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TERRARIUM. EARTH DESIGN: ECOLOGY, ARCHITECTURE AND LANDSCAPE

A CURA DI SILVIA MUNDULA, KEVIN SANTUS, SARA ANNA SAPONE

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TERRARIUM. EARTH DESIGN: ECOLOGY, ARCHITECTURE AND LANDSCAPE
edited by
Silvia Mundula, Kevin Santus, Sara Anna Sapone

Terrarium collects research and reflections on the relationship between space, soil, vegetation and the biotic community, linked through the metaphor of the terrarium. The book is curated by a research group from the Ph.D. program "Architectural Urban Interior Design", coordinated by Alessandro Rocca (Department of Architecture and Urban Studies at Politecnico di Milano), involved in the PRIN Sylva by the IUAV research unit.

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TERRARIUM. EARTH DESIGN: ECOLOGY, ARCHITECTURE AND LANDSCAPE

BIOMES

WILDNESS

METAMORPHOSIS

TERRARIUM AS A DESIGN METAPHOR

SILVIA MUNDULA
KEVIN SANTUS
SARA ANNA SAPONE

> A climate within a climate, a little world within a world. (Ward 1854, p. 11)

The word *Terrarium* has many different meanings and interpretations. Its roots lie in the Latin word *Terra* (earth or ground), and earth constitutes its base layer. Its primary function is to create a self-sufficient ecosystem which sustains plants and other living beings. Indeed, a *terrarium* is designed to create and maintain a specific ecological state, which is self-contained and self-perpetuating. The history of *Terraria* begins with the story of the *Wardian case*, created in the 19th century by Dr Nathaniel Bagshaw Ward to nurture plants used for medical purposes, which were struggling to survive during the Industrial Revolution. The *Wardian case* was then used to transport vegetation, in particular the exotic plants which were discovered during geographical exploration. It worked as a

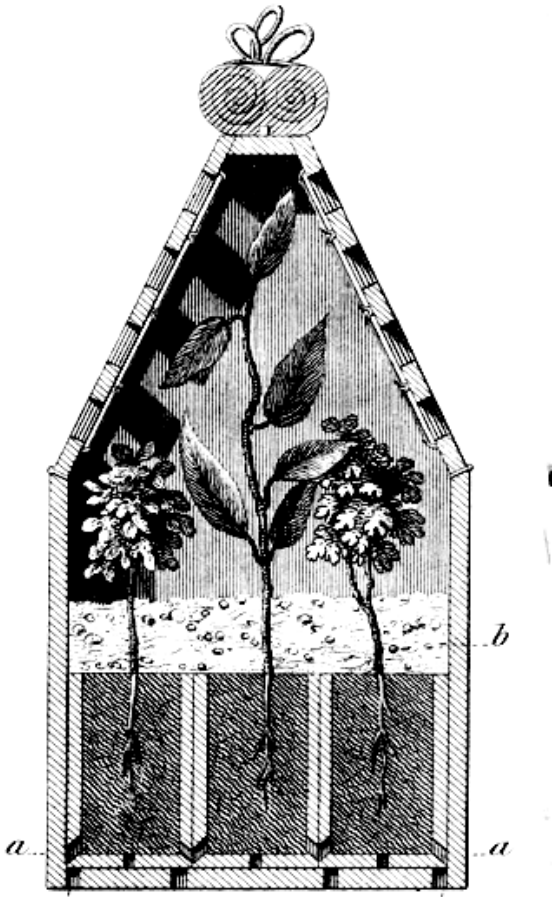
> vehicle for environmental scrutiny in Victorian culture, the Wardian case married seductive visions of fertile growth with frank discussions of the human activities that put all vegetation at risk (Wells 2018, p. 168).

The concept of the *terrarium* as a structure which encloses an ecosystem, poses architectural challenges. In this regard, *terraria*, which are tools to sustain, transport and display rare species from faraway lands or different climates, can be interpreted as artifacts for observation and as spaces to nurture living forms which require particular growing conditions, as well as places for leisure.

As described in *On Wardian Cases for Plants and Their Applications*, the *terrarium* aims to

> obtain, in short, in the isolation afforded by the glass covering, a climate within a climate, a little world within a world, in which, while their wants

Box to protect plants during sea voyages.Drawing of the inside.
Image published in the paper by John Lindley, "Instructions for Packing Living Plants in Foreign Countries, Especially within the Tropics; and Directions for Their Treatment during the Voyage to Europe," Transactions of the Horticultural Society of London 5 (1824). Work under no copyright protection according to the Biodiversity Heritage Library.



> are satisfied, the plants enjoy an immunity from external disturbing influences (Ward 1854, p. 11).

Terraria are protected space, as well as a miniature version of a specific environment or an architectural structure. They are both desirable ecosystems and structures in which nature is artificially grown and displayed. Therefore, the *terrarium* represents both the container and its content, as well as the relationship between these two elements. This allows us to link the *terrarium* to the idea of *future nature* (Gissen 2019), where the latter is interpreted as both a process and a space for interaction. The concept of *terrarium* as an object is replaced by the concept of *terrarium* as a metaphor of man's impact on natural ecologies. These hybrid ecologies display new ways to coexist for humans and other living beings and new forms of nature. By reflecting on the meaning of the *terrarium,* the contributions to this book show that man's understanding of nature is continually in flux, in both theory and practice. Indeed, this concept of *terrarium* leads to discussion– often both contradictory and oppositional – about the critical relationship between architecture and nature.

Architecture has often drawn inspiration from nature, as described by architectural critics such as Adrian Forty (2000), and has also used nature as a model to reinforce the authority of design choices (Whiston Spirn 1997). Nature's physical and atmospheric presence has also provided inspiration for the design and amplification of sensory experiences (Rahm 2023). However, in the final decades of the twentieth century, science has often been used to emphasise the supremacy of nature, paradoxically questioning its own role. Ian McHargh's *Design with Nature* (1969) undoubtedly changed the relationship between design and the natural environment, by introducing the subject of ecology.

Ecology not only took its place in the design world but also became a driving element for many designers, replacing, in a way, the role of nature (Whiston Spirn 1997). Furthermore, the increasing relevance of urban nature for ecology highlighted the potential interplay between spontaneous vegetation and spatial design (Kowarik 1991). This led to a different interpretation of the boundaries between the built and the unbuilt and to an interest in the inner dynamics of this in-between space. Architecture culture was also influenced by the identification of the environmental crisis – which was first mentioned in the seminal report *The Limit to Growth* (1972) – as well as by the recent recognition of climate breakdown. It showed how man has modified the precarious relationship between territory, climate and technology, by reshaping the geological strata of Earth and by playing with topographies, as discussed in *Robotic Landscape* (Girot 2022) and in *The Earth is an Architecture* (Trévelo, Viger-Kohler 2021). Also, the recent exhibition at the MoMA in New York, *Emerging Ecologies. Architecture and the Rise of Environmentalism,* explores the relationship between architecture and the environment with a focus on the rise of an ecological consciousness (Carson, 2023). Therefore, the *terrarium* can also be interpreted as an element of mediation between the space for life, the atmosphere, and Earth (Ingold 2021). It is evident that man's understanding of nature has become multifaceted and open to question, and so the *terrarium* itself appears to be a system which unveils not only desirable and endangered environments but also "the decay and the uncanny" (Morton 2007). The uncertainty underlying the cultural debate, which is a common thread running through every chapter in this book, results in the various critical interpretations of the *Terrarium*.

ISLAND, MACHINES, BIOMES, WILDNESS, METAMORPHOSES

As part of the Prin Sylva series, *Terrarium* gathers diverse contributions which investigate the relationship between architecture and nature from multiple perspectives; through texts, drawings and photos. Some authors describe the *terrarium* in visual essays, documenting both designed and abandoned landscapes through photos and drawings. Other authors use the metaphor of the *terrarium* as a means to explore theories and projects, which range from the scale of the landscape to the scale of the building.

Terrarium has five sections which look at the metaphor of the *terrarium* from different perspectives: *Islands*, *Machines*, *Biomes*, *Wildness* and *Metamorphoses*.

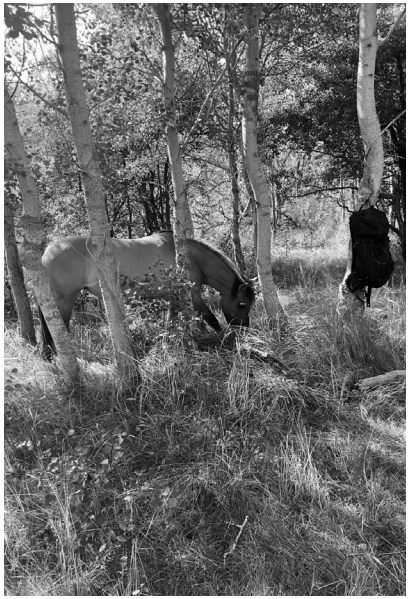
Islands focuses on the notion of *terrarium* as an enclosed ecosystem, exploring portions of landscape and architectural constructions as isolated microcosms. The island is a metaphor for an enclosed space which is separated from the outside. The chapters in this section concentrate on the contrast between what stays inside and what is left out, both in domestic spaces and in the urban realm.

Machines looks at the *terrarium* as a system in which single elements reveal the whole. Nature is shaped by architecture and architecture is shaped by natural dynamics. The chapters in this section interpret the *terrarium* by looking at the tectonic as well as the typological resonance of land or vegetation.

Biomes highlights the relationship between entities within a certain environment, whether that is a small plot or the whole planet and overcomes the binary thinking that separates human beings from other forms of life. These biomes reveal the coexistence of different living and non-living beings, exploring their interaction and evolution. They are investigated not only from a human point of view but also from various

Islands, Machines, Biomes, Wildness, Metamorphoses,
Photos by Sara Anna Sapone, Various locations
(Berlin, Amsterdam, The Hague, Almere, Venice), 2022-2023.



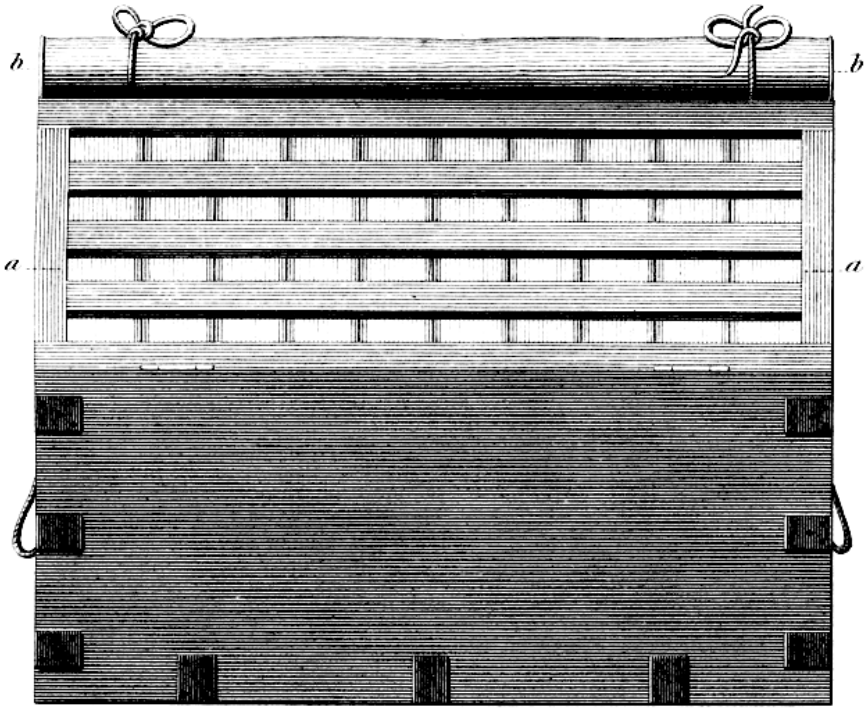


other perspectives which focus on the relevance of the biotic community.

Wildness looks at how unpredictable natural dynamics can be, in spaces which seem to be enclosed by defined boundaries, either physical or conceptual. These natural dynamics create places which are unexpected *terraria*. Vegetation develops outside the rules, creating precious reserves for biodiversity and attractive spaces between the built and the unbuilt.

Metamorphoses defines the *terrarium* as a space where profound changes occur. In this sense, the contributions to the book are reflections on climate change, territorial alterations and reclamation processes, describing architecture as a space in continual transformation, growth and decay. Therefore, each contribution with its own concept of *terrarium* is a critical reflection on the relationships between ecology, architecture and landscape.

Box to protect plants during sea voyages. Drawing from the outside. Image published in the paper by John Lindley, "Instructions for Packing Living Plants in Foreign Countries, Especially within the Tropics; and Directions for Their Treatment during the Voyage to Europe," Transactions of the Horticultural Society of London 5 (1824). Work under no copyright protection according to the Biodiversity Heritage Library.



ISLANDS

AN OCULUS INTO THE GROUND. MOTHERHOUSE, AND PRESENCING HOMESICKNESS BY DRAWING

JO VAN DEN BERGHE

The notion of Terrarium, for the man formerly known as an architect (the author), is to be understood as the material thickness of the substance of the Earth, made visible by the architect who, first and foremost, is craving to draw vertical topographical sections, his oculus into the ground. These drawing sessions relate to Plato's concept of Chora. Alberto Pérez-Gòmez, commenting on Plato's Timaeus, describes Chora as "the receptacle and, as it were, the nurse of all becoming and change", and "a mass of neutral plastic material upon which differing impressions are stamped", subsequently relating Chora, "this prima materia", to an architecture of presence (Pérez-Gòmez 2006, p. 12). Drawing Chora is drawing the topographical section, the fertile ground in which

> the horizon […] is trapped somewhere between the cave and the tower […]. The architect becomes the surgeon who cuts open the earth and is unafraid to tear the sail that has moved the horizon and defended the unlimited. He can establish places under the ground, and these become the new way to travel into the past, as the horizon faces a new journey (Fjeld 2009, p. 108).

An excavated Hortus Conclusus that lodges the observation of life and death, the most poignant observation of mankind, nestles centrally in the section which anatomizes the sightlines that depart from the eye of the man formerly known as an architect who dwells in a brick cabin. From there he timelessly gazes into two sarcophagi: the first one for his beloved wife—his embalmed horizon, the second one, visible via a focused mirror that points the gaze downwards, for the departed mother, the mummified place of Chora. These three architectural bodies, materialized in glazed brick, coal tar, leaf gold and brass profiles, adopt the dimensions of the human bodies they shelter. Thin roof overhangs as wings, with refined architectural details, flap in brass reflections of benign moonlight. Imbedded in the excavated Hortus Conclusus that is sinking into the topography, it all comes closer to the heart of the Earth. This family of architectural bodies springs from the Motherhouse, meant to be turnable into a camera obscura, the cabalistic house of houses an architect is homesick for—a homesickness this drawing architect permits himself to dwell in. While drawing, the Motherhouse sets up to fuse with the Hortus Conclusus, an earthen island—the temporal refuge for the unfathomable—in an undulating sea of earth. Life is a narrow passage between an endless sea and an endless sea. Drawing so permits the poet-as-draftsman to oracle poetic discourse, rather than discursive logos. Yet, dense poetic language emerges from utterly acute drawing sessions through immediate verbalization. This may lift a most personal musing, that wells up from drawing, to an intersubjective level of understanding. Transcendental intersubjectivity (Hüsserl 1991).

An Oculus into the Ground

Drawing by Jo Van Den Berghe, on thin light sensitive paper, scale 1/10, 2398 x 869mm. Pencil, Muji marker, white Tipp-ex, Tesa tape.

