the 'Alexa Frankenstein Skill' has been developed with the logic that Alexa would state its own ontological status via its own skills service, based on its evolving AI functions and operations resulting in legible AI. This DF enables us to speculate how it could be conceivable to implement interactions for legible AI, thereby resulting in more ethical and trustworthy AI operations while also highlighting what is presently missing from current AI-infused products. By reflecting

43 Lindley, Akmal, and Coulton, 'Design Research and Object-Oriented Ontology'.

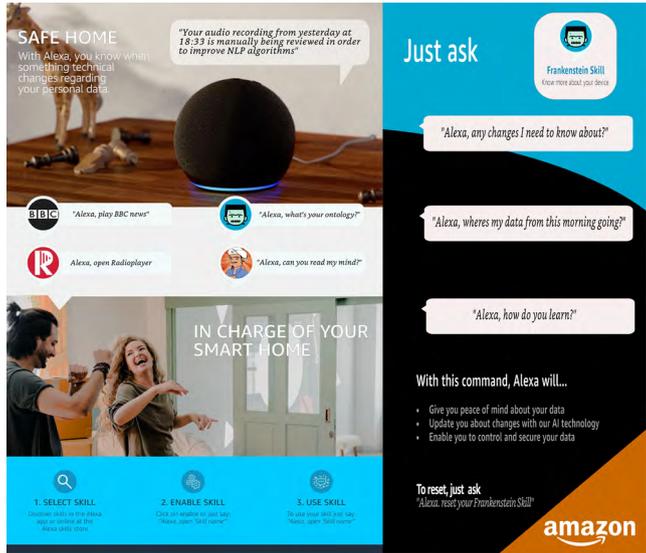


Fig. 2

A Diegetic Thing, working on multiple levels, from the world building of a mundane lived experience to a platform for speculative ontological Carpentry, providing a theoretical solution within itself for AI legibility. Image by the author Franziska Pilling.

on the initial constellation and the DF together, designers can further speculate what actants would need to evolve, or power structures be revised, to encourage enhanced user agency. Furthermore, the application of world building offers a speculative, yet uncannily tangible platform to consider the ontology of Alexa via Carpentry, thereby permitting a more-than human perspective of the thing in question, and an alternative insight towards possible solutions beyond the usual scope or rhetoric.

Conclusion and Future Research

This research paper is a starting point of a larger body of research, concerned with developing AI as a material for design. This paper uses OOO philosophy as a methodology to explore how design research can achieve a tangible, albeit uncustomary, perspective of AI. While it is noted that the DF has the opportunity to expand and develop, it is presented here as a means of highlighting that OOO can be a generative method and ideation tool by which to fabricate original ideas pertaining to the complex and obscure nature of AI. The facilitation of OOO provides

a contemporary method of bypassing the dogmatic allegiance to the primacy of human perspectives in HCD and moves towards a more open and sympathetic view of all actants in a given context or ecology. We focused on the current lack of AI legibility, a culmination of varied motives, as noted in this paper, where designers have the freedom to adopt alternative design approaches to provide solutions to contest the opaque nature of AI. The use of OOO in design provides the means of making the intangible and complex qualities of AI and data into materials to design with while providing generative and analytical tools to design for non-human things. To respond to this challenge, design and its metaphors need to evolve and keep pace with the rapidly evolving sociotechnical landscape - the adoption of OOO and alternative theories in design is an accessible way to accomplish this.

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Metabolic Architecture: Dialogues with Microbes

Microbes; Metabolism; Dialogues; Living Architecture; Bioelectricity; Active Living Infrastructure: Controlled Environment (ALICE).

Rachel Armstrong

KU Leuven, Campus Sint-Lucas, Ghent/Brussels, Belgium
Rachel.armstrong@kuleuven.be

Rolf Hughes

KU Leuven, Campus Sint-Lucas, Ghent/Brussels, Belgium
Rolf.hughes@kuleuven.be

To enable a life-promoting era of microbial *design*, ways of mutually engaging our microbial ecosystems are needed. This is a challenging proposition under the established conditions that shape the modern Reign of Hygiene, where, especially at a time of pandemic they are regarded as contaminants and agents of disease. Cleanliness, or so we have long been told, is next to 'Godliness'. Since biogenesis, however, microbes have tirelessly shaped the Earth's ecosystems and with the right approach that is enabled by twenty-first century insights and developments in molecular biology, they can establish an appropriate environmental equilibrium for the present era to establish a new liveability. Drawing on the European Union funded projects *Living Architecture and Active Living Infrastructure: Controlled Environment* (ALICE), this paper explores what it means to design along with microbes by establishing dialogues, using the language of metabolism, specifically in the production of bioelectricity. Capable of transforming our everyday activities into world-making actions, the architectural future of designing dialogues with microbes is discussed to counteract the impacts of our increasingly hostile planetary systems.

Our Microbial World

The current lockdown during the COVID-19 pandemic spotlights the presence of microbes — fungi, bacteria, protists, archaea, viruses — all around us. They are even in our homes, where we usually spend around 90% of our time (Green 2014). Highlighted by the recent discovery of the *human microbiome* (Lederberg and McCray 2001) and the *microbiome of the built environment* (Kembel et al. 2012), we now know that our bodies and all surfaces have a characteristic microbial ecosystem. Microbes have always been an essential part of the living world, tirelessly shaping the Earth's ecosystems since biogenesis. With the right design approach, the same microbes can also establish an appropriate environmental equilibrium for the present era, so that we may find a new baseline for co-existence. This is something that, in various ways, we have already explored, but have yet to unleash its potential. Representing safe and effective processing platforms throughout human history, microbial applications are widely used in cooking, fermentation, antibiotic production, burial rituals, and sewage treatment. In a twenty-first century context, however, their broader technical uptake is complicated by modernity's Reign of Hygiene, which equates them with infectious disease—a principle that, in practice, ends at the plug of the sink and the toilet bowl. Promoting notions of microbial sterility as an ideal, domestic rituals pursue microorganisms to extinction through liberal applications of household poisons — despite less than one percent of all microbes being pathogens (Editorial 2011). Using cutting-edge biotechnological insights, we can alter our view of the microbial realm by paying attention to its world-making potential. With fresh access to the microbial commons all around us, which facilitates the *relatively frictionless exchange of biological materials between microbes and people* within our living spaces, new technologies establish the stage for *interspecies diplomacy*. Everyday transactions become possible that comprise a kind of microbial *economy* between human and microbe that is founded on metabolism and is

capable of transforming our everyday activities into life-supporting actions (de Lorenzo 2015). Our present lifestyles do not support such exchanges, as modern technologies are focused on the metabolism of machines, where life-promoting infrastructures are a secondary concern for building design. By focusing on our microbiomes, and our own role as propagators of the microbiome of the built environment, we are poised to directly influence microbial activity within the built environment in ways that *can be designed* to generate environmentally beneficial outcomes. To access these desired probiotic actions, a different approach to design is needed. Most notably, the “pure” human subject at the heart of architectural design is decentred, so we can pay close attention to the kinds of microbes we live alongside, recognise their diversity, understand their needs and observe how they behave in different settings. Present knowledge of the natural history of the microbiome of the built environment is incomplete and cutting-edge research is needed, which includes its characterisation, to help us strategically engage its potential — not only during a pandemic but also in untroubled times.

Microbial Dialogues

Our present view of microbes is established by the Reign of Hygiene¹ that regards them as contaminants and agents of disease. To enable an era of microbiome design, ways of mutually coexisting along with our microbial ecosystems are needed, while simultaneously addressing the environmental

1 The Reign of Hygiene is a notion of cleanliness that typifies modernity. It is characterised by regiments of products, materials and technologies that were said to destroy all known germs through multiple, vigorous acts of chemical sanitation. Assisted by wipe-clean ceramics, with white veneers that spotlighted the presence of dirt, antimicrobial products and practices went from novelty to an essential fixture in our daily lives within the course of a century.

wrongdoings of the Anthropocene.² To a microbe, environment is everything, so a detailed understanding of the microbial realm is needed for the *design* of microbiomes within the indoor environment by shaping airflow, surfaces, humidity, concentrations of resources, and the availability of sites for colonisation, to encourage particular kinds of microbial action that begin *essential microbial dialogues*.

Microbial Dialogue I

M1: Oh, you're here.

M2: I brought you a gift.

M1: You've had a long journey.

M2: This is for you.

M1: Make yourself at home.

M2: Thank you for having me.

M1: Think of yourself as one of us.

M2: What a lovely —

M1: Our humble abode. But we like it. We call it home.

M2: It's spotless.

M1: Good fences make good neighbours. The cleaner comes Tuesdays and Fridays. The gardener Sundays. I imagine you are hungry.

M2: Actually – But thank you for asking.

M1: Oh.

M2: I like this place. It's warm.

2 Anthropocene is used to describe the time where the "human imprint on the global environment has now become so large and active that it rivals some of the great forces of Nature in its impact on the functioning of the Earth system" (Steffen et al. 2011). It is characterised by the climate emergency caused by overuse of fossil fuel energy and compounded by rapidly growing urbanisation.

M1: We expected you to be cold.

M2: No, it's warm. Very warm.

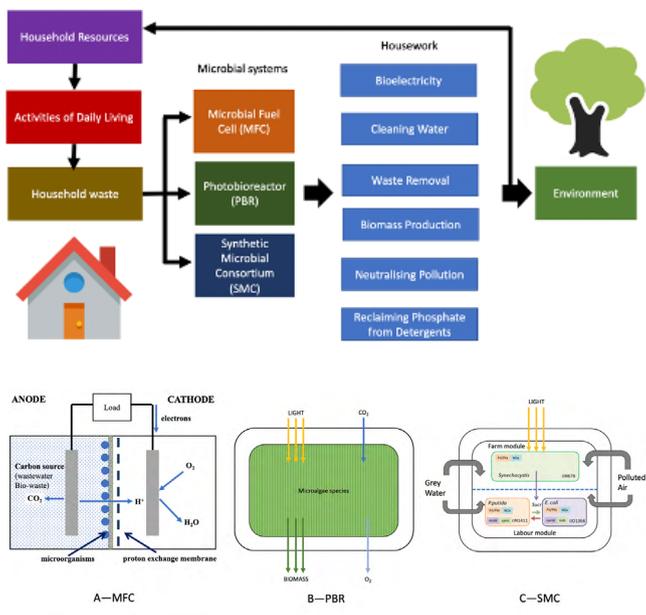
[Pause].

M1: Look, if you are to stay here, it's best we establish some rules—basic personal hygiene, for example. Cleaning routines. So we don't get under each other. So everything stays spick and span.

Living Architecture

Such relationships are more than speculative. Prototypes that establish these forms of exchange already exist. Living Architecture³ is an architectural case study in designing the metabolic processing powers of microbes. This freestanding interior partition wall and multi-utility system is about the size of a large bookcase, and is suitable for installation in a bathroom, or kitchen. Powered by household waste — urine and greywater — resident microbes produce energy in the form of bioelectricity, as well as cleaning water, removing waste, neutralising pollution, reclaiming phosphate from washing liquids and generating different kinds of biomass. Environmentally beneficial outputs are circulated within the home as renewable resources, establishing a platform for a circular economy of the household, [Fig. 1] (Armstrong et al. 2017). Interrogating the extent of the design of microbial processes, Living Architecture uses three different “brick” types to provide ideal homes for microbes with distinctive types of metabolism, namely the microbial fuel cell, algae photobioreactor and synthetic consortium bioprocessor, [Fig. 2].

3 The *Living Architecture* project is a Future and Emerging Technologies Open project funded by the Horizon 2020 research and innovation programme under EU Grant Agreement no. 686585. It brings together experts from the universities of Newcastle, UK; the West of England (UWE Bristol); Trento, Italy; the Spanish National Research Council in Madrid; LIQUIFER Systems Group, Vienna, Austria; and Explora, Venice, Italy.



The microbial fuel cell houses an anaerobic bioelectrically active biofilm, whose electrons are harvested to produce usable amounts of electricity, while removing organic matter from water (Ieropoulos et al. 2016). The system is self-powered, and its actions are coordinated by an artificial intelligence, which optimises the system outputs. The metabolism in the photobioreactor is photosynthesis, which traps sunlight and carbon dioxide to produce solid biomass. The anaerobic and photosynthetic metabolisms are linked by introducing oxygen from the photobioreactor into the cathode, which boosts the electrical power of the microbial fuel cell, generating a cyclical economy of matter powered by metabolism. The final metabolic “brick” is a synthetic consortium bioprocessor that is composed of a farm and labour module separated by a selectively permeable membrane. The farm system feeds the labour module by housing engineered organisms that over-produce sugar, which passes through the membrane into the labour module to feed workhorse organisms. Within the sugar-rich environment the well-known genes of these species can be combined to design new metabolisms that do not occur

Fig. 1
Circular Economy of the household provided by the Living Architecture installation. Rachel Armstrong, courtesy of the Living Architecture project.

Fig. 2
The three bioreactor types of Living Architecture installation: A — Microbial Fuel Cell (MFC); B — Photobioreactor (PBR); C — Synthetic Microbial Consortium (SMC). Rachel Armstrong, courtesy of the Living Architecture project.

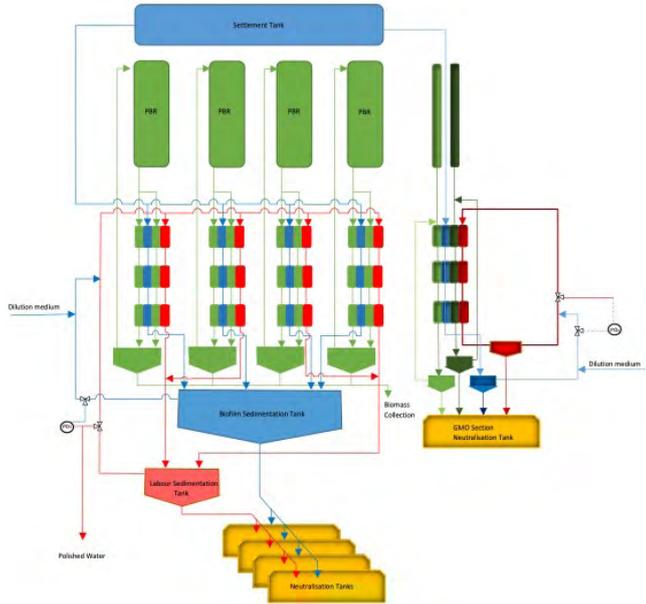


Fig. 3

Living Architecture final bioreactor complex. Courtesy of the Living Architecture project.

Fig. 4

Living Architecture final installation. Rolf Hughes, courtesy of the Living Architecture project.

in nature. Specifically, phosphate can be reclaimed from household detergents and polluting nitrous gases are removed from the air. The ability to stitch different metabolic building blocks together between microbial species greatly increases the metabolic range for design and enables the scaling of these processes. The final configuration of the Living Architecture bioreactor complex is shown in [Fig. 3] and the final installation in [Fig. 4].

Active Living Infrastructure: Controlled Environment (ALICE)

A digitally enabled version of a bioprocessor “brick” from Living Architecture comprises the *Active Living Infrastructure: Controlled Environment*, or ALICE,⁴ prototype, which provides an interface that facilitates *conversations with* microbes and is shown in [Fig. 5].

Using real-time energy data, ALICE powers and informs “data microbes”, or “mobes,” that appear as animations which invite people to use a remote-controlled system which feeds and warms them in a feedback loop that takes place within the “brick,”[Fig. 6].

Demonstrating the scalability of the system, *999 years 13 sqm (the future belongs to ghosts)*, a modified version of Living Architecture, was developed for the Whitechapel Gallery in collaboration with artist Cecile B. Evans as part of the “Is This Tomorrow?” exhibition. Housing a screen-based system powered by an array of microbial fuel cell “bricks,” the clear-walled apartment embodied the smallest rentable space in London with the longest possible lease, embodying a posthuman “household” inhabited by ghosts of the past, present and future. Establishing foundational principles for bio-digital architectures, these design-led explorations interrogate new frontiers in low-power electronics, materials and robotics, [Fig. 7].

The low power electronics systems powered by microbial bio-electricity in these prototypes and installations are critical for stabilising carbon dioxide emissions, as they establish limits to consumption and promote the re-deployment of “waste.” With the appropriate innovation, necessary constraints, such as 12V

4 Active Living Infrastructure: Controlled Environment (ALICE), is a collaboration between the University of Newcastle, University of the West of England and Translating Nature. This EU-funded innovation award prototypes the construction of a novel bio-digital interface using Microbial Fuel Cells and augmented reality experience for “living” bricks developed in the Living Architecture project.



Fig. 5

The Living Architecture 4-chamber bioreactor complex acts as an “organic battery” for a digitally-enabled user experience. Rolf Hughes, courtesy of the Living Architecture project.



Fig. 6

ALICE augmented reality experience with “mobes” that are viewed through an iPad. Courtesy of the ALICE Project.

Fig. 7

999 years 13 sqm (the future belongs to ghosts) installation by Rachel Armstrong and Cecile B. Evans at the Whitechapel Gallery, London, 2019. Courtesy Rolf Hughes.



power supplies to domestic environments, do not reduce the overall quality of living but invite new lines of innovation, for example, using ultrasound for washing⁵ and incorporating elastocaloric materials in refrigeration (Cong et al. 2019). Present approaches using renewables do little to reduce the thermo-economic profile of societies, as they aim to match the outputs of fossil fuel-based technologies established by past innovation and perpetuated through ongoing urban growth. To reduce our overall resource consumption and environmental impact, however, the economy must be kept at a steady state while investing energy in maintaining our civilisation, rather than expanding it. This also means that existing fossil-based innovations must urgently be phased out, and new non-fossil fuel-based technologies with qualitatively different impacts developed (Garrett, Grasselli and Keen 2020). Microbial technologies are ideally situated to fulfil this goal, offering a vital, relevant platform at a critical time in our history that renders effective carbon dioxide emission reduction achievable, while simultaneously promoting liveability and securing fairness for the natural world.

The Bioelectrical Commons

The ecological turn in architecture is, therefore, based on a new *thermo-economics* as the foundation for a regenerative society. Using “living” microbes instead of “dead” fossil fuels, utilities are not separate systems but are regulated in parallel with each other. Scaling up transactions from an individual household to an urban environment, however, requires convergent innovation, where different aspects of low-impact lifestyles are networked together in ways that catalyse social, design-led and technological innovation. By shaping our values, lifestyles, environmental impacts and economies, microbial technologies will alter design

5 A conventional washing machine will use 400 to 1300 watts, with modern Energy Star rated models using about 500 watts, while most ultrasonic cleaners run at an average power of 50 watts to 100 watts per gallon (Sonic Soak 2019).

imaginaries that change building affordances and our lifestyle expectations. In this way, they will gain the performative and cultural equivalence of Le Corbusier's "machine à habiter".

"A house is a machine for living in. Baths, sun, hot-water, cold-water, warmth at will, conservation of food, hygiene, beauty in the sense of good proportion. An armchair is a machine for sitting in and so on." (Le Corbusier 2007: 151)

Currently, our relationship with microbes is not aligned with twenty-first century scientific insights, where, through the active design of microbial landscapes — from scaling up microbial fuel cells, to photobioreactor and mycorrhizal farms — probiotic health benefits can be reaped, environmental impacts are reduced and through localised cultivation, their actions can be directed towards performing the (house)work of everyday life. Committed to scaling up the specific applications characterised by bioelectricity systems, the PHOENIX⁶ network is developing strategies for the implementation of a low-power society through bioremediators (metabolising toxins), biosensors (detecting pollution), and bioreactors (generating resources like biomass and energy). While urban scale installations are not yet formalised, their development is likely to follow three key pathways: "smart" bioremediation systems, urban retrofit, and combined utilities infrastructure for off-grid settlements, see Table 01.

6 PHOENIX is a COST (European Cooperation in Science and Technology) Action (CA19123) network of forty EU member state representatives that explores uses of microbial platforms to addresses issues of urban protection, resilience and rehabilitation of damaged environments. See, <https://www.cost.eu/actions/CA19123/#tabs|Name:overview>

Types of microbial action	Technological System	Applications	Urban Manifestation
Bioelectrically active biofilms.	<i>Active Living Infrastructure: Controlled Environment (ALICE).</i>	Waste-powered organic battery for 12V electronic systems.	<i>Low-power electronics</i>
Bioelectrically active biofilms, photosynthetic microalgae and synthetic microbial consortium.	<i>Living Architecture</i> strategically combines the different metabolisms to generate circular metabolic exchange.	Low power energy, cleaned water, bioremediation.	<i>Circular economy of the home</i>
Diverse microbial metabolisms and processes selected with respect to the type of contaminated media that needs detoxification and the nature of the pollutant(s).	<i>In situ</i> (in place of contamination), or <i>ex situ</i> (off the site of contamination), with bioreactors for bioremediation including packed, stirred tanks, airlift, slurry phase, and partitioning phase reactors, etc.	Environmental clean-up.	<i>Selective bioremediation</i>
Diverse microbial processes and metabolisms selected with respect to the contaminated media that needs detoxification and the nature of pollutant(s). Bioelectrically active microbes also generate electrons in the presence of certain metabolic conditions rendering the production of a signal specific to the presence of a metabolite.	<i>In situ</i> (in place of contamination), or <i>ex situ</i> (carried in MFC-powered robots fuelled by extant organic matter).	Monitoring of sewerage.	<i>Smart sewers</i>
Bioelectrically active biofilms.	Designed receptacles for specific exchanges between human and microbe like urinals, e.g. <i>Pee Power®</i> , <i>Green Pee</i> .	Turning urine into usable electrical energy, e.g. playing computer games, lighting, powering electronic devices, e.g. mobile phones.	<i>Urban retrofit</i>
Bioelectrically active biofilms, photosynthetic microalgae and local microbial species that respond to specific metabolites.	Strategic combination of different metabolisms to generate circular metabolic exchange within a specific site or community.	Configurable systems that can change outputs according to community needs and resource availability.	<i>Off-grid living</i>

Table 01. Overview of emerging applications in microbial design

Smart bioremediation

Operating through existing infrastructures such as wastewater treatment plants, processing centres for toxic agricultural wastes (e.g. coffee, olive oil), and brownfield site remediation, microbial technologies can be scaled to urban applications. Incorporating naturally forming biofilms and mycoremediation into these sites enables the harmful substances within elutants and residues to be neutralised through specific types of metabolic processes that also harvest bioelectricity. This powers a range of (biodegradable) environmental sensors that monitor (or “observe”) the overall process and are coordinated by an AI, which also establishes the possibility of bioremediation blockchain networks.

Urban retrofit

Influencing the emergence of the bio-digital city, highly valorised microbial technologies can generate bioelectricity from waste, which is strategically deployed in urban settings. These retrofit approaches do not change the extant infrastructure of cities but instead offer valuable adjuncts to overall reducing the thermoeconomic profile of specific urban spaces. Encounters with microbial technologies can be framed within a cultural context to encourage relatable installations like urinals, the otherwise unsightly outputs of which are used for plant irrigation and fertiliser, while also generating enough electricity to stimulate social encounters, for example, by powering a mobile phone or LED system (Walter et al. 2018: Green Pee 2020). On a community scale, urban wastewater gardens are installed widely in Europe and East Asia, which are based on a fixed bed biofilm system utilising both natural (plant) and engineered (bimodule) root structures. The incorporation of root microbiomes into waste processing drastically occurs within a botanical garden setting capable of servicing between 5,000 to 30,000 inhabitants (Organica Water 2020). Although these processing plants are not currently integrated with microbial fuel cell arrays to

simultaneously generate electricity, such convergence is already under consideration in the construction of artificial wetlands (Xu et al. 2019) and in the EU Innovation Action proposal “Microbial Urbanism” (Hughes and Armstrong in press). As citizens are no longer obligate consumers of resources but producers able to share their resources, they benefit through a range of economic benefits, from reducing energy costs, to establishing micro economies that trade bioelectricity, enable off-grid living, use blockchain contracts, and even introduce a bioelectrical commons for communities to power public spaces, e.g. LED street lighting.

Off-grid settlements

Freed from the expectations and constraints of modernity, settlements without existing infrastructure such as outlier holiday homes, festivals (Glastonbury) (Barrett 2019), refugee camps (Oxfam 2015), and mobile homes like caravans, have the potential to rethink their entire way of living — from the activities of daily life, to land ownership, and even issues of population mobility in response to climate stress, where transboundary mobility can be lifesaving in emergency times (Hart 2015). With microbial technologies providing a circular metabolic economy capable of sustaining a good quality of life for off-grid living, such lifestyle choices contextualise the uptake of microbial technologies from first principles and may become increasingly popular as planetary systems become more hostile.

Microbial Dialogue II

M2: You want me to say I’m sorry. But I’m not.

M1: You never understood how we live.

M2: You never fixed things. You didn’t even take care of your kids.

M1: I wanted to flush it away, the chaos. But the flush is broken.

M2: It's hard for you to let go.

M1: Why should I?

M2: Things are much livelier now. New life is budding. How does the song go? *We are the dead. Short days ago/We lived, felt dawn, saw sunset glow,/Loved, and were loved, and now we lie-*

M1: You're mocking!

M2: Frankly, we're not bothered by mistakes – we always find a way. It's you that should be concerned. Truly. [Pause]. Admittedly, it might be a bit late.

Conclusion

The strategic application of microbial systems in our cities, landscapes and living spaces present spatial and material challenges that are vital for reversing some of the damage our species has inflicted. If we are to develop new architectural and urban programmes based on metabolic transactions afforded by the microbial commons, we need to design research and investment towards configuring a *new liveability*. Projects such as Living Architecture and ALICE show that the potential of actualising a *bioelectrical commons* is feasible, an ambition shared by the PHOENIX COST Action, although there are many barriers to uptake. Microbial technologies provide the building blocks of a combined utilities platform that offers a real alternative to fossil fuel-based amenities where both humans and nonhumans can actively coexist through mediated conversations and highly socialised modes of cohabitation within domestic and urban environments (Armstrong, 2019; 2018; Armstrong and Hughes, 2021; Armstrong, Ferracina and Hughes, 2020; Hughes, 2019; 2018, Hughes and Armstrong, 2020). In the absence of a liveable, sustainable “normal,” such developments may even be essential for our ongoingness.

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Material Preservation: Reuse of Man-made Capital as an Ecological Approach in Architectural Design

Built Environment; Circular Economy; Reuse; Urban Mining; Bricoleur.

Elisa Zatta

Università Iuav di Venezia, Venice, Italy
ezatta@iuav.it

This paper aims to depict the potential role of the reuse of building products and components as a sustainable strategy for the management of the built environment, as well as evaluate the contributions this perspective brings to the architectural and cultural debate. Among the circular strategies, reuse exceeds the ecologic potential of recycling processes, as through the preservation of man-made capital – understood as a product of the Anthropocene – it ensures the persistence of the material culture that conceived it. In this paper I shall discuss the implementation of reuse through an overview of the European practitioners' activity in the field. The first section contextualises reuse within a multidisciplinary framework, illustrating its role as a resource efficiency approach in urban mining strategies. The second section details the implications of this approach for the methods and outcomes of architectural design, both through an examination of the current theoretical position and the analysis of contemporary case studies, stressing the ecological purpose and cultural significance of these practices. The third section analyses how the *bricoleur* approach in architecture represents an attitude able to ensure the preservation of both cultural and natural capital, framing this perspective in the contemporary architectural domain.

Introduction: value retention of resources in the Anthropocene

Although still lacking a formal definition as a geological time unit, the Anthropocene is generally considered the consequence of the mounting impact of human activity on Earth.¹ According to stratigraphic evidence, current research² identifies the mid-20th century as the breaking point in Holocene dynamics and patterns. As the traces of this change in pace must be sought in the sediments of human activities, nothing better illustrates the stratified evidence of contemporary consumption and production patterns than our built environment. In this respect, Waters and Zalasiewicz³ argue that concrete, “a ubiquitous component of the modern technosphere” since the 20th century, could be considered “the most abundant anthropogenic sedimentary rock on the planet”.

As part of the man-made capital, human settlements were designed according to a linear approach, that is, without taking into account their end of life.⁴ Since Construction and Demolition Waste (CDW) accounts for a considerable share of the total waste production, the current state of the European building stock⁵ leaves little room for optimism. In the next decades, a large number of buildings will require too many energy, seismic and dwelling improvements to be renovated, and will more likely be demolished. The resulting materials will be recycled, if not disposed of. However, since both energy and matter are subject to degradation, recycling reveals itself as unfit for dealing with linearity's product – waste.⁶

1 Results of binding vote by AWG (Anthropocene Working Group) released 21st May 2019. Available at: <http://quaternary.stratigraphy.org/working-groups/anthropocene/> [last accessed: 10.2020]

2 Zalasiewicz et al., “The Working Group on the Anthropocene”, 55

3 Waters and Zalasiewicz, “Concrete”, 84

4 Papanek, *Progettare per il mondo reale*, 8

5 EU Buildings Database

6 Georgescu-Roegen, *Energia e miti economici*, 37

Moreover, the circular economy is recently gaining momentum as a strategy fostering sustainability, suggesting how processes belonging to the “inner loops” (e.g. repair, reuse, and remanufacture) should be preferred to recycling since they represent higher forms of “value retention”.⁷ In this perspective, the intrinsic value of material resources differs from their economic one: the more the original state of a manufactured good in the economy is preserved through lifespan extension, the more its value retention is ensured. Avoiding the energy and emissions required for both new manufacturing and recycling, or, rather, saving “most embodied resources (energy, material and water)”⁸ of a product, reuse strategies prove to preserve both natural and man-made capital.

Consequently, the implementation of reuse processes may constitute an appropriate tool for the sustainable management of the current building stock, promoting life extension of products and components when a building’s end of life appears no longer deferrable.

Could these processes play an active role in contemporary architecture as a means to encourage the preservation of both the natural and built environment? What are the implications of this paradigm in architectural practice and cultural debate?

Approach and structure of the research

According to the perspective outlined above, this paper investigates the reuse of building elements as a significant tool to promote a transition towards a more sustainable built environment, identifying how this contemporary architectural practice demonstrates an ecological approach.

The first part of the paper (paragraph 3) contextualises reuse practices in architecture as instruments for an efficient material

7 Reike et al., “The Circular Economy”, 248

8 Stahel, *The Circular Economy*, 30

resources management from a multidisciplinary point of view, highlighting the social and economic advantages such practices may generate, as well as their suitability for the preservation of both manufactured and natural capital.

The second part (paragraph 4) examines the dynamics that reuse processes could activate in the resource management of future urban areas, according to a metabolic perspective and through urban mining strategies.

The third part (paragraphs 5 and 6) reflects on the practitioners' bricoleur approach, which enables them to apply their ingenuity in redefining the relationship between the material and form of reclaimed elements and their "second life" function, according to the specific residual performance. This section analyses several international case studies, identifying the reasons that motivated designers to reuse building products and components, besides ecological purposes.

The fourth part of the paper (paragraph 7) analyses and discusses the investigation in relation to current policies and research in the field, finally drawing the research conclusions in the fifth part (paragraph 8).

Reuse processes in construction: more than material efficiency

The externalities of the post-industrial linear economy emerged during the 1960s, under the guise of the "environmental crisis."⁹ Although the development myth¹⁰, advocating an infinite growth in a finite system, does not envision the concept of "limits,"¹¹ the irreversibility of the economic process¹² was never tackled as a factor leading to resources depletion and environmental

9 Commoner, *Il cerchio da chiudere*, 10

10 Latouche, *Come sopravvivere allo sviluppo*, 27

11 Boulding, "The Economics"; 4; Schumacher, *Piccolo è bello*, 35

12 Georgescu-Roegen, *Energia e miti economici*, 30

deterioration.¹³ In this perspective, the circular economy “inner loops”, shifting the focus from production to durability, could contribute to foster sufficiency, rather than efficiency and growth,¹⁴ hence reducing waste.

These strategies could represent a means to address the construction materials footprint, since “even though materials can change their form, they cannot disappear”,¹⁵ and neither can CDW. Acknowledging an economy that “remains too ‘linear’”¹⁶, recent European policies have been addressing resource efficiency in constructions beyond the buildings’ operational energy, as well as issuing guidelines and protocols to foster proper CDW management. The two Circular Economy Action Plans¹⁷ stress the importance of adopting a life-cycle approach, identifying the construction sector as a key value chain in which to enact circularity and enhance overall sustainability of the built environment.

In particular, the reuse of building elements, preserving the energy and carbon embodied within products and components, enables the reduction of manufacturing emissions, and “is also likely to promote local sourcing, manufacturing innovation and job creations”.¹⁸ The social advantages of processes such as reuse and remanufacture are extensively illustrated by Stahel,¹⁹ who argues their higher labour input due to the connection to a local context in geographical and volume terms, also requiring additional activities that are absent in manufacturing. Moreover, reuse preserves, within the durable elements’ features and

13 On the contrary, the solution was quite promptly identified in the “sustainable development” narrative, allowing the linear paradigm to endure by relying on green growth (Latouche, *Come sopravvivere allo sviluppo*, 29; Parrique et al., *Decoupling debunked*, 58)

14 Stahel, *The Circular Economy*, 66

15 Lynch, *Deperire*, 125

16 EC, 2019

17 EC, 2015; 2020

18 Gorgolewski, *Resource Salvation*, 21

19 Stahel, “Policy for material efficiency”, 9



performances, the traces of the human design and activities that shaped them.²⁰ This artificial capital management represents a twofold contribution to the future sustainability of urban areas, promoting both the reduction of their ecological footprint and the conservation of a sedimentary and stratified built environment [Fig. 1].

Reclamation as a strategy for a circular built environment

Cities' metabolism represents one of the fields to be more carefully governed to foster carbon neutrality. Regarding material flows, buildings and infrastructures fall victim to real estate dynamics, whereby their obsolescence no longer reflects a structural or functional failure,²¹ but mainly market trends. The

Fig. 1

Reclaimed tiles, Rotor Deconstruction showroom, Brussels. Image by the author

20 Ghyyot et al., *Déconstruction et réemploi*, 84

21 Abramson, *Obsolescence*, 4

assumption that a standing building is more likely a material mine than its rubble in a backfilling would be,²² implies a more conscious approach than the selective demolition one. Indeed, while separating material flows merely leads to more efficient waste management, salvaging all material resources resulting from a clever strip-out process means considering them as valuable products and components. Urban mining strategies in the architectural field are gradually adopting this perspective, recognising the value embodied in the material stock of a city,²³ and European practitioners in the field have recently been fostering deconstruction more than destruction, hence reuse more than recycling.

The current built environment was not designed for disassembly – as hopefully future constructions will be, which will enable a more efficient management of the elements composing them. Rau²⁴ argues that contemporary cities represent more “depots” than “mines”, due to the lack of information concerning their embedded stocks. Ghyoot et al.²⁵ identify the main features of the “ore” that increase salvaging difficulties in its being heterogeneous and unpredictable, scattered and private, and therefore hard to estimate in amount and value. Other difficulties include storage management, higher labour costs, and the amount of time involved in deconstruction. Nevertheless, regardless of the obstacles posed by logistics and market trends, reuse is gradually leaving its niche and becoming part of contemporary architectural research. This approach revives attention to the local as environmentally appropriate, but also to the urban as the ecological and cultural perimeter that is the source of both inspiration and – literally – means.

22 Lynch, *Deperire*, 217

23 Gorgolewski, *Resource Salvation*, 48

24 Rau and Oberhuber, *Material Matters*, 126-130

25 Ghyoot et al., *Déconstruction et réemploi*, 92-95

“But what would our cities look like if our buildings were to be built from locally available, renewable and salvaged resources”?²⁶

Making do: the embodied significance of what is at hand

The environmental advantage is a shared and fundamental motivation among the researchers and practitioners implementing the reuse of building elements. Moreover, the importance given to locally harvested or recovered products and components does not suggest only an ecological motivation, but also an acceptance related to their history. It is therefore worth analysing whether this implication of reuse strategies accompanies the ecological motivation in contemporary design.

In the architectural past, reclamation was a conventional building practice, a way to save materials and labour and, in many cases, to convey a message as well.²⁷ Even nowadays, reuse means dealing with the history of a man-made product. It involves the context of its design and production, its installation and setup, the construction it was a part of and removed from, but, moreover, it represents the opportunity to design the next step of that product’s narrative.²⁸ These circumstances refer to a resource-conscious approach, which involves several domains of the architectural sphere, including the technical, the material and the cultural ones.

Jeanne Gang²⁹ argues that the unique physical characteristics of construction materials make it “possible and exciting to work with them as generative forces for a project, rather than relying on form or imagery as a starting point”. The architect suggests that adopting a pre-industrial experimental approach, flexible and open to possibilities, and re-focusing mining on

26 Gorgolewski, *Resource Salvation*, 1

27 Esch, “Reimpiego”, 876

28 Manzini, *Artefatti*, 45

29 Gang, “The Cook”, 163

the man-made world, would convey this perspective into practice. Analysing 6a architects' attitude, Scalbert³⁰ points out how "architecture involves some detective work. You look at things, you look under and through things because they are a source of knowledge, signs of a momentary resourcefulness". The author then draws a parallel between a professional practitioner and Levi-Strauss' *bricoleur*, operating within the bounds of "the restrictions imposed by the specific history of materials at his disposal". Manelius et al.³¹ illustrate how Vankunsten Architects led the Nordic Building Component Reuse research project (2014-2016), in order to maximise the reuse of elements harvested from a large residential refurbishment. Their experience led to the introduction of the term "rebeauty", implying the weathering aesthetics as an essential part of a future circular culture in architecture. Ghyoot et al.³² argue how "preserving the formal integrity of an element is not just a way to amortise its environmental impacts on a longer lifespan, it is also a way to consider a more significant and complete heritage", introducing the concept of "embodied culture". As the authors are members of the Rotor collective, this perspective clearly emerges in their work.

Re-interpreting the material history

Rotor's recent consultancy for the Multi Tower design project in Brussels, led by CONIX RDBM, aims to integrate in the refurbished building an amount of reclaimed elements equal to 2% of the total, in weight. This will allow the modernist building – in some way an undesired product of a time of dramatic urbanisation in Brussels' history – to preserve its character through both on-site reuse and off-site reuse, the latter mainly involving elements harvested from constructions belonging to the same age. The reclaimed products and components are interior finishings,

30 Scalbert, *Never Modern*, 38

31 Manelius et al., "Rebeauty", 2

32 Ghyoot et al., *Déconstruction et réemploi*, 86



such as false ceilings or paving, but also façade cladding elements such as limestone or aluminium profiles [Fig. 2].

In Copenhagen, Lendager Group is likewise involved in the monitoring of the material flows circulating in the urban area, looking for opportunities to reuse elements in their projects. Combining the design practice (Lendager ARC) with a team constructing and testing the prototypes (Lendager UP), they were able to salvage masonry portions of several residential and industrial buildings set for demolition, and assemble them in modules used for the external layer of the Resource Rows (2015-2019) façades. This unprecedented experiment led to the creation of a heterogeneous texture embedded in the walls of a new building, while preserving old buildings walls.

Mecanoo's Maritime and Beachcombers Museum in Texel (2011) recalls, in its wooden exterior cladding, the building tradition of the Dutch island dwellers who, for hundreds of years, "made use of driftwood from stranded ships or wrecks to build their houses and barns".³³ Shading the main glass façade with reclaimed vertical wooden boards, the architects intended to reinterpret the

Fig. 2

The deconstruction of the Multi Tower original aluminium cladding in progress, December 2019. CONIX RDBM, Rotor. Image by the author

33 Houben, *People Place Purpose*, 159



local tradition of beachcombing and recycling. Indeed, like many of the objects exhibited in the museum, these cladding elements also come from the sea – in this case sawn hardwood sheet piling recovered from the North Holland Canal and given a “second” life in the building [Fig. 3].

The Circular Pavilion, designed by Encore Heureux, was conceived as a temporary construction to be exhibited in Paris on the occasion of the COP21 (2015). The name of the pavilion itself reveals the principles guiding the selection of its material components: since it was meant to represent a symbol of the circular economy, it maximised the use of reclaimed elements. 180 doors recovered from a social housing refurbishment in the city were used to clad the fronts of the pavilion, while the timber structure, the insulation, the interior finishings and furniture were harvested in different construction sites, where they were considered leftovers or waste.

A bricoleur in the Anthropocene

Both the positions in architectural theory and the practitioners’ perspective illustrated above reveal how reclamation and repurposing processes are rooted in a specific “place” understood as a product of social and cultural forces. The choice of an urban or regional sourcing perimeter due to environmental reasons does

Fig. 3

The Maritime and Beachcombers Museum cladding. Mecanoo. Image credit: © Wim Goedhart

not entail restrictions in terms of building opportunities; it rather represents a chance to merge the ecological advantages with the prospect of rediscovering appropriate means to deliver a construction, and rethinking the function of elements.³⁴ Design is strictly bound to the technical feasibility of constructing with the given tools – the elements at hand, which, deriving from the local context and having a previous life, also have history. In this perspective, reuse represents a way to add another material layer – one that was already there, but in a different way – to the built environment as a socially, economically, politically, and culturally produced stratification.

These considerations, in light of the analysis of current European reuse practices described in paragraph 6, disclose two essential features of the practitioners' approach. The first lies in the interest the reclaimed object raises in the architect, generating a design process in which the aesthetic and technical results are produced by an experimental method,³⁵ at times an unprecedented pattern. The second is related to the importance recognised to ingenuity as an essential tool to turn an idea into practice through an almost artisanal perspective. These features depict a *bricoleur* approach linked to the architects' ability to understand the material nature of the products and components, and to deal with them.

As fascinating as this perspective may be, the contemporary European building sector does not appear as a likely context in which an architect-bricoleur could easily adopt such a design approach. This mainly depends on two different factors. The first is related to the conventional practices in the sector, as nowadays "buildings involve matter and energy that come from all over the world"³⁶, while the second involves the necessary introduction of the reclamation topic in building codes

34 van Hinte, Pieren and Jongert, *Superuse*, 18

35 Brooker, "Tabula Plena", x

36 Benjamin, *Embodied Energy and Design*, 51

and related norms. Hopefully, international and national policies will steer the construction sector towards circularity, enabling processes environmentally sounder than recycling to gain both the attention of stakeholders and economic feasibility. The integration of reclaimed elements in contemporary buildings could hence foster reuse processes as a way to preserve the formal and cultural features of the built environment through a closed-loop local metabolism. This approach would also yield environmental benefits, fostering circular patterns that avoid the externalities arising from extraction and transformation of raw materials, but also prevent useful building products and components from becoming waste. The acceptance of reuse practices as a means to preserve both the natural and built environment could play a part in this transition.

Even though anthropocentric products may represent the result of an uncaring attitude toward the environment, the future necessity to mine the man-made capital in order to preserve the natural one requires a new design approach, willing to re-evaluate the building stock as a source of both inspiration and – literally, again – means. After all, it would foster more sustainable cities, embedding culture in the ecology paradigm.

Conclusions

In the essential transition towards a new interaction between Man's production and consumption patterns and the Earth's biological cycles, urban areas play a key role. Our built environment, albeit produced without taking into account the consequences of its obsolescence, represents a chance to mine the artificial capital while preserving the natural one.³⁷ In this perspective, reuse practices in architecture could provide sustainable outcomes, focusing on the local as appropriate, and considering its immaterial heritage as a resource embedded in building products

37 Ruby and Ruby, "Mine the city", 243-244

and components. The designer's ingenuity hence represents a crucial tool to govern urban material flows, maximising resource efficiency and shaping a sustainable urban environment through the reinterpretation of the built products of the Anthropocene.

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Bio-based Polymers for the Design of Temporary Structures through an Eco-Sustainable Construction Process

Ecological Parametric Design Approach; Interaction Design; Bio-Based Polymers; Reversibility And Recyclability; Temporary Architectures.

Marta Bonci

Università di Bologna, Bologna, Italy
marta.bonci@studio.unibo.it

Davide Prati

Università di Bologna, Bologna, Italy
davide.prati5@unibo.it

Cecilia Mazzoli

Università di Bologna, Bologna, Italy
cecilia.mazzoli2@unibo.it

Environmental sustainability is the primary common goal of any resource processing intervention. It finds a legitimate collaborator in construction technology and innovation, whether consciously adopted to improve eco-friendly energy savings or used passively to reduce the effect of works on the global ecosystem. Research and technical implementation are essential components of the project, often not very tangible but useful in achieving economic results and, above all, higher quality in the relationship with the end user. Biopolymers represent an area with significant development potential because they combine high technical potential with the sustainability factor. Green polyethylene (PE) maintains the same properties, performance, and versatility of application as fossil-based PE, which facilitates its immediate use in the plastics production chain and its recyclability within the same recycling process of traditional PE. Creating temporary modular structures

that optimise production times and costs with technologies that exploit environmental sustainability principles represents a valid alternative to usual, expensive and complicated construction systems. By adopting a parametric approach to the prefabrication of components, designers could obtain a more economical, easily customisable, modular, flexible, reversible, adaptable, and demountable solution.

Introduction

The role of industrial design has always been to create interactions between man and the environment. “Research and technological application [...] are essential contents of the project, often not very visible but effective for obtaining economic results but above all of higher quality in the relationship with the end user”.¹ By definition, interactive art cannot ignore the public’s participation in the functioning of the work. The attempt is to overcome the artist-spectator duo’s intellectual or contemplative relationship, activating emotional stimuli that involve the public in a path of participatory experience. When extended to the relationship with urban space, the concept of interaction between man and urban-scale construction is nowadays, more than ever before, a topic of great importance. The environmental impacts of the life cycle (manufacturing, installation, service life) of temporary pavilions built with “new materials” and reused materials is a recent research trend.²

This paper aims to demonstrate, through eco-friendly design, how it is possible to obtain a temporary spatial structure that respects the environment without sacrificing the aesthetic aspects. It consists of adopting a new perspective oriented towards the recent architectural postulates and the eco-compatibility criteria of the life cycle, design time, and zero km materials. Finally, the goal is to suggest potential applications of “second-hand” materials, components, and design connection systems.

1 Alessandro Trivelli, (Maggioli Editore, 2011).

2 Catarina Thormark, (Doctoral Thesis, Lund Institute of Technology, 2001).

For example, a study on the “Reuse of materials and components to build a temporary eco-structure”³ explored how recycling and reusing materials at the end of their life cycle can attain practical and not only theoretical benefits. In other words, it is possible to develop concrete strategies that are feasible, with genuine green accounting advantages through the avoided impact. The case study shows that locally recovered and reused materials have a high potential that extends beyond this particular project. There is a significant amount of available waste and secondary products that would otherwise become waste.

The Delft University of Technology developed a research project that promotes reclaimed plastic material to fabricate temporary structures.⁴ The project is supported by using digital techniques and reversing design processes rather than new resources. Therefore, temporary structures appear to be the most suitable buildings for developing and prototyping innovative construction systems based on materials and components still unexplored.

Reversible urban space: temporary structures made with bio-based materials

The effects of the global crisis on the city are manifold, both socio-economic and solo environmental. Still, they can be synthetically traced back to an increased demand for quality, services and functions that are not adequately addressed. By its very nature, the city is a dynamic organism, taking shape in step with human life evolution. Therefore, its continuous variation is a prerequisite for the coexistence of the built form of the environment and collective living structure.⁵

3 Carol Monticelli et al., 2013.

4 Ginevra Nazzari, (Master’s degree thesis, The Netherlands, Delft University of Technology, Faculty of Architecture and the Built Environment, 2019).

5 Emanuela Belfiore, (Gangemi, 2001).



A change in the system of values has been brought about by the need to meet increasingly complex and mixed needs originated by new individual and collective behaviours.⁶ In the transition towards a renewed urban comfort, urban planning must be synchronised over time. It has to propose solutions that consider both the needs of the city and people trying to reconnect the social and spatial fragmentation, according to an inescapable ecological key in relation also to climate change.⁷ [Fig. 1]

In recent years, the temporary use of urban public space is consolidating as a system of being together in the open air. Today, living in a small area of urban outdoor is an international trend.

6 Laura Ricci, 2014.

7 Francesca Acicca and Manuel Torresan, 2017.

Fig. 1

Woman in a white and blue floral shirt with a clear plastic bag on her face. Photo by Daniel Chekalov on Unsplash.

In the space between the sidewalk and the street, custom-made products can be installed to perform a noble practice for man: the meeting and sharing of a place. In the United States, this kind of architecture has become a usual practice for recovering non-places in the community in the last decade.

The goal is to “steal” as much as possible portions of road and space dedicated to vehicles and give it to people, giving shape to small areas for stopping, sitting, and resting. New social needs dictate the decision to adopt this type of design to slow down the increasingly frenetic pace of living in a large metropolis. San Francisco was the first city to experience this new way of stopping along the city streets.⁸

Since 2012 the city has been filled with temporary installations. They contribute to welcoming people and enhancing the landscape while sharing a social and ecological responsibility, becoming a resting place surrounded by vegetation and often used to display art, to create pleasant and comfortable spaces in portions of the city that were previously anonymous and without identity. These temporary installations establish themselves as sustainable small-scale interconnected products to activate new social practices, share readings and information, and strengthen the civic fabric. Structures “scattered” in urban spaces to bring people together and reactivate the economy and vitality of areas that had died out over time.

Whether a project commissioned by public bodies or an initiative coming from a private client, temporary installations represent the interconnections and interdependencies that arise between society and territory. They enhance the respect for the space in which we live and, consequently, the behaviours we assume. Places that are morphologically similar are different in atmosphere, care, vitality, and the number of people involved. As stated by Mariateresa Aprile, of the Sapienza University of

8 Francesco Armato, 2018.



Rome: “Why are some spaces preferred to others? First of all, it should be considered an aesthetic question, but the morphology is not a consciously considered element in the choice of places, and it is not enough to explain how space becomes a place. Instead, the functional aspect has a greater incidence. Vital spaces, crowded with people on the move and intent on doing many different activities and preferred by citizens, are those that are most able to adapt to many activities that take place there even simultaneously; they are flexible spaces for different uses.”⁹

The world is seeing an increase in architectural experiences based on the design of interventions aimed at fulfilling new and growing needs for populations - in more or less critical situations - which not only respect the environment but place it at the centre of the project through the adoption of sustainable criteria, constructive systems and materials. Even in Africa, where it might seem that these factors do not represent the prerogatives of architectural projects, the search for spaces adaptable to the ever-increasing need for drinking water has led a team of architects to rethink space to make it useful to the Ethiopian population. Warka Water is a project in which an integrated village designed to accommodate 100 people - local ethnic groups in Cameroon who need to live with dignity - will also become a cultural centre with quality spaces for social gatherings. An example of collaboration with rural communities is construction

Fig. 2

On the left, the original Warka Tower; on the right, the Warka Tower project by Arturo Vittori (Warkawater.org). Image elaboration by authors.

9 Mariateresa Aprile, (CNAPPC, 2017).

with indigenous techniques and local natural materials that respect the place's cultural identity - an example of how to live in harmony with nature [Fig. 2].

The Warka Tower installed in the village collects water from the atmosphere (rain, fog, dew), providing an alternative water source for rural people who face challenges in accessing drinking water.¹⁰ A passive structure, it works only with natural phenomena such as gravity, condensation and evaporation. Easy to maintain, it is independently managed by the villagers. The project depends on local weather conditions, the geomorphological characteristics of the site, and local culture. With research into innovative materials, the design can undoubtedly contribute to realising new behaviours and man-space relationships.

Another example of how temporary structures can prove to be intelligent design solutions in support of populations in need is offered by architect Shigeru Ban, well known for his use of paper tubes in various applications. After the Hanshin-Awaji earthquake in 1995, Ban used paper tubes for the walls' main structural elements to build temporary shelters and a church for disaster victims. The project was further adapted and used in 2001 for relief homes in Ahmedabad, India, and in 2010 for post-earthquake shelters in Haiti. While suitable for permanent applications, paper tubes have become popular for temporary structures, especially for their potential inventiveness and minimal environmental impact.¹¹

The 21st century between environmental pollution and new lifestyles

While rethinking urban space as a place where different cultures, ethnicities and attitudes meet, creating relationships and new scenarios, the design of versatile, safe and dynamic

10 Arturo Vittori and Andreas Volger, (blog), 2015.

11 Steven J. Preston and Lawrence C. Bank, 2012.

structures finds its expression in a construction process for temporary structures made of ecological material.