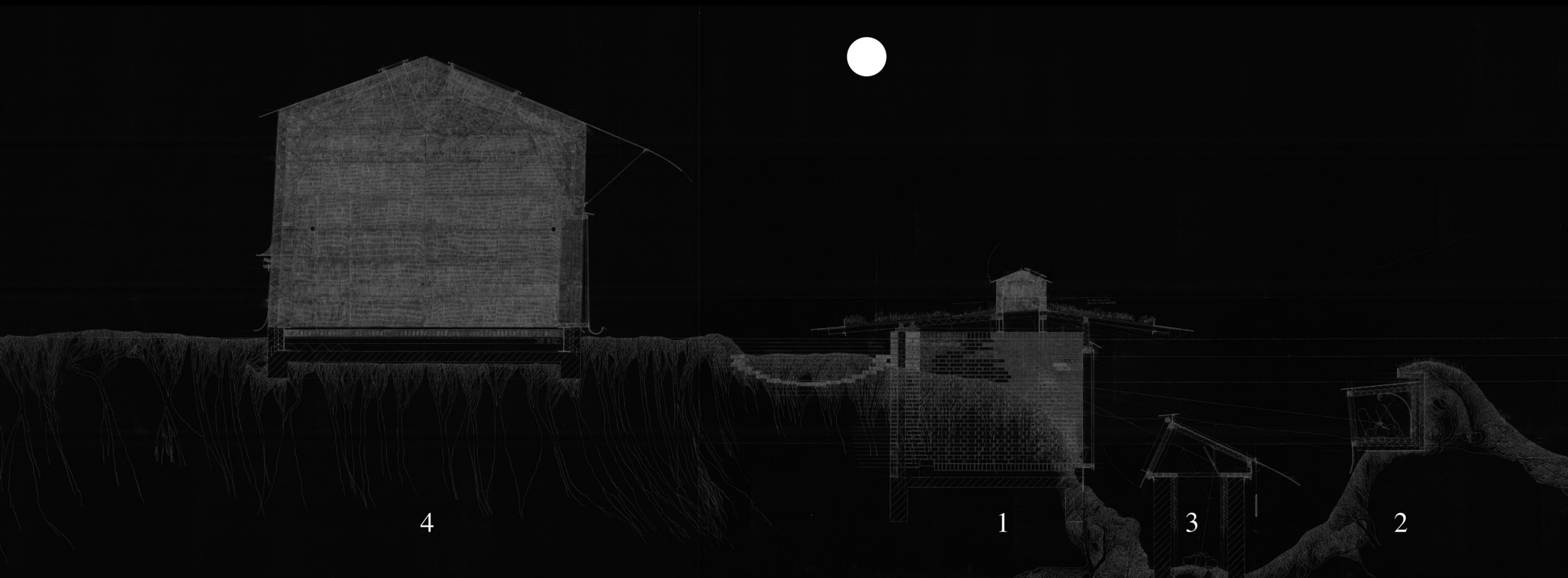
The drawing shows four architectural characters, imbedded in their topography under the pale light of the Moon.

1. The Brick Cabin: sunken into the topography, clay excavation, onsite open air brick production, yellow glazed brick, cross bond, flowered roof, little black house (epdm) on top as access (ladder), brass edging details, rainwater pond, one window (gaze), corporeal scale

2. The First Sarcophagus: embalmment, nude model lying, horizontal architectural stretch, walnut wood, double beveled glass display, brass edging details, corporeal scale, Life

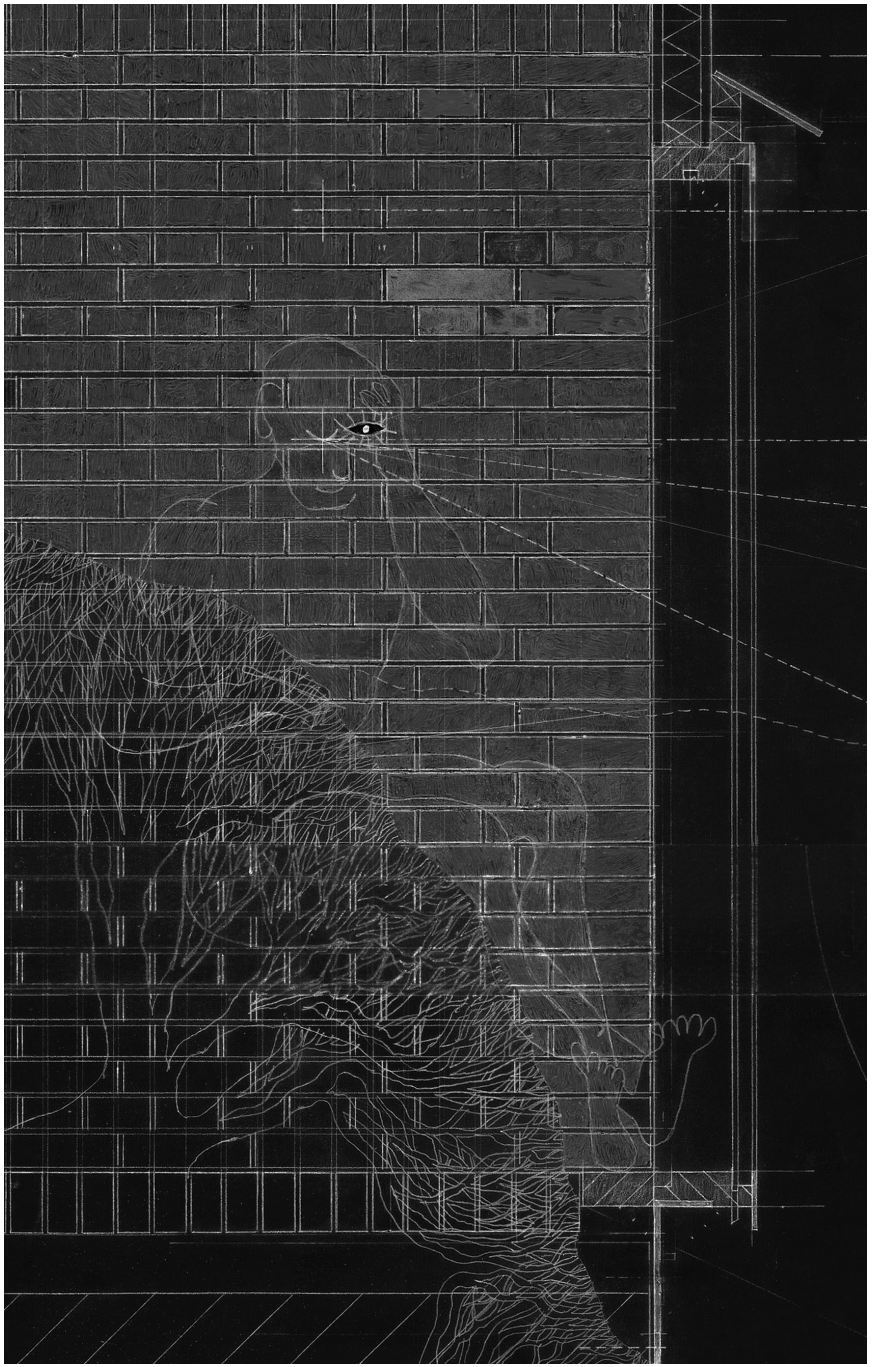
3. The Second Sarcophagus: mummification, dark vertical abyss, inclined mirror, access window with counterweight, silk buttoned upholstry (vieux rose), brass edging details, corporeal scale, Death

4. The Motherhouse: section-elevation, mat black epdm walls and roof, camera obscura, dark thin edging details, corporeal scale.

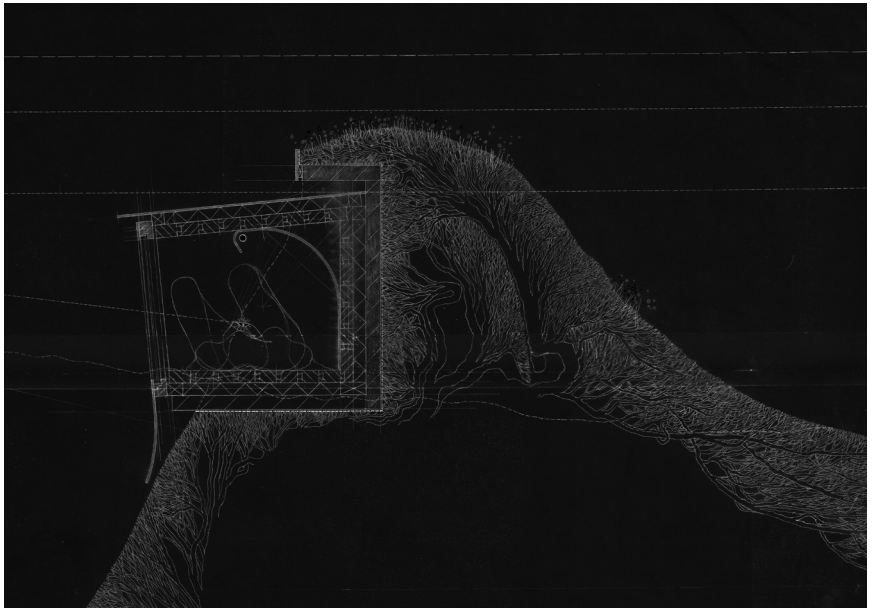


The Brick Cabin
to cantilever over the Hortus Conclusus, an oculus into the ground.

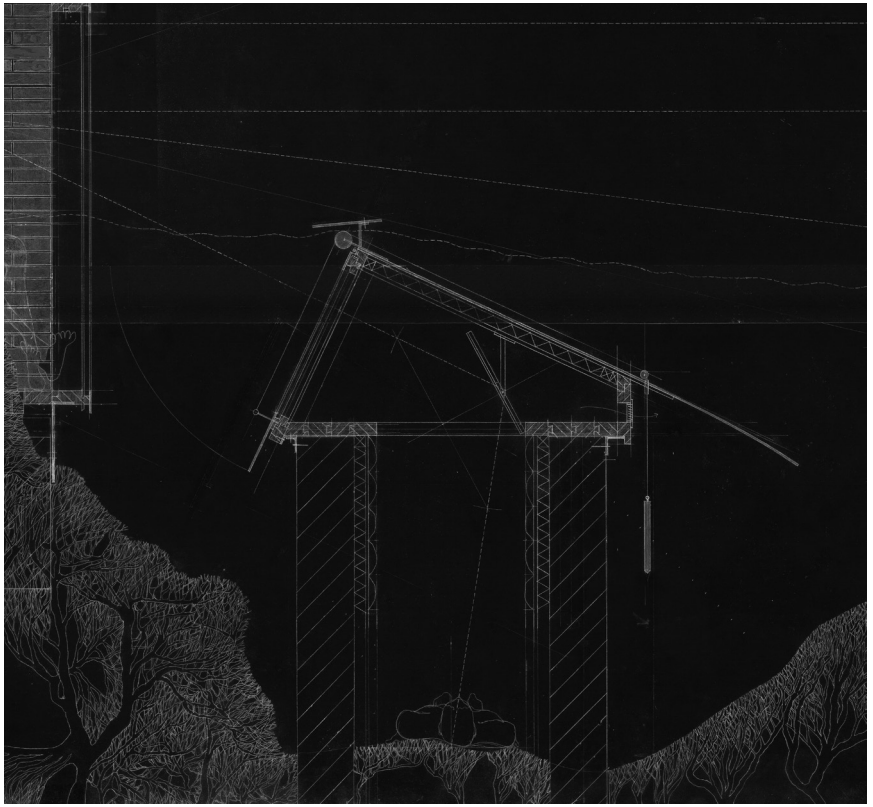
The Brick Cabin, gaze
the Man formerly known as an Architect,
gazing through the window of his brick cabin.



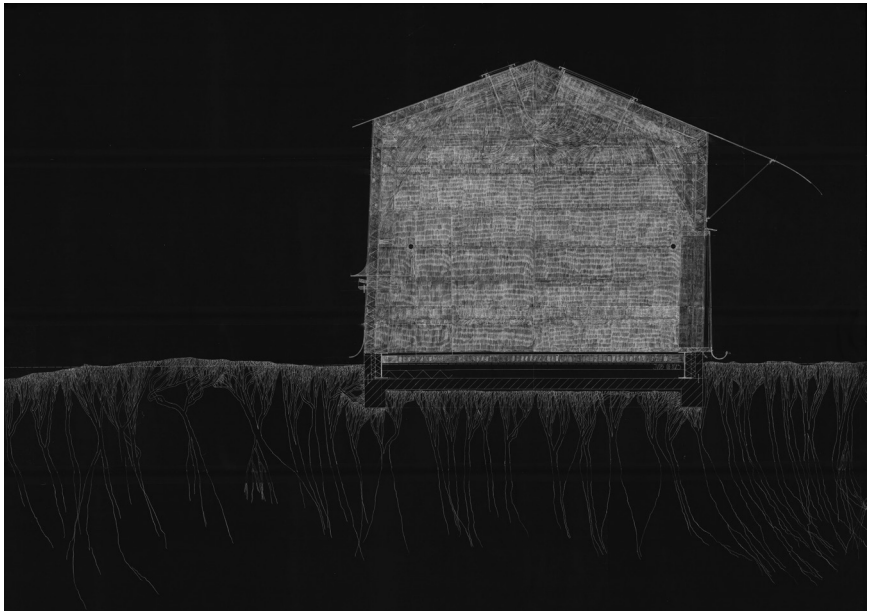
The First Sarcophagus
the embalmed horizon.



The Second Sarcophagus
the mummified place of Chora.