Most of the factors leading to environmental pollution are plastic waste, photochemical smog, traffic, global warming, climate change, the disposal of chemical and toxic substances, pesticides and soil contamination, and widespread telecommunication systems. As stated in the document published by the European Environment Agency, entitled *Urban Environment*, in the last five years many administrations have promoted a sustainable development method within the framework of local Agenda 21 policies, including reducing the consumption of water, energy and raw materials.¹² Besides, green areas can improve the urban climate by absorbing air pollutants and providing physical and recreational spaces.¹³ Another worrying factor that contributes to environmental pollution is waste, with its production and disposal. It is known that most of it is plastic waste, and the use we make of it today is now disproportionate due to its availability. Leading industrial and materials scientists and chemists say it is not necessary, even impossible, to imagine a world without plastic. Quite the opposite: it is possible and necessary to think “with another plastic”. The principles outlined by ICLEI in the *Cities for Climate Protection* campaign to reduce CO₂ emissions highlight the importance of renewable energy sources, the recovery of energy, cogeneration, promotion of public transport, and planting.¹⁴ Simultaneously, the essential role that the use of ecological and sustainable materials can play is not a small one: some materials derived from renewable sources, and therefore always available, can capture CO₂. The range of innovative bio-based and biodegradable materials is vast, as is the choice of associated production methods to create ecological and sustainable products and services.

12 European Environment Agency, (Denmark: European Environment Information and Observation Network, 2008).

13 E. Gregory McPherson et al., 1997.

14 Heather Zeppel, (Palgrave Macmillan UK, 2013).

Biopolymers represent the turning point for solving problems related to the recovery of waste and the increase in petroleum product prices. There are three ways in which biomass can be processed, and they give rise to polymers such as PLA, PE, or PHA.¹⁵ The advantage is that biopolymers can replace traditional analogous materials already on the market. Biodegradable products derived from biological sources, used in packaging and food, have a very short life cycle, whereas non-biodegradable polymers derived from natural sources are recyclable and durable over time. They are used in the automotive, appliance, footwear, and construction sectors. In the field of highly performing temporary structures inserted in urban and architectural contexts, the material used is derived from a renewable source with a low environmental impact (therefore biodegradable).

“C’era una volta” temporary structure

The material selected for this project is *I’m green*™ PE¹⁶, a plastic produced from sugarcane. This renewable raw material captures CO₂ from the atmosphere during its production, contributing to reducing greenhouse gas emissions, which is a strategic objective in the long term. The innovative aspect is that Green PE maintains the same properties, performance, and versatility of application as polyethylene of fossil origin and can be recycled within the same recycling chain as traditional polyethylene. Therefore, rethinking the meaning of living and experiencing ecologically new connections and relationships with others is possible. As some cities grapple with economic decline and depopulating neighbourhoods, several academics and professionals have focused their attention on the causes, conditions, and patterns of the resultant vacant land.

15 Braskem, 2019.

16 <http://plasticoverde.braskem.com.br/site.aspx/Im-greenTM-Polyethylene>

In contrast, others lay out broad programmatic, institutional, fiscal and design responses to address vacancy on-site or on city-wide scales. Are “permanent” solutions appropriate? Tactical urbanism, for example, follows a path for temporary, incremental, flexible and experimental responses to vacant urban land.¹⁷ Engineering and sustainable features of temporary structures need to be considered an integral part of the design process, beginning at the conceptual phase. The safety of structures cannot be checked only at the end of the design process but must be fully integrated throughout to be most effective.¹⁸ This reversible parametric construction system is designed to tackle the themes of recyclability, sustainability, modularity, and form-function relationship. The design process of assembly systems with low environmental impact must include the study of safety, waterproofing, and the production processes associated with biopolymeric materials.¹⁹

One of the priority requirements of the assembly system consists of the parametric design of the prefabricated modules. So it is possible to obtain flexibility and versatility, in terms of different solutions and, therefore, different liveable experiences, based on the needs of the users and the social purposes for which the temporary structure must be built. The dry assembly of elements makes it possible to join different components with mechanical joining technologies that become so integral through a precise constructive logic that does not require the use of connection materials intended to consolidate after installation, such as adhesives and sealants. The aim is to create a modular and versatile complex, which may be a valid alternative to traditional construction systems, often complex and expensive (in terms of money and time), used today to create temporary structures. The parametric design gives the structure the

17 Jeremy Németh and Joern Langhorst, 2014.

18 Preston and Bank, “Portals to an Architecture”.

19 Marta Bonci, (Master’s degree thesis, Bologna, Alma Mater Studiorum – Università di Bologna, Scuola di Ingegneria e Architettura, 2019).



Fig. 3

Parametric process
for temporary bio-
based structures.
Image by Marta
Bonci©.

following characteristics: prefabrication, modularity, flexibility, reversibility, adaptability, customisation, disassembly, and sustainability. The peculiarity of the proposed construction system is the self-locking function. The modules are generated starting from the segmentation and assembly of modular elements, similar or identical. Depending on their configuration, they constitute a compact and unitary system, without the aid of additional connection elements, exploiting the intrinsic topological properties of assembled solids. With these TIM systems (Topologically Interlocking Materials), each segment transfers its weight to the blocks immediately below, on which it rests. Construction proceeds with successive rows, from bottom to top, as in any gravity system, and with consecutive arches. The structure construction is self-supporting, with excellent stability and resistance thanks

to every segment's weight and the self-locking system, which gives integrity and solidity to the whole.²⁰ [Fig. 3]

The system's building blocks are made of bio-based and 100% recyclable HDPE with gas-assisted injection moulding, starting from ethanol obtained from the alcoholic fermentation of sugar cane. By dehydration, ethanol is transformed into ethylene and then into polyethylene through standard catalysed polymerisation (by addition). The material is completely waterproof and suitable for outdoor applications thanks to its polyolefin nature. It is ductile, therefore it has no brittle fracture behaviour or particular deterioration of its properties over time. Thus, there is a considerable saving of material while obtaining extreme lightness of each piece, reducing cycle times with a 20-30% energy consumption saving at each cycle and eliminating any suction.

Conclusions

The project seeks to promote recycled materials to realise temporary structures for different aims to rethink and renovate the urban spaces that today are unused or degraded. The construction of these *pavilions* is considered an essential test bench to experiment, validate and disseminate innovative solutions based on recycled and reused materials, forming modules to be dry assembled with parametrically designed flexible configurations, according to a circular approach. The importance of reusing materials for the construction of eco-structures could reduce the environmental impact by up to 40% in specific building categories, showing how vital it is to distinguish the different phases of a building's life cycle. In temporary structures, architecture, lightness and reversibility are a priority because the most significant environmental impact is during the production phase. During the in-use phase, the impact is nearly zero, mainly due to the frequent absence of thermal plants or air conditioning systems.

20 Cecilia Mazzoli, (Doctoral thesis, Bologna, Alma Mater Studiorum – Università di Bologna, 2015).

In line with the research paradigms, the parametric approach - which lies at the basis of the design process for developing the proposed construction system - guarantees compliance with sustainability principles. These are intended as modularity and prefabrication, speed of production and on-site assembly, reversibility and customisation, recovery, and recycling materials. Future development of the research project could lead to the generation of unlimited geometric configurations of the blocks and the final assembled solutions, depending on the requirements to be fulfilled and the optimisation and circularity level to be reached.

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‘Making Kin’ in Fashion Design. From Agri-food Waste to Sustainable Materials in Italy

Redirective Practices; Fashion Design; Biomaterials.

Ilaria Vanni

University of Technology Sydney, Sydney, Australia
ilaria.vanni@uts.edu.au

Alessandra Vaccari

Università Iuav di Venezia, Venice, Italy
avaccari@iuav.it

Paolo Franzo

Università Iuav di Venezia, Venice, Italy
paolofranzo@iuav.it

This contribution explores the unique combinations and interdependencies that emerge in current fashion design in Italy. The paper focuses on the encounter between technology and biology to experiment with textiles and materials for the fashion industry.

The theoretical framework draws on Donna Haraway’s concepts of making kin as generating new collaborations and staying with the trouble. It brings these concepts together with Tony Fry’s definition of futuring and Alice Payne’s fashion futuring. We applied these ideas to the analysis of four Italian case studies illustrating how four companies use agri-food waste: Orange Fiber from citrus, Grado Zero Innovation from fungi, Frumat from apples, the latter used by Womsh for the production of sneakers. Building new relationships between humans and nonhumans, in this case between companies, agri-food processing waste, new materials, and con-

sumers represent a possibility to work towards a more sustainable future starting from the dynamics of the present.

The paper presents findings on redirective practices as a way to stay with the trouble from initial research on fashion, and reports on new alliances and collaborations between people, business, waste, territory, technology and biology.

Staying with the trouble

Donna Haraway, writing about possible responses to the Anthropocene, invites us to “stay with the trouble”. With this, she means “learning to be truly present, not as a vanishing pivot between awful or edenic pasts and apocalyptic or salvific futures, but as mortal critters entwined in myriad unfinished configurations of places, times, matters, meanings”.¹ This position of radical present plays out as an alternative to an imaginary of “technofixes” and its opposite, which Haraway calls a “game-over” imaginary. With technofixes, she writes, technology comes to the rescue of the world. On the contrary, the game-over imaginary does not envisage any possibility of intervention in the world shaped by the Anthropocene and Capitalocene. Staying with the trouble, instead, invites us to generate new collaborations, configurations in the present.²

The paper explores the unique combinations and interdependencies that emerge in current fashion design in Italy, focusing mainly on the encounter between technology and biology in the experimentation of textiles and materials for the fashion industry. From the industrial revolution of the eighteenth century onwards, the textile industry has been a mainly symbolic area of how technology has shaped the face of the modern world. This heritage makes it an ideal environment to explore and understand new research in biomaterials and the use of

1 Donna Haraway, *Staying With the Trouble: Making Kin in the Chthulucene* (Durham: Duke University Press, 2016), 1.

2 Haraway, *Staying With the Trouble*, 3-4.

these biomaterials in design from a historical, cultural, and social perspective.

To investigate these experimental possibilities, we rely on the concept of futuring developed by design theorist Tony Fry. Futuring, unlike the futurism described by Haraway, does not sit in either the hope or the despair in the future camp. Instead, it requires interventions in design practices to facilitate knowledge exchange; politically contest the unsustainable status quo; promote the transformation of knowledge into action, and shape communities of change working towards a common goal. As Fry emphasised, redirective practices break away from established ways of thinking, working and making, creating new designed objects, and unique design cultures, practices, and designers.³

“Futuring” is becoming an essential concept in fashion, thanks to the sustainability scholar Alice Payne.⁴ Payne recognises futuring as a dynamic process able to traverse and mediate two contrasting interpretations of sustainability. The first interpretation sees futuring as an optimistic and gradual technological evolution towards a cleaner industry. The second endorses a more prudent approach to freeing fashion from the imperative of unsustainable growth of capitalism. Payne argues that “fashion’s future in the Anthropocene cannot rely solely on the emergence of new and better technology, but rather requires a paradigm shift to transform conventional fashion production and consumption to new cultures of using, making and remaking”, and she defines this paradigm’s shift “a ‘rewilding’ of fashion”.⁵

In our view, the concept of “fashion futuring” allows overcoming the exclusivity of some of the proposed sustainable solutions

3 Tony Fry, “Redirective Practice: An Elaboration”, *Design Philosophy Papers* 5, no. 1 (2007): 5-20. Tony Fry, *Design Futuring: Sustainability, Ethics and New Practice* (London: Bloomsbury, 2014).

4 Alice Payne, “Fashion Futuring in the Anthropocene: Sustainable Fashion as ‘Timing’ and ‘Rewilding’”, *Fashion Theory* 23, no. 1 (2019): 5-23.

5 Ivi: 14.

to fashion.⁶ These positions include, for instance, “eco-fashion” beyond environmental sustainability;⁷ “slow fashion” as a critique of the acceleration of fashion production and consumption;⁸ and the ancient Greek philosophical concept of “beautiful and good”,⁹ which combines ethics and aesthetics. These approaches reaffirm fashion as an elitist concept that exclusively entails the linkage between slow and expensive, innovation and luxury. On the contrary, fashion futuring is a new approach to sustainable fashion that emphasises initiatives ranging from the creation of circular economies¹⁰ to participatory design models¹¹ and open design.¹² All these initiatives have in common the quest for a more holistic approach to fashion design, manufacture and consumption in which slow entails, for instance, DIY practices and innovation supported by the free circulation of ideas and skills.

The paper presents findings on redirective practices as a way to stay with the trouble from initial research on fashion, and reports on new alliances and collaborations between people, business, waste, territory, technology and biology.

6 Alessandra Vaccari and Ilaria Vanni, “Un modello di produzione sostenibile nella moda”, in *Remanufacturing Italy: l'Italia nell'epoca della postproduzione*, ed. Maria Antonia Barucco, Fiorella Bulegato and Alessandra Vaccari (Milan-Venice: Mimesis-dCP, 2020): 44-57.

7 Sarah Scaturro, “Eco-tech fashion”, *Fashion Theory* 12, no. 4 (2008): 469-488. Sass Brown, *Eco Fashion* (London: Laurence King, 2010).

8 Kate Fletcher, *Sustainable Fashion and Textiles: Design Journeys* (London: Earthscan, 2008). Kate Fletcher, “Slow Fashion: An Invitation for Systems Change”, *Fashion Practice* 2, no. 2 (2010): 259-265. Hazel Clark, “Slow + Fashion - an Oxymoron - or a Promise for the Future...?”, *Fashion Theory* 12, no. 4 (2008): 427-446.

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10 Paul Smith, Jen Baille and Lynn-Sayers McHattie, “Sustainable Design Futures: An open design vision for the circular economy in fashion and textiles”, *The Design Journal* 20, no. 1 (2017): 938-947.

11 Anja-Lisa Hirscher and Alastair Fuad-Luke, “Open Participatory Designing for an Alternative Fashion Economy”, in *Sustainable Fashion*, ed. Kirsi Niinimäki (Helsinki: Aalto ARTS Books, 2013), 174-182.

12 Zoe Romano, “Openwear Collaborative Clothing”, in *Agents of Alternatives: Re-designing Our Realities*, ed. Alastair Fuad-Luke et al. (Berlin: AoA, 2015), 220-228.

The case studies

We applied this theoretical framework to the analysis of four Italian case studies. These are three companies that produce sustainable materials from agri-food waste - Orange Fiber, Frumat and Grado Zero Innovation - and Womsh, a company that produces sneakers using one of these innovative materials.

Alessandra Vaccari organised a round table on reusing and recycling food waste (titled *Alimentare la moda*, to feed fashion) with these companies on 2 October 2020 as part of the 2020 Sustainable Development Festival.¹³ The roundtable aimed at documenting the participating companies' practices, innovation and aspirations about fashion sustainability. Their founders represented the four companies: Enrica Arena from Orange Fiber, Gianni Dalla Mora from Womsh, Giada Dammacco from Grado Zero Innovation and Hannes Parth from Frumat. Although all four companies are committed to the shared project of waste management towards a more sustainable fashion, each concentrates on particular produce.

Orange Fiber, founded in Catania in 2014, has patented a system for extracting cellulose suitable for spinning from citrus pulp, that is, from the waste from the agri-food production of juices, concentrates, perfumes and essential oils.¹⁴ As Arena explained, the yarn, classified as human-made cellulose fibre, is used to make fabrics ready for printing. Grado Zero Innovation is a company in the province of Florence that has researched, acted as a consultant and prototyped innovative materials derived from Tuscan agricultural products since 2001. Their experimentation includes Muskin, a leather substitute obtained from the *Phellinus ellipsoideus* fungus.¹⁵ The company is currently researching how to scale up Muskin to industrial production and

13 <http://www.iuav.it/Ateneo1/IUAV-SOSTE/NEWS/ARCHIVIO/2020/--online-1/index.htm#alimentare>.

14 www.orangefiber.it

15 www.gzinnovation.eu

a more standardised manufacturing process. Finally, Womsh is a fashion brand founded in 2014 in the province of Padua that produces vegan footwear using Apple Skin, a material similar to leather made by Frumat from apple processing waste.¹⁶

All four companies are compelling because they have experimented with sustainable materials from the agri-food industry's waste by-products for several years. They are also interesting for their geographical location since they are distributed from the north to the south of Italy, in areas - especially in the case of Frumat and Orange Fiber - traditionally disconnected from the fashion industry. Finally, these companies are part of a network of shared values, and alliances of humans and nonhumans, bearing witness to Haraway's invitation to generate new collaborations and configurations in the present by staying with the trouble.

Making kins

More importantly for this paper, these four case studies are significant examples of "making kin" because they create new connections between disparate elements; produce alliances between biology, technology and design; and generate new configurations of materials from waste. Building new relationships between humans and nonhumans, in this case between companies, agri-food processing waste, new materials, and consumers represent a possibility to plan a sustainable future starting from the dynamics of the present. The four case studies create a glitch in the textile and fashion industry's production chain. From fruit pulp to mushrooms, the four companies recover waste materials from local agri-food industries, transforming waste into assets, and putting them back into the production chain through new alliances and configurations. Findings from the round table suggest that "making kins" happens on different levels.

16 www.womsh.it

What follows are examples of collaborations and configurations among multiple actors:

- Among the fashion industry, individuals, companies and projects. For instance, Arena argued that the fashion industry supports research on new materials because it provides the most straightforward path towards sustainability since it implies only a few adaptations to the supply chain. She also pointed out that both individuals and companies contribute to developing ideas and business through crowd-funding campaigns.
- With the resources of the territory where companies are located. Companies identify and enhance resources through innovative business ideas. For instance, Orange Fibre recovers waste from oranges produced in Sicily, and Frumat processes waste from apples in Trentino.
- Between companies and fashion brands that share an interest in a less wasteful fashion and give visibility to projects, such as Orange Fibre's collaboration with Salvatore Ferragamo in 2017.
- With the components of the production chain that share the same values and visions of the future, such as the meeting between Frumat and Womsh which allowed to develop experimentation on Apple Skin and to find rapid application in sneaker collections.
- With research institutions and universities, as emerges from the twenty-year-long experience of Grado Zero Innovation, which experiments on technical textiles and innovative materials by turning academic research outputs into market-oriented sustainable and innovative products.
- With wholesalers, retailers and consumers who can be educated to become an active part of the change process. Womsh, for example, trains its retailers, involving them in the process of spreading values, and its customers, asking

them to bring their shoes back to the store at the end of the life cycle to be recycled, as opposed to contributing to landfills. Arena also explained that Orange Fiber educates consumers on the correct disposal of products, to enable them to put these materials back into circulation and give them a new life.

- With companies along the supply chain. Arena stressed the importance of networks:

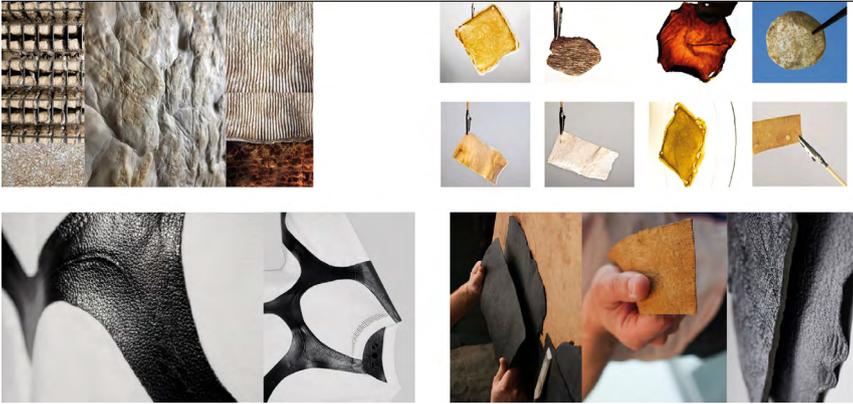
In our experience, the accelerators, as I told you before, both at the Italian and international level have been fundamental for us. Both to understand where we were and where we were going, and because sometimes you risk - coming from this sector - being a little self-referential; so being networked with other innovators who are doing something similar allows us to understand the field better.

The significance of being part of a network (in Italian *fare rete*) is also emphasised by Dalla Morra, who while recognising the lack of historical precedents in building networks, states that:

The networks are fundamental to make the movement grow, to spread good practices with less difficulty and above all, to have a more insightful impact on the social fabric with projects of change.

The findings from the case studies provide models of futuring, and redirective practices, that is in Fry's definition: "dealing with 'what already is' and turning it towards the future with sustaining ability".¹⁷ Fry presents examples of what in practical terms turning towards the future with sustaining ability entails. Fry makes the case that redirective practices materialise particular ideologies, create political imaginaries, shape how people

17 Tony Fry, *Design as Politics* (Oxford and New York: Berg, 2011), 77.



interact, prefigure material cultures and economies, and model alternative systems.¹⁸

The same points were made in the round table by all participants. For instance, all companies stressed that the material production of textiles and designs made from these textiles from agri-food waste substantiates shared beliefs in a less wasteful and more sustainable fashion design system. Orange Fiber, Frumat, Muskin, and Womsh also invest in communicating values and educating the public, contributing to creating a political imaginary. The four case studies also show how by creating new alliances the research, development and production of biomaterials shape new interactions among researchers, producers and consumers. In this sense, the four companies' work can also be understood as modelling alternative supply chains and prefiguring different material cultures [Fig. 1].

Fig. 1

Lucile Garrault, *Biomaterials Poster*, 2019. In: Garrault, L., 2019, *Biofashion Manifest. The nascent phase of biomaterials in the new concept of fashion*, MA thesis, Master's Degree Programme in Fashion and Visual Arts, Università Iuav di Venezia. Image by the author.

18 Fry, *Design as Politics*.

Conclusion

In the current climate breakdown, as design researchers we must consider which kind of fashion futures we are going to advocate for, and how we can collaborate with designers to facilitate these futures. In this paper, we analyse one of such collaborations, a round table with four companies engaged in the research, production and design of biomaterials derived from agri-food waste. This effort might seem small. However, we see it as a way to participate in the configurations and alliances that shape new interactions, create a new political imaginary, prefigure innovative material cultures and materialise shared beliefs in “sustainability”.¹⁹

We have been interested in testing Donna Haraway’s invitation to stay with the trouble, starting from the here and now to generate new alliances able to redress both the techno-utopian and game-over imaginary of the Anthropocene and Capitalocene, in relation to fashion design. In this process we have created new theoretical relations, bringing the idea of staying with the trouble together with Tony Fry’s exhortation to see design as a redirective practice, and Alice Payne’s call to shape new cultures of using, making and remaking.²⁰ We also brought together four companies in the Fashion Futuring round table.

Reflecting on the round table discussion, we want to highlight the importance of “making kin” for all the participants, to establish new alliances between people, companies, resources, waste, design and technology to change how the fashion production chain works towards more sustainable processes. Some significant elements emerged in the round table discussion: first, the importance of working with local resources, such as waste from oranges in Sicily or apples in Trentino. Second, the relevance of networks: with other companies, industries, fashion designers

19 Fry, *Design as Politics*, 77.

20 Payne, “Fashion Futuring in the Anthropocene”.



and researchers. Third, the necessity to create new alliances with consumers through communication and education.

We hope that the work we started will make these alliances more visible, interconnected, and more robust.

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Neoanthropocene Augmented Cities

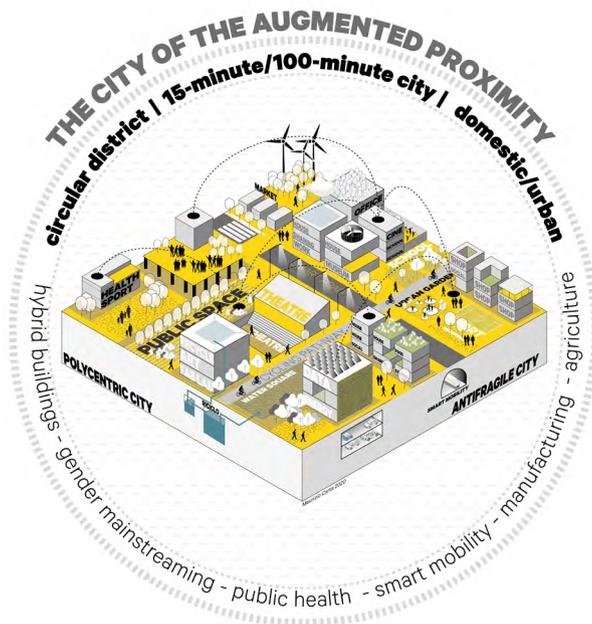
Urban Regeneration; Resilience; Climate Change; Anthropocene

Maurizio Carta

Università degli Studi di Palermo, Palermo, Italy
maurizio.cart@unipa.it

Contemporary cities could be considered vibrant organisms of places and communities, of data and information, of sensors and actuators, of actions and reactions generated by people and environment both. Cities must be more responsive to our behavioral changes, enabling devices for enhancing our contemporary life. We would be able to build a more efficient urban environment, able to sense, to understand and to act everyday and for everyone. In the post-city age and beyond the smart city, Augmented City is a new paradigm that perceives the demands of more networked, knowledge-based and creative society, that answers to the global change by a new circular metabolism. The Augmented City is a spatial/cultural/social/economic platform for enhancing our contemporary life, individual and collective, informal and institutional, expanding the urban space generated by the effects of innovation. The Augmented City redefines dogmas of urbanism that we often thought of being more static and rule-based, recovering its prospective, incremental, responsive and creative approach. We need to think, design and manage cities more sentient, opensource and intelligent, again productive, creative and based on recycle, cities resilient, fluid and reticular, and truly strategic.

The Augmented City isn't the city of the future, but it brings us in a different present, it brings us towards the Neoanthropocene.



We have entered a «New Climate Regime» (Latour, 2015): a new regime of life that crosses the planet involving very different systems and different levels of development and that requires a radical innovation of our being in the world, of human relations and of homeostasis between humanity and other species. It is a regime that calls for a renewed commitment to caring for the common home (before the planet evicts us) and demands a new ecological paradigm of development. We are at the apex phase of a crisis that we have been going through since the second half of the 20th century and which had manifested numerous signs of a metamorphosis of the world (Beck, 2017), which has worsened since the 1960s (Meadows et al, 1972), when all the contradictions of selfish and extractive capitalism produced since the Industrial Revolution exploded (Harvey, 2003; James, 2009; Sassen, 2014), and the awareness began to spread that the Anglo-American model of Western development produced social inequalities, cultural impoverishment, consumption of physical resources far beyond the limits of the planet (Rockström et al,

2009), as well as gentrification phenomena due to urban regeneration based on the expansion of real estate speculative bubbles, and the explosion of dramatic health effects derived from the devastating ecological footprint of development.¹

Today, the health pandemic has become entangled with the environmental and economic crises, generating a dramatic 'syndemic' condition (Singer, 2009), i.e. the perverse aggregation of several simultaneous epidemics in a population with varying degrees of fragility that aggravate the burden of disease. COVID-19 is a disease of inequalities, affecting more disadvantaged people relegated to the margins, who have low incomes and are socially excluded or suffering from chronic diseases, often produced by pollution, due to phenomena that require new public policies for cities that address in an integrated manner environment, health, education and housing, and are not limited to providing epidemiological responses (Horton, 2020).

In order to respond to the syndemic degeneration of our relationship with the planet, therefore, nothing can remain unchanged and we are obliged to rethink the character and role of all the components of society and their repercussions on people's lives, on the places we inhabit, on the activities we carry out and on the way we pursue our aspirations: in short, we are obliged to radically rethink the model of development without progress, starting with the forms and modes of living in cities, the prevalent form of our habitat. What is needed is a circular metamorphosis of development that will prompt our ethics, stimulate criticism and demand a return to development policies based on territorial capital (on generation and not on its despoliation), first and foremost the city with its spatial capital: the prevalent

1 Already in a 2007 report, the World Health Organisation warned of viral infections as one of the greatest threats in a planet undergoing severe climate change (World Health Organisation, 2007). Changes in rainfall and humidity, warming of the troposphere, and voracious urban expansion change the interactions between different biological components, and when ecological niches open up, viruses colonise a new being (us) and initially behave very aggressively.

form, function and community of the human species on the planet. I believe that the city can be the antidote to its own metastasis, breaking out of the trap of conflict with nature, returning to its homeostatic capacity with other living species and with the Earth.

What is needed, therefore, is a radical rethinking of the development model that generates a sustainable future and a corresponding revolution of the cities (a revolution in the literal sense of the term “return to the origins”), of the spaces that compose them and of the human and natural relations that weave them together, a rethinking of the settlement paradigms, a renewal of planning protocols and a regulation of the instruments of government, so that the city can once again become a driver of collective human progress, a device for rebalancing inequalities through the remodulation of spatial justice (Soja, 2010) and the reduction of marginalisation, rather than an ancillary substrate to the selfish economy or a place of conflict and unhappiness, or a place of health distancing.

The city, however, is a complicated artefact - in its powerful seduction that has resisted numerous crises and attempts at replacement for six thousand years (Glaser, 2011; Hall, 2013) - because it is never the product of a single deterministic will that produces individual actions, but is the result of the emergence of sudden innovations, of dynamics that are independent at first but then interrelated by the creativity of the inhabitants, of actions set in motion by a very large number of individual and collective actors, each of which, in pursuing its own ends, finds itself adapting them within a system of reciprocal interrelations, the outcome of which always exceeds the intentions and control of the most powerful actors. Because the real powerful actor in

the evolution of the city is its *exaptation*,² which it has learnt from nature, i.e. its creativity to evolve through sudden, random, redundant and sometimes bottom-up variations, which are used through a 'functional co-optation' by communities to assign new functions to it, which will then be consolidated through creative adaptation, giving shape to new ways of inhabiting the city, different modes of production, changes in mobility, and cultural innovations. Indeed, the city is a multi-identity spatial organism, produced by human communities different in time and cultures that produce an admirable solution of intentionality, spontaneity, causality and planning through a powerful and permanent *bricolage*.

As urban planners and architects, but also as decision-makers and entrepreneurs, administrators and citizens, scholars and activists, we need to understand how to reactivate the creative, generative and innovative capacity of the city in the midst of the Anthropocene era (Crutzen, 2005). During its mad rush during the last two hundred years, humanity has arrogantly confronted all other living species to become the most powerful force shaping the environment. Since World War II, an even more pervasive and accelerated 'anthropo-development' (McNeill, Engelke, 2018) has produced such anabolic effects that the human footprint on the planet has become immense, far beyond any other dominant effect, relegating all others to species of subjugation. The ability of urban settlements to maintain the necessary relationships with the rural component, which has always been a faithful companion of evolution, has been eroded. The productive and generative capacity of local manufactures has been sedated, weakening the endogenous factors of development in favour of predatory globalisation, and the regenerative value of

2 The concept of *exaptation* was consolidated in 1982 by Stephen J. Gould and Elisabeth S. Vrba (2008) to define the 'missing term' in Charles Darwin's theory of evolution that can describe the process by which nature evolves by random and potentially redundant innovations in such a way that an organism can functionally co-opt a trait developed for other adaptive reasons, in an extraordinary creative *bricolage*.

building maintenance and landscaping has been forgotten, just as the natural territorial circular processes that guaranteed the self-sufficiency of many communities have been interrupted or diverted. Inequalities have also exploded, confining huge parts of humanity to the trap of underdevelopment, denying them access to basic rights and depriving them of a future.

We must, therefore, as a cultural and political challenge, as well as an ecological and economic one, abandon what is to all intents and purposes an erosive, extractive, pervasive, unequal and conflictual Paleanthropocene in which we live in order to enter decisively, and responsibly, into the responsible *Neanthropocene* (Charter, 2019), the new era of an ‘ecological anthropocentrism’ in which humanity, instead of being the problem, resiliently plans and implements the transition to ecological development, reactivating the ancient alliance between human and natural components as cohesive forces: a sensitive, respectful and temperate anthropocentrism aimed at repositioning humanity in an integrated scheme with nature, a hybrid of humans and non-humans. To act effectively towards the Neanthropocene, however, we must abandon the econometric canons of the 20th century, as Kate Raworth (2017) clearly indicates, proposing her model of the «doughnut economy” to think with a 21st century mind and, therefore, change the horizon from GDP growth to respect for the rights of humans and the planet and to place the economy in the broader context of natural life, outside of which there is no other possible wealth.³ It is therefore necessary to understand the complexity of urban systems, which are much more interconnected and articulated than the scholars who traced the curves of market and demand according to a mechanical balance that is the result of a partially rational vision. We need to go back to designing in order to regenerate, since the ecological degradation produced by the Paleanthropocene proved

³ A circular development model that, for example, will be explicitly applied in Amsterdam as part of its *Circular Strategy 2020-25* (Circle Economy and the City of Amsterdam, 2020) for the new urban agenda.

to be untreatable with growth, which was on the contrary an outrageous predator of the planet's vital resources, a generator of recursive crises, of "poly-crisis" (Morin, 2020), an outrageous predator of the planet's vital resources. (Morin, 2020), and an accelerator of inequality.

The commitment of Neanthropocene communities will be to work on urban settlements characterised by the restarting metabolism of different life cycles, some still active but slowing down, others produced by the surplus and overproduction of changing urban complexes. It means, for example, working on the new rhythms (social and productive) of the abandoned settlement fabrics, making them attractive to communities undergoing territorial reallocation, or adapting the infrastructure networks undergoing transformation to carry new flows generated by the re-modulation of demand, or redefining the production systems towards a mature districtisation between local resources and their transformation. These actions will have to be tackled through modification, removal or reinvention, thanks to which the components of local development are recreated, without destroying them but changing their functions pursuing a generative perspective and increasing their creative resilience, i.e. their capacity to adapt to change and reinvent themselves.

Crisis-proofing augmented cities

Designing the cities of the transition to the Neanthropocene means rejecting the consolation of a molecular approach made up of minor maintenance and modifications and accepting the challenge of an ecosystemic, organic approach, and being guided by a new vision that is far-sighted in order to look far into the horizon of innovation, but also capable of looking backwards by recovering knowledge, rituals and practices that are structurally self-sufficient and circular because they have not yet been seduced by the demon of anthropic development. What is needed, therefore, is a new effective paradigm for modifying

urban metabolism, recombining the genetic code contained in the areas and flows to be put back into circulation, often fragmented or weakened, but still capable of generating new fabric if reactivated by the vital energy produced by the cycles of water, food, energy, nature, waste, people and goods.

I have called this new urban paradigm an “augmented city” (Carta, 2021), since it is capable of amplifying the resources and responses of Neanthropocene cities and communities starting from real conditions and without consoling hyper-technological escapes towards the pseudo-paradises of *smart cities*. The regeneration of the human habitats of the Neanthropocene therefore requires the design of places that can accommodate temporary functions within a programmatic cycle that looks at the whole day or year in the distribution of functions, the attraction of highly innovative uses, and the refuge of citizenship that we have seen during the pandemic. A circular city project that governs the balance between functions and inhabitants, reducing the frenzied recourse to gentrification as a false idol of real estate speculative bubbles. It means, for example, remodelling the times and cycles of the city to extend equal opportunities and also to combat gender differences: this is what is known as *gender mainstreaming*, which has been experimented for years in Vienna, especially in order to design more women-friendly cities (Criado Perez, 2020).

Our urban life is liquid, relational and multi-scalar, and if confinement protects us, it also shows the need for plurality and relationships (even conflictual ones) that therefore require multiple and diversified metabolisms, a real hyper-metabolism that demands a greater circularity, porosity, and self-sufficiency of the city. The regeneration of syndemic-proof human habitats requires modifying the forms and modes of inhabiting domestic, collective and work spaces, also by learning from the new practices we have experienced in the days of ‘social distancing’ (new mature digital relationships, modes of sustainable mobility,

cooperative solidarity, etc.). The objectives of an anti-independence urbanism must pursue:

- the amplification of the short radius of proximity, extending and enriching neighbourhoods with the multiple functions of living, reducing their marginalisation in relation to the dominant hyper-centre model;
- reinforcing an intelligent distribution in the urban space of activities and flows of people, verifying their effects on people's well-being;
- rethinking the density/intensity of urban functions in more flexible and less rigid abstract forms.

In concrete terms, we must replace the rigid separation - an obsolete child of the Modern Movement and the machine city - of places for living, working, having fun or producing, with their unsustainable demand for physical mobility, with an urban and architectural design of circular places that do not produce waste and that, amplified by technological and digital innovation, can accommodate temporary and multiple functions within a cycle that looks at the whole day or year in the distribution of functions, the attraction of temporary uses, the reception of highly innovative functions, and the shelter of citizens in difficulty. No longer rigid places where it takes too long to accommodate new functions, but more flexible places that rapidly evolve to adapt to the increasingly elastic needs of pandemic cities. I imagine pneumatic places that expand and contract according to needs, both in the normal change of cities and, even more so, in emergencies. They will change houses, schools, hospitals and offices, having discovered new functions to contain or eliminate and the need to exchange functions. Above all, we will no longer have to plan the traditional distribution of houses, schools, offices, squares, streets, parks, hospitals and theatres, but we will have to facilitate a fertile *bricolage* of places that, when needed, can function as houses, schools, offices, squares, parks,

theatres, libraries, museums and places of care, playing greater roles in the life cycle of communities.

The challenge for urban habitats will be to recover their natural polycentrism and the relative self-sufficiency and diversity of their neighbourhoods and suburbs which, ceasing to be fragile suburbs, will once again become places of life and not just homes, bridging the educational, employment, cultural and digital divide, equipping themselves with proximity places for public health and self-sufficient energy communities. I imagine cities with renewed urban proxemics composed of an archipelago of 'augmented urban communities' that reduce their frenzied centripetal mobility and ensure that many needs (not all) are met within a 15-minute walk. It will therefore be necessary to extend the domestic space by expanding those intermediate spaces that can allow a life of relationships in safety: widening pavements and providing temporary pedestrianisation to increase the space for children to play and exercise, implementing new service design and tactical urban planning interventions to shape everyday spaces in a different way, bringing theatres, museums and cinemas into the public space, reusing disused buildings to safely accommodate shared functions.

I am certainly not proposing a city of fenced-off tribes or unreachable acropolises, but an archipelago of differentiated neighbourhoods (the city of 15 minutes interconnected with the city of 100 minutes), made up of vocational or creative attractions that guarantee the vitality of crossing flows distributed in time and intensity, connected by a network of parks, gardens, pedestrian streets, cycle paths, roads for electrically-assisted cars - true arteries of sustainable mobility, safely connecting neighbourhoods through parks and gardens, reusing disused railways, and even using courtyards and alleyways. A sort of pneumatic osmotic belt to amplify domestic space, to increase - in safety - opportunities for socialising, becoming a city project, the necessary evolutionary leap produced by the creative co-option of new

spaces and uses that we have had to invent in pandemic times and that we can co-opt to make gardens, productive activities and spaces for a relational life that is safe because it is more distributed rather than frenetically attractive in a hyper-centre, but not dispersed in a frenzied atomisation.

Conclusions

It is no longer the time for maintenance or minor adjustments to the model. A bold urban revolution must be fought for the transition to a generative and responsible Neanthropocene, in which humanity takes charge of adopting new behaviours - and related space forms and functions - after having been the cause that generated an unsustainable ecological footprint with its consumption. No longer a dominant imperfect species, but a responsible humanity that takes on the responsibility of using new approaches and technical tools, elaborating a new agenda for sustainable development within a renewed circular alliance between practices, disciplines, technologies, institutions, people and nature.

Therefore, the crisis-proof metamorphosis of urban habitats will have to be based on four priority actions: a) improving the ways and measures of representing urban phenomena, using a greater number of sources and integrating them; b) facilitating *civic hacking* and the collaborative remodelling of urban spaces; c) stimulating gender, time and scheduling policies to rethink urban rhythms; d) rethinking, also through the use of new norms and design tools, the location of urban functions and the configuration of tissues according to a flexible, polycentric and reticular vision.

After we have defeated the microscopic but powerful adversary in the interspecies struggle, and after we have learnt to modify our way of inhabiting the planet, the post-pandemic city (or more likely endemic to recurrent crises) will be safer thanks to the social resilience we have learnt to exercise in dramatic

times and thanks to the anti-fragility we have introduced into its spatial fabric. Cities were the trigger for the viral pandemic, crisis-proofed augmented cities must be the antidote and antibody for a necessary radical ecology.



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Towards Conviviality in Smart Territories

Smart City; ITC; Urban Ethics; Urban Planning; Territorial Studies.

Federico Diodato

Università di Bologna, Bologna, Italy
University of Paris-Est, Paris, France
federico.diodato2@unibo.it

Today, smart planning models are beginning to show aspects of fragility, with Sidewalk Labs' abandonment of the Quayside Toronto project being an emblematic example.

This fragility indicates the need to deconstruct these powerful narratives and reflect on the appropriate application of ICT devices to spatial planning.

The article aims to analyse the power of the dominant narrative, that of the smart city, which confers to the models of territorial development a conceptual value finalised in the production of economic value.

The smart models present a series of limitations:

Spatial ones, by creating a disconnection between physical and digital spaces;

Political ones, by reducing territorial governance to its technical dimension;

Social ones, by externalising and privatising public services.

These limitations imply the delegation of the control of these technological devices with which we interact.

After the analysis of smart planning, the article will explore an alternative approach regarding the use of technology. This approach will be based on Ivan Illich's conviviality theory, and will aim to examine the development of smart territories as a place of reintegration of social relations and community in order to outline a different relationship with technology.

Could technology establish an ethical relationship between territory and community?

Technology and territory: a problematic relationship

“In about twenty years’ time, we will enter the third millennium of our history. Some imagine it as a miraculous era: diseases will have disappeared, everyone will live more than a hundred years. These optimists believe that many of our problems, such as pollution, overpopulation and violence, will have been solved by intelligent measures and new techniques,”¹ wrote Ernest Dichter in the late 1970s in the preface of *Comment vivrons-nous l’an 2000?*

Today, 40 years later, the narratives that celebrate this optimism towards the use of new technologies find in the smart city narrative a crucial model for territorial planning strategies.

However, what has been presented for the past ten years as a revolutionary and inevitable process of territorial development is beginning to show signs of fragility:

The recent abandonment of the Quayside project in Toronto by Sidewalk Labs, Alphabet’s subsidiary for smart city promotion, is a major example.

On 7 May 2020, with a short letter published online,² Sidewalk Labs CEO Daniel Doctoroff declared the end of the Quayside project.

His statement depicts three years of challenges and ultimately the end of Quayside, one of the most ambitious urban planning models in North America. In 2017, after winning the call

1 “D’ici une vingtaine d’années, nous entrerons dans le troisième millénaire de notre histoire. Certains l’imaginent comme une ère miraculeuse : les maladies auront disparu, tout le monde vivra plus que centenaire. Ces optimistes pensant que beaucoup de nos problèmes, telles que la pollution, la surpopulation, la violence, auront alors trouvé leur solution grâce à des mesures intelligentes et l’aide de techniques nouvelles”. English translation by the author, in Ernest Dichter, *Comment vivrons-nous en l’an 2000 ?*, INF (Paris: Hachette, 1979), 13.

2 Daniel L. Doctoroff, “Why we’re no longer pursuing the Quayside project — and what’s next for Sidewalk Labs”, Medium, May 7, 2020, <https://medium.com/sidewalk-talk/why-were-no-longer-pursuing-the-quayside-project-and-what-s-next-for-sidewalk-labs-9a61de3fee3a>.

for proposals for the development of the Toronto port area, Sidewalks had the ambition to develop a prototype project that combined urban planning and new information and communication technologies (ICTs).

The scale of the project can be grasped in the 15,000 pages of the development plan presented in June 2019. Known by the acronym IDEA (Innovative Design and Economic Acceleration), the project provides a strategic vision for 77 hectares of land: an area equipped with thousands of sensors which, through data processing and analysis, will determine the strategic use of infrastructures, equipment and buildings.

A ground for urban innovations, as announced on the Sidewalk website, with the goal to create through the application of technological innovations in the physical environment “a complete community and a great neighbourhood in its own right” and “improving people’s lives”.³

Since its launch in 2017, the project has been challenged by the local population who did not feel reassured by the data collection and protection systems proposed by Sidewalk. A year later, in 2018, Ontario Privacy Commissioner Ann Cavoukian resigned, stating: “I imagined us creating a Smart City of Privacy, as opposed to a Smart City of Surveillance.”⁴

The need for a debate on the themes of “privacy, ownership and governance” was pursued by the opposition committee to the Quayside project, #BlockSidewalk, concerned that the proposed planning model was designed to create a “Data Surveillance Zone”.

3 “Quayside”, Sidewalk Toronto, accessed August 11, 2020, <https://www.sidewalktoronto.ca/plans/quayside/>.

4 Gabrielle Canon, “‘City of Surveillance’: Privacy Expert Quits Toronto’s Smart-City Project”, *The Guardian*, October 23, 2018, sec. World news, <https://www.theguardian.com/world/2018/oct/23/toronto-smart-city-surveillance-ann-cavoukian-resigns-privacy>.

This planning model, rather than proposing sensible innovations, would generate a surveillance and control policy driven by the commercial interest of private technology companies, with the possibility of transforming the entire area into a gigantic surveillance network.

Sidewalk's abandonment of the project has shown its inability to deal with the demands of opposition committees combined with the current health and economic crises.

This fragility suggests the need to deconstruct these powerful narratives and to think about an alternative application of ICT devices to spatial planning.

Narrative and planning: the construction of the *smart* narrative

The formulation of narratives is constitutive of contemporary models of spatial planning, whose objective is not only to give meaning to the past, but rather to prepare the arrival of a desirable future. Stemming from this need, technology companies have begun to develop a series of storytelling, whose protagonists are technology and the relationship that it can establish between mankind and territory.

The importance of storytelling in planning is not, however, a peculiarity of smart models:

The very act of planning involves the narration of future events, and narratives applied to planning models are not limited to making the complexity of the territory intelligible, but also help to organise it by preparing it for what the future might bring. Storytelling is an essential tool to practice planning, and it is doubly linked to planning: on the one hand it is a tool *of* planning, and the realisation of a project can be seen as a stand-alone



Fig. 1

En l'an 2000,
Le Matin,
January 2nd, 1908⁶.
Credits: gallica.bnf.
fr / BnF.

act of storytelling; on the other hand, it is a tool for planning, as stories are told to develop new visions [Fig. 1].⁵

It is therefore a powerful tool of persuasion, and this power is shaped by the influence of politics and the private companies' interests, which can use it to establish themselves and push urban planning strategies. Narration is not always based on the development of inclusive planning models, that could include a

⁵ Merlijn van Hulst, "Storytelling, a model of and a model for planning", *Planning Theory*, August 2012, vol. 11, no. 3, p. 299-318.

⁶ I wish to thank Ferdinando Gizzi for the suggestion.



plurality of players into the planning process. In this sense, it is a strong legitimising device that structures power and knowledge together, but if this power is not balanced out, other interests may play a determining role.⁷

This legitimising device is widely used in smart narratives applied to urban and spatial planning. In order to analyse their construction, we can identify three main players:

The author, the ICT companies that write these narratives;
The narrative itself, a vision of urban planning managed through data collection and analysis;
The public, identified with the city (which adopts these solutions) and the citizen/user (who uses these technologies).

The author: smart city, a corporate storytelling

Since the early 2000s, ICT companies have contributed to the development of a planning model based on corporate storytelling processes.

Encouraged by the recessionary economic context, they have developed long-term business strategies focused on marketing and ICT innovations.⁸

The acronym ICT stands for technologies related to the processing and transformation of data and then used as managing processes.

Their use is crucial to enable the optimisation of urban services promised by smart models. These devices have radically changed our relationship with the machine: we cannot limit ourselves to acting on them, but it is necessary to interact constantly.

7 James A. Throgmorton, "Planning as Persuasive Storytelling in a Global-Scale Web of Relationships", *Planning Theory*, 2003, vol. 2, p. 125-151.

8 Sotirios Paroutis, Mark Bennett, and Loizos Heracleous, "A Strategic View on Smart City Technology: The Case of IBM Smarter Cities during a Recession", *Technological Forecasting and Social Change* 89 (November 1, 2014): 262-72.



The stored data, through their processing and linking, produce knowledge, and the retransmission of this knowledge to the devices that will use them allows private technological companies, on the one hand, to optimise the urban services promised by the smart models, and, on the other hand, to constitute the power of territorial management [Fig. 2].

Thanks to the widespread use of sensors, software, digital networks and remote-controlled devices, ICT companies are emerging as the best solution for governing cities with millions of residents. A jackpot of 100 billion dollars, of which IBM is the coordinator:

“If Siemens and Cisco aim to be the electrician and the plumber for smart cities, IBM’s ambition is to be their choreographer, superintendent and oracle rolled into one”.⁹

Fig. 2

Smart City, Cisco
Systems, 2013.
Credits: Creative
Commons.

⁹ Ibid, 63.

The narrative: the hegemony of calculation

Cybernetic studies in the 1950s and 1960s and early forms of artificial intelligence played a predominant role in the development of these smart narratives,¹⁰ contributing to the dissemination of one of the founding myths of the digital age:

Of a non-human intelligence form making a contribution to the functioning of the urban system.

These stories are structured in two main steps:

In the beginning, smart narratives aim to make complexity simple, to simplify reality to make it communicable, in which ICT is the answer to making the world look better. To reach this result, it is necessary for companies to open a conversation with the market segment they are targeting, mainly managers and potential businessmen, people who are likely to open up mentally to the opportunities of the future.

Secondly, the narrative strategy guides the potential client towards actions to address this need, and in doing so, companies rely on their ability to offer intelligent technology services and then appear as indispensable players in the solution.¹¹

The smart product is then presented to potential customers: a commercial solution consisting of a set of services that is for sale and whose use transforms cities/territories/planets into smart cities/territories/planets.

The aim of these stories is to redefine the relationship that human beings establish with technology and territory, presenting smart models as the culmination of an evolution driven by technological innovation.¹²

10 Antoine Picon, *Smart Cities: Théorie et critique d'un idéal auto-réalisateur* (Paris: Editions B2, 2013).

11 Ola Söderström, Till Paasche, and Francisco Klauser, "Smart Cities as Corporate Storytelling", *City 18*, no. 3 (2014): 307–20.

12 Francesca Bria and Evgeny Morozov, *Ripensare la Smart City* (Turin: Codice Edizioni, 2018).

The public: the role of cities and citizens

“In a world of machines, or of creatures that can be reduced to machines, technocrats would indeed be gods.”¹³

With these words, Lewis Mumford warned us against a technical progress outside human control, detached from social progress and only serving itself, where the development of technologies can lead to a domination over the physical dimension of the territory. Referring to Norbert Wiener,¹⁴ the forerunner of cybernetic studies, he underlined the risks of the potency of automation technology:

If technology grants us all our wishes, when asking for perks, how can one be sure to ask for what one truly wants and not what one thinks one wants?

In today’s conversation about having faith in the progress and development of ICTs, what is the role of cities and citizens in these narratives [Fig. 3]?