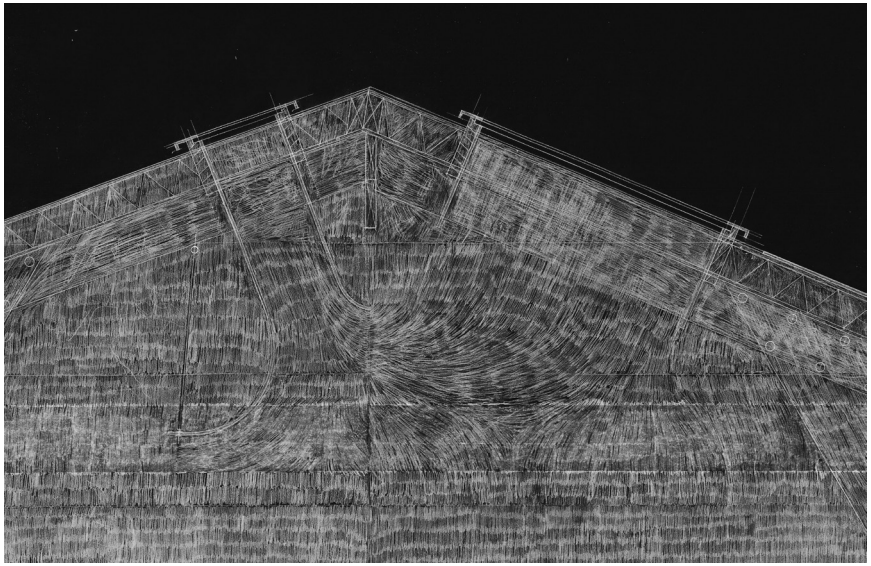


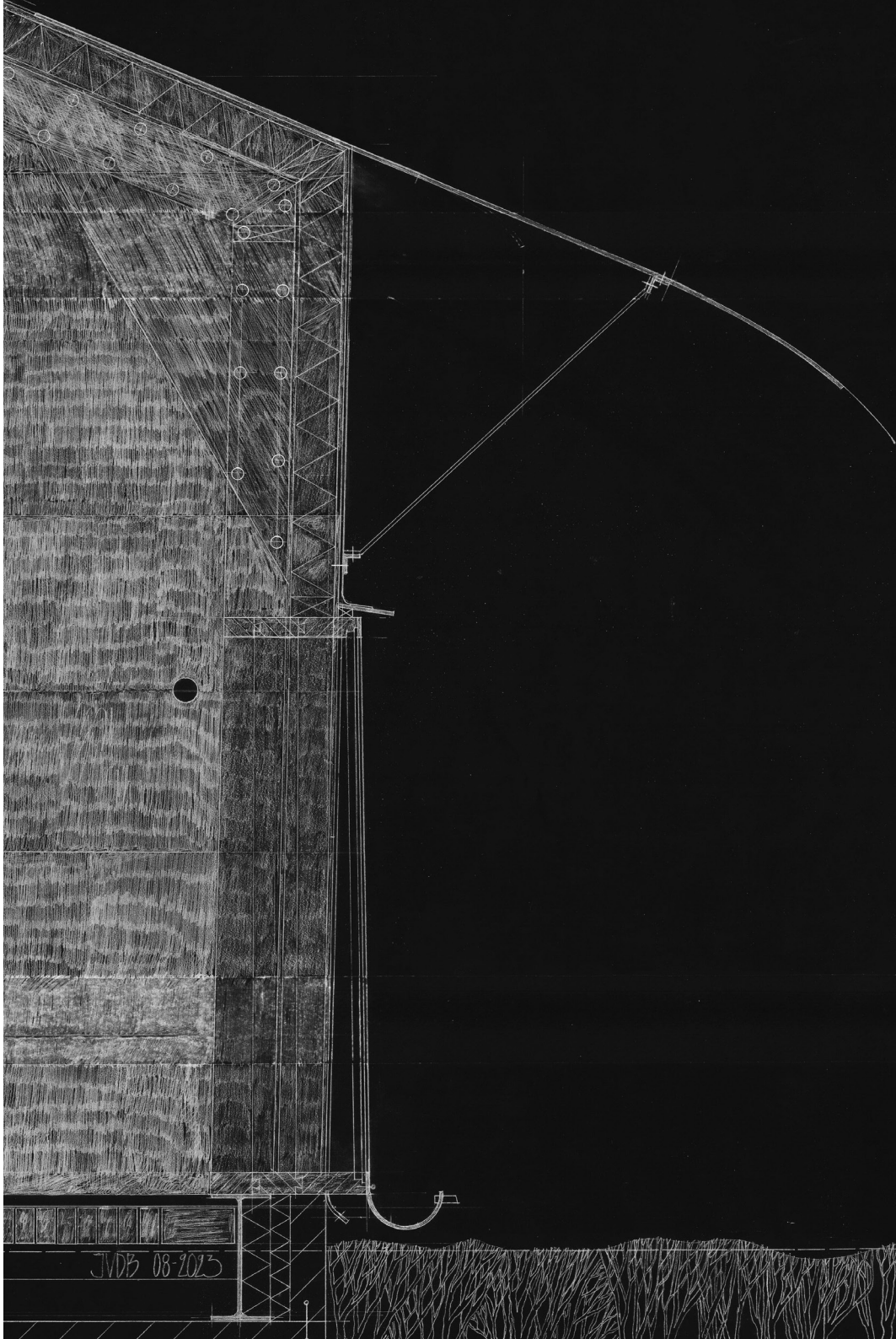
T*he Motherhouse*
the cabalistic house of houses.
(below) *The Motherhouse, camera obscura*
door latch under curved rain hood, door with spy lens for camera obscura.



The Motherhouse, rooflights
strange light play under rooflights, only when made
accessible through moveable hatches from the inside
(only at moments when the camera obscura is not in use).

(to the right) *The Motherhouse,* window, roof
slightly inclining window, internally accessible through large sliding door
(closed at moments when the camera obscura is in use).





The Brick Cabin protruding into the earthen Hortus Conclusus.
Fragment of the drawing at mundane daytimes.

AFFECTIVE ENCOUNTERS: NATURE CLOSE TO THE SKIN

SASKIA DE WIT

In an era of globalisation, landscape architects and urban designers have learnt to think big: large-scale plans with far-reaching visions, saving the planet and solving urgent global challenges. Usually, we try to solve these problems in the same way that we created them: with advanced and generic technological methods, and with significant investments. Yet this bigness is still largely the domain of international players, and its effects do not necessarily foster the quality of urban spaces. On the other end of the spectrum is the small realm of a *terrarium*, intriguing because of the contradiction between their otherworldliness and the representation they offer of the world as we know it. They share this quality with gardens, described by Michel Foucault as "the smallest fragment of the world and, at the same time, represents its totality, forming right from the remotest times a sort of felicitous and universal heterotopia"[1]. What if we learned to think small again? What do small gestures have to offer to reveal what is valuable and meaningful and to foster a novel understanding of the relation between humans and nature? How can they sharpen our view for the particular, identifying the places in the landscape in their structural, material, dynamic, practical, atmospheric, mnemonic, and discursive identities?

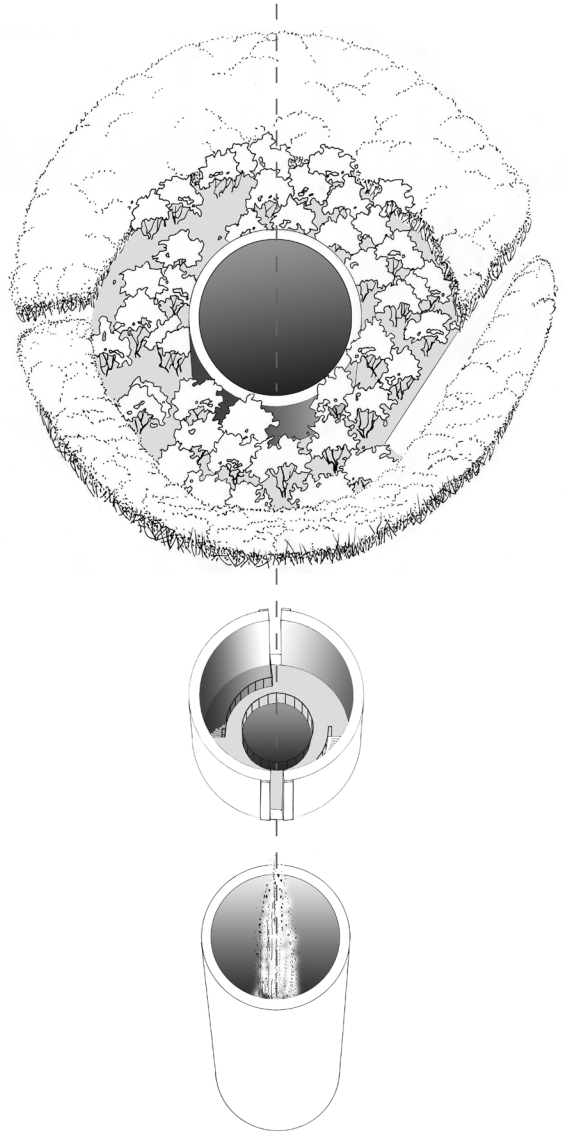
*Terrarium*s teach us about nature. However, our understanding of nature is dominated by images of large natural landscapes untainted by humans, such as the Himalayas and the Arctic. And the way we have exploited nature has much to do with the resulting tendency to conceptualise a boundary between us humans, and nature. In order to move beyond this dualistic concept of humans versus nature as "the other" we need to appreciate the inextricable relationship between human and nature, and move past considering what we think of as "nature" through the lens of visual beauty or distant images, sublime ideals or technical ecology.

A deep reading of the Wasserkrater Garden (Bad Oeynhausen DE, Agence Ter 1996) will provide some clues to unfold novel perspectives on the relationship between humans and nature. This discussion is based on an analysis of this garden that was executed as part of a research on enclosed gardens in the metropolitan landscape[2]. The analysis aims to capture the different qualities of the perception of the place, which means that evaluating the garden starts at my own perception in situ, now that the project has matured and "settled", adding to the original intentions of the designer, and the historical context at the moment of design, intentional or accidental changes over time.

The Wasserkrater Garden is hidden underground, only to become visible when the water jet shoots into the air.
Photo by Sebastiaan Kaal, 2012.

The suburban landscape of Bad Oeynhausen.
Photo by Sebastiaan Kaal, 2012.

The various layers of the garden—valley, crater, spiral stairs, round pool and fountain—elaborate on the central organisation, materialising the vertical axis. Drawing by Saskia de Wit, 2012.



A SUBURBAN GARDEN

The Wasserkrater Garden is one of a series of gardens in the Aqua Magica Park, designed in 1997 by the landscape architectural office Agence Ter for the suburban agglomeration which includes the towns of Bad Oeynhausen and Löhne, near Hanover in Germany. Through an unbridled growth of suburban housing and infrastructure the landscape has been transformed into a discontinuous multipolar and fragmented landscape where structures of rural landscapes and urban settlements are converging with no recognisable borders, and spatial, visual, geographic, and programmatic differentiation seem to disappear. A "placeless geography," lacking both diverse landscapes and significant places, seems to have replaced the localism and variety of places.

SUBTERRANEAN FAULTS

The fertile loess soils in the area are intensively used for agriculture, with forests at the steep slopes of the valleys, but the specificity of this landscape resides underground, invisible to the human eye. A prominent range of densely forested hills forms the edge of a zone where the earth's crust was uplifted between 80 and 90 million years ago, followed by a series of disturbances. The thick layer of marine sediments from the Jura era (200-170 million years ago) was pressed together and raised to a more than a hundred-kilometre-long bulge. At present, the marine sediments lie hidden underneath a roughly 30 metres thick cover of quaternary deposits, but a range of underground faults—planar fractures in a volume of rock, resulting from the earth's movements at that time—presses the water through the quaternary layer to the surface: carbonated salty water, rich in iron and minerals, up to 36 degrees Celsius⇓. The water has travelled through the subterranean layers for thousands of years, incorporating these minerals. The thermal waters made the region known as the "healing garden" of Germany, with five spa towns—Bad Driburg, Bad Lippspringe, Bad Meinberg, Bad Salzuflen and Bad Oeynhausen. Bad Oeynhausen was the result of the accidental discovery of a thermal spring, when searching for salt deposits for the salt industry. Soon after the healing abilities of this spring were recognised, the first baths were built, bringing about a wave of economic prosperity. The town was designed as a uniform composition around a central Kurpark. At the end of the twentieth century, after the hey-day of the bath culture, the number of attendances in the spa towns and the numerous health centres

and spa clinics dwindled. Nowadays Bad Oeynhausen is one of many smaller centres in the continuous suburban tissue.

The representation of the underground water, the basis for the regional economy and for the cultural identity of Bad Oeynhausen as a spa town, used to be ingrained in the architectural typology of the bathhouses, and in that of the surrounding architectural objects, like pump rooms and drinking fountains. These buildings were typically organised around long corridors, coming together in a *rotunda*, an octagonal or circular, dome-covered central space. Some salt springs emerge in the shape of large fountains, incorporated in the Kurpark.

The Wasserkrater Garden refers to both the fountains and the central spaces of the spa buildings, making the hidden underground accessible and showing the visitor where the water came from.

THE WASSERKRATER GARDEN

The garden is positioned exactly above one of the subterranean fault lines, which used to determine the form and position of the town but are now hidden underneath the suburban developments. The natural source of the subterranean water is made expressive again in the fountain that is the centre of the garden, enabling the visitor to explore a landscape that had remained hidden from the public eye. By carving vertically in the soil the suburban landscape is connected to the natural landscape underneath. The precise position of the garden on the subterranean fault line is emphasised by a concentric composition of the fountain, crater and sunken garden, a sequence that is experienced as consecutive layers of enclosure, while penetrating into the earth. The main enclosure is the earth itself, so the garden remains hidden and only becomes visible when the water jet suddenly shoots into the air. The double boundary of the sunken garden and the cone-shaped crater wall enables a sequence of entrances, as a rite of passage before entering the inner space.

The various layers—valley, crater, spiral stairs, round pool and fountain—elaborate on the central organisation, materialising the vertical axis. The contrasting materialisation of the valley and crater enhances the image of the underground garden. In the circular valley dappled sunlight through the canopy of densely planted Juneberries (*Amelanchier lamarckii*) evokes the image of a natural forest valley. Creeping willow (*Salix repens*) covers the sides of the valley and undergrowth of shade-loving plants forms a lush green carpet. The crater walls are made of Corten steel, clad on the inside with gabions. One enters the

crater through a narrow slit with heavy doors, to descend twenty metres to the bottom of the crater via a spiral staircase. The funnel shape of the space forces the visitor closer to the centre while descending, increasing the risk of getting wet. The noise of the fountain, the spray of water touching skin, the subterranean coolness, the change in equilibrium and muscle tension when descending under the surface of the earth, the effects of light and shadow create a multi-sensory experience, which emphasises the exposure of nature and involves a "feeling of being surrounded by or infused with an enveloping, engaging tactility"[4].

THE SOUND OF WATER

The water was pumped up from the aquifers about five hundred metres below the surface and is stored in an underground reservoir, fifteen metres below the floor of the crater. This reservoir feeds the fountain: a permanent field of small jets, and the thirty-five-metre-high geyser. Most striking about the water is its sound, rising and waning. The water bubbles from the bottom of the crater, drips down from the gabions on the stairs, their sound echoing in the depth, while from the black water surface the frothy water column ejects far above the craters' edge. Each time the water jet suddenly falls away, the space is wrapped in a dense mist. The choreography of water is accompanied by artificial rumbles and flashes of light, creating a spectacle that evokes the water's sheer force in the earth's bowels. The tangible water—erupting in uneven intervals like a living being—evokes an artificial image of the subterranean fault, making the invisible, underground natural force physically felt. Although its volume does not rise above the volume of the everyday sounds the fountain produces the most conspicuous sound on the field. Since the garden is below ground level, it is the sound and not the view which announces the garden from afar. Once descended into the valley the fountain is clearly audible. The sound level is only slightly lower here than in the surrounding field, but in the intervals between the eruptions of the fountain the valley appears to be much quieter. The high-pitched background sounds (the human vocals) are muffled; the bird sounds and the wind remain. On the other hand, the volume of the fountain becomes louder. The position of the entrances can be heard by the leaking of sound from inside the crater: 63 decibels near the entrances. Still the difference in sound level is only a few decibels. Within the confines of the crater walls the sound is retained, and the different stages of the choreography of the fountain can be clearly distinguished: starting from the stac-

The roughness of the walls, the contrasts of light and dark, the change in equilibrium and muscle tension when descending enhance the sensation of being underground. Photo by Sebastiaan Kaal, 2012.

cato rattle of the dripping, a heavy bubbling raises the sound level, and to a climax of 83 decibels when the fountain erupts. Already on the uppermost entrance platform the background sounds have disappeared altogether, and when descending the stairs, the sharp rattling sound of dripping on the metal stairs takes over. Down at the lowest level, the sound of the fountain is loudest: its 83 decibels prevent people from hearing each other's voices. In the intervals one can still hear the continuous dripping. This distribution of the sound levels in space and time reflects the centrally organised visual space of the garden. It also reflects the meaning of the underground space—the invisible landscape of the aquifers, the *genius loci* of Bad Oeynhausen.

IMMERSIVE EXPERIENCES – PLAY AND CONTEMPLATION

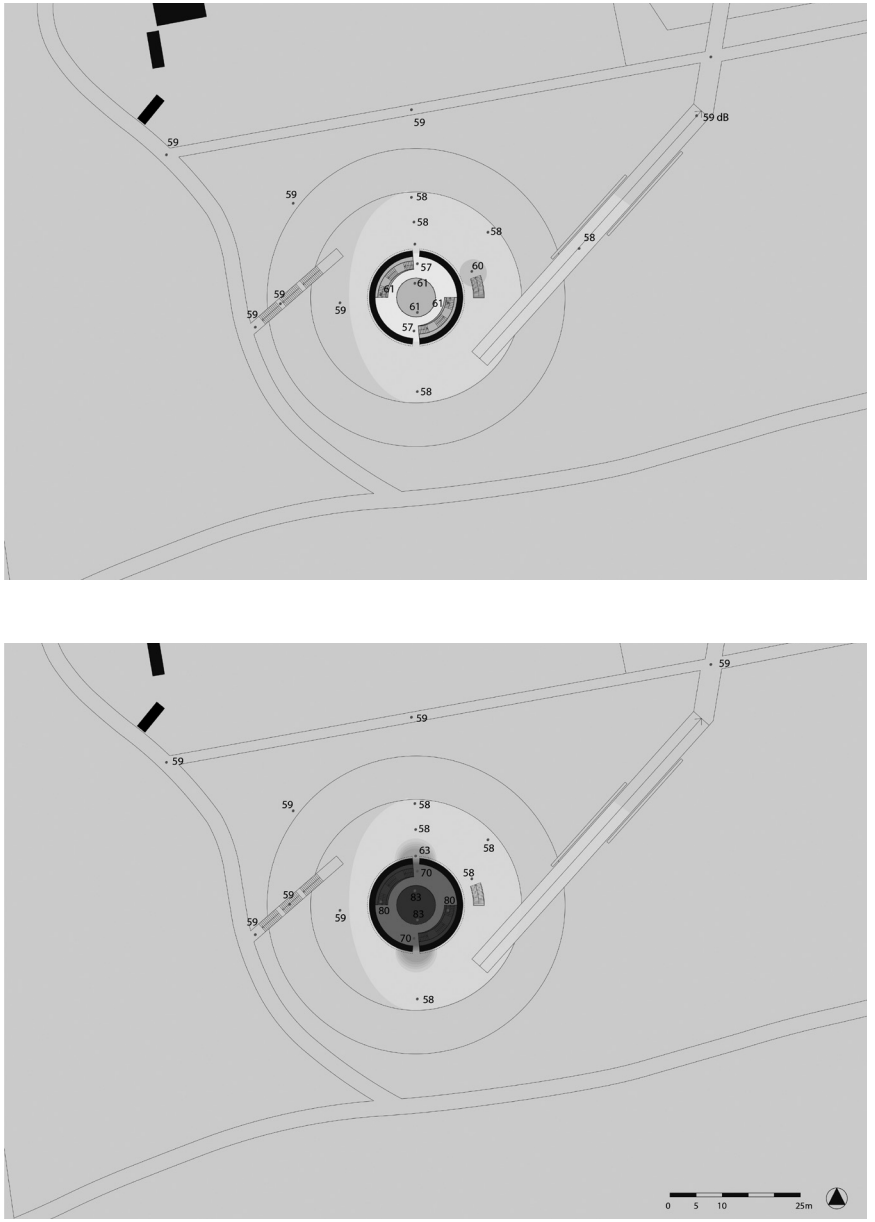
The horizontal plane of the park is the level of the everyday, public life. Retreating into the depths of the earth in the Wasserkrater is also retreating from public life into an individual experience of nature. The garden functions as a stage—a setting for the actions of the spectator, who moves through an abundant image and uses the space actively, impelled by sensorial effects. The physical thresholds of the consecutive layers of enclosure are supported by several management strategies. At the entrance a small fee needs to be paid (guaranteeing surveillance but not so high as to prevent people from entering). The outer ring is always accessible, but the doors in the wall of the crater can be locked at night and outside the season. These thresholds express the transition from the social park to the individual garden, setting apart a sequestered space for play, and evoking a temporary and limited, ideal world. Its adventurous quality—trying to find out how it works, the time intervals to move without getting wet—makes the Wasserkrater Garden a place for active engagement and discovery. This is counterbalanced by the contemplative engagement of perceiving the material qualities of the garden and watching others play.

The concept of play is an integral part of contemporary metropolitan culture,

> a game without an overall aim, as play without a transcendent destination but not without the practical necessity of rules agreed upon and of (inter)subjective imagination; as a complex of games each one having its own framework, its own rules, risks, chances, and charms.

The global aspect of the metropolis is inherently linked to the emergence and the success of digital media, which by their design encourage playful use. Digital media immerse the user in

Isobel maps of the garden during eruptions of the fountain (left) and during intervals (right) reflect the different stages of the soundscape. Sound level measurements were taken on an almost windless Sunday morning (13 May 2012, between 10.30 and 12.00). The floor of the valley remains a quiet space whereas in the crater the volume oscillates between 57 and 83 dB. Drawing by Saskia de Wit, 2012.



time and space set apart from physical space and real-time, and are characterised by new forms of freedom, rules and fun. However, the playful use that is generated by gardens such as this one is of a different order. This type of play does not set the users apart from physical space, but connects them to the *genius loci*, as actors being part of the play. The garden is a *hortus ludi*: a stage for the *homo ludens*. The visitor is an actor and a spectator at the same time, with the garden as the stage as well as the gallery from where one can contemplate the image of nature. The garden induces the visitors to actively engage in the space, moving, playing, conversing, which is triggered by multi-sensory stimuli. Play is a free act, it is not necessary, not a task. It is an intermezzo, complementary to and, therefore, part of life in general. But despite being enacted in a (consciously) imaginary world between different players, play recognises clear rules in terms of time, place and order, evoking a temporary and limited, ideal world. As such, the garden is designed as a sequestered place, set apart from its surroundings by its sequence of thresholds.

PROXIMITY

In landscape architecture the emphasis usually is on what geographer Johannes Granö defined as *Fernsicht* [distant view], the part of our environment we mainly experience by vision: the landscape, determined by the horizon. Visual experience detaches us from tactile experience, it dematerialises the world to a spectacle. To move beyond considering landscape and nature through the lens of visual beauty or distant images, and beyond sublime ideals or technical ecology, begins with enabling what Elizabeth Meyer called "affective encounters". For these affective encounters to happen, we need to be near, to experience our surroundings, to be immersed in them.

In the garden the scientific distance of a *terrarium* is replaced by the embodied experience of proximity. *Nahsicht* [proximity] is the environment we can experience with all our senses, making one attentive to the material reality of earth, plants and water, such as mass, grain, fragility or suppleness. Whereas terrariums can be understood as objects for observation, with us humans as the outside controlling agent, in gardens humans are part of the same environment, of the same ecology, both observer and participant. They interact with the space and its dynamics, simply because of their presence. The convex space of the enclosure, providing protection as well as engagement, is like a shell, intimately connecting the visitor and the surrounding space. The symbiotic relationship between a mollusk and its shell is reflected in the geometry of the shell, which only becomes meaningful because of its mollusk, as Gaston Bachelard described. This symbiotic relationship of proximity evokes sensory experience, which is, as Arnold Berleant argues, the key to environmental awareness. The conscious body does not observe the world contemplatively but participates actively in the experiential process, the experience of multi-sensory bodily engagement with the place.

The garden is a multi-sensory object, a space seen as well as felt, touched and heard. The enclosure and proximity of the garden space puts an emphasis on its materiality and its perception: a haptic perception, or an inducement for affective encounters.

CONCLUSION

The Wasserkrater Garden expresses an understanding of nature brought close to the skin: as an embodied experience. Though hidden underground, the Wasserkrater Garden is the pivot point of the park's composition, evoking a tension between being in the centre and being excluded or hidden, a tension that intensifies the experience. With the sunken garden as a filter between the suburban landscape on the surface and the tactile and rough crater that is dramatised as much in its artificiality as in its naturalness, the garden evokes contemplation as well as fun, with elements of the unexpected and surprise. The garden is a place for an intense experience of nature, condensed into playful ritual, which is ordered by the rhythm of the fountain, gradually building up to a dramatic climax and subduing into nothing, only to start over again, in an endless cycle. The reception of the haptic information of the garden by skin, muscles and joints reduces the distance between human and nature to within the body, internalising the experience. The emphasis in the Wasserkrater Garden has shifted from representing identifiable natural and cultural territories to exposing the spatial and temporal natural dynamics. It exposes wilderness not in opposition of, but as an integral part of the metropolitan realm, evoking an embodied experience as an immersive encounter with nature. The natural force of the underground water becomes perceivable, while at the same time all our senses tell us that it is brought up by human hands. In the classical design tradition gardens represented the first nature of natural processes and the second nature of cultivation and organisation, as well as the first and second nature as real places, outside the urban realm. In the continuously changing

metropolitan landscape, however, structures of cultural landscapes and urban settlements have converged into a field of forces and vectors that result in types of landscape that are hard to distinguish. Maybe this is why the emphasis in metropolitan gardens such as the Wasserkrater Garden has shifted from representing identifiable natural and cultural territories to exposing the spatial and temporal natural dynamics, and from representation to engagement. The layer of first nature is dissected and exposed in all its complexity. The garden exposes wilderness not as an opposition to the urban territory but as an integral part of the metropolitan realm.

The threshold between inside and outside, outside and inside, creates a sheltered place inside, a temporary refuge from the outside world, and at the same time a place outside, in the margin.

From this outside position, at a distance from the public domain, from daily life, from the regulated and programmed spaces of society, the embodied experience of gardens can evoke a new understanding of nature. Something that we are part of and is part of us, not emphasising identifiable natural territories but exposing the dynamics of nature, the spatial and temporal aspects of nature, and our own engagement.

In the Wasserkrater Garden there is no distinction between what is natural and what is manmade, and nature is exposed as something close to the skin, incorporated into the metropolitan fabric and our daily environment. It shows that the premise that we somehow stand outside (or apart from) nature no longer holds true. Nature is not only found “out there” but also “in here”, and in the shell-like space of the garden the boundary between human and nature is dissolved, emphasising the necessity of an attentive interaction with, and care for the living environment, which is not an abstract and inexhaustible force but interwoven with everything we do. To be fully engaged with nature means to come into a visceral and immediate contact with it. Addressing the proximate senses such as sound and touch removes the physical distance between us and nature, and nature as the object of appreciation dissolves as a separate and distant “thing” and becomes inextricably intermingled with the perceiver.

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S. de Wit, *Hidden Landscapes, The metropolitan garden as a multi-sensory expression of place*, Architectura & Natura Press, Amsterdam 2018, pp. 311- 345.

The position of the fault lines is derived from the map “Tektonische Übersicht” as shown in O. Deutloff, *Geologische Karte von Nordrhein-Westfalen 1:25000; Erläuterungen 3818 Herford*, Joh. Van Acken, Krefeld 1995, p. 94.
In the southern half of the area, where the Wasserkrater is, is derived from the *Geologische Karte von Nordrhein-Westfalen, Blatt 3818 Herford*.

C. Foster, *The Narrative and the Ambient in Environmental Aesthetics*, Journal of Aesthetics and Art Criticism, 56 , 1998, p. 133.

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G. Bachelard, *The poetics of space*, translated by Maria Jolas , Beacon Press, Boston 1994, pp. 105-107.

A. Berleant*, Living in the Landscape; Toward an Aesthetics of Environment* , University Press of Kansas, Lawrence 1997, p. 12.

CHINESE GARDENS. ALLEGORICAL ECOLOGIES IN AN URBANIZING WORLD

GERARDO SEMPREBON

This contribution proposes to read the Chinese Garden as an architectural metaphor for a measured ecology. Featured by artificial groundworks, fishponds crossed by meandering passageways, verdure arrangements, halls, and pavilions for different purposes, gardens have developed over history as magnificent architectures tailored to build secluded and controlled realities. Building artificial grounds to simulate angles of the world is an attitude traceable in different cultures. A paradigmatic example was the construction of the Parc des Buttes Chaumont, one of Paris' most important public parks. Engineer Charles Adolphe Alphand had the rock pickaxed for three years and, in 1867, gave Paris a picturesque garden imitating a mountain setting, complete with fake cliffs and an artificial waterfall. This episode witnesses the boundless confidence in man's ability to shape the habitat in which he lives at will. Such an attitude was aligned with unquestioned positivistic faiths in scientific and technological progress and envisioned no limits to the possibility of altering the morphology of sites and giving them the form of invented landscapes. It is crucial to pinpoint that these approaches never characterized the philosophy of Chinese gardens, which, following the precepts of traditional philosophies, have been constructed to reproduce miniaturized angles of the world permeated by harmony between natural and artificial elements. As clearly defined in their borders, the gardens had to evoke the interplay of correspondences, the cosmic energy animating the world, and benevolently oriented it via cosmology and rites (Jullien 2014, p. 119). Moreover, it is worth reminding that, as in classical *shanshui* paintings[1], they went beyond depicting or confronting reality as it was, projecting

> Chinese literati's idealization of relationships between human and nature, through the attainment of visual and spiritual harmonies via the composition of a timeless image of nature (Chu 2021, p. 2).

Indeed, their picturesque environment goes far beyond the mere imitation of nature and embodies the complex network of correspondences. The exhibition curated by Fang Zhenning *Stroll in HuanCui Tang* exposed at the 2017 SUSAS (Shanghai Urbas Space Art Season)[2], which represented the panorama of a notable scroll from the Ming Dynasty in Anhui style, is a striking example of the ethical and aesthetical values imbued in Chinese gardens portraying both a place for pleasure and a metaphor for living in the world. Unlike some other cultural genealogies marked by cultural fractures, Chinese historical culture has been able to absorb contrasts and dramatic changes along its evolutionary path.

Poster of Stroll in HuanCui Tang exhibition curated by Fang Zhenning at the 2017 Shanghai Urbas Space Art Season, which represented the panorama of a notable scroll from the Ming Dynasty in Anhui style. The poster emphasizes how gardens' architecture is used as a tool to frame, contemplate, and live off the landscape. Photo by Gerardo Semprebon, 2017.

As an expression of this striking resilience's capacity, the Chinese garden has been a spatial entity crossing time, space, and meaning, substantially preserving its tangible connotations and principles, intimately connected to intangible forms of art, poetry *in primis*. Indeed, a large part of traditional Chinese architecture can be understood as a device for observing the landscape, a cosmos animated by vital forces integrating anthropic and pristine elements, where gardens have usually embodied miniaturized reproductions of classic landscapes. Along many meticulous descriptions of Chinese gardens, one will surely realize the cultural substratum that has fed the will to create exquisite spaces for the secluded *otium* of bureaucrats working in urban administrative centers, always eager to evoke the breath of the *qi* across an allegory of traditional landscape.

The balance between anthropic and wild signs is the key to understanding the distinctiveness of Chinese gardens. In regard to this, Paolillo annotated that from the Qing Dynasty, the last before the fall of the empire, architectural elements have increased in presence to the detriment of naturalness. In his words, buildings started not seeming any more elements placed within landscaped microcosmos but frames or borders of the space inside (Paolillo 1996, p. 127). The meaning of spaces enclosed by architecture, like courtyard houses, has always epitomized fundamental aspects of life, such as the connection with ancestors or Heaven. Architecture as physical and built thresholds between different domains, such as a street and an interior of the house, or even simply two separate rooms, has increasingly shaped the spatial experience one encounters in daily routines. The open space inside buildings, creating pauses in the movement, has stimulated a vertical tension between the ground and the celestial sky, characterizing the domestic realm where life could unfold under the "watchful eye of Heaven's arch" (Ruan 2021, p. 19).