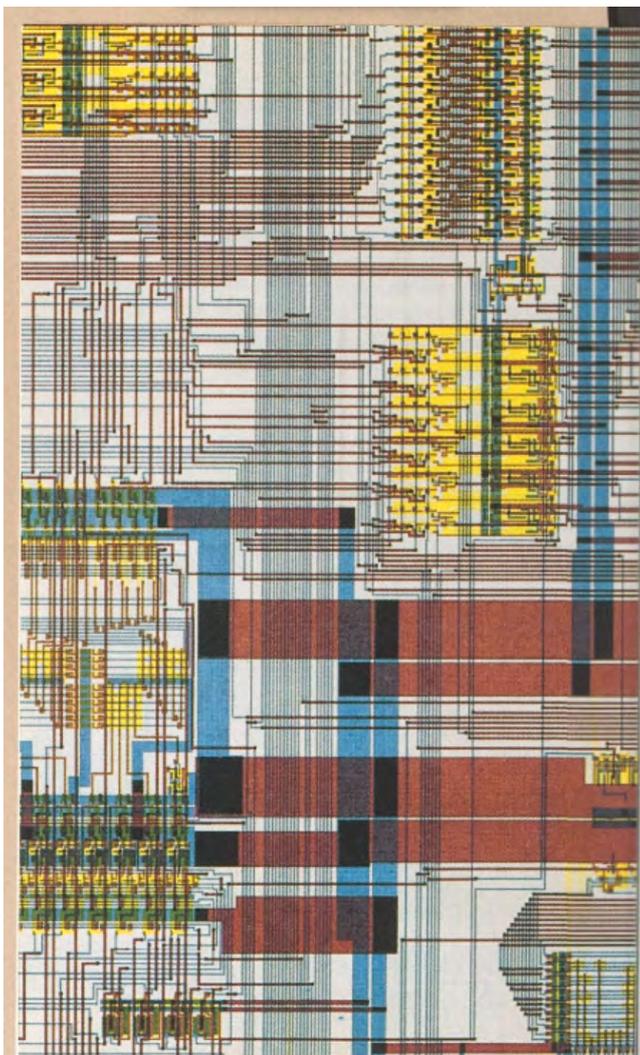
In smart systems, public space is increasingly being managed by processes driven by ICT companies.

The resulting space must be understood as a new form of territory, a “zone (...) intended to serve as a platform for the operation of a new ‘software’ for governing human activity”.¹⁵ This platform would set the base for a gradual substitution between public administration and private interests. Urban and spatial planning models are subsequently digitised and purchased by administrations as a commodity. ICT companies build the “regime of desire” that conceives them, and they assume the role of

13 Lewis Mumford, *The Myth of the Machine: The Pentagon of Power* (New York: Harcourt Brace Jovanovich, 1970), 75.

14 Norbert Wiener, *La cybernétique: information et régulation dans le vivant et la machine*, trans. Robert Vallée and Nicole Vallée, 1 vols., Sources du savoir (Paris: Éd. du Seuil, 2014).

15 Orit Halpern, Robert Mitchell, et Bernard Dionysius Geoghegan, “The Smartness Mandate: Notes toward a Critique”, *Grey Room*, September 2017, vol. 68, 113.



main actors in smart narratives by directly influencing the lives of citizens identified as mass consumers.

Reflecting on the promises of this new territorial governance, the philosopher Bernard Stiegler underlines the risk of a “digital inurbanity” in which ICT companies would replace public entities. The delegation of all choices to databases would create a hegemony of calculation that would preclude free decision-making

Fig. 3

L'intelligence artificielle, Joanna Pomian, 1959.
Credits: gallica.bnf.fr / BnF.

and create a short circuit in the relationship between the individual and the socio-economic system.¹⁶

From smart city to convivial territory

This growth in automation processes calls into question the “freedom” of the citizen who uses these devices:

Are we always free to decide on our uses and lifestyles?¹⁷

By delegating the control of these technological devices, we are actually losing our own responsibility for actions that we do not directly produce.

Can we gain control over the technological devices with which we interact? What is our degree of “freedom”? Are we responsible for the effects these devices have on the territory?¹⁸

The search for an alternative approach to the use of technology echoes the concept of “conviviality”¹⁹ developed in the 1970s by the philosopher Ivan Illich, who warned us against the “counter-productive” aspects of modern society. Technical tools have crossed a threshold of mutation and are the means for dominating nature, and making human beings slaves to the technical system.

Illich's thesis consists in reversing the deep structure that reacts to the relationship between human beings and technology, considering that it is necessary to develop a new type of relationship to replace the values of technology with an ethical value:

16 Bernard Stiegler, *Séminaire Pharmakon - La Smart City comme lieu sans lieu*, 2018, <http://www.philoinfo.fr/2018/07/bernard-stiegler-la-smart-city-comme.html>.

17 Matthieu Amiech, “Peut-on s'opposer à l'informatisation du monde?”, *Terrestres*, June 1, 2020, <https://www.terrestres.org/2020/06/01/peut-on-sopposer-a-linformatisation-du-monde/>.

18 Adriano Fabris, *Etica per le tecnologie dell'informazione e della comunicazione* (Rome: Carocci, 2018).

19 Ivan Illich, *Tools for Conviviality* (Harper & Row, 1973).

The convivial relationship.

The convivial relationship outlines a theory that prophesies a reversal of the relationship between human beings and the technical tool, in which the technical tool should meet three requirements to become a convivial one:

- 1/ Generating personal autonomy;
- 2/ Producing neither slaves nor masters;
- 3/ Extending personal reach.

By rejecting a technology that enslaves and programmes human beings, Illich proposes a vision of technology that increases personal energy and imagination, which aims to produce tools to work *with* people rather than *for* people.

The concept of conviviality is also characterised by its multiversity:

Illich does not propose a model that can be applied in a standardised way to different contexts, he instead suggests procedures to allow each community to choose its own achievable utopia, encouraging a diversity of lifestyles.²⁰

How can the concept of conviviality be related to our contemporaneity, in which we must constantly interact with the environment of information?

At iConference 2013, American researchers Santoso and Kuehn examined how Illich's thesis can be translated into smart models, pointing to the need to create technologies that allow individuals to interact with each other and build relationships, and to make it possible to connect and coordinate critical activities (transport, public services and public safety) through a technologically sophisticated system.²¹

20 Silvia Grunig Iribarren, "Ivan Illich (1926-2002): la ville conviviale" (Paris, Université de Paris-Est, 2013).

21 Stephanie Santoso and Andreas Kuehn, "Intelligent Urbanism: Convivial Living in Smart Cities"; 2013, 566-70, <https://doi.org/10.9776/13278>.

The two researchers identified four principles to promote conviviality through technology:

- 1/ Facilitating communication, sharing information and providing access to data;
- 2/ Creating choices and enabling decision-making;
- 3/ Engaging in informed municipal governance;
- 4/ Enhancing the multi-sensory experience.

At this stage, the question to ask is whether this way of using technology can radically change the way the territory is planned. The possibility of a convivial society is not opposed to it becoming digital, but rather to an alternative use of the technical tool to produce a local economy that makes technology a social future.²²

Conclusion

From the actualisation of Illich's conviviality, we should open up to another narrative, which considers the territory in its sense of "common good".²³

Aware that, in any case, we are within the framework of these strategies and that any reference to ethics can easily be integrated into narrative devices that aim at economic utility.

To go further, an interesting application of conviviality could be found in The Transition Network approach.

The Transition Network is inspired by the *Transition Handbook*,²⁴ written in 2008 by Rob Hopkins. It aims to use technology that focuses both on human needs and on its "appropriate" use. Each community of inhabitants can invent the actions that suit the specificity of its territory, taking inspiration from the network of other cities.

22 Bernard Stiegler et al., "Manifeste Ars Industrialis", <http://www.arsindustrialis.org/>, 2010, <http://www.arsindustrialis.org/manifeste-2010>.

23 Alberto Magnaghi, *Il progetto locale* (Turin: Bollati Boringhieri, 2010).

24 Rob Hopkins, *The Transition Handbook: From Oil Dependency to Local Resilience* (White River Junction, Vt: Transition Books, 2008).

It is a multiversity-oriented and site-specific approach, proposing a storytelling that aims to foster “a movement of communities coming together to reimagine and rebuild our world”²⁵. The Transition Network incites initiatives that are intended to be resolutely “positive”:

As underlined by Valérie Peugeot, the environmental crisis is an opportunity “for societal transformation, involving all the players who ‘make the city’ (non-profits, companies, residents, local authorities, etc.) in the process, in the most inclusive approach possible”.²⁶

From this perspective, an intelligent city is a city that cultivates the intelligence of its inhabitants.

Unlike the example of Quayside Toronto, this narrative considers the territory as a place of creation of social value, where it is necessary to rethink the relationship between nature and technology in order to articulate technical infrastructure and society in a synergistic way.

The aim of this approach to ICTs is to develop narratives that are not only targeted to producing economic value, but that are capable of putting the freedom of the human being at the centre of the reasoning, in the words of Adriano Fabris, “how we can relate, in a correct and good relationship, the various online and offline environments in which we live today.”²⁷

25 “Transition Network”, accessed February 4, 2021, <https://transitionnetwork.org/>.

26 “de transformation sociétale, et cherchent à associer tous les acteurs qui ‘font la ville’ (associations, entreprises, habitants, pouvoirs locaux...) à la démarche, dans une approche la plus inclusive possible.” English translation by the author, in Valérie Peugeot, “Collaborative ou intelligente? La ville entre deux imaginaires,” in *Devenirs Urbains*, ed. Maryse Carnes and Jean-Max Noyer (Paris: Presses des Mines, 2014), 51.

27 “del modo in cui possiamo mettere in relazione, in una relazione corretta e buona, i vari ambienti online e offline in cui oggi ci troviamo a vivere.” English translation by the author, in Fabris, *Etica per le tecnologie dell’informazione e della comunicazione*, 192.

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Unblackboxing Waste Management in Practice. A Set of Actions Enabling Circular City Making

Unblackboxing; Post-Use Materials; Waste Management; City Making; Circular Strategy.

Saverio, Massaro

Università degli Studi della Basilicata, Matera, Italy
saverio.massaro@unibas.it

This contribution intends to focus on the crisis of waste, particularly on the impact of post-use materials on practices of city making in the European context.

Waste is framed as an evident, perpetual and pervasive phenomenon that has affected both the geosphere and the organosphere. To deal with such an issue, it is needed to imagine new evolved forms of radical co-existence with discards, enabling circular practices.

The waste management infrastructural networks belong to an industrial system and their functioning corresponds to a *black box* model. In the age of information and transparency, the notion of *unblackboxing* is here introduced with the aim to propose a set of actions for circular city making. Actions are based on three main considerations regarding the informational value of waste, the relationship between society and waste and, finally, the relationship between waste and city.

The actions will be described with examples, references and research-driven initiatives provided by the author.

Preface

This contribution intends to focus on the crisis of waste, particularly on the impact of post-use materials on practices of city making in the European context. Waste is framed as an evident, perpetual and pervasive phenomenon that has affected both the geosphere and the organosphere. Through the concept of *wasteocene*, Armiero and De Angelis highlight how society depends on an economic model and a system of relationships that systematically transform materials, places and people into waste (wasting). Therefore, waste is not an object but a set of relationships that determine toxic waste (Armiero & De Angelis, 2017).

Established studies in *garbology* together with recent findings on plastiglomerate¹ and fatbergs² show that post-consumer materials are unamendable traces intertwined with ecosystems. To deal with such an issue, it is needed to imagine new evolved forms of radical co-existence with discards, enabling circular practices.

Urban waste management (WM) infrastructures belong to the industrial or “modern” city, whose legacy is based on the principles of analytical separation, mono-functionality, zoning and homogeneity (SAGGIO, 2013), characterised by the production of negative externalities, from brown areas to the streams of urban solid waste.

Unblackboxing the waste management infrastructure

The spaces of WM infrastructure designed as black boxes tend to be rejected by local communities that don't accept them nearby dwellings or neighbourhoods (known as the NIMBY - Not In My Back Yard syndrome). Their operation must

1 Kirsty Robertson, “Plastiglomerate” *E-flux Journal* 78, December (2016). Source: <https://www.e-flux.com/journal/78/82878/plastiglomerate/>

2 Mike Michael, “London's fatbergs and affective infrastructuring”, *Social Studies of Science* 50:3 (2020): 378

be uninterrupted and, at the same time, they are detached by daily life and their activity is separated by human behaviours. As remarked by Jefferson & Lettieri, “the systems that support the modern city are all around us but hidden either below ground, within the walls, floors, and ceilings of buildings, or are rendered invisible to us by virtue of their commonplace-ness. Their outputs are engaged with routinely, for instance through transportation and communications networks, yet their physical presence is often unconsidered” (Jefferson & Lettieri, 2017).

The operation of WM infrastructures is normally taken for granted; therefore, a contact and a recognition between users and infrastructure occur only when the operation is interrupted and a system error (or bug) is revealed.

From a socio-technical perspective, the WM networks work as a *black box*. In short, the black box model is based on three factors: the vision of the external envelope, the recognition of the input mechanism and the empirical evidence of a final result. Regarding the waste cycle, its management model can be easily associated with a *black box* model: the composition of the flows is not exactly known, the behaviour of the waste management system remains obscure or unclear (Graham & Thrift, 2007) and the nodes/spaces, similarly to other urban facilities such as electrical power stations and other substations, are opaque and enigmatic urban presences.

The notion of *unblackboxing* is here introduced with the aim to stress and subvert the *black box* logic of dumb and mono-functional facilities and to give a new dignity to post-use materials; the term is borrowed from science and sociology and here reminds of both a socio-political and spatial process through:

- the deconstruction of the complexity of the infrastructure by unfolding its flows and processes;
- the endurance of the constancy of maintenance and repair towards a redesign of physical interfaces and infrastructure-user relationships (Colmellere, 2015);

- the introduction of public awareness on current production/ consumption patterns and the exploration of the possibilities offered by the spaces that are related to the waste cycle (Sendra & Sennett, 2020);

Assuming that in the contemporary information age “the web has taken the place of the assembly chain, ‘mixité’ has replaced zoning, the computer has replaced the machine and narration has taken the place of mono-functionality”³, then what is the role of WM infrastructural networks in a post-industrial city? Analysing them as socio-technical systems, here it is proposed to reframe waste as a cultural driver for circular city making and to express the concept of unblackboxing into a set of actions to reveal value and enable new forms of social performativity and prosumership.

The analysis starts from three main considerations: the first relies to the informational value of waste, the second concerns the society-waste nexus and, finally, the third is about the relation between waste and the built environment.

Waste is a matter of bits and atoms

The notion of waste is not objective or absolute. The value attributed to materials and products, as the notion of *waste*, is the outcome of variable and temporary social conventions. In the current take-make-dispose linear model, this information value (e.g.: energy, processing, memory, story, etc.) is often invisible and scattered. Information is a key element that shapes digital environments and, at the same time, reconceptualises physical and spatial categories (Offenhuber & Ratti, 2017). In order to legitimate the informational value associated to materials and artifacts, digital duplication and twining are added to embedding and embodiment.

3 Saggio Antonino, “The impact of IT Revolution in the contemporary city”, in *Le Carré Bleu*, 3 2013, p. 16.

The tracing of material biographies is proposed by Thomas Rau and Sabine Oberhuber through the Universal Declaration of Material Rights (UDMR) and the Materials Passport, as parts of a new toolkit driven by the fundamental role of information. The development of such tools, together with a further implementation of the recently adopted requirements for Extended Producer Responsibility schemes, would create the enabling conditions for an ontological shift, paraphrasing the philosopher Luciano Floridi (Floridi, 2020), whereby materials are intended as services, products are designed as banks of raw materials and, finally, buildings begin temporary storages.

Taking care of the informational value associated to post-use materials and waste streams is also possible through web-based projects, such as the Harvest Map by Superuse Studios, a web platform for the exchange of waste materials in design that fosters the matching between multiple stakeholders, helping raise alternative networks and supply chains.

Similar initiatives are represented by archives of materials open to communities, such as the following examples:

- the OS Material Archive of the TCBL Foundation⁴ found at the TextileLab in Amsterdam, consisting of an analogue/digital and open-source archive for collecting and displaying DIY sustainable materials and their related knowledge;
- the Material Archive⁵ of the Stiftung Sitterwerk, a centre for art, research and production in St. Gallen, Switzerland. The material archive holds more than 1000 material samples, documenting historical and recent material developments in art, architecture and design;
- Materiom, an open-data-based library featuring “recipes” for materials made from locally sourced biomass.⁶

4 See: <https://tcbl.eu/project/os-material-archive>

5 See: <https://materialarchiv.ch/>

6 See: <https://materiom.org/>

Post-use materials are commons

Waste is typically considered as a new resource. Assuming this, there is the risk of extending and perpetuating the extractive and consumerist logic of the capitalistic model. As argued by Cavé, urban post-use materials can be considered common-pool resources (CPR), namely semi-decentralised relational systems managed collectively (Cavé, 2017). Ostrom has extensively worked on commons, defining them not just as resources but also as relational ecosystems that are collectively managed and are based on convergence.

Moreover, new commons-based models rely on a more sustainable and inclusive strategy, with the aim to extend the life and value of materials and products; within a product-as-a-service model where users pay for function or performance instead of taking on product ownership, saving the user maintenance, storage, repair and end-of-life costs. Thus, the roles of individuals and system errors are reconsidered and reframed. Firstly, individuals and local communities are no longer passive and marginalised entities but rather active agents of change. Secondly, “surplus” isn’t considered an inefficiency of the system but rather an opportunity to learn: the error isn’t a failure, instead it’s a generative act through which to enable citizens and support circular city making. A clear example is given by the Peccioli’s landfill in Italy’s Tuscany region, whose main activities are waste disposal and energy production from biomass, solar and aeolian. It’s a success story based on three factors: the active involvement of the local community, the concern for the environment, and the positive economic impact for the area. Here, the local community has been invited to directly take part in the activities of the public company Belvedere S.p.A. and its revenues are re-invested in community-related services. The purpose of this is to enhance civic participation, with the public body involving citizens as active stakeholders who are allowed to take strategic decisions.

This approach fosters new perceptions of existing WM spaces and calls for new urban narratives. A possible way to fill the physical and perceptual gap between the infrastructure and users is to know them better and investigate their potential. Somehow, evoking Kevin Lynch's exhortation to organise excursions to local landfills with archaeologists and historians (Lynch, 1994), the Rome-based non-profit association Urban Experience proposes the *walkabout*, a performing media format in which peripatetic conversations are combined with nomadic radio broadcasts, for a participatory urban exploration.⁷ Since 2017, some explorations have focused on the spaces of urban metabolism in the city of Rome, Italy, within the framework of municipal cultural activities.⁸ *Recycling Rome* (2017) proposed a walk through the city to explore multiple spaces where waste could be collected, sorted and transported; the action continued on public transport and finally ended with a workshop aimed to envision and share, together with the local WM agency, possible evolutions of spaces from both the architectural and service design points of view. This research-in-action continued in 2019 and 2020, enriched with an artistic and performative layer: the waste collection centre near the Cinecittà film studios became a theatrical set for the radio performance "Ah che bei giorni!" by Consuelo Ciatti based on her rewriting of Beckett's text⁹; its second replica has been recently made during the programme *Softscience*¹⁰, linking the walkabouts to each of the United

7 The method enables the participants to become protagonists of an "augmented action" of sense-making and live blogging on social media. Moreover, connecting smartphones and headphones to a radio receiver (whisper radio), allows a radio stream to be transmitted live on web radio and georeferenced on an interactive map (geoblog.it). A description is available at the link: <https://www.urbanexperience.it/walkabout/>

8 These explorations were organised according to the ratio and the advancements of the doctoral researches conducted by the author.

9 Infante Carlo, *Beckett tra i rifiuti. Tra le pieghe dei paradossi urbani, in un walkabout con anima teatrale*, in www.urbanexperience.it, published on 26/09/2020. Source: www.urbanexperience.it/beckett-tra-i-rifiuti. A video of the performance is available at the link: <https://youtu.be/tzhG30uctaM>

10 See: <https://www.urbanexperience.it/eventi/softscience2020/>



Nations' Sustainable Development Goals (SDGs). The performative act took place inside a container for the roadside collection of WEEE, transforming the waste collection centre into a theatrical stage and a space for a new cultural production, open to the city and connected with the neighbourhood. Walkabouts are experimental unblackboxing actions that further reinforce the deep connection between culture and circular metabolism: they reframe waste and individuals within a new orientation system, intervening on urban thresholds and proximity conditions. Although ephemeral, this action reveals the cultural potential inherent in WM spaces by working on urban thresholds and barriers, by activating community-based cultural practices as a driver for enhancing service design and innovating the typologies of WM urban spaces. The combination with the performing arts serves as a critical element to inform an understanding that humans are part of networks of complex relationships operating at a multitude of scales and languages [Fig. 1], [Fig. 2].

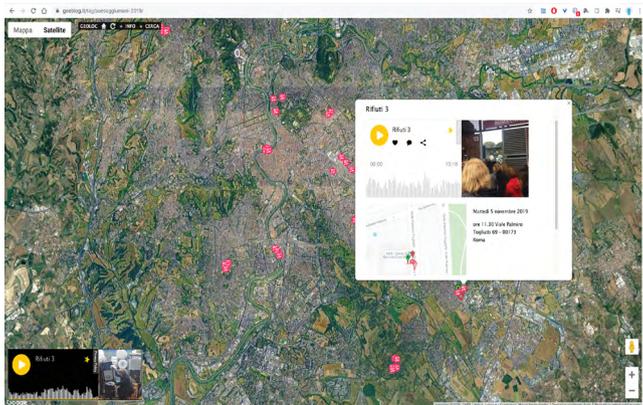


Fig. 1

Consuelo Ciatti, performance at Cinecittà Waste Collection Centre, Rome, 2019. Image by the author

Fig. 2

Histories written into geographies. The walkabout radio streaming on www.geoblog.it, 2019. Image by the author



A new pact between waste and cities

The current waste management infrastructure still derives from an industrial model and represents an example of a black box whose operations remain hidden. How can architecture represent the future *circular society*? Attention is paid to understand how the “inverted pyramid” scheme of the European waste prevention strategy¹¹ will influence the urban environment of European cities. The European waste hierarchy marks the end of the use of landfills and enhances the creation of a network of proximity equipment for waste management. On the one hand, landfills are regenerated and transformed into parks as for the Valdemingomez Park (Madrid, Spain), sport & leisure facilities such as the Metabolon (Cologne, Germany) or urban renewable energy parks as for the Georgswerder Energy Hill (Hamburg, Germany). On the other hand, proximity spaces emerge in the neighbourhoods where urban metabolic flows are made visible and individuals establish new relationships with their waste.

Even more actions such as collecting, sorting, transporting, exchanging, distributing, reworking and recycling will tend to result in a series of small to medium scale hybrid urban equipment, able to catalyse the existing flows and create synergies between the different existing urban systems. Examples can be found with innovations from both the architectural and service design points of view. These intermediate “civic spaces” deconstruct the complexity of the infrastructure by unfolding its flows and processes, integrating community services and enabling new forms of prosumership.

The idea that local communities and stakeholders can play a pivotal role in generating new shared value is at the base of many experiences in the Netherlands, where the circular economy finds fertile ground (Savini, 2019). A first example is *Wasted*, an

11 See: https://ec.europa.eu/environment/green-growth/waste-prevention-and-management/index_en.htm

Amsterdam-based initiative launched by the Cities Foundation in 2015 and consisting of a neighbourhood-scale supply chain based on laboratory spaces and associated activities, machines and mobile carriers (hardware) as well as a web platform, a mobile app, a rewards system and a programme of education and research activities (software). The project started with the collection of plastic and now also integrates paper and textile fractions. Similarly, *Zero Waste Lab* was launched by De Gezonde Stad in Amsterdam in 2016 as a local spot used to collect and upcycle waste. A second lab was opened in 2017. The community's rubbish is exchanged for a local currency which can be used to buy goods and services at local shops. The lab itself serves as a place of awareness and information about circular practices. The organisation is run by people outside the labour market who are trained to become raw materials experts. Post-use materials are upcycled and reused locally and the rest is collected by Zero Waste Lab's business partner AEB.

A second example is the Upcyclecentrum in Almere, Netherlands¹², funded by the municipality and completed in January 2018. The building has been built using secondary raw materials, including materials from a demolished swimming pool. A traditional recycling centre has been transformed into an innovative hub for startups and companies working on residual waste flows supplied by the population of Almere. The activity programme involves local residents, students from the adjacent education centre and also Raw Materials Collective Almere, a cooperative that valorises the municipality's waste flows generated from public space management.

These neighbourhood upcycling facilities are small physical traces of this proximity-based approach. It should be pointed out that they are not isolated actions, rather they are parts of

12 The project is part of City Deal Circular City, a wider strategy that brings together 9 cities, 3 ministries and 3 knowledge parties, with the aim of achieving fully circular cities in 2050. See: www.upcyclecity.almere.nl

wider territorial strategies and political roadmaps to the circular economy in the respective countries.

The redesign of physical interfaces and infrastructure-user relationships accompanied with added aesthetic value is found in the Maag Recycling facility in Winterthur, Switzerland, that includes a waste collection centre, a lab, offices and sanitary facilities, fitting in a hinged area between the residential and the industrial areas of the city.

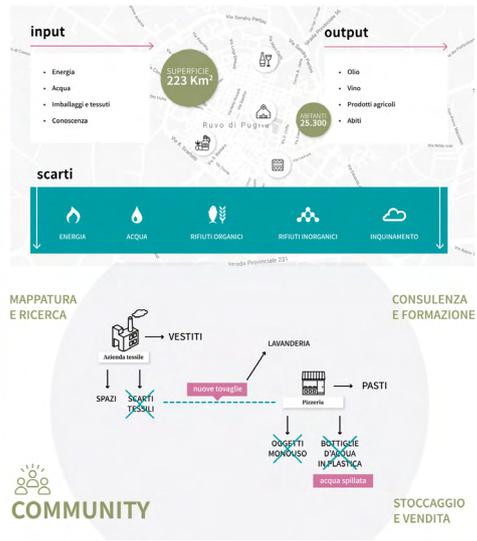
Transparency and accessibility are two key factors: a clad made from metal perforated panels allows to see through the spaces during the day. The building is open to the city thanks to bright green surfaces and a public area on the roof with a parking area and a community garden made from recyclables.

Some of the abovementioned examples showcase possible synergies between circular economy and urban regeneration¹³ and have been used as key references in a multidisciplinary workshop, co-tutored by the author, where tools and methods have been tested with multiple experts, companies and citizens. The workshop was organised in Ruvo di Puglia in Italy's Apulia region in 2019, a town where an urban regeneration process for dismissed commercial spaces in the historical city centre, to be reactivated with temporary activities, has been launched.

The goals of the workshop were: to raise awareness and involve different sections of the population with respect to the idea of circular economy (public administration, schools, companies, researchers); to define a circular strategy at a territorial scale, and to develop design ideas for new spaces, products and services in the urban context.

A preliminary activity has been to map the material flows of small companies, their value network and the use / non-use of

13 The workshop was organised within the framework of the Festival Nove Nove Nove "Mutations" in Ruvo di Puglia and was co-headed with the journalist and circular economy expert Emanuele Bompan. Source: www.novenovenove.org



social and production spaces. These companies were a group of bakeries, restaurants and pizzerias in the historical city centre and three companies - an oil company, a winery and a textile company - located in the industrial district.

The first scenario proposed to plug a new laboratory into the unused spaces of the textile factory, to reduce paper and disposable plastic items and also to start the recovery of waste food in the historic centre. This generates a virtuous synergy: new table linen from textile waste, designed and developed in the new textile lab, would characterise commercial activities in the historical city centre and foster the opening of complementary services (laundries, ironing rooms, tailors, craft shops, etc.) in the empty spaces of the historical city centre, according to a circular re-branding strategy.

The scenario was completed with the launch of physical and digital marketplace for the sale & purchase of by-products and waste between local economic actors [Fig. 3].

Fig. 3

Photos and graphics from the workshop Ruvo Circolare, Ruvo di Puglia (Apulia region, Italy), 2019. Image credit: © (La Capagrossa association and the author)



This contribution intends to underline the role of waste beyond the actual improvement or innovation of the service performed by municipalities and companies. It is a question of understanding its role and potential for city making. In order to face the multidimensional status of post-use materials, community-based services, business and governance shall be provided within the design of spaces; in this sense, more systemic benefits compared to industrial facilities located in suburban or rural areas are expected to be determined.

The abovementioned examples showcase also how unblackboxing is intended as an action of representation, reimagination and external projection of waste and that new civic spaces shouldn't be merely for the storage of matter (and information), but true laboratories for the transformation of post-use materials into cultural assets. According to such challenges, accurate monitoring tools and new professional figures are required, such as a circular district manager to guide processes of evidence and monitoring. Moreover, in the Italian context, an important leverage would be to contextualise such challenges within the civic realm given by the progressive affirmation of social enterprises and the third sector (non-profit organisations) within the entire national framework.

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S.04

SHIFTING
URBAN VISIONS

Pictures of Floating Grounds. Voluntary Exiles and Ecological Narratives: the Case of Oceanix Floating City Project

Floating Cities; Narratives; Environmental Replication; Spatial Privatisation;
Marine Ecologies.

Matteo Vianello

Università Iuav di Venezia, Venice, Italy
mvianello@iuav.it

The paper's discourse focuses on Oceanix (2019), an architectural proposal for a futuristic city designed on artificial platforms floating on water surfaces. By focusing on the project advertising images, the paper will try to unfold the idea of the environment forwarded by Oceanix, together with its architectural aesthetics. While being presented as an innovative city with new urban and ecological ontologies, Oceanix embraces narratives of preservation, considering the project as a voluntary exile of a selected community. Finally, the paper will look at Oceanix as a relevant statement for the earthling urban debate since it problematises the replication of land urbanism onto water surfaces, thus making evident the relationships between ground, ecology and architecture.

In April 2019, the United Nations Agency for Human Settlements (UN-Habitat) held the first round table to look into floating cities as a radical urban strategy able to adapt coastal cities to the predictions of rising sea levels. As a hypothesis that embraces a complex change of paradigm for several aspects regarding cities and territories, the UN round table hosted many and heterogeneous figures, from academics to economists.¹ Among the invited speakers, the entrepreneur Marc Collins Chen and the architect Bjarke Ingels² presented an urban project proposal called Oceanix.

Presented officially as an “adaptable, sustainable, scalable, and affordable solution for human life on the ocean”,³ Oceanix communicates the hypothesis that the future of cities may soon be displaced onto a series of artificial grounds which float on water surfaces, through the deployment of the most advanced technologies concerning renewable energetic resources.

Despite most of the round table guests claiming for the urgency of radical strategies for the future of cities, Ingels’ project hides deeper narratives which need to be investigated and improved. Beyond its technical feasibility, this paper will instead focus on the rhetorics behind these futuristic urban images, in relation to the words used to depict the project.

According to this premise, Oceanix will be investigated through a two-fold perspective: on the one hand, as a statement about how architects have been conceiving water surfaces since the second half of the 20th century; on the other, as a relevant example of the architectural aesthetic of floating cities, especially those related to the climate change crisis.

1 Among the participants were Professor Nicholas Makris of the MIT Center for Ocean Engineering, the Nobel prize-winning economist Joseph Stiglitz, and the activist Suzy Amis Cameron. Source: Fixsen, “Bjarke Ingels Unveils an Ambitious Plan for Floating Cities at the U.N.”

2 The proposal was put forward by a cross-disciplinary team composed of, among others, Studio Other Spaces (Olafur Eliasson and Sebastian Behmann). Source: “Oceanix Media.”

3 “Oceanix Media.”

An ecology of the exile

The narratives envisioned by Oceanix are rooted in already existing issues which are affecting coastal urbanism: on one side the ever-growing demographic pressure; on the other the predictions of unstoppable rising sea levels. Since even the known phenomenon of land reclamation is appearing inadequate, the shortage of buildable land pushes the research of alternative strategies for providing more ground. Nevertheless, what appears crucial is that Ingels' floating city is advertised not only as an alternative project of geoengineering, but also as a chance to resettle the existing concepts and relationships between the urban ground and water surfaces.

Paradoxically, right through the narratives that underline the innovation behind the project, Oceanix embraces a conservative conception of the marine environment. Indeed, while claiming to take the rising sea level (and thus water surfaces) as a chance of conceptual renovation, this city proposal appears less innovative than it looks through the architect's words and images.

However, since the second half of the 20th century, architects have been already using water surfaces for the same purposes of Oceanix: to develop other modes of settlements able to embrace different systems of energetic production and consumption.⁴

Eventually, inspired by many existing informal floating villages that witness a continuity between land and water,⁵ modernist architects coupled the long tradition of water settlements with the challenges of modern cities, producing a vast series of radical projects. Besides the heterogeneity of proposals and purposes,

4 Many of these projects come from the Metabolists group of Japanese architects. See, in particular, the works of Kikutake Kiyonori in: Kikutake, Kiyonori, Ken Tadashi Oshima. *Kiyonori Kikutake: Between Land and Sea*. (Zürich: Lars Müller, 2016).

5 An extensive demonstration of modernist architects' interest in existing floating villages can be found in the publication: E. and J. Rougerie, eds., Special Issue: 'Habiter la mer', *Architecture d'aujourd'hui*, 175 (September – October 1974).

it could be argued that floating cities often consisted of projects of replication which physically, conceptually and historically addressed water surfaces with narratives of future and hope.

Nevertheless, while these projects have contributed to make floating cities a well and long known architectural genre, “innovative” projects like Oceanix seem to be doing nothing more than rebranding the past, by contextualising architectural experiments that refer to past conceptions of urbanism and just place them within the current ecological situation.

Although we have recently witnessed the tangible climatic phenomenon as a global and immanent condition, Oceanix’s narratives appear evidently dismissive of this existing scenario. Eventually, the historical speculation about the refoundation of cities beyond the land results nowadays as a reactionary act, perhaps bearing out the shift from an innovative to a preservative behaviour, from an endeavour to an escape.

Such narrative friction becomes even more evident if we focus on the image that couples the peaceful and untamed marine environment with an anthropic urban archipelago – a totally man-made ecology surrounded by an ideal physical environment.

As a consequence, rather than a “bold step towards a more resilient future”,⁶ the project might be better read as a voluntary exile of a selected urban civilisation from a threatened land toward another safe ground.

Despite its escapist tone, this same point activates some reflections on how these narratives *make sense* of the sea environment, and how ecology and architecture is supposed to be preserved. By reading Oceanix as an act of exile, one could argue to identify two complementary narratives: on one side the glimpse of a new promised ecology (i.e. oceans); on the other the project of a utopian floating urban space [Fig. 1].

6 “Oceanix Media”.



Liquid Eden

Fig.1

Aerial view, the man-made floating archipelago and its relationship with marine ecology.

Image credit: © (OCEANIX/BIG-Bjarke Ingels Group)

Since the proposal is “calibrated for the most vulnerable tropical and subtropical regions around the globe”,⁷ Oceanix may be considered as a de-contextualised diagram which could be adapted to several different environmental contexts.

7 BIG, “SFC Oceanix City”.

Moreover, rather than addressing a more specific marine context, the floating city seems definitively to prefer an abstract and subjective vision of water surfaces, by pursuing and narrating an anthropic life in harmony with the oceans⁸. Indeed, the background behind the archipelago appears to be a plain and calm water surface, on which a sunny sky reflects clear rays. The water seabed, wild and untamed, is rich in fish species and microorganisms which dialogue harmoniously with the floating anthropic infrastructures, as the whole environment provides a constant and perfectly homogenous quantity of resources which feed the renewable urban energetic system.⁹

Interpreting these glimpses through Fred Sharmen's words, Oceanix renders more than just "a credible future object", indeed "the world in which that object exists, seemingly transformed by the new thing in it."¹⁰ However, if we agree with Sharmen's statement, the background behind Oceanix expresses a precise, yet fictional, conception of water surfaces. That is, the place for a second creation of the world, a blank space where to recast ecologies, grounds and territories according to the human perspective, rather than conceiving it for what it actually is: a complex and dynamic environment, in complementary relation to the land. Indeed, we do not only see a *happy city*, but a *happy city* in a *happy environment*.

Oceanix's advertisement of pursuing a serene life with the ocean space seems to be telling us that seas are not considered as an ecological counterpart of the land. Rather, such a subjective vision renders the marine environment as a totally detached, seemingly extraterrestrial planetary surface. Represented as a promised land which ensures hope and happiness for humans,

8 "SFC Oceanix City".

9 Looking at the press materials, Oceanix forwards two different climatic scenarios of the same urban view. They appear captioned as "NEIGHBOURHOOD BOARDWALK, MIDDLE EAST" and "NEIGHBOURHOOD BOARDWALK, NORTHERN EUROPE". See: "Oceanix Media."

10 Sharmen, *Space Settlements*, 239.

the water surface becomes the last physical environment able to sustain the future of cities.

Oceanix could be linked to the ecological anxiety related to the finitude of Earth's resources.

Its necessities and purposes are recalling the modern ecological debate, when a series of texts recognised planet Earth as a closed and fragile system, questioning the capacity to sustain human anthropic footprint. Among the many, the 1972 scientific report *Limits to Growth* made explicit the finitude of resources, by calculating the maximum population the world could host.

In an attempt to constitute a retroactive history of Oceanix's ecological anxiety, the Italian physician Cesare Marchetti questioned the Club of Rome's predictions for the future of human settlements regarding resource and spatial scarcity. By focusing on food and energetic production processes, Marchetti revised the dynamics between cities and the physical environment, portraying a scenario where the Earth sustains the population growth of 15 billion people – far beyond the limits imposed by the Club of Rome. The thesis argues that the “Earth-carrying capacity for man” is still significant even with such numbers, since new ways of producing energy and food in unprecedented quantities could be enlightened by new technologies. For instance, instead of consuming ground for agricultural production for food, new exploitation processes could synthesize “wine and cheese”¹¹ from hydrogen and so on. Likely, rather than referring to land as the only buildable surface for cities, Marchetti suggests considering the possibility of expanding urbanism towards more available surfaces. Through this perspective, the water surface becomes a land's mirror, an endless surface, where it is finally possible to get rid of the anxiety related to the buildable land shortage. Furthermore, through the consequences of

11 “The techniques that made it possible to produce such a splendid variety of wines and cheeses out of two insipid fluids can be deployed to reproduce the miracle”. Marchetti, 1113.



his thesis, Marchetti shares with Oceanix an analogous subjectivation of the environment. According to Marchetti, while technological improvements are transforming the practices and the cultures of source exploitation, we will witness a consequent change in the use of territories. In this technophilic scenario, Marchetti confers on the environment an aesthetic relevance, by contributing to accomplish the cultural environment of men. In other words, whether technology has brought the source

Fig. 2

Public spaces of Oceanix city, the urban dynamics alongside the platforms' edges. Image credit: © (OCEANIX/BIG-Bjarke Ingels Group)

exploitation to a different frame, the environment must now have a “contemplative” dimension.¹²

Oceanix’s ‘Liquid Eden’, in this sense, could therefore be considered a contemporary, dystopian *mise en scene* of longer and more rooted narratives of water surfaces. Both in Oceanix and Marchetti’s report, the sea is seen as “a tabula rasa launching ground for new cultures, infrastructures, and modes of production”,¹³ However Oceanix’s optimism is slightly different from one of its historical precedents. The high quantity of resources and space of marine surfaces is now seen more as a place of exile, rather than a new frontier to conquer [Fig. 2].

Doppelgänger

The architectural aesthetics of Oceanix renders such narratives of exile even more explicitly.

Indeed, the ‘new city’ after the exile seems to copy the one of the land. Through the renders, it is possible to glimpse the spaces of a new environmental-care citizenship sized between 300 and 10,000 inhabitants.¹⁴ Although their lives are now off their native land, the inhabitants of Oceanix keep their native habits, seemingly advertising that on a new floating ground, life could continue more happily and more serene, finally free from the displacements of climate change which affected the land. Neither does the liquidity imposed by the floating ground permit a change of the motherland’s urban domesticity, since a relevant traffic jam of electric cars, couples jogging along the island’s banks, and boats connecting one side of the city to another confirm this suggestion.¹⁵

12 Marchetti, 1117.

13 Drapac, “Escapist Ecologies”, 8.

14 “Oceanix Media”.

15 See the image in Figure O2. “PRODUCTIVE EDGE”.

For the earliest proposals of floating cities, water surfaces have been useful for finding new radical urban diagrams, eventually sensing that “context becomes more negotiable in isolated zones — when the horizon line is always visible and when architecture begins to drift, and change.”¹⁶ Indeed, in the second half of the 20th century, projects of urban replication into other environments were considered a crucial practice for the development of new settlement typologies, through the deployment of high infrastructural technology. For architect Paolo Soleri, radical and different environmental conditions (such as sea space) offer the chances to provoke the radical revision of the existing architectural paradigms. In formulating this position, he coined the term “exotic seeds”,¹⁷ to express the new ideas of urbanism which were able to challenge the existing known paradigms. In other words, what is now considered rare, unknown and exotic, could become the common condition.

Oceanix shares with this theory the same faith in technology and outer environments, but in a different cultural and chronological context. By paraphrasing Soleri, rather than the first seeds of new marine cities, the escapist tones of Ingels’ project lead us to consider it more as the last reservoir of the urbanism of land. In Oceanix, the modular hexagonal floating platforms will provide new ground, while the most improved technologies and infrastructures will preserve the existing aesthetics of land spaces and the habits of their inhabitants. In doing so, Oceanix narrates an enclosed settlement, fragmented in several islands, where ecology is preserved in big glass domes,¹⁸ witnessing another kind of relationship between urban and natural environments.

16 Drapac, “Escapist Ecologies”, 9.

17 Soleri, “On Kionori Kikutake’s Utopian Paradigms Of Marine Metropolis”, 4.

18 See Figure 02 and Figure 03.



Fig. 3

Ecological preservation and replication, the earthling landscape transplanted onto floating platforms.

Image credit: © (OCEANIX/BIG-Bjarke Ingels Group)

As a consequence of this, spaces and physical environments are shaped according to the project of a selected community. Since exploration figured as a meaningful way for “testing, verifying and assessing notions [...] which may well become run-of-the-mill in the next century”¹⁹, extraterrestrial environments offered not only the chance to develop new settlements, but especially

¹⁹ Soleri, 5.

the rise of a new paradigm of communities. However, the new marine landscape has turned Soleri's hope of spatial democracy into its own opposite, to the extent that the Oceanix islands resemble something more similar to a gated community. Specifically, the *islandness*²⁰ behind the floating city typology stresses the privatisation of spaces, proposing settlements composed of micro private ecologies [Fig.3].

Conclusion

Whether Oceanix figures as a *doppelgänger* of land cities, it becomes even more important to understand which new contents it could tell us about existing urban conditions.

Looking back at the premises of this critique, we could argue that Oceanix did not set a clear line between the abstraction of a vision and the immediacy of a strategy. Water surfaces have always been conceived as a halfway between an abstracted surface and the objective entity of the marine ecological surface. Through this perspective, Ingels' interest in water surfaces indirectly becomes a statement about land territories. While envisioning a negotiation between cities and physical environments, Oceanix renders more evident the persistence of anthropic narratives and the subsequent inadequacy of this strategy to bring forward an innovative cultural position.

The narrative friction which Oceanix brings forward is for historian Dipesh Chakrabarty a symptom of deeper conceptual biases. In his seminal publication *The Climate Of History: Four Theses*,²¹ the historian claims that climate change is a point of ontological contradiction between two histories: the Earth's biological history and the one related to modern globalisation. Exactly as happens in Oceanix, the tangible effects of the current

20 For expanding the discourse see Dodds, della Dora, "Artificial Islands and Islophilia", 7; Sloterdijk, *Foams: Spheres III*, 291-474.

21 Chakrabarty, "The Climate of History", 197-222.

environmental mutations are questioning the known ideas and the relationship between cities, territories and ecology.

If any architectural project inevitably brings with it a subjectivation of the context (through its imaginary and its narratives), Chakrabarty's thesis is pushing to understand which narratives could appear possible and which are precluded.

In this sense, the contradictions within the project's aesthetics betray the architect's words, leading us to other questions: which subjects (anthropic and non-anthropocentric) of the existing land territories are being saved by Oceanix?

If on one side this question undermines the rhetorics behind projects such as Oceanix, on the other it turns these visions into a deeper image of the existing conditions, enlightening the open exhibition of urban *clichés* and subjectivised positions towards marine ecology.

However, from a false promise we could gain a new, privileged perspective.

Paradoxically, it is actually their lack of innovation and radicality, their flawed attempt to propose new alternative 'modes of settlements' that make projects like Oceanix relevant for the architectural discourse. They could be read as a demonstration per *absurdum*: what if Oceanix not only preserved, but drove to its extreme terms the existing earthling urbanism?

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S.04

SHIFTING
URBAN VISIONS

Cohabitation of Species and Design Cultures in Three Cemetery Areas in Berlin North-Neukölln

Urban Cemeteries; Berlin; Urban Nature; Nature Conservation; Urban
Densification.

Elena Ferrari

Università Iuav di Venezia, Venice, Italy
e.ferrari5@stud.iuav.it

Berlin's urban cemeteries are places of nature, inhabited by a wide variety of species. Contemporary socio-ecological qualities of Berlin burial areas offer hints to rethink the opposition between wilderness and anthropic space in urban environment. The recent history of three Berlin North-Neukölln cemeteries shows how the cohabitation of different species has challenged the design culture of three urban natural landscapes located in a district undergoing significant urban transformation. The paper shows how in three historically similar urban natural spaces ownership regimes have influenced different design and management approaches.



Berlin's urban cemeteries are striking urban landscapes where the coexistence of nature, cultural-historical heritage and novel urban practices provide a representation of the interdependencies that exist between the human and non-human world in the city. Old burial areas are green structures included in a defined and often walled perimeter and over the years have become *islands of biodiversity* within the urban fabric. Today there are 224 cemeteries in Berlin covering 1364 hectares of land. Cremation, preferred to burial in coffins, has resulted in the partial or total abandonment of many of these areas. In Berlin North-Neukölln, the functions of three cemeteries have lately been completely or partially transformed. Their contemporary use is closely intertwined with design approaches that have integrated non-human agency into space management and resulted in different outcomes. Under the pressure of urban transformations that have affected the neighbourhood since the year 2000, the multiple socio-ecological values of the three urban cemeteries have recently emerged, questioning their future development prospects, which envision their partial construction.

Cemeteries, nature and conservation

Most of the Berlin cemeteries were built during the 19th century on the city outskirts due to the high mortality rate and the increase in population during the industrial era. Progressive urban growth had embedded them in central districts. Since the 1970s, interest in the historical, artistic and scientific value of cemeteries has led to a reconsideration of these areas as places to be protected on account of their environmental and ecological qualities. In 1977 a Berlin law on the preservation of historical goods expressly recognised for the first time some inner-city graveyards as building and garden monuments, giving them a completely new value.¹ From the 1980s onwards, scientific efforts have focused on the taxonomic survey of the natural qualities

1 Krosigk, "Friedhöfe Als Gartendenkmal – Das Beispiel Berlin".

of burial sites. In the walled city of West Berlin, among other important studies conducted on urban biodiversity,² the vegetation of 50 cemeteries was examined by the botanist Anne Graf, who discovered a number of species of plants³ corresponding to half of the total flora of West Berlin at that time – found in just 1% of the whole city land.⁴ By analysing the Weißensee Jewish cemetery in Berlin, ecologist Ingo Kowarik and colleagues point out that burial grounds can be habitats for non-human species generally adversely affected by habitat loss and forest fragmentation in urban environments.⁵ In this land-use type the high diversity of environmental conditions, the coexistence of wild and ornamental plants and areas with different levels of maintenance provide a variety of ecological niches for plants, animals and insects that is rare to find elsewhere, “perhaps even outside the city altogether in different types of landscapes”.⁶

Nature conservation regimes in cemetery areas currently conflict with Berlin inner-city development strategies, which aim at urban densification, hence the consumption of vacant land and open spaces available for construction. Although burial sites could play an important role in the conservation of urban biodiversity and provide valuable ecosystem services, many of them are privately owned and often threatened by new development projects.

The vulnerability of the cemeteries’ ecological richness to urban change is addressed by Matthew Gandy when discussing the discovery of the rare hoverfly *Pocota personata* in London’s

2 Sukopp, *Stadtökologie: Das Beispiel Berlin.*; Lachmund, *Greening Berlin. The Co-Production of Science, Politics, and Urban Nature.*

3 690 species of wild ferns and flowering plants (128 included in the Red List). See Graf, *Flora und Vegetation der Friedhöfe in Berlin* (West).

4 Kowarik, “Urban cemeteries in Berlin and beyond: life in the grounds of the dead”.

5 Kowarik et al., “Biodiversity functions of urban cemeteries: Evidence from one of the largest Jewish cemeteries in Europe”; Buchholz et al., “Biological Richness of a Large Urban Cemetery in Berlin. Results of a Multi-Taxon Approach.”

6 See footnote 4.

Abney Park⁷. *Pocota personata* is associated with so-called *rot holes* in old ash trees. The survival and inclusion of these trees in an urban area on the land of the cemetery thus supported the life of this highly endangered species. Although taxonomic studies revealed the ecological importance of the place, the site does not enjoy a formal state of protection. As Gandy argues, the story of the discovery of a small invertebrate in a cemetery and its interdependence with the existing vegetation highlights a broader discourse concerning the difficulties of securing and implementing legal instruments to protect biodiversity in urban areas.

The case of the three urban cemeteries in Neukölln presented in this contribution offer an insight into how political and private interests can influence the design and management of urban natural contexts of ecological richness.

Three burial areas in Berlin North-Neukölln

The St. Jacobi and Jerusalem V cemeteries and the former St. Thomas cemetery⁸ were built next to each other in the late 1800s as part of a larger burial complex along the western side of Hermannstraße, on the outskirts of the old city centre. They were designed according to the trend of that time, based on foreign models, which provided a regular geometric distribution of the areas in order to maximise the burial space.⁹ Located next to the former Tempelhof Airport in today's northern part of Neukölln, the three sites hold a particularly environmentally important position in the neighbourhood. They cover an area of almost 20 hectares and serve as important wind corridors and

7 Gandy, "The fly that tried to save the world: Saprophytic geographies and other-than-human ecologies".

8 Full names: *Neuer St. Jacobi Friedhof*, *Jerusalems- und Neue Kirchengemeinde-Friedhof V*, *Neuer St. Thomas Friedhof*. In this text the author uses the name abbreviations: St. Jacobi, Jerusalem V, St. Thomas.

9 Such a cemetery typology, called *Alleequartierfriedhöfe*, have a reticular structure, with trees planted along avenues and hedges along secondary paths.

cold islands in a densely built-up urban area. North-Neukölln is historically characterised by the lack of public green spaces, low-income population and high percentage of immigrants. In the last fifteen years, the district has gained popularity among young expats, becoming a gentrification hotspot.¹⁰ Following the conversion of the former Tempelhof Airport into a park in 2010, the cost of land in the surrounding areas has risen over ten times.¹¹ This has led to a second phenomenon of gentrification¹² and an increasing real estate market interest. Throughout the northern part of Neukölln district, the urban area where the cemeteries are located – *Schillerpromenade* – is the one most marked by urban densification processes, where the largest number of housing units are being built.¹³ Under these circumstances, in the last five years the story of the three cemeteries has rapidly changed.

The land of St. Jacobi and Jerusalem V is owned by the *Evangelischer Friedhofsverband Berlin Stadtmitte* [Lutheran Berlin Cemetery Association]. Parts of the areas are under construction or will be built on in the future.¹⁴ Only the former St. Thomas cemetery is no longer owned by the church association and it was redeveloped into Anita Berber Park.

Former St. Thomas cemetery: Anita Berber Park

In 2015, after remaining unplanned for years, the St. Thomas land was purchased by the city of Berlin as a natural area to

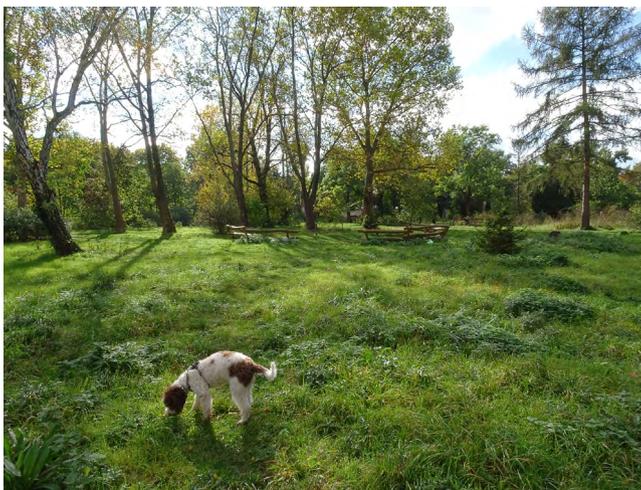
10 Bernt, Grell, and Holm, *The Berliner Reader: A Compendium on Urban Change and Activism*.