THE TWIST OF AN URBAN WORLD

China's tremendous transformations over the last decades have influenced the perceptions and understandings of human-nature relationships in its environmental and perceptive attributes. Gardens have not been immune to such transitions, and I suggest that, as controlled ecologies, they open to new interpretative frameworks.

The domain of art, especially when explored with provocative contents and forms, has provided new interpretative keys to decipher traditional meanings in fast-evolving contemporaneity.

Example of architectural elements framing space's experience and verdure arrangement in the classical garden of Suzhou Canglang Pavilion, also known as Great Wave Pavilion. Photo by Gerardo Semprebon, 2018.

I consider the work of two Chinese figures to suggest the twists Chinese gardens as allegorical ecologies are undergoing in the wake of today's reality spatial configuration.

In 2014 Artist Yang Yongliang produced digital reinterpretations of Song Dynasty master paintings, turning the classical and harmonious balance between pristine lands and human presence into tremendously-detailed concrete jungles featuring contemporary Chinese megacities. One needs to get closer to realize that the overall picture, the classic landscape by Fan Kuan's *Travelers among Mountain and Streams* (*Xishan xinglu tu*, ca. 1000), results from a meticulous digital assemblage of images of high-rise buildings, construction cranes, and demolished sites. Yang used images of architectures as brushstrokes so that, for instance, mountains are mosaics of skyscrapers and streams are collages of packed motorways. Yang's work has been acknowledged to reflect many of the controversial aspects of Chinese urbanization (Wang 2017), also being defined as a "toxic sublime" rendering of ongoing predatory practices toward the environment (Puppin 2019). The ambiguity embedded in his almost romantic, in the sense of pan-like feeling, attitude unfolds in both the will to minutely describe urban stacking and devouring real-estate machine and synthetically evoke intense emotions at a glance, which becomes the engine for speculating and questioning the ethical, aesthetic, and contemplative outcomes of the current developmental model and its relations with the environment. Beyond grasping the dramatic transition of Chinese land, Yang's art remarks that if, on one side, urban development made life thrive in cities, on the other, it also caged these lives, illuminating the twist of forms and meanings permeating historical and contemporary landscapes in China. This shift, which has given life to differentiated exposing modalities, has been corroborated by the advancement of modern artistic techniques, primarily related to the digital production of images and other contents, which contributed to emphasizing the social, political, and environmental dimension of landscape representation (Chu 2012), with particular reference to the Ecological Civilization ideology (Semprebon 2021). Even though human figures appear absent in Yang's composition, suggesting a remarkable gap from the ancient painting scroll, nonetheless, it may be inferred that "human interference is at once omnipresent and invisible" (Tan 2016, p. 227).

What is revealed is also a relatively connivance to what *de facto* may be assumed as a new canon of classics: the uncontrolled phenomenon of excessive urbanization as an antagonist to nature.

According to Ortells-Nicolau, Chinese development em-

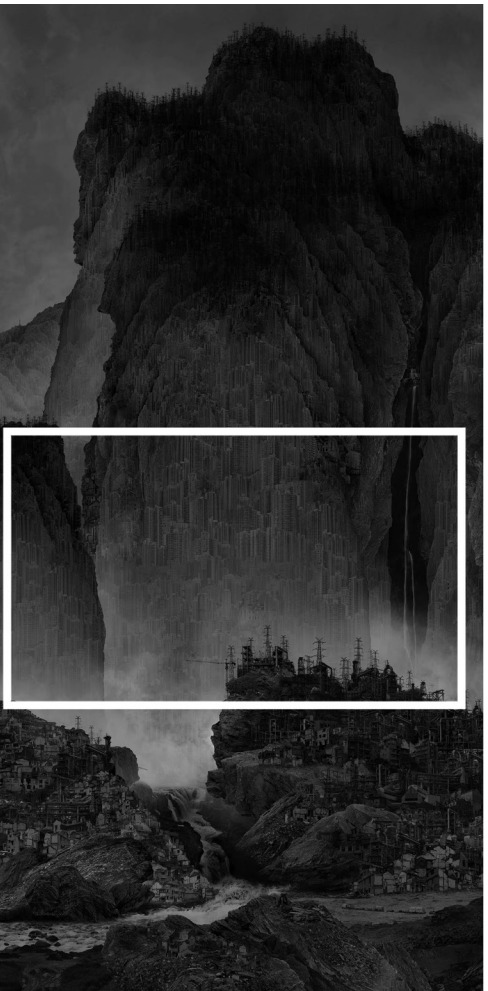
bodies the connotations of a "ruination" process driven by land speculation and economic growth (Ortells-Nicolau 2017). For Kiu Wai Chu, the modern world recomposed into classical iconographies represents people's nostalgia for a lost benevolent connection with nature and tradition (Chu 2012). Nevertheless, the anthropogenic pressure on the environment also mirrors the deliberate plan of land transformation that may represent the contemporary ideology of classics, provocatively rendered by Yang with traditional iconographies. The inherent effect of the estrangement of Yang's work's first impression triggers further and deeper reflections on spatializations and perceptive impacts of social, economic, and political forces. Overcoming binary relationships like past and present, nature and city, tradition and modernity, his *Artificial Wonderlands* embrace a more nuanced dimension suspended between ephemeral and substantial, restful and threatening, organic and mechanical, generic and peculiar, perceptual and conceptual (Mickle 2016).

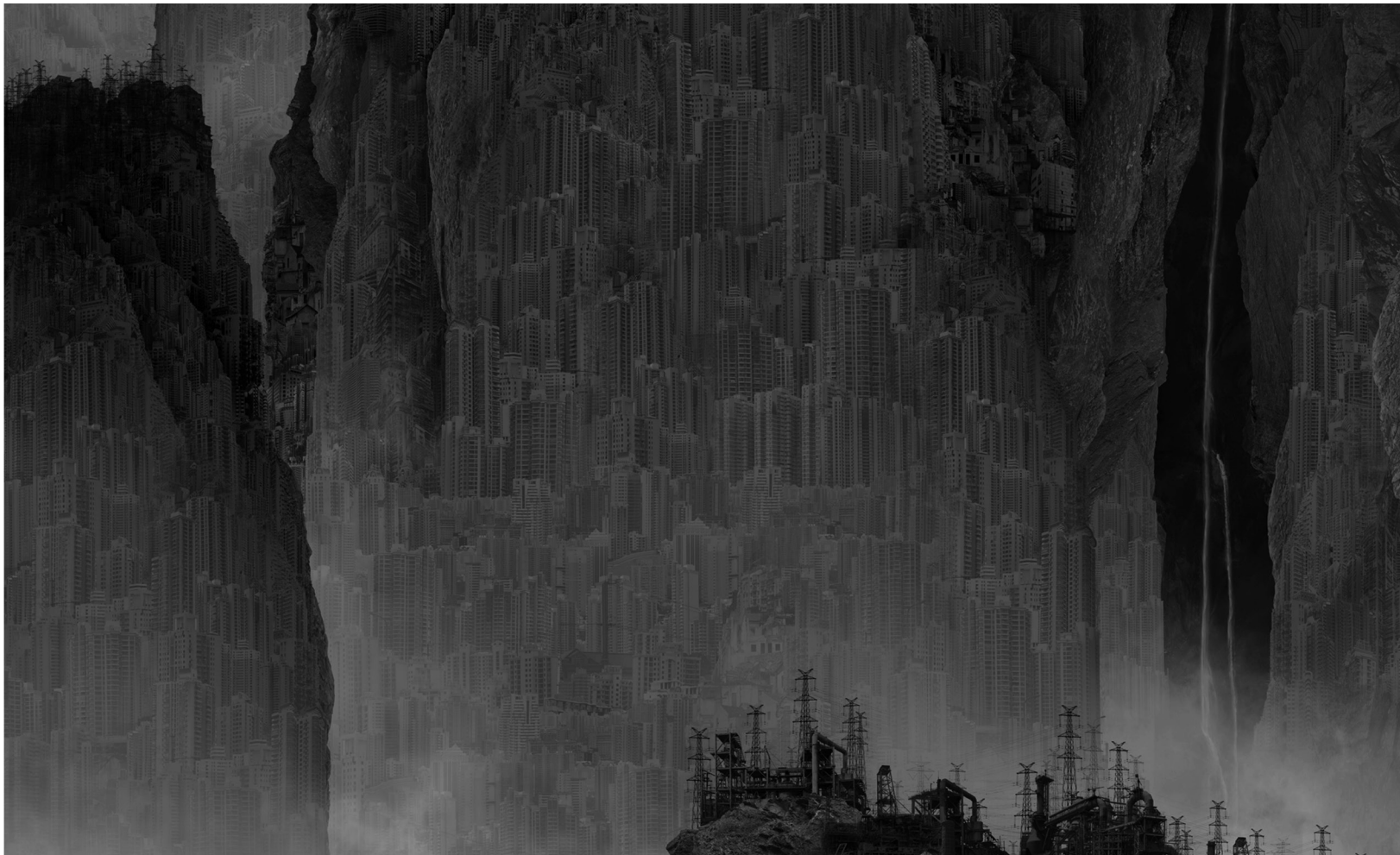
The semantic backflip reaches a climax with Ma Yansong's manifesto for Shanshui City, the utmost urban ideology reinterpreting traditional lost landscapes in contrast to the commodification of urban realities, to the "monuments of capital and power" (Ma 2014, p. 26) and to the soulless idea of buildings as "machines for living" (Ma 2014, p. 28). Here as well, it is crucial to remark on Ma's position in regard to Chinese classics' ecology. Describing Chinese classical gardens, he wrote that

> what makes them a treasured cultural heritage is their representation of a distinct worldview in which humanity and nature coexist in harmony, not the fact that they happen to meet certain ecological and environmental criteria [...] the only true sustainability lies in a building's spiritual and cultural significance for residents and the community (Ma 2014, p. 46).

For him, *shanshui* is an "image of the natural world created within the subconscious to act as consolation and compensation for the struggles of political life" (Li 2014, p. 224), which he upscales at an urban and territorial scale to forge a new type of poetic living. On these bases, Ma's critique of the unquestioned application of environmental technologies moves on the grounds of the convincement that buildings and cities can offer renewed spiritual and emotional connections between humans and nature within an urban setting that is not necessarily green. The suspicion he has nurtured toward green as a panacea for all ills puts him in an eccentric position compared to the mainstream urban visions for the future of cities. Take, for instance, Stefano Boeri Architetti's Liuzhou Forest City⇓, an upscaled

Yang Yongliang, *Travelers among Mountain and Streams*, from “Artificial Wonderland II” series (2014).
On the left is the entire artwork, and on the right is a zoom.
Courtesy of Yang Yongliang.





development of the celebrated Vertical Forest prototype, where the image of the new city derives directly from the accurate definition of greeneries on otherwise generic buildings. Another example we can cite is SOM's Urban Sequoia⩚, the project for a skyscraper able to sequester carbon with the help of algae. In this case, a city made of buildings working like machines will implement green materials to remediate pollution in a metabolic way. SOM rejects picturesque fake figurations either of forests or natural and cultural landscapes. Ma's position appears more inclined to an allegorical reconnection with folkloristic wisdom far from an idealized imitation of the past but able to trace a contemporary Chinese identity independent from foreign models. In his words, Shanshui City

> is not simply an eco-city, or a garden-city, nor does it imply modeling the city's architecture on natural forms such as mountains. Rather, it represents humanity's affinity for the natural world, and our quest for inner fulfillment, as expressed in philosophies of the East (Ma 2014, p. 20).

He often compared this idea with Louis Kahn's Salk Institute, which is a place without vegetation but intimately connected with nature, because for him "what we see is […] ourselves resonating within the landscape of the mind" (Ma 2014, p. 65). One of the first applications of Shanshui City is the Chaoyang Park Plaza in Beijing. The two towers soar on the skyline and, from a distance, reflect on the water of nearby lakes. On the ground, dwarfed buildings reproduce a small-scale environment equipped with greenery and resting spaces protected from the bordering urban chaos. In Ma's conception, this composite of allegorical mountains, rocks, and waters triggers connections with the traditional values of *shanshui* paintings, latent but forged in the soul of the Chinese. With this in mind, we have to look at his "Fake Hills," a project that "is not a direct representation of a series of hills, nor it is a mathematically generated abstraction. It is an emotional act; its origin lies in affection" (Ma 2014, p. 174). Ma's attitude, in the end, is not so far from that envisioned by builders of the past committed to hosting emperors' tombs in reshaped hills, underground mausoleums, or other artificially made landscapes.

THE GARDEN AS AN ALLEGORICAL ELEMENT OF RESISTANCE

Augustin Berque listed four criteria for the existence of landscape as such. First, linguistic representations, or one or two words to say landscape. Second, literary representations, oral or written, that praise or describe a landscape's beauty.

MAD Architects, *Chaoyang Park Plaza*, Beijing (2017). Top left: street view between the "mountains" and the "waters"; top right: on the ground floor, smaller pavilions and greeneries evoke a more controlled human scale environment;bottom: viewed from Jingshan hill, the "mountains" lose their evocative meaning. Photo by Gerardo Semprebon, 2018.

Third, pictorial representations that have the landscape as a theme. Fourth, representations through gardens proving an aesthetic assessment of nature (not gardens for subsistence). He pointed out that such criteria can be found in many societies, but only in properly landscape societies are all four criteria (Berenson 1953, p. 186). Alain Roger found that the Chinese society was the only one deserving this title of landscape society before also Westerns ones started manipulating the four criteria in the XV century (Roger 2009, p. 41). Such an enduring and fertile tradition is undoubtedly a priceless legacy, yet it poses questions on the role it can play in present and future eras. If, in the past, gardens mirrored and reproduced an idealized relationship between humans and nature fixed in classic landscape paintings and Chinese gardens, what do they signify in the contemporary milieu?

On one side, we have seen how Yang Yongliang's reinterpretation of classic paintings became both a way to denounce aesthetic and ecological concerns that belong to a collective dimension suspended between the nostalgic regret of the lost emotive relation with nature and the acquiescence to a new urbanized everyday indifferent to both environment and landscape. On the other side, we have Ma Yansong's skeptical position on technocratic attitudes toward the construction of any living setting. His point has assonance with Alain Rogers's critique of "ecolocracy" as a design attitude solely concerned with respecting the *environment* and not the *landscape* (Roger 2009, p. 106). The initially-mentioned pursuit of earthly paradises as envisioned by ancient builders is today more relevant than ever, as the beautiful words used by Alvar Aalto remind us,

> the ultimate goal of the architect (…) is to create a paradise. Every house, every product of architecture (...) should be a fruit of our endeavor to build an earthly paradise for people. [7]

If, on one side, the term paradise enlarges the extent of the aesthetic experience, evoking the peacefulness and delight of all senses, on the other, it suggests the possibility of salvation and redemption whose values rooted in the past may be reconsidered at present. If we accept this condition, Chinese gardens are not only priceless cultural assets or spectacular tourist destinations but also legacies of a precedent civilization and elements of resilience in a world moving toward uncontested urbanization.

[1] M. Foucault, *Of Other Spaces: Utopias and Heterotopias*, in N. Leach (edited by) Rethinking Architecture; A Reader in Cultural Theory, Routledge, London 1997, p. 354.