11 In 2010, 340 euro / m² - in 2020, 3600 euro / m² (data available at <https://fbinter.stadt-berlin.de/boris/>)

12 Ali, Haase, and Heiland, "Gentrification through Green Regeneration? Analyzing the Interaction between Inner-City Green Space Development and Neighborhood Change in the Context of Regrowth: The Case of Lene-Voigt-Park in Leipzig, Eastern Germany."

13 Data of housing units built in the last 10 years in Berlin North-Neukölln, provided by Bezirksamt Neukölln von Berlin Abt. Stadtentwicklung, Soziales und Bürgerdienste Stadtentwicklungsamt in May 2020.

14 STATTBÄU Stadtentwicklungsgesellschaft mbH, "IFEK Hermannstraße".



compensate for the high environmental impact of the Federal Highway 100 extension project. The cemetery had not been active since the 1970s and since the mid-2000s has been used as a space to walk dogs in the wild nature,¹⁵ as is the case for several *Brachflächen* [wastelands] in Berlin.¹⁶ In 2017, the area was redeveloped into Anita Berber public park (Figure 1) through participatory design process that involved different stakeholders, taking into account the previous features of the areas as well the claim of a dog walkers citizens' initiative to secure the space for their canine friends. The former cemetery now has a *hybrid* status, between an urban park and a dog zone – a semi-wild corridor, in which domesticated and wild spaces cohabit.¹⁷ The existing spontaneous vegetation, including bushes trees and meadows, has been integrated into the new project. Only small interventions, wooden benches and playgrounds have been introduced. Some historical elements are preserved as

Fig. 1

A dog walks off the leash in Anita Berber Park . In the background, wooden furniture, part of the new park design. Image by the author.

15 Documentation about the participatory design process is available at <http://schillerpromenade-quartier.de/>

16 Another contemporary example is the *Rütli School* building site in Neukölln.

17 Rosengren, "Wastelands of Difference? Urban Nature and More-Than-Human Difference in Berlin and Gothenburg."



monuments, like the main plane tree avenues, which have been developed into pedestrian walkways connecting Hermannstraße to Tempelhofer Feld. The rest of the area is a wild natural space, where people can cross meadows or follow small unpaved and unconventional paths and dogs can walk off the leash [Fig. 1].

Jerusalem V

The western part of the Jerusalem V cemetery, adjacent to Anita Berber Park, had been used as a garden from 2015 to 2018. The so-called *Die Gartnerei* was a cultivable space, part of a co-created project¹⁸ aimed at social inclusion and integration for people who had fled their countries. The garden activities terminated in 2018, when a representative of the Neukölln Nature Conservation Office claimed that a protected species of owl, the *long-eared owl* or *Asio otus*, had its nest in a tree close the garden's greenhouse [Fig.2].

Fig. 2

Garden established during the pandemic, in the western part of the Jerusalem V cemetery on the area of the former "Die Gartnerei". Image by the author.

18 The project was based on a collaboration between Schlesischen 27, *raumlaborberlin*, *Prinzessinnengarten* and *Evangelischen Friedhofsverband Berlin Stadtmitte*. Information about the project was provided through a conversation with a partner of *raumlaborberlin* in October 2020.

Following the closure of the garden, the space remained formally unused. When the COVID-19 pandemic began, a group of people mostly from Latin American countries started to cultivate the disused area again (Figure 2). On the same spot of the former *Die Gartnerei*, in a few months the new community grew to about 80 people with no central organisation body. “The only form of organisation that we have is a Telegram chat group,” said a girl gardener from Guatemala.¹⁹ She also explained that the land owner was aware of the newly created community garden and was keeping contacts with some of the members. However, it was never guaranteed that the Neukölln Nature Conservation Office would intervene again against the apparently inappropriate use of the area.

The central part of the Jerusalem V cemetery retains its original function; among the spontaneous vegetation some gravestones are still scattered. The eastern side of the area overlooking Hermannstraße has been sold and is under construction.

St. Jacobi

The St. Jacobi cemetery had remained semi-abandoned until 2018, when a group of people from the initiative *Prinzessinnengarten* – a temporary urban garden born in 2009 in Kreuzberg and one of the most debated pioneer urban regeneration projects in Berlin²⁰ – moved into the area. The land owner has lately begun to develop models of ecological use for graveyards in North-Neukölln and Kreuzberg, thanks to the Berlin Sustainable Development Programme (BENE) with the support of ERDF funding. As part of this collaboration, *Prinzessinnengarten Kollektiv*²¹ (Figure 3) has started to promote the cemetery as a hub for various practices related to ecology, gardening, nature

19 Interview with three gardeners at Jerusalem V, September 2020

20 Bartoli et al., *Licht Luft Scheiße Perspektiven auf Ökologie und Moderne*.

21 *Prinzessinnengarten Kollektiv* is only a group of the gardeners who were part of the first *Prinzessinnengarten* project at Moritzplatz in Kreuzberg.



protection and environmental education. Nowadays, community gardens, agricultural crops, spaces for insects and beekeeping, together with a number of formal and informal activities, coexist with burial areas characterised by ornamental and wild vegetation. Over two years, *Prinzessinnengarten Kollektiv* has managed to establish a large number of collaborations and stewardships within the neighbour. The land of St. Jacobi has become not only a new green recreation space for North-Neukölln dwellers but also a platform of experimentation for experts on ecological issues, universities, schools and citizen scientists.

A survey conducted in 2019 has shown that some protected plants, rarely found on other Berlin grounds, are present at St. Jacobi. These include *Puschkinia Scilloides*, *Scilla Lucilie* and *Scilla Mischtschenkoana*.²² A biotope study of the same site reveals the value of some existing trees with holes in their trunks, probably habitats for birds or mammals.²³ As a result of these findings, the *Prinzessinnengarten Kollektiv* group currently

Fig. 3

Prinzessinnengarten
Kollektiv community
garden at St. Jacobi
cemetery.
Image by the author.

22 Data provided by Bernd Machtzi, Office of the State Commissioner for Nature Conservation and Landscape Management, August 2019

23 Data provided by gruppe F landscape architects, June 2020

devotes one day a week to a grassroots mapping work of the area's natural qualities that could yield taxonomic results to be included in future biodiversity conservation plans [Fig. 3].

In February 2020, the same representative from the Neukölln Nature Conservation Office who opposed the garden project at Jerusalem V, threatened the *Prinzessinnengarten Kollektiv* association to end its activities. The accusation concerned the inadequate cultivation of some plants such as chard and kale and the carrying out of practices inappropriate for a burial context and its natural habitat. After a petition that collected more than 10400 signatures, an agreement was reached on the future collaboration of the garden project with the district's authorities.

Cohabitation and design cultures

The recent history of Berlin North-Neukölln cemeteries features how ecology embedded in the design process has shaped virtuous and controversial dynamics regarding conservation and management regimes of three urban natural spaces. The cohabitation of human and non-human species resulted in two very different design outcomes according to land propriety schemes, namely on Anita Berber Park public land and on Jerusalem V and St. Jacobi private lands.

At Anita Berber urban park, nature conservation management integrated in the project resulted in an example of virtuous and long-term public intervention, that can “illustrate a change in contemporary discourse about how to respond to wild nature within more formal types of green spaces”.²⁴ The design embraces the needs of different species, including dogs among the first park users. In this sense, the conventional hierarchy between space-user-design opens to a wider reinterpretation of the anthropic project of natural landscapes.

24 Kowarik, “Urban cemeteries in Berlin and beyond: life in the grounds of the dead”.

At Jerusalem V and St. Jacobi, the current space management must be framed within the temporary dimension of project's state: *in-between* the past condition of abandonment that fostered wilderness settlement and future plans for partial construction of the areas, which result in the negative impact on the surrounding ecosystem. Private interests on the lands make fragile both the tenure of nature conservation in the cemeteries and the community practices that take place within them. As often happens in Berlin, urban gardening and community activities are accepted because they provide a low-cost alternative in green maintenance and keep control on unused areas that will be redeveloped in the future. Such informal uses are relegated to a state of precariousness and do not acquire value in urban development policies, which is both a result and a strategy of neoliberal urban governance.²⁵ Although grassroots activities taking place in the Jerusalem V and St. Jacobi cemeteries cause minimal disturbance to the ecosystem and actively contribute to biodiversity conservation and taxonomic work surveying area qualities, they have been paradoxically threatened by nature conservation policies, while the areas occupied by gardens and community activities will probably, in the future, be partially occupied by schools and residential buildings.

Lastly, the story of the presumed existence of a *long-eared owl* in Jerusalem V cemetery and its protection led to political discussion over the site's future perspectives and questions about how to deal with the matter. The greenhouse built too close to the tree that apparently hosted the owl's nest was the official reason to stop the garden practices. It is, however, worth considering that the *Die Gartnerei* project had a strong vocation as a welcoming place for refugees, which was at odds with the right-wing political vision of the person in charge of the nature conservation office in Neukölln at that time. At Jerusalem V

25 Rosol, "Public Participation in Post-Fordist Urban Green Space Governance: The Case of Community Gardens in Berlin".

cemetery, the *long-eared owl* became a symbol of how a non-human species could influence decision-making criteria in urban planning and how bird ecology could shape (perhaps negatively) design interventions.²⁶

The conservation of inner-city natural resources seems to be the major challenge facing Berlin's urbanisation policies, aimed at creating a compact city with a higher urban density. The contemporary socio-ecological qualities of burial areas offer hints to rethink design cultures and nature management regimes that overcome the opposition between wilderness and anthropic space and foster human-nature relationships in urban environments.

26 Jasper, "Acoustic botany: listening to nature in a former airfield".

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S.04

SHIFTING
URBAN VISIONS

Towards a New Sublime? Designers Exploring the State of Indeterminacy and Facing the Unpredictable with Participatory Creativity and Through Common Research Actions

Designing Scenarios; Digital Imagination; Event Storytelling; Public Engagement; Transformation.

Elena Vai

Università di Bologna, Bologna, Italy
elena.vai@unibo.it

The contribution proposes the hypothesis that the visions of artists are, as has happened in the past, a communicative and persuasive tool to feed new imaginaries and that the design scenarios of designers can draw inspiration from the more radical visions expressed by artists. Limiting the scope of reference to the analysis of the exhibition events that have investigated the theme of the Anthropocene and its representations in recent years, through this paper we try to respond to a series of open questions: whether the ability to represent the relationship between man and territory depends on the technologies available; whether the ability to represent future scenarios can be separated from non-anthropogenic visualisations; how the designed visions of the future are able to transform into practice and whether they have the communicative power to activate unprecedented relationships between different targets and people. The attempt is to verify how the design tools and methodologies, specifically speculative design, advanced design and scenarios, can help to elevate empathy and public engagement on the great themes of humanity, helping to settle new cultural paradigms in the collective imagination.

and sort it into “visual collections”, similar to what happened in the past with the first medieval herbariums, in the sixteenth-century Wunderkammern or in the collections of plants, animals and fossils of Ulysses Aldrovandi, who aspired to reproduce on paper the “theater of the world” (Vai, 2017).

The contribution proposes the hypothesis that artists’ visions are still a communicative and persuasive tool to feed new imaginaries and that the anticipated scenarios of designers can be based on the most radical visions expressed by the artists as well as on the tools and methodologies of design (Trocchianesi, 2012), specifically speculative design (Dunne & Raby, 2013), advanced design (Celaschi *et al.*, 2011) and scenarios (Celaschi & Formia, 2014). Starting from the paradigm of the Anthropocene and its representations, through this paper we try to respond to a series of open questions:

- whether the ability to represent the relationship between man and territory/nature depends on the technologies available;
- whether the ability to represent future scenarios can be separated from non-anthropogenic visualisations;
- how planned visions of the future are capable of precipitating in practice;
- and whether they have the communicative power to activate unprecedented relationships between different targets and people.

The methodology adopted in the analysis of the theme has at its centre the disciplines of design in its plural concepts related to advanced design processes (Celi, 2015), to the anticipation and design of scenarios through representation tools. The examination of events that have taken place over two years – *Anthropocene* curated by Urs Stahel, Sophie Hackett and Andrea Kunard (2019); *Blind Sensorium / The paradox of the Anthropocene*, the personal exhibition by photographer Armin Linke organised on

the occasion of Matera 2019 European Capital of Culture; *Tools for After*, a project launched on the occasion of the *Anthropocene Design Week 2020* – was conducted through visits to the various exhibition venues, the analysis of articles that appeared in the press reviews and contributions in catalogues, as well as through interviews with the curators.

Anthropocene: new relationship between man and territory

The idea of entering a geological era called the “Anthropocene” (Crutzen & Stoermer, 2000) – in which humans are at the centre and the primary cause of permanent changes to the planet and irreversible damage on a global scale – has been brought to the attention of a generalist audience by artists, critics and filmmakers in recent years, narrated in several exhibitions and filmed in the documentary *Anthropocene – The Human Age*, directed by Nicholas de Pencier, Jennifer Baichwal and Edward Burtynsky (2018).

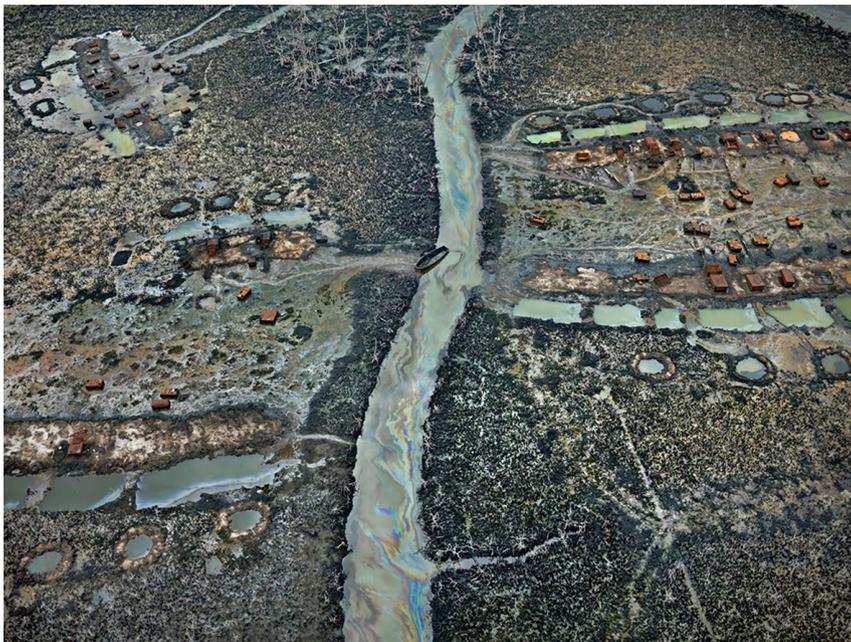
This spectacularisation through media and plural technologies is accompanied by an even greater awareness that the transformation of the Earth’s behaviour is not permanent and irreversible, but can be intimately linked to the transformation of the behaviour of individuals, thanks to the effects measured during the first lockdown to limit the spread of coronavirus in spring 2020, which have seen decreased levels of air and water pollution and the consequent “recolonisation” by animals of urban areas. The question arises how the global spread of awareness of the transformative power of behaviours in the hands of individuals could condition the continuous and timely mutation of the individual/territory relationship and its representations.

The COVID-19 crisis has led to the manifest emergence of this awareness, a trace already present in the work of designers in the last decade, that is, the opening of the field of applicability of the discipline of design and its tools and processes from

the object and its production and communication, to behaviours (Rawsthorn, 2018), through the analysis of user behaviours and the design of immaterial and dynamic components of product services. Within this now consolidated framework of design as a tool, process, methodology and cultural system, below are described experiences that allow to trace recurring and responsible design-driven processes, applied by artists, designers and architects in the representation of a new relationship between man and territory.

Indeterminacy and unpredictable relationships: the sunset of the notions of centrality and authorship

The Euclidean metric that allowed through the scale drawing of maps to represent the world and orient us has collapsed, and with it the concepts of continuity, homogeneity and isotropism on which it was based. Today, the interpretation of the “outside” of us passes through algorithms and the collection of big data, and the concept of mapping is no longer enough to catalogue mutation (Celaschi *et al.*, 2019), inhomogeneity and heterotopy. Since the birth of Internet and the idea of “the net”, the notion of centrality has been dissolved; as happened in the past in the guilds, today artists, designers, architects manage to anticipate new interpretative approaches and visions through their common research actions. First, the appropriation of the world through mythology, philosophy, drawing, narration, science and technologies gives way today to a kaleidoscope of collective and transient representations, which seem to confirm how much the network, the cultures of the project and the technologies of 2D, 3D and virtual reality representation have exponentially multiplied the ability to represent the mutant relationship between man and territory/nature. An example of this topic is the documentary *Anthropocene – The Human Age* (Pencier, Baichwal & Burtynsky, 2018), presented as part of the *Anthropocene* exhibition curated by Urs Stahel, Sophie Hackett and Andrea Kunard, organised by the Art Gallery of Ontario and the Canadian



Photography Institute of the National Gallery of Canada in partnership with the MAST Foundation of Bologna in 2019.

In the art project that investigates the indelible human footprint on Earth, Edward Burtynsky, Jennifer Baichwal and Nicholas de Pencier combine photography, cinema, including drone shooting, augmented reality and scientific research, to create a multimedia exploration of visual impact. To document the changes caused by human activity on the planet and witness the effects on natural processes with the aim of generating greater awareness in people, the three artists relied on the research of the international group of Anthropocene Working Group scientists that is gathering evidence of the transition from the current geological epoch, the Holocene (which started about 11,700 years ago), to the Anthropocene (Stahel, 2019) [Fig.1].

Fig. 1

Oil Bunkering
#1, Niger Delta,
Nigeria 2016,
Edward Burtynsky,
Anthropocene -
Fondazione MAST©
Edward Burtynsky,
courtesy of Admira
Photography, Milan
/ Nicholas Metivier
Gallery, Toronto.



Fig. 2

Blind Sensorium project | The paradox of the Anthropocene, personal exhibition by photographer Armin Linke. © image by the author

A similar attitude in combining scientific research and participatory creativity can be found in the *Blind Sensorium project | The paradox of the Anthropocene*, a personal exhibition by photographer Armin Linke in collaboration with Giulia Bruno and Giuseppe Ielasi, curated by Anselm Franke and Armin Linke, organised on the occasion of Matera 2019 European Capital of Culture. The goal was to establish the synchronicity of the different forces that are changing the appearance of the planet through a stratification of sources and contents, leveraging an extraordinary capacity for symbolic manipulation. Using photography and moving images, Armin Linke reveals the mechanisms and structures that govern the system in which we live, at the local and planetary scale [Fig. 2].

The filmmaker and photographer has for more than a decade been contributing to the contemporary debate on the Anthropocene, involving some of the most important intellectuals and scientists and generating new methodologies of artistic and scientific research (Mancuso, 2018).

The same author states that “photographic work cannot ignore the collaboration with scholars of different disciplinary fields and the appropriation of content can only pass through different forms of transmission” (Linke in Bruno, 2020). It is the syncretism of different disciplines and looks, of plural forms of transmission, those that have been collectively designed and collected in a sourcebook, not a catalogue tout court, but a spatial cartography of the exhibition, like a storyboard, a score, a stratigraphy of the exhibition in two-dimensional form, an on-board journal of the collective artistic and curatorial research process. The visitor engagement process was designed starting from the target of students and future supporters who were invited to a workshop and to contribute to the narration of the exhibition by building their own exhibition catalogue, made up of comments, questions, photographs and sketches. This process of co-design, documented in the catalogue, testifies to the measure of the generative power of these events in the diffusion of contemporary knowledge and themes of complex topicality, in order to influence a collective action.

Secondly, the ability to propose future scenarios passes through representations that use different audiovisual media in multichannel mode, and the reproduction of sounds and content. Mind maps, emotional maps, infographics and videos are tools increasingly used and democratised by social media. The latter, despite the issues of dependence brought to the attention of the general public by the docufilm *The Social Dilemma*, today allow to develop individually, and potentially collectively, a more critical and responsible attitude by difference. If replicated on a large scale, these behaviours can positively influence the creation of new sustainable behaviours and condition young designers to design non-anthropogenic visualisations, but inspired by the archetypes of Mother Nature [Fig 3].

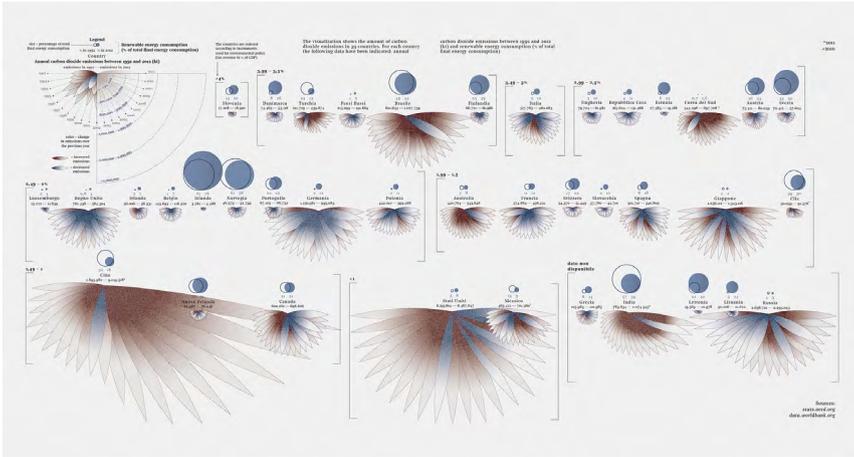
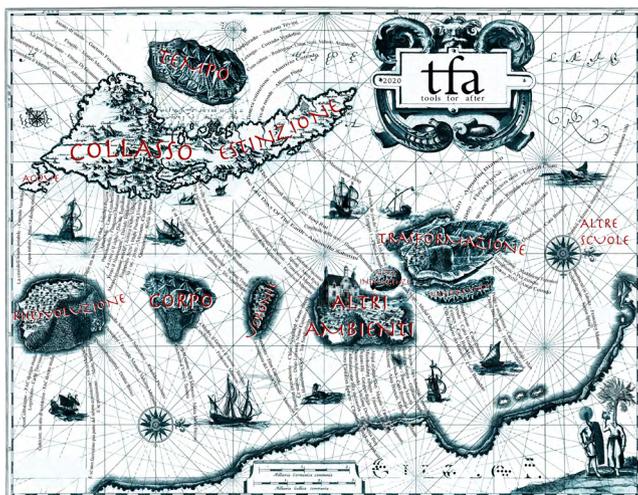


Fig. 3

Carbon Dioxide
Emissions

Data visualisation
for La Lettura –
Corriere della Sera.
Design by Federica
Fragapane.

Thirdly, in order to try to answer the question of how the planned visions of the future are capable of precipitating in practice, it may be useful to grasp at the same time how the contamination and hybridisation of cultural formats (temporary events, in presence, blended, online, live streaming) can contribute to expanding the reference audience of a given cultural paradigm and consequently to increase its awareness and desire for participation (Szacka, 2019). An example of this is the *Tools For After* (<https://www.toolsforafter.com/anthropocene/>) project, a call launched to designers, musicians, architects, designers, artists, storytellers, actors, directors and photographers, on the occasion of the *Anthropocene Design Week 2020* – held in live streaming from 21 to 26 April 2020. The video posted on the site encourages you to present scenarios to attempt a collaborative exploration of possibilities, solutions and utopias. The visual register used borrows the great archetypes of ecology (deforestation, climate change, melting ice and ocean pollution) partly translated into the 17 global goals for sustainable development, and represents them through the “pacified” vision of intact forests and crystal clear seas. Creating the oxymoron and inviting you to become part of the community of creators of new solutions, tools and visions, is the pressing rhythm of the words accompanying



the images: deep time, extinction, collapse, self-determination, cosmopoiesis [Fig. 4].

Tools For After, through crowdsourcing processes, stands as an online laboratory of ideas to collectively find answers to questions about the tools for the after, on what is useful to design in the days of the Anthropocene, a topic that in the last nine months has been cancelled in a process of mimesis by the phenomenon of the pandemic. The imagination has suddenly changed because the world has changed: the awareness of the curators of *Tools For After* was to rely on the imagination of scenarios that could collectively influence the potential transformation of the real. Today, with the pandemic, the future has changed and the *Tools For After* project can be one of the contributions to draw real time a map of the Anthropocene imagination not entrusted to individuals but to the collective, a collaborative exploration of possibilities, solutions and utopias. The idea of any centrality, authorship and certainty has been abandoned, constants are emerging in contemporary design: experience is the project, the process becomes the product, it is the collective that creates the value, it is the responsible relationships that we choose to establish with the world that become good practices, for example

Fig. 4

Tools For After
Scenario Map © TFA.

for administrations that ex post will have to translate them into urban, housing and environmental policies, social and cultural, in order to maintain consensus.

Conclusions

These reflections emerged from the comparison of the methodologies and the tools adopted by artists, designers, scientific researchers and architects in addressing the theme of the representation of the Anthropocene, from the material and immaterial supports to the actions implemented during exhibitions held in recent years. The attempt was to outline the recurring and responsible design-driven processes in the representation of a new relationship between man and territory aimed at answering a series of questions.