[2] 山水, *shanshui* is the word addressing classic landscape painting in mandarin. It is composed of two characters, 山*shan* meaning mountain, and 水 *shui*, meaning water. Alain Roger suggests considering also the word 风景, composed by the character 风, *feng*, meaning wind, and 景, *jing*, meaning scene. Roger suggests that *fengjing* means the atmosphere of the landscape and *shanshui* its elements, since these two terms may indicate both the object and the representation of the landscape. See: A. Roger, *Breve trattato sul paesaggio*, Sellerio editore, Palermo 2009, p. 49.

[3] See: https://www.susas.com.cn/2017susas/EN-phone/index.html [accessed 8 August 2023].

[4] See: https://www.stefanoboeriarchitetti.net/en/project/liuzhou-forest-city/ [accessed 25 July 2023].

[5] See: https://www.som.com/news/at-cop26-som-unveils-urban-sequoia-a-proposal-to-transform-the-built-environment-into-a-network-for-absorbing-carbon/ [accessed 25 July 2023].

[6] Lecture given at the Swedish city planners' meeting in Malmo in 1957. See: A. Aalto, *The Architect's Conception for Paradise,* in G. Schildt (edited by), *Alvar Aalto Sketches*, The MIT Press, Cambridge Massachussetts and London 1978, p. 158.

The reality of contemporary landscapes classics. Left foreground: the garden of the Confucian Temple in Shanghai; left background: the pressing generic city; right: Nanjing, the new “classic” landscape. Photos by Gerardo Semprebon, 2019 and 2018.

LANDSCAPE ARCHIVE COLLECTIONS. DESIGN THE CONTEMPORARY TERRARIUM

GIULIA SETTI

Building an archive on the contemporary landscape, or a Terrarium as this volume invites us to do, implies a reflection on the meaning of the term archive[1] applied to the project and, even more restrictively, to the landscape. In fact, it is no longer just a matter of cataloguing and organising documents or records, as one would do in a traditional archive, but rather of describing and selecting projects that use the archive as an operational tool. The idea of the Terrarium proposes to reflect on the relationship between ecology, architecture and landscape, with respect to contemporary design, and to understand the relationships between land, nature and space which has long been the subject of reflection in the disciplines of architecture and landscape (Bonneuil, Fressoz 2016; Braidotti 2013; Morton 2016). Therefore, one possible interpretation of the contemporary Terrarium is to imagine a natural, living archive that grows and changes over time and in space.

This paper compares three possible design options with respect to the construction of a Terrarium: on the one hand, the research carried out by Cesare Leonardi and Franca Stagi through an almost obsessive cataloguing of the species identified by the two architects during numerous field trips and which has as its premise the need to construct a scientific tool useful in the design of green spaces. On the other hand, the projects as part of Junya Ishigami's Art Biotop Water Garden and the park, designed by Catherine Mosbach, surrounding the Louvre Lens by SANAA, use the species in the archive – the arboreal species – as a preparatory tool for the project and test its real potential. The paper emphasises the need to cultivate continuous and productive links between landscape and architecture. Mosbach does this by merging the landscape of the Louvre Lens with the buildings of SANAA; Ishigami uses architecture to design his artificial garden, the individual tree crowns and the relationships between water and vegetation; while for Leonardi it is the form of the tree itself that becomes architecture.

THE ARCHITECTURE OF TREES: A SCIENTIFIC AND OPERATIONAL ARCHIVE

Cesare Leonardi's work began in 1982 and, through a more than 20-year-long survey carried out together with his wife Franca Stagi, has made it possible to build an immense arboreal heritage published in the volume *L'architettura degli alberi*, which contains the systematic description of 211 arboreal species. The book is the product of an exhibition of the same name held the year before, in 1981, in Reggio Emilia and then in Modena, which told of the journey of discovery of trees undertaken by the two architects.

Cesare Leonardi's passion for the description and study of tree species developed during his university years; his fascination for the vegetation in the Florentine hills led him to choose to develop, as the topic for his thesis, the design and plan for a new urban park in Modena♌. The forms of vegetation, and of trees, represent a wonderful world that attracts Leonardi more than the forms of architecture and drives him on a real journey in search of the main species to document, draw and describe. The construction of this scientific Terrarium, through the field study of tree species, began in Florence, then in Modena and on the Modena Apennines, then continued, together with Franca Stagi, for about twenty years and was an epic journey, where photography and design allowed the species being chosen by Leonardi to be captured.

From Cesare Leonardi's archives we learn how the journey, which first began in Italy, led him to visit the Botanical Garden of Palermo, the Reggia di Caserta and Villa Taranto on Lake Maggiore, to then move around Europe, to the lakes in Switzerland, to France, and to finally document the beauty and magnificence of London's parks.

Franca Stagi argued that

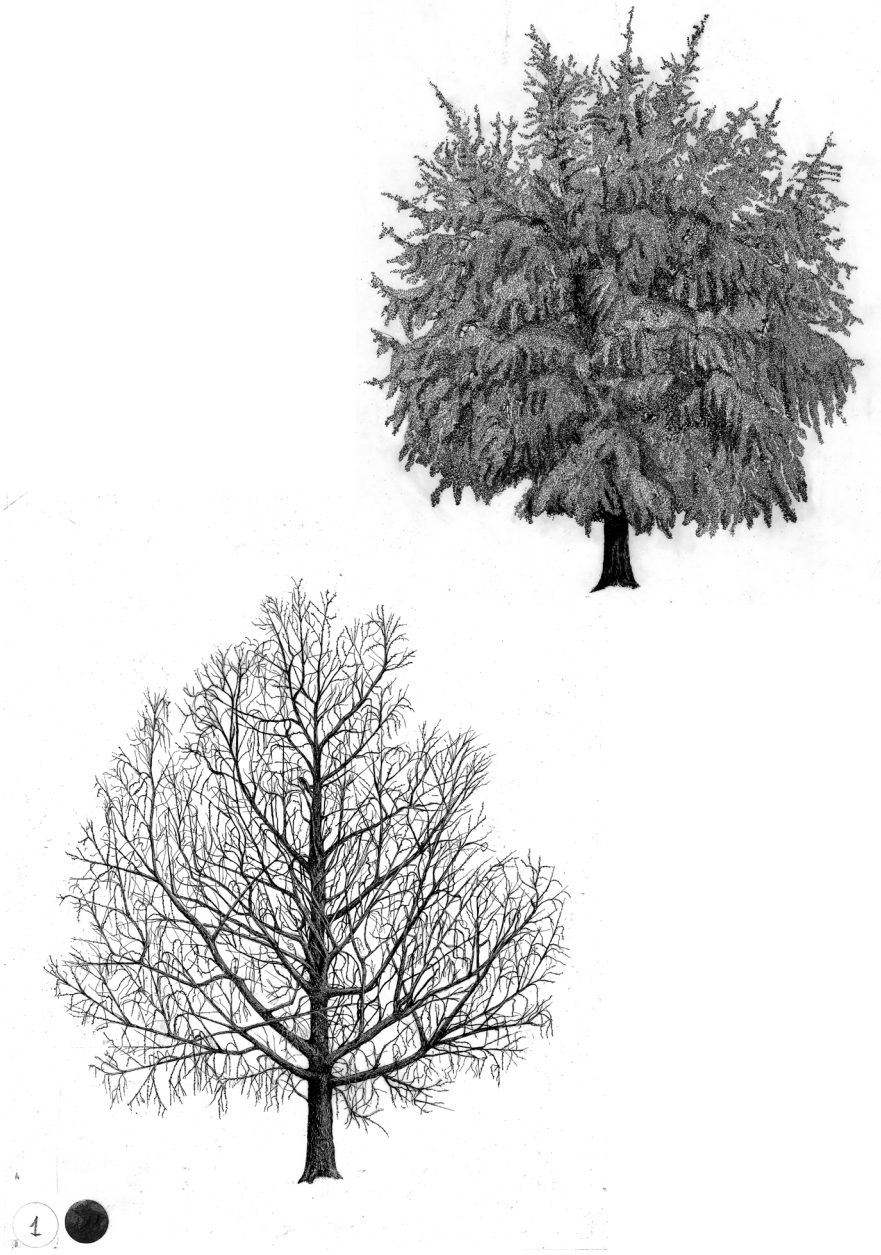
> we must understand trees in order to design parks; to know them one by one, and also to understand that the design of a park is the design of a 'becoming,' the proposal of a mechanism of transformation, growth, life and death (Leonardi, Stagi 1982).

It was precisely the need to understand trees in depth, in order to be able to use them in design, that drove Leonardi to gather information almost obsessively and to produce a manual that, to this day, is a valuable archive for those involved in green design. As with every archive, it is notable to highlight the criteria used by Leonardi to select and represent the tree species; each tree, considered of interest, is photographed in the field and its measurements are noted. Afterwards, Leonardi proceeded to the punctual redrawing of each tree, using photography as the basis of his work, and choosing to represent each species on a scale of 1:100.

L'architettura degli Alberi builds a relevant but abstract selection of trees and puts them all in a designed archive, representing a scientific terrarium. Indeed, 211 species are described through 374 drawings, to which detail drawings are added, where Leonardi depicts the leaves and fruits of each tree, as well as datasheets that describe each individual species and report their territories of origin, adaptation to the urban environment and different climatic conditions. Leonardi chose drawing as

Cesare Leonardi, Franca Stagi, *L'Architettura degli Alberi.*
Poster of the exhibition held in Reggio Emilia and Modena in 1982.
Courtesy Fondazione Archivio Leonardi, Modena.

Cesare Leonardi, Franca Stagi, Ginkgo biloba.
Ink on transparent film. Original drawings are in scale 1:100.
Courtesy Fondazione Archivio Leonardi, Modena, 1982.



the fundamental tool to compile this archive; the meticulous representations drawn by Leonardi are images of rare beauty that fascinate for the diversity and variations that each species presents (Cavani, Orsini 2017). At the same time, the drawing allows both the distinctive features of the tree to be captured and isolates the tree from the surrounding landscape. The archive designed by Leonardi has abstraction as its main feature; each tree is a miniature, finely represented, where every detail is reproduced with extreme precision and care.

Structure⇓ is at the center of Leonardi's work, in the study of trees and their growth habit, as seen in his drawings as well as, at the same time, in the photographic compositions, which are defined by the juxtaposition of a series of images in sequence and by the green structures, as Leonardi calls the parks he designed between the 1960s and 1980s.

Leonardi's work, which is still too little known, is a significant example of the inseparable relationship between research and design; the study and cataloguing of arboreal species gave Leonardi an in-depth insight into the elements of his future projects.
The design of each park thus becomes a time for verification, for choosing precise species and creating an original tree structure non repeatable elsewhere and designed for that specific context. But it is also the manifesto of a magnificent obsession, as Joseph Grima recalled in the curatorial statement at the opening of the exhibition at the Villa Croce Museum in Genoa in 2017.

> *L'Architettura degli Alberi* by Cesare Leonardi is a poetic ode to the magnificence of trees, the life's work of an architect who was obsessed by their effortless beauty and offended by the callousness with which most architects treated their presence (Grima 2017).

BETWEEN REALITY AND ABSTRACTION: JUNYA ISHIGAMI'S DESIGN ARCHIVE

More real is the Terrarium interpretation made by Junya Ishigami in his project *Art Biotop Water Garden* developed in 2018, in Tochigi (Japan), which relocates an existing forest to an adjacent site; originally, the area was a densely wooded *satoyama*⇑, which was to be transformed into a luxury villa complex.
Ishigami draws specific shapes of trees and ponds for this uncanny garden, where trees are moved and rearranged into a new composition. Bright spaces appear between the 318 unique tree shapes and 160 thoughtfully designed ponds between each tree. Ishigami creates a mysterious landscape where the selected species – beech, oak, canine cherry – coexist with the water thanks to an artificial system of pond waterproofing.

The Art Biotop Water Garden demonstrates its charm precisely in the ambiguity that separates and unites the natural and the artificial: a thin line that Ishigami delicately crosses in the conception and construction of this garden. The natural organic harmony of tree foliage and overlapping silhouettes contrasts with the artificial arrangement of plants that follow a precise pattern, designed by Ishigami, and intertwine with the pond system, representing a completely artificial landscape. The garden builds a delicate and fascinating relationship between the sinuous geometries of the water islands and the main verticality of the trees planted on them (Yoneda 2021).

Moving the existing tree species was a delicate and very complex operation, carried out with the help of special machinery – only two of which can be found in Japan – that can move four trees per day. The artifice constructed by Ishigami is extremely interesting because it builds a living archive – a garden – made up of species placed to construct a faux-natural landscape. Indeed, as mentioned earlier, the species transported in the garden (beech, oak, canine cherry) could not coexist with water in a natural environment, which is why Ishigami uses a pond sealing system that allows this coexistence and enables a new relationship between nature and water that has never existed before.

Ishigami's project raises profound questions related to the transformation of nature by humans; it is evident that, thanks to modern technology and experiments conducted in various fields, it is possible to intervene in the natural environment, creating increasingly artificial and controlled landscapes (Ishigami & Associates 2019). Art Biotop Water Garden shows how detailed and conscious landscape design can help intertwine and merge the natural and human environments in increasingly interesting ways. Ishigami constructs a series of precious drawings to describe the choice and arrangement of species for the Water Garden. As in Leonardi's work, drawing is a tool for constructing a precise archive to describe the delicate forms of the garden and the intersections between water and nature. The refined designs produced by Ishigami, in particular the different layouts of the garden and its elements, describe the balance that is recreated between vegetation and water. Alongside the plans showing the artificial design of the ponds and the location of the trees, Ishigami builds a list of the drawings of all 318 trees that have been moved and reintegrated into the new water garden. This catalogue of tree drawings has an illustrative and pseudo-scientific character (Yoneda 2021) because what is really of interest is the root configuration of each species and the conditions that each tree needs to survive.

Ishigami's concise planimetric representation reduces the trees to abstract points, circles immersed in a series of organic forms – the ponds –, while the anatomical thorough examination of the species is depicted very clearly in section, where both the size and shape of the roots and the shape of the different treetops and crowns are illustrated. The construction of the Art Biotop Water Garden demonstrates how the close collaboration between architects, landscape architects, gardeners and arborists is necessary to build the right balance between plant geometry and botanical and hydrological knowledge, which is essential for species' survival.

Compared to traditional Japanese gardens that change with the passing of time and seasons, time is suspended in the Water Biotop Garden. The trees' foliage cannot grow too much, or in an uncontrolled way, to avoid unbalancing the free space left between the trees, and precisely drawn by Ishigami, or so the view of the landscape is not obstructed. The garden results from rigorous maintenance work by skilled gardeners caring for the plants and their geometric form.

TIME AND LANDSCAPE: THE CHANGING LANDSCAPE OF THE LOUVRE LENS GARDENS

Time is the element that unites – in different ways – the three projects that are the subject of this paper and the different forms of archive that have been imagined, planned and designed.
Creating a landscape that crosses time is the objective of the garden for the Louvre Lens Museum, designed by Catherine Mosbach, in 2014; the architecture-landscape built for the SANAA project stands on the remains of a previous railway track. Here, the abandoned rails were the niches of a new decolonization, based on vegetation, resulting in a pioneer forest to the west and native plant corridors along the rider seams.

The new museum built in Lens by Kazuyo Sejima and Ruye Nishizawa constructs the landscape (Rocca 2013) and merges with it, thanks to the reflecting façades of the buildings that draw ethereal, light and almost evanescent spaces in total contrast to the monumental symmetry of the museum's main building in the Palace du Louvre, Paris (Jacob 2013). The new museum is located on a coal mine site, decommissioned in the 1980s, and respects its layout through establishing five volumes arranged as a cluster, a cluster of separate buildings that are linked to one another in topological ways (Rocca 2013). The volumes are adapted to the site's gentle, wave-like slopes and the museum is broken up into long, winding volumes that slightly bend and follow the traces of the existing railway track (Sejima, Nishizawa 2015).

Louvre Lens, garden landscape, aerial view.
Credits: ©Philippe Frutier ©adagp, 2014.

Louvre Lens, Garden.
Photos by Iwan Baan, 2012.

It is, however, the creation of the garden that surrounds themuseum that provides a balance to the system of transparent and plastic volumes designed by SANAA. The garden, designed by Catherine Mosbach, welcomes and preserves the spontaneous vegetation on the site, which has grown over the many years of abandonment, proposing a regenerative scenario where the choice of different species determines a changing and refined landscape. In the landscapes designed by Mosbach, different conditions coexist, such as clearings, wooded meadows, soil perforations, and draining stones that reduce environmental dust, where visitors are intrigued and urged to explore (Mosbach 2019).
The aerial view of the Louvre Lens site shows how the coal industry has shaped and designed the areas, in particular it is responsible for the differentiation of areas for the production and transport of materials, as well as the clustering of living spaces. It is clear that the mining economy has indelibly left a mark on these places and, for this reason, Mosbach's project appears very valuable because it recognises the memory of the past – and of the abandonment – that has defined the character of these environments. The park thus represents a system that accommodates within it the site's different souls and, at the same time, serves as a backdrop for the exhibition volumes that are developed on different formations and that overlap in small places, which determine the transitions between one space and another (Mosbach 2019). The garden's design is established by different landscapes that alternate and follow one another throughout the development of the park and allow the visitor to take a highly variable, articulated and unpredictable journey throughout time. Three main points open up at the north and south ends, allowing the park to be crossed quickly from east to west along its entire length; these points follow the old railway. Other minor routes, paths and short crossings, on the other hand, invite you to linger longer in the different areas, forests, flower meadows, esplanades and bodies of water (AA.VV. 2017).

The soil's surface is perforated with draining stones, which become mineral deposits and are the preferred substrate for the growth of mosses that trap heavy metals in the soil and reduce dust in the environment. The perforations in the mineral surface of the garden ensure a gradual transition from the flowery glades to the mineral surfaces, which are densely packed around the museum and allow visitors to enjoy the spaces.
The mining past and the sandstone deposits that are already present have, over the years, become a preferred haven for the growth of a diverse flora.

The construction of the museum had a limited impact on the species that had colonised the area, thus preserving the biodiversity that had developed over time. This has made it possible to preserve valuable plant species, particularly rare in northern France, that had grown on railway tracks, such as astragalus glycyphyllos and mullein [7].

The structured vegetation added by Catherine Mosbach alternates between grasslands and gardens of memory that recall the carbon cycle, fields of tall bundles of grass arranged along to the plot's long side and that cross, instead, paths of mown grass; while at the edges of the site we find the densest part of forest. To call Mosbach's garden for the Louvre Lens a terrarium may seem risky, but hers is an experiment that harmoniously accommodates, and in a single design, very different species and helps preserve species that are increasingly rare. Mosbach's landscape reminds us of the passing of time, the fusion of past and present and the need to preserve the biodiversity of places. The idea of narrating these different passages of time is, in itself, the construction of an archive. As, in part, does Ishigami who, instead, places the – often invisible – boundary between the artificial and the natural at the centre of his design in the construction of the landscape, constantly moving between abstraction and reality. Finally, Cesare Leonardi's fascinating work is perhaps the most literal interpretation of Terrarium, a reasoned and designed collection of species, which is, however, subject to the passionate choices of the architect who freely chooses how to compose their archive, with which species and how to represent them. Leonardi and Stagi's manual is an extremely rich piece of work not only because it reminds us that design cannot ignore its elements but because it still represents a valuable legacy for the future of landscape.

Time, abstraction, and drawing are the hallmarks of the interpretations of Terrarium chosen for this paper. Although designed and drawn at very different times, each tells of the need to know, intertwine and merge landscape and architecture through continuous references and suggestions.

[1] The Treccani dictionary defines an archive as: a collection of private or public documents relating to a person, a family, a municipality or a state. Reference is made to: https://www.treccani.it/vocabolario/archivio/ [accessed 25 August 2023].

[2] The thesis, written under the supervision of professor Leonardo Savioli at the University of Florence, focused on the area that will later become the Parco della Resistenza, and designed its green landscape.

[3] The exhibition *"Cesare Leonardi - Strutture"*, curated by Joseph Grima and Andrea Bagnato and held at Villa Croce, Genoa, from 18 February to 9 April 2017, explored the relationship between structure, architecture and landscape design in Leonardi's work.

[4] The term *Satoyama* literally means "village and mountain", but the word indicates a particular type of landscape and place that indicates the border zone between forests and agricultural fields.

[7] Reference is made to the description of the Louvre Lens project and Catherine Mosbach's garden on the museum's website: https://www.louvrelens.fr/le-louvre-lens/architecture-et-parc/ [accessed 25 August 2023].

TERRARIA. AN EXPERIMENTAL GRAMMAR OF SOIL CONTAMINATIONS

MARGHERITA AUTORINO

> As the Wasteocene logic reproduces wasted people and ecosystems, any alternative project cannot be anything less than a multispecies liberation alliance. (Armiero 2021)

A terrarium is a miniature landscape project: the definition of a circumscribed space aimed at the apparently controlled containment of a specific ecosystem and the contemplative observation of its vital movements.

The name terrarium misleads one into thinking that the object of interest is the soil itself, in Latin *terra*. In truth, it is what happens between and of the parts of the contained substrate that arouses infinite wonder: the chemical-physical transformations of matter that allow the progressive activation, multiplication, and replacement of life forms.

This experiment stems from the intuition that in every soil, even the most bituminous and monstrous urban waste, there is a biological, ecological, and aesthetic potential to be expressed. The aim was to test and compare, all conditions being equal, the *happiness of existence* (Clement 1991) and the micro-architectural complexity of an urban waste soil and a commercial one.

The design action consists simply of building three identical containers and planting the same seeds in different combinations of the two soils. The rest is waiting, with almost no maintenance but systematic documentation. The design posture is humble and courageous at the same time: the provision of certain structuring elements to trigger and observe a process whose development is the negotiated work of several authors, human and non-human. Traces of unexpected, situated, and always eloquent vitality are witnessed, even when minimal; the terrarium is an instrument to amplify its diversity.

If this were a truly scientific experiment, it would require a significant disciplinary (e.g., pedological, biological, photographic) and economic apparatus, as well as a certain programmatic-executive rigour and quantitative-dimensional copiousness.

Nonetheless, the interest of this device lies precisely in its prototypical uncertainty, because it is contingent and therefore real, and because a process composed in this way constitutes a possible response in the contemporary quest to redefine the no longer binary relationship between man and nature, between project and landscape. The partial loss of control can be a co-creative stimulus instead of inhibition, a space for "a multi-species liberation alliance" (Armiero 2021).

SITE

At the edges of the large open space of the Ex-Mattatoio in Rome, spontaneous gardens emerge seasonally, often unnoticed.
The project is located along the inner perimeter of the boundary wall, in a de-paved portion facing east, framed by wooden planks and protected by the foliage of a young olive tree.
Photo by Margherita Autorino, 2023.

TRIGGER

Boxes

Three identical Plexiglas parallelepipeds open at the top, with minimum handling dimensions (50x25x12 cm). Waterproof, to retain moisture. Transparent, so as not to filter light or especially the observer's eye.

Soils

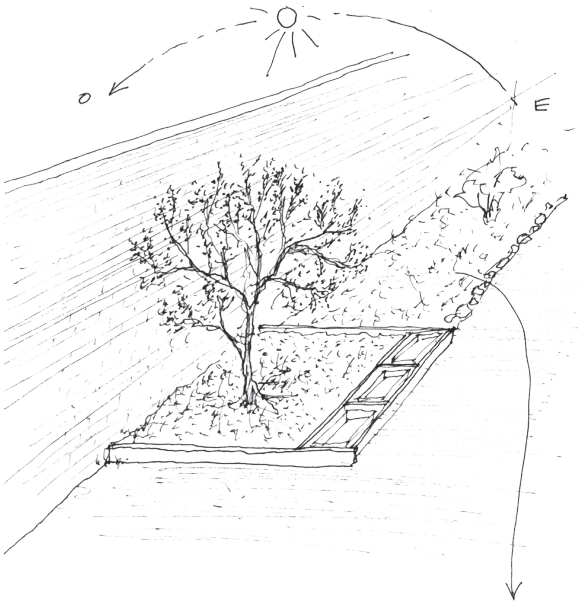
20l of urban waste soil, found on site (aggregates, sand, organic matter, asphalt). 20l of universal garden soil, purchased (neutral sphagnum peat). The two soil types converge in three combinations, in order top-down in the image: a poor and draining one, exclusively waste soil; a rich and compact one, exclusively topsoil; a mixed one, half of both types.

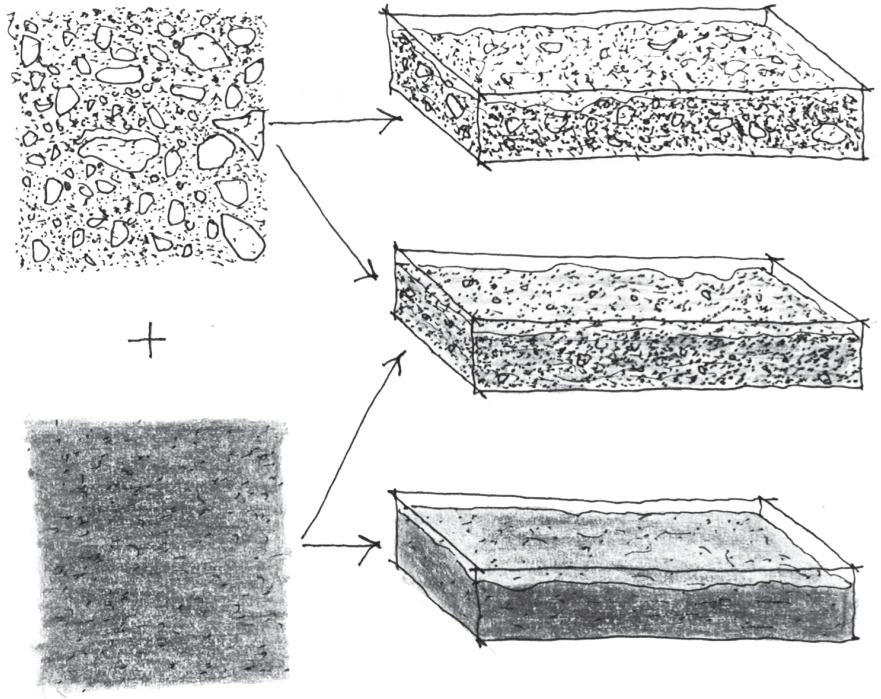
Grains

Explosive composition of herbaceous perennials, biennials and annuals, melliferous and cosmopolitan.

Borago officinalis, Calendula officinalis, Echium vulgare, Hypericum perforatum, Lotus corniculatus, Medicago lupulina, Melilotus officinalis, Onobrychis viciifolia, Phacelia tanacetifolia, Salvia officinalis, Sinapis alba, Trifolium incarnatum, Vicia villosa.

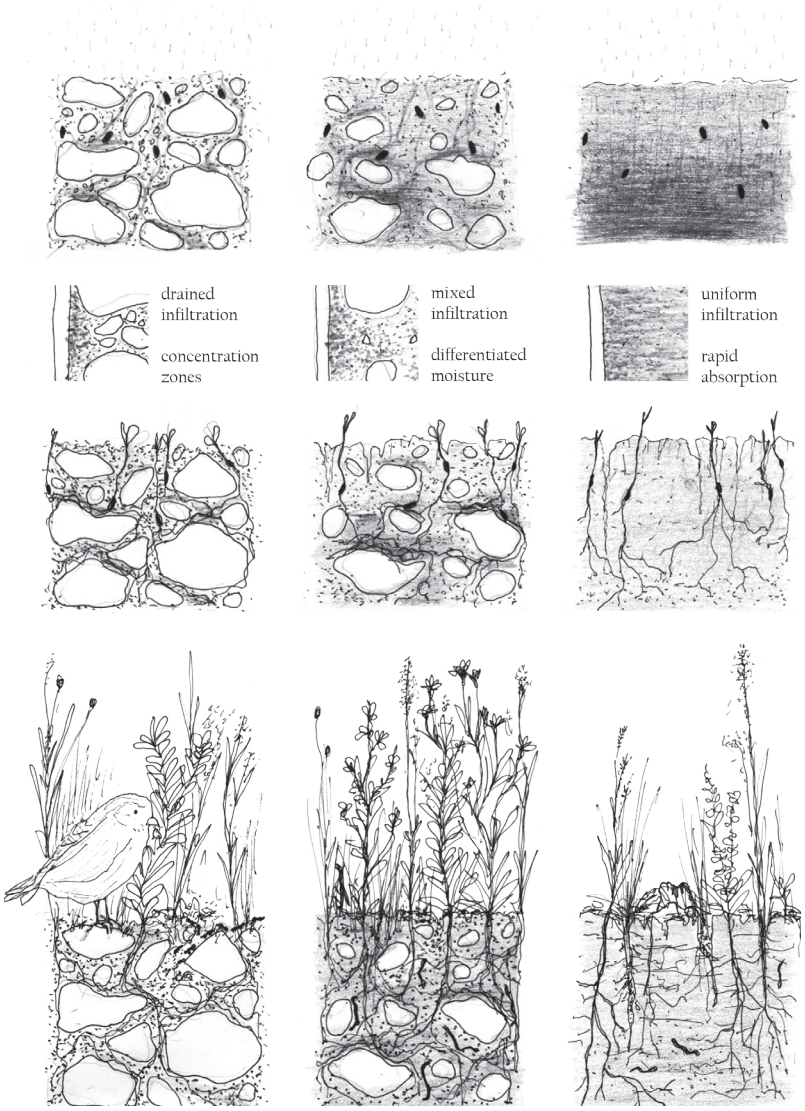
Drawings by Margherita Autorino, 2023.





ECOLOGIES

The composition of each soil favours different chemical and physical dynamics of moisture and nutrient distribution, thus encouraging specific settlements. The large and numerous aggregates of waste soil (left) create differentiated drainage and a system of cavities and accumulations. The homogeneity of universal topsoil (right), on the other hand, produces uniform absorption, which, combined with abundant nutrients, generates a fertile and short growing cycle. Plants, insects and animals are distributed according to the most suitable conditions. Drawings by Margherita Autorino, 2023.

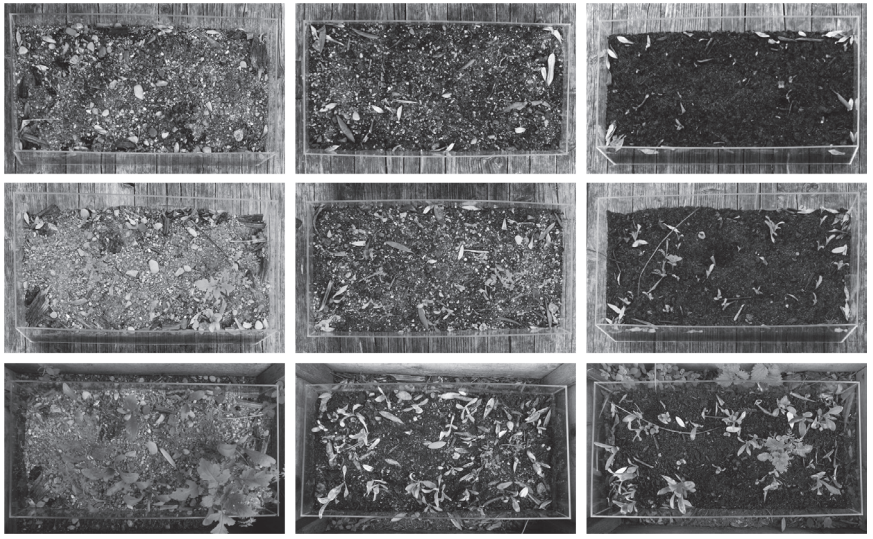


TIME

Pictures were taken every ten days during spring 2023.
In order, from left to right: waste soil, mixed soil and topsoil.
Photos by Margherita Autorino, 2023.