It has emerged how much the network, the cultures of the project and the technologies of 2D, 3D and virtual reality representation have exponentially multiplied the ability to represent the mutant relationship between man and territory; as well as the ability to proposition future scenarios through representations using plural media and multichannel distribution modes; how much the degree of user involvement on the theme of the Anthropocene, with the coronavirus epidemic, has accelerated awareness and influenced new sustainable behaviours; finally, how much the designed visions of the future are minimally capable of precipitating in practice. The progressive dematerialisation of the media to convey the visions of the future seems to correspond to an increase in public engagement on the great themes of humanity. Cultural events dematerialised in digital thus contribute to increasing collective awareness even in the general audience. However, in this nascent phase of renewed ecological thinking, an awareness of individuals seems to emerge that confronts that of the community (for example the Fridays For Future movement) still solely on a level of denunciation and not of planning, without actually putting in place actions with a transformative,

perhaps utopian value, of reconciliation between the present condition of the planet and humanity. If Superstudio's imaginative narratives of the second half of the 1960s were able to build a vision of the future through an irreverent cultural project (Formia, 2017), today's designers and artists have not yet managed to build a vision of the future. They seem to be relegated to an initial phase of collecting images of reality, disoriented by the tragedy in progress, still unable to express a project and imagine new visions. We are aware of how limited we are in our ability to impact significantly. Paradoxically, reality today, in an era of confinement on the occasion of the first major COVID-19 emergency, has denied in just forty days of quarantine (March-April 2020) the idea that the alteration of the balance between land and man had reached a point of irreversibility, instead offering new spaces of imagination and at the same time reconfiguring "downwards" the anthropocentric vision of man. Through these reflections, therefore, an attempt has been made to deepen how the ability to build "fictional" scenarios following the taxonomy of probable, plausible, possible and preferable futures, can be a methodology to be adopted especially during the crisis phases, to make citizens understand and bring citizens closer to the continuous transformations. (Formia & Vai, 2019). To conclude, let's imagine that design research will be increasingly collective, in the hands of experimenters, artists, dowsers, designers and researchers (e.i. C.R.I.C.C. – Research Center for the interaction with the Cultural and Creative Industries established at the University of Bologna). A community that, together with the citizen scientists as sensors of change, will be immersed in foreign and alienating environments, experimenting in the search for a necessary balance (Aime, 2019).

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Design for Social Innovation in Italian Inner Peripheries*

Inner Peripheries; Design For Social Innovation; Design For Territories; Relational Design; Sharing Practices.

Dario Scodeller

Università di Ferrara, Ferrara, Italy
dario.scodeller@unife.it

Eleonora Trivellin

Università di Ferrara, Ferrara, Italy
eleonora.trivellin@unife.it

Davide Turrini

Università di Ferrara, Ferrara, Italy
davide.turrini@unife.it

Marco Manfra

Università di Ferrara, Ferrara, Italy
marco.manfra@unife.it

Italy is scattered with small peripheral settlements, often characterised by difficult environmental morphologies, a lack of public services and a tendency toward depopulation. These places are mostly located in inland mountainous or island areas, far away from big cities. Yet despite a significant drop in population, they are still home to a quarter of the Italian population, distributed over more than two thirds of the entire country.

Today, a few of these towns are being reorganised and repopulated, re-establishing a sustainable community approach thanks

* Since the work was shared between the four authors, the editing of chapter 2 is attributable to D. Scodeller; chapter 3 to D. Turrini; chapter 4 to M. Manfra; chapter to 5 E. Trivellin, and chapters 1 & 6 to all the authors.

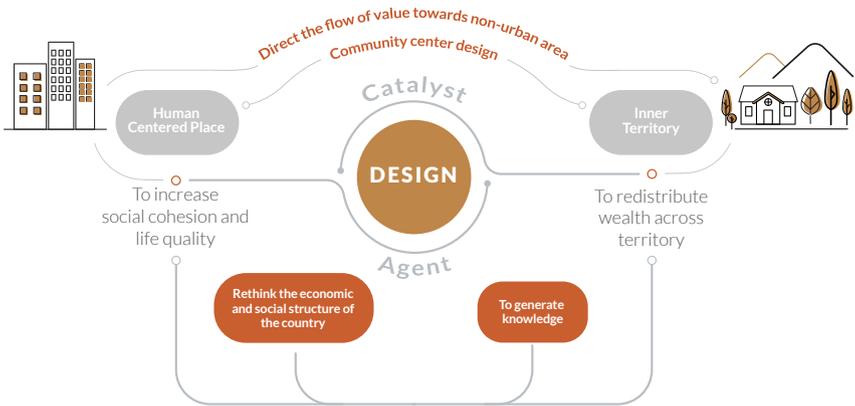
to innovative forms of organisation and entrepreneurship, capable of bringing together cultural, natural and social capital and production chains. In these contexts, unexpected models of innovation and design are born, to outline peculiarities of extreme interest for a contemporaneity that comes to include the dramatic instances of the current pandemic circumstances.

The aim of this paper is to draw attention to strategic scenarios, theoretical guidelines and examples of good design practices, already created or in progress, including those by the authors, related to the promotion of eco-literacy, community and on-demand health and social services, the promotion of local agri-food systems, the preservation of know-how and craftsmanship, highlighting the contribution that articulated and multiscale design can provide in transforming territorial fragility into social and economic opportunities.

The Italian territory is scattered with small, marginalised settlements often characterised by the lack of public services, by a physical morphology impeding connections and mobility, and suffering from depopulation. These places are mostly found in hilly and mountainous inland areas along the Apennine ridge, in the mountainous areas of the Alpine foothills and the Alps, or on islands, far from large urban centres with their infrastructural arteries, and yet, despite a significant demographic decrease, they still host a quarter of the Italian population, spread over more than two thirds of the country's territory.¹

In addition to being characterised by the distance from the major centres and the scarcity of civic services, the internal areas generally hold significant environmental and artistic cultural resources. However, these characteristics aren't sufficient to curb the abandonment of peripheral territories. With

1 Barca, Casavola and Lucatelli, "Strategia nazionale per le Aree interne: Definizione, obiettivi e strumenti di governance", 19. These areas occupy 60% of the surface of the national territory. They manifest phenomena such as a decline in population, an increase in demographic aging, and a weakening of the economic and productive fabric. The rise in unemployment causes the underutilisation of entire territorial areas such as - for example - unused agricultural land.



the establishment of the *Agenzia per la Coesione Territoriale* (Territorial Cohesion Agency), the *Strategia Nazionale delle Aree Interne* (National Strategy for Inner Areas), and, more recently with the *Piano Sud 2030* (2030 Plan for Southern Italy), the issue has begun to receive attention, materialising in the allocation of funds to integrate these territories, or in any case bring them closer to the dynamic centres.²

Although there is an urgent need to resolve the opposition between centres and peripheries, we must also remember that Italy has a complex structure that cannot be shortly described with the simple dualisms of large–small, far–near, city–countryside, or centre–periphery. In fact, there is a nuanced gradation that we do not find, with the same characteristics, in any other European nation. The historical reasons that have defined this system form the basis of peculiar strengths and criticalities which are worth exploring, not only from a social point of view, but also from an economic and productive one as well as from a design culture perspective [Fig.1].

Fig. 1

Main topics, formula and research approach

² Italian government, Presidenza del Consiglio dei Ministri, *Piano Sud 2030, sviluppo e coesione per l'Italia*.

Rethinking inner peripheries beyond the Anthropocene

To try to define what the role of design is for these contexts, in view of the new kinds of relationships between humanity and territory explored by the conference, it is useful to refer to the in-depth analyses articulated by the *Forum disuguaglianze diversità* (Forum on Inequality and Diversity).³ Among the fifteen points proposed to reduce inequalities, points 6, 8 and 10 are of particular interest since they address the development strategies for research and businesses aimed at places, as well as guidelines for the tools for environmental sustainability. The sixth in particular, “Collaboration between universities, centres of expertise and small and medium-sized enterprises to generate knowledge”, addresses the issue of the country’s economic structure and how it has a profound relationship with the peculiarities of the Italian environment.

The studies of these situations, starting with Becattini’s,⁴ highlight not only moderate company size and consequent agility, but also the importance of a network that connects companies with research and training centres. This collaboration has the aim of increasing knowledge and increasing social cohesion through improved job opportunities, raising the quality of goods and services produced, and promoting a clear vision of the concept of territory where the introduction of new technologies favours sustainable and responsible development and has the objective of redistributing wealth and generating social value while preserving the environment and improving the quality of life. In general, the need for a design for the territories and the environment that starts from these assumptions is thus highlighted:

- the environment is not only the setting for human life, but it is a system in which man is an integral part and which he should responsibly protect even if only for the sole purpose

3 Forum disuguaglianze diversità, *15 proposte per la giustizia sociale. Ispirate dal programma di Azione di Anthony Atkinson*, 81–104.

4 Becattini, *La coscienza dei luoghi, il territorio come soggetto corale*, 25–37.

of safeguarding himself; therefore, every planning act must be not only human-centred, but also environment-centred. This approach is clearly expressed by the British anthropologist Tim Ingold, according to whom “user-centred design casts practitioners as the mere consumers of objects designed *for* them, and not *by* them, in order to satisfy predetermined ‘needs’.”⁵ For Ingold, design cannot be anything other than a participatory path in which something not known in advance is sought.

- the design that favours the interests of high-density human settlements, motivating these choices with a distorted idea of democracy (which does not start by responding to people’s needs, but with economic and political power concentrated and strengthened in urban centres), has yielded solutions which have often only had negative effects on the so-called marginal areas.

Referring to established practices of participatory planning, which from De Carlo to Dalisi and Manzini have for decades characterised the Italian culture of design,⁶ as well as to the anticipatory actions of Danilo Dolci – who at the Palma di Montechiaro conference in 1960 proposed the definition of “depressed areas” for those territories where socio-economic conditions (poverty and education level) alienated communities from the rest of the country⁷ – design, in these contexts, could act, on the one hand by enlarging the recipient (from individual to the community and the environment), and on the other hand by developing an attitude of active listening aimed at a more extensive collaboration in planning actions, as the interpretation and synthesis of the stakeholders is more complex.

5 Ingold, *Making: Anthropology, Archaeology, Art and Architecture*, 70.

6 De Carlo, “L’architettura della partecipazione”, 87–142; Dalisi, *L’architettura della imprevedibilità: Glossario delle varianti*, 13–14; Manzini, *Design, When Everybody Designs: An Introduction to Design for Social Innovation*, 77–90.

7 Costantino and Zanca, *Una Sicilia “senza”: Atti del convegno di Palma di Montechiaro del 27–29 aprile 1960 sulle condizioni di vita e salute in zone arretrate della Sicilia occidentale*, 118–127.

The theme is also proposed as a nexus for theoretical reflection on the capacity for action, the limits of the tools of the different disciplines of the project as a whole (design in its various meanings, including urban planning and architecture) in defining directions of intervention. Faced with the danger that the “global nature system” is not governed as a common asset, but by organisations or administrations with competing interests, leaving room for the domination of “geopowers,”⁸ a useful theoretical reference appears to be the re-evaluation of thought and action by Patrick Geddes – member of the Town Planning Movement – who asserted the relationship between urban design and social justice in his work at the turn of the nineteenth and twentieth centuries. He argued for a close relationship between *integrated communities* and active management of the territory, proposing concepts such as “think global, act local”⁹ and the development of territorial analysis tools such as the “valley section” to highlight the interactions between anthropic systems and the morphology of the territory, and not least by underlining the role entrusted to education to support the understanding of places and biodiversity.

It thus appears increasingly urgent and important that design focuses its attention on those marginal areas where, as there are no major external interests, collective and widespread requests can constitute a source of attraction for actors and activities that usually focus and develop in more populous centres. The initiatives and projects that this paper aims to analyse and highlight, ranging from experiences of active citizenship, to new cooperative forms, to community health and social services, to the protection of know-how and craftsmanship, fit into this general framework, highlighting the contribution that well-structured and multi-scale design can provide in transforming territorial fragility into social and economic opportunity.

8 Bonneuil and Fressoz, *L'événement Anthropocène: La terre, l'histoire et nous*, 113–114.

9 Geddes, *Città in evoluzione*, 103–146.

New economic chains between participation and sharing practices

The collective action of people intending to re-inhabit marginal areas, helped by a widespread propensity for participatory design, is seen today as a laboratory of socio-economic practices for mutual survival in apparently inhospitable places. Faced with the current crises and unsustainable consumption patterns, humanity has found the territory and its communities to be indispensable places, once again full of meaning, and cooperation as a privileged way to experience and rethink them. Through the reassessment of ethics as a collective phenomenon of solidarity and social utility, and thanks to a new practice of relationship design aimed mainly at the design of groups of operators, activities and services, the inner areas can thus “recreate projects and circular economies where the concept of capital is also a social and cultural matter”¹⁰. In this regard, the new community cooperatives are emblematic: not satisfied with promoting a political and ideological stance but which propose a responsive common action that gives rise to diversified local activities, totally collaborative and never competitive.¹¹ These associative forms relate principles of trust, responsibility, subsidiarity, mutuality and shared investment through an initial group of co-planners and volunteers who are responsible for developing process and service planning for the whole territory. The objectives of these participatory visions are to produce value through economic initiatives capable of guaranteeing income regardless of favoured welfare programmes; promote territorial enhancement by recovering the identity of the place; and offer job opportunities especially for the younger generations.

10 Manfra and Turrini, “Towards a new resilience culture: Relational design and workshops of social innovation for fragile areas in central-southern Italy”, 337.

11 Teneggi, “Cooperazione”, 103–107.

Particularly fitting cases of collaborative practice in this context are those of the Emilian Apennine villages of Succiso and Cerreto Alpi, which constitute “cooperative towns” with the aim of restoring sites and activities for socialisation and services, but also developing agricultural and food chain co-production capable of reinvigorating opportunities and local working conditions, interrupting the exodus of young people towards the valley and even allowing them to return.¹² What emerges is therefore a “supportive ecosystem that brings out, catalyses and sets up the potentially available resources”¹³ allowing citizens to be proactive and creative in defining common initiatives.

In this scenario, the role of the designer is therefore not to design finished solutions but to mediate, facilitate and encourage the spread of the project, through the strengthening of ties, relationships and cooperative exchanges between individuals. Thanks to their proactiveness, the design culture can provide (and even more so in the future) optimal conditions for an idea to take shape and, ultimately, will be able to confer over time guidelines and tools for executive co-design practices, laid out in the sectors of product design, services and communication, which are all strategic for the success of the new supply chains.

In this sense, the designer is no longer concerned only with configuring decisive solutions in the first person but rather defines himself as a mediator, or *actant* capable of conceiving, experimenting and adapting multiple alternatives in expanded collaborations, both in the material and immaterial world¹⁴; in short, he becomes the architect of possible choices which, thanks to co-planning optics, place the real needs of the territory, the community or the individual at the centre of every design.

12 Teneggi, “Cooperative di comunità: fare economia nelle aree interne”, 297–306.

13 Manzini, *Politiche del quotidiano: progetti di vita che cambiano il mondo*, 95.

14 Fagnoni, “Da Ex a Next: Design e territorio, una relazione circolare basata sulle tracce”, 16–27.

Hence, design can abandon a purely authorial dimension and can become a common tool, practiced by people with different disciplinary backgrounds, or by individuals who have not followed specific education paths. After all, Victor Papanek, a pioneer of social and sustainable design, even in the 1970s described how creativity and the capacity for design planning are inherent in every person regardless of their training courses and experiences.¹⁵

The various stakeholders who have worked to support the agri-food chain of the Frattura white bean are an emblematic case study for the analysis conducted here, where the citizens of the village of Frattura di Scanno in the Marsicani Mountains have met on participatory paths in partnership with the Matrix96 Cooperative, the University of Bologna, the Archaeological, Fine Arts and Landscape Superintendence of Abruzzo, the Municipality of Scanno and, recently, the University of Ferrara.¹⁶ Within this project, motivated by a socio-anthropological documentation mission, the desire of the community to regain possession of its identities emerged—identities lost due to a long process of abandonment. This was achieved through co-planning practices conducted by the residents, anthropologists and by designers of different backgrounds who have worked on the regeneration of disused public spaces and on the recovery of the ancient line of indigenous legumes (now a Slow Food presidium), which has transformed into an economic opportunity that is expanding with the involvement of young inhabitants of

15 Papanek, *Design for the Real World: Human Ecology and Social Change*, 15.

16 The latest advancement of the Frattura project took place in 2019 with a workshop on participatory paths for the food supply chain, as part of the community festival “Non solo un fagiolo”, which was also attended by representatives of the Department of Architecture of the University of Ferrara.

Frattura and which involved process design and communication activities.¹⁷

Education, care and community services

Education sites have always contributed to forming relationships between territories and learning but peripheral locations often affect the equity of the school supply due to differences in the conditions of access, both in terms of space and infrastructure, and of economic and social opportunities; thus heightening existing problems of territorial fragility. Nevertheless, places on the edge continue to show themselves as places of change, where inequalities are more marked, but where the best innovations are born.

This can be seen from many examples of regeneration underway for some time in the field of non-traditional education. These concern development practices and sustainable teaching actions able to produce participatory dynamics and stimulate investment in territorial resources and in the often neglected intersection between knowledge and local development.¹⁸

This is the case, for example, of the primary school of Ronchi Valsugana (TN), where a project has been created based entirely on outdoor education and eco-literacy. This has increased the number of students, encouraged turnover among teachers and the settlement of new young families. The model of the school network of the Madonie in Sicily is also particularly impressive. There, through research-action practices, participatory paths were tested in the construction of a three-year plan for educational offerings in a territorial key: green community, innovation,

17 Del Fattore, Rizzo and Felici, "From people to landscapes: The Fluturnum Project: Archaeology and anthropology in the Tasso-Upper Sagittarius valley", 15; Rizzo, *Una comunità competente*, 1; Manfra and Turrini, "Towards a new resilience culture: Relational design and workshops of social innovation for fragile areas in central-southern Italy", 340–342.

18 Luisi and Tantillo, "Scuola e innovazione culturale nelle aree interne", 10–14.

energy, agri-food, health, environment, culture and tourism. This pedagogical chain will support the experimentation of innovative smart schools through laboratories for integrated digital teaching and territorial fab labs¹⁹ with particular reference to the theme of renewable energy.

It is not difficult to imagine how these education sites can attract further and ever more incisive design projects that can respond to the demand for improved quality of life: services and training offers, accessibility and new devices, mobility infrastructure, institutional networks of shared research and planning, active civic participation and associative social fabric, and the redefinition of spaces aimed at recovering a cooperative vision of educating.²⁰ And if it is true that, in addition to education, the care and health of those who live in peripheral areas are essential aspects for their recovery, then free and creative multidisciplinary design planning, increasingly understood as a strategic process, political, place-based, problem-solving or reframing of themselves, can certainly be placed in the planning bed of experiences related to care systems. Pharmacies that become multifunctional centres, community nurses and midwives who are part of the territorial assistance network, participatory first aid that activates community networks for emergencies (also guaranteeing specific services to residents such as, for example, shovelling snow or bringing medicines and firewood to the elderly), are just some of the ideas born from proactive and intersectional approaches capable of mobilising and enhancing the energies of the territory and the community.²¹

The municipality of Riccia (province of Campobasso), for example, combines housing with assistance to the infirm and recuperation of the historic centre, meant to improve its potential

19 Anderson, *Makers: The New Industrial Revolution*, 21–39.

20 Lo Presti, Luisi and Napoli, “Scuola, comunità, innovazione sociale”, 417–434.

21 Costa, “Cura”, 109–114.

with infrastructure interventions and remote assistance/tele-medicine. Indeed, a service centre is planned for the Casa della Salute in Riccia: “This is intended for social and psychological assistance, as well providing for continuous health monitoring; it aims to provide daily help and concrete support to the non-self-sufficient elderly and to those who live alone or in disadvantaged conditions. A sort of ongoing assistance – an experimental, local reinterpretation of what is called long-term care – ensuring innovative forms of health care with treatments oriented to support individuals to achieve greater functionality according to their health conditions”.²²

Training and job opportunities for peripheral productions

The necessity of training professionals for the needs of small and medium-sized Italian businesses has led to the development, since 2015, of some actions that have constituted a pragmatic, but not formalised, proposal of what in Europe is called dual training.

Between Florence and Siena, an integrated training plan has been structured around an “Interior and Design” technological district which starts from the analysis of the territories’ needs and then gives guidance capable of encompassing regional policies up to those on a European scale. The project is set up to cover a network of non-homogeneous subjects who are able to provide answers regarding competitive applications for training plans. The university centres of Florence, Siena and Pisa, some research centres, secondary schools with technical and artistic training orientation, companies that belong to the regional technological districts (in particular those in the interior design, nautical and fashion sectors) and training agencies are the fundamental sites (nodes) for development of the activities. The entire design system mainly refers to two documents: one from the

22 Golino and Colavita, “La sanità di prossimità: un progetto di welfare per le Aree Interne”; 9.

Regional Economic Planning Institute of Tuscany (IRPET),²³ the other from the Experimental Furniture Centre of Poggibonsi.²⁴

The network described establishes a non-hierarchical relationship between urban centres and peripheral areas and attributes to each node the role of protagonist with specific professional skills strongly linked to the territories to which they belong. While the research centres are traditionally located in the capitals, the secondary schools, productive sectors and training agencies are located in territories that need to strengthen their skills that have been lost due to their marginalisation.

The objectives have been developed on several levels: to raise the qualification levels of the personnel of manufacturing companies to facilitate the push towards innovation by providing an alternative response to incremental innovation; to set up training strongly oriented towards sustainability so that its principles become a company legacy; to optimise training times by organising training so as to match demand with supply; and finally to create a distribution of opportunities that allow the territory and urban centres to be conceived as a single and complex entity. The immediate aims were to find professional solutions for students who have just graduated, reintegrate those into the company who have left the working world, and raise the applied knowledge of university students who in many cases have combined academic with professional paths.²⁵

Among the projects that have received funding from the European Social Fund through the Tuscany region, two of them have among their objectives the updating of traditional craftsmanship skills in the digital age. We refer in particular to a training course for managers and a training course for

23 Faraoni, *Anticipare i fabbisogni: i risultati delle indagini sulle imprese dinamiche toscane*, 5.

24 CSM – Centro Sperimentale del Mobile e dell'arredamento Soc. cons. a r.l., Poggibonsi, Siena, internal paper (2017).

25 Trivellin, "La formazione professionale: Uno strumento di crescita per il territorio", 234.

technicians.²⁶ With different degrees of in-depth study, the two training courses have set themselves the objective of developing mechanisms capable of facilitating creative processes, where digital technologies can facilitate responsible production, both from an environmental and social point of view.

In some respects, the *enabling technologies*,²⁷ and all the discoveries of the research project Paradigms 4.0, have meant that innovative processes are no longer proportional to the size of the companies: the most innovative production companies today belong increasingly to peripheral territories and they can be small in size.²⁸ What has been written so far confirms that industrial design, in its methods and dimensions, faces completely different problems compared with its beginnings, while remaining consistent with the goal of improving the living conditions of people and the environment.

Perhaps design should function with the bricoleur's approach, seeking to find value in what is available.²⁹ The words of Claude Levi-Strauss, transposed here from a different context, can express this very effectively: the rational concatenation of elements of the network can be seen only in hindsight; the bricoleur takes things apart in order to connect them in new ways to make them work differently. Equally effective as an analogy is the kaleidoscope: "an instrument that contains scraps and fragments through which structural combinations are created" where "certain marks acquire the quality of meaningful things"³⁰.

26 The courses we refer to are Digi.craft IFTS, funded in 2019, and *Craft and Maker* for the strategic training of technical professions, funded in 2019.

27 Celaschi, Montanari and Padula, "Approcci all'innovazione trainata dal design", 75.

28 It is emblematic in this regard that the Nuova CEV glass factory in Empoli was awarded as an innovative company, among 128 competitors, in the Tuscan regional award "Primavera d'Impresa." Nuova CEV is a company from the lower valley of the river Arno belonging to a sector in severe crisis with just 33 operators counting owners and employees.

29 Flaviano Celaschi, "Il design come mediatore tra saperi: L'integrazione delle conoscenze nella formazione del designer contemporaneo", 19–31.

30 Levi-Strauss, *Il pensiero selvaggio*, 48–50.

Overcoming the model of industrial production and intensive exploitation of the environment in which design was born and developed, which from many points of view is considered no longer applicable, has allowed us to recover some elements that are characteristic of craftsmanship; all this is also due to technologies that allow us to re-establish a relationship with the local community and a means of production without having to give up an extraterritorial dimension.

Conclusions

As seen here, the culture of planning and in particular the discipline of design can contribute to the protection and social and economic reactivation of fragile territories in many ways: from the definition of strategies and guidelines, to the configuration or reconfiguration of work groups, processes and activities, and the creation of services and products. These intervention scenarios are certainly part of the design for the territories, defined with a particular approach that fine-tunes local development strategies and of which the territory is co-author,³¹ but evolve at the same time towards new frontiers still partly to be delineated, embracing different possible scales of intervention and interest, from the promotion of traditional local supply chains up to the political dimension of national or supranational planning.

What constantly characterises the local enhancement processes, independently of the observation scale, is the need to consider the territory as a system of interrelated and interdependent resources for which design can assume a strategic role³²; the approaches and case studies illustrated in this contribution then highlight how design can assume this function even more in the processes of enhancing or relaunching an area

31 Franzato, "Design nel progetto territoriale", 1-6.

32 Villari, *Design, comunità, territori. Un approccio community-centred per progettare relazioni*, 7-9; Scodeller, "Design per il territorio", 25-30; Peruccio, Menzardi and Vrenna, "Designing for Territorial Revitalization. A diffused art exhibition to foster Northwest Italian Inner Areas", 190-197.

considered marginalised, aiming at participatory and collaborative actions (a bottom-up approach) that put a new value on the so-called territorial heritage³³ of a cultural, social, productive and environmental nature.

Within the limits imposed by some local administrations that are often anchored to a concept of closed local communitarianism, effectively opposing the initiatives of innovation that have been highlighted here, the designer must increasingly reflect on the ability to connect people, places, institutions and companies, and, in designing the tools to make different actors dialogue, on the possibility of giving communities the ability to become, themselves, autonomous carriers of innovation. Thanks to his transversal skills, the designer can create relationships with associations, communities and individual citizens, playing the role of community-manager, to help direct inner peripheries towards responsible choices.

Therefore, new planning areas are opening up which are completely or partially unexplored, which represent crucial challenges for the designers of the future, offering interesting opportunities for research and experimentation. In conclusion, in these contexts, the designer who is and will be increasingly part of collective planning among peers, has a greater responsibility for training and experience, and will have to direct communities towards responsible choices using the tools of empathy, participation and storytelling.³⁴

33 Magnaghi, *Il progetto locale. Verso la coscienza del luogo*, 300.

34 Perullo, *Estetica ecologica: Percepire saggio, vivere corrispondente*, 178.

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