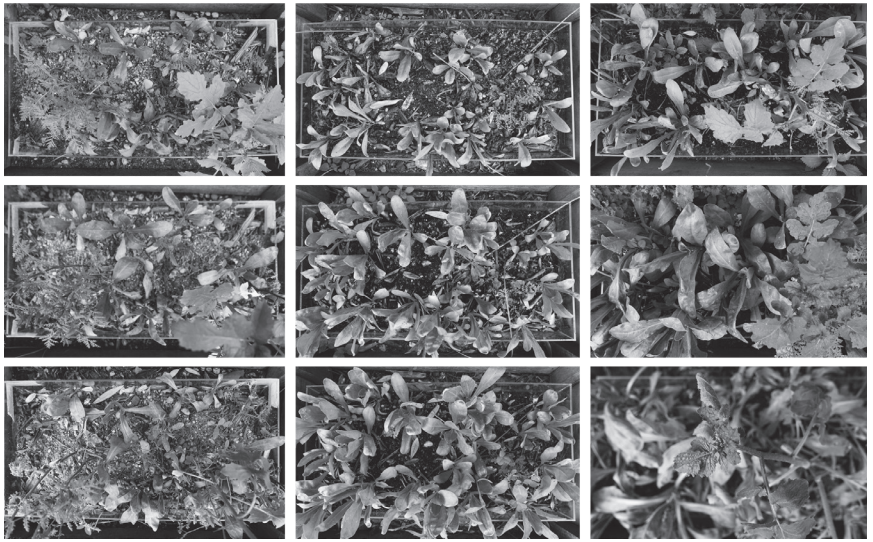
April

The first germination phase, after the rainy month, is already diverse. In the waste soil, a *Sinapis alba* and a *Phacelia tanacetifolia* stand out slender and solitary. The mixed and topsoil produce an even and slower distribution, mainly of *Calendula officinalis.*



May

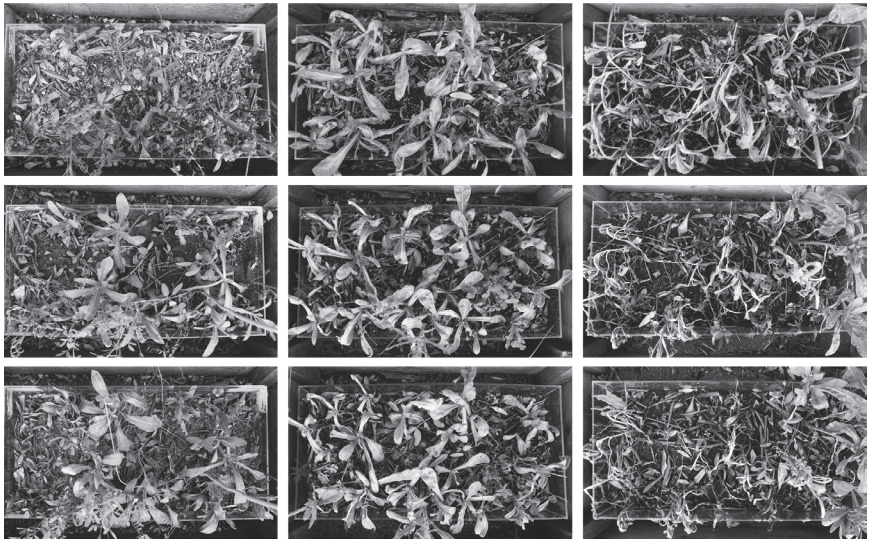
All three terraria explode. Everywhere the area covered by vegetation exceeds the bare one. A few species use the others for support and protection: *Echium vulgare* and *Vicia villosa* in the poor soil, *Trifolium incarnatum* in the mixed, *Salvia officinalis* in the rich. All around, the olive tree drops a few leaves to mulch the surface, nettle, *Euphorbi*a, and ants take up space, who knows if *Bituminaria bituminosa* will also...



June

The first forms of decay, especially in topsoil. It is all decomposing organic matter, food for other species.

Some, such as *Melilotus officinalis* in waste soil, are biennials or perennials; they will only partially decay, enter a state of dormancy and re-emerge after the adverse season.

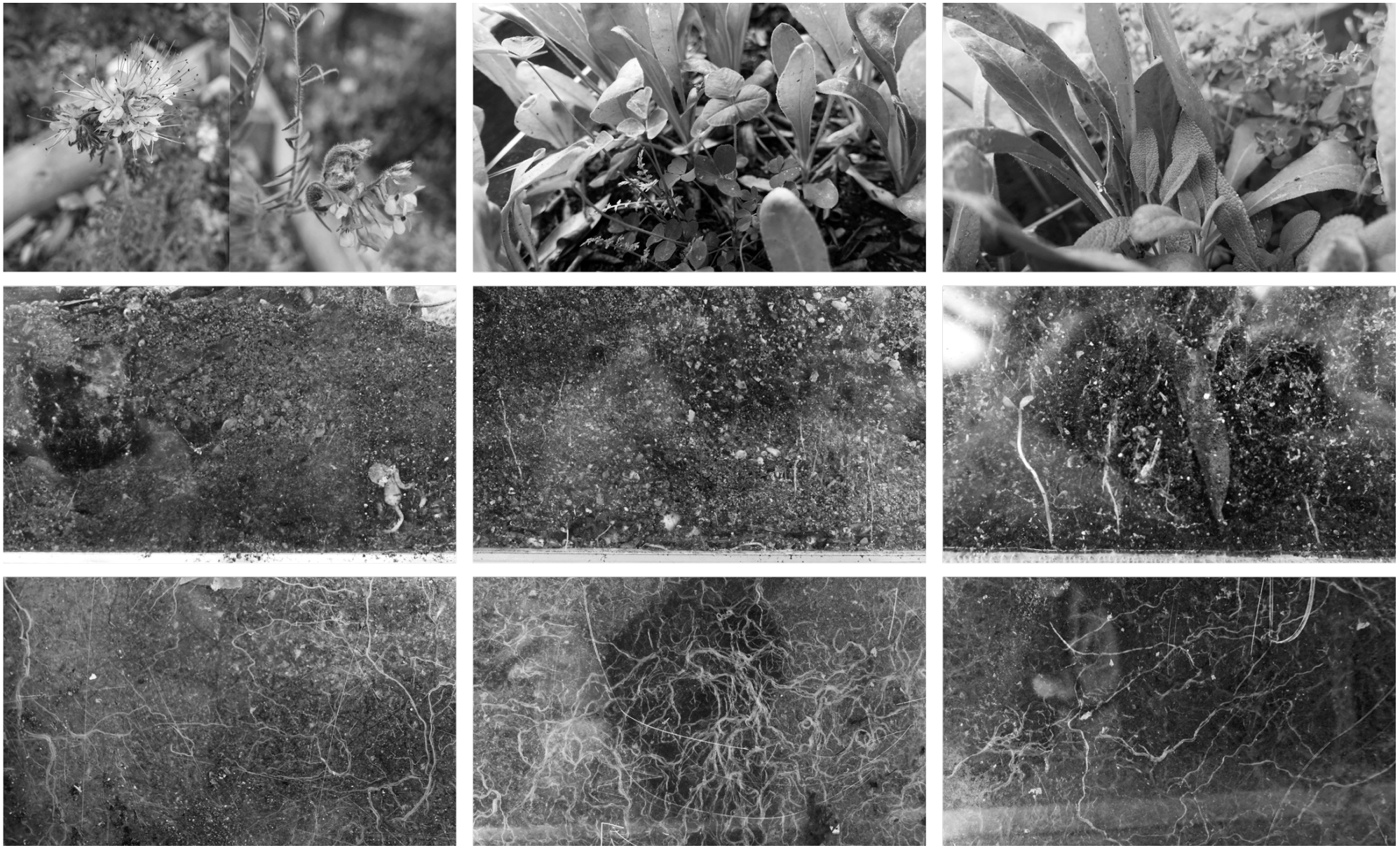


ARCHITECUTRE

The most spectacular result is the microscopic spatial one. In the first case a monumental composition, the most thinned and the most flowering (in the picture *Phacelia tanacetifolia* and *Vicia villosa*) as well as the most diverse in depth: large cavities, with their relative reserves of moisture, are true caves with moss beds; elsewhere, large buds are preparing for future hegemony. In the second case, a discrete hypostyle hall at the surface (in the picture *Calendula officinalis, Trifolium incarnatum, Phacelia tanacetifolia*), supported by a dense, branched root system at the very bottom. Finally, in the third case, a layered arrangement of clumps on the surface (in the picture C*alendula officinalis, Salvia officinalis)* proves ephemeral at depth, where thin linear structures float.

Each condition has generated a specific ecology and architecture.

Photos by Margherita Autorino, 2023.



DEBRIS TERRARIA. BERLIN AND ITS VOID ISLANDS

SARA ANNA SAPONE

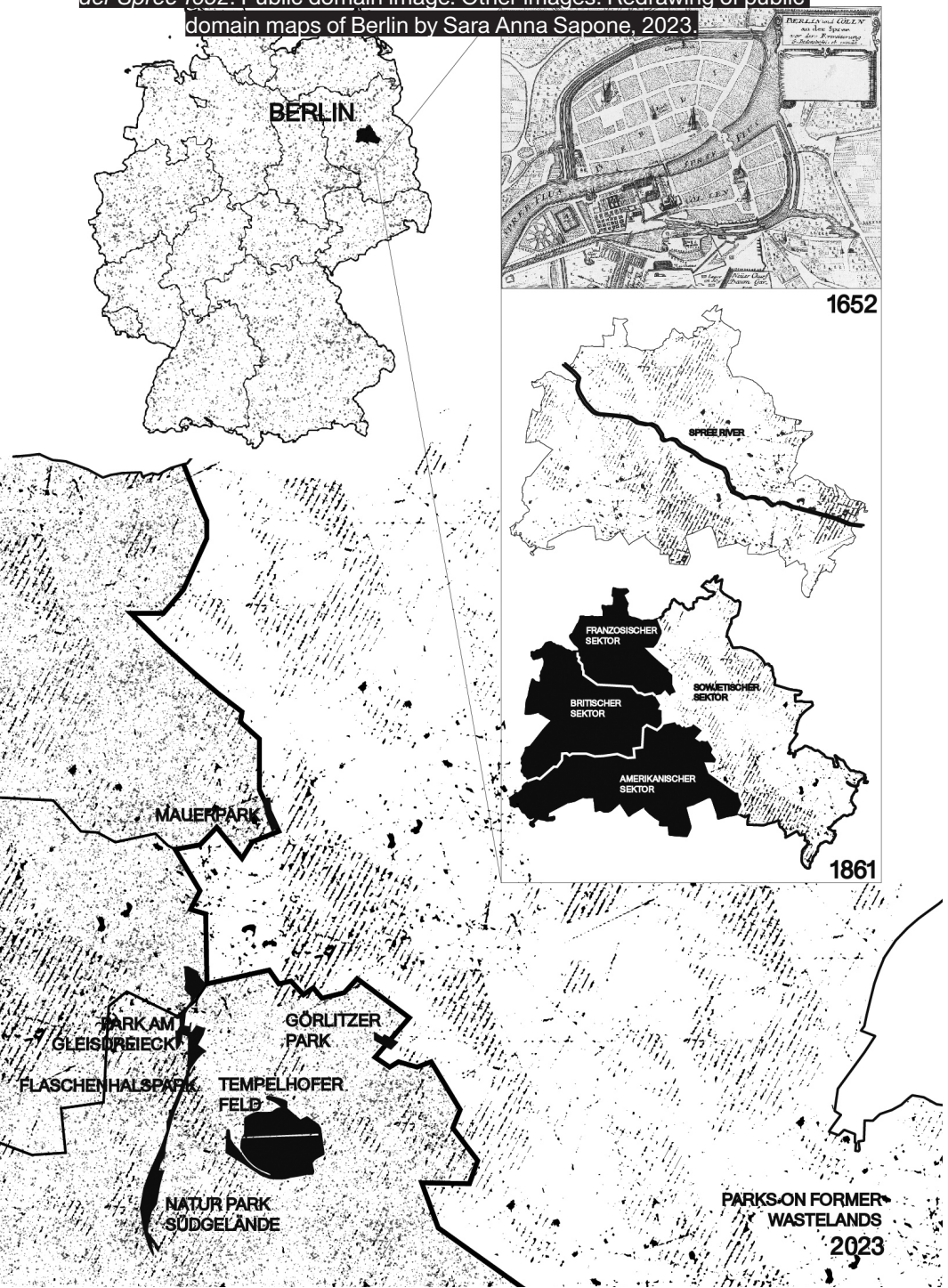
BERLIN AND ITS ISLANDS

Berlin can be seen as an island city and a city made of islands. This is due to manifold aspects rooted in its geography, history and socio-political conditions.

On the territorial scale, this German city is enclosed by territories with a fundamentally different character and vocation, the Brandenburg region, to which it doesn't belong to as a City-state with a vast hinterland and high population density. Berlin is also fragmented in itself. Since its foundation, it has been divided by its river, the Spree. In time, it was further split in two halves as result of the Second World War aftermath and the construction of its infamous wall. It separated the East from the West and was destroyed only in 1989, still leaving its mark on the city's development to this day.

On an even smaller scale, Berlin is an enclosure of islands of absences, a constellation of smaller lands with uneven edges, leftovers of wartime destruction and lack of transformation pressure. In fact, in the aftermath of the war roughly 28,5 sq. km. of the city's surface was covered in debris and left with an uncertain future. To further complicate the matter, the division of the city between the Allies and the Soviet Union meant the migration of a considerate portion of citizens and the abandonment of countless facilities. The reusable debris and construction materials were implied in the reconstruction, and the unusable ones were destined to be stocked outside the city, mostly constituting the place currently known as *Teufelsberg*. This mound, higher than 120m, is nowadays a thick forest entirely composed of the debris from West Berlin, an altered landscape that appears like a regular forest. A mountain of waste on the outskirts of the city that is perceivable as a nature reserve.

The *rubble lands* that stayed untouched within the city had a different destiny. For these places, the development need was mainly very little due to dire political and economic conditions. The debris and destruction left by the war were generally cleared out without establishing new functions or future plans, leading to the development of spontaneous vegetation allowed here to thrive. Such spaces can be regarded with various names, wasteland or leftovers, *unoccupied and uncultivated land* with a generic negative connotation (Gandy 2013, p. 1302), emphasizing their nature of former anthropic land, now void of use or purpose and left polluted or heavily altered from an ideal original state. However, we can also look at them in a positive light, regarding them as *Third Landscapes* (Clement, 2005) spaces of potential for cities where nothing is yet decided or as *Terrain vague* (Solà-Morales 1995, pp. 118-123), *non-places* in wait to become something else.



Berlin and its Islands. The geographical and historical context. Top right: Grundriss der beyden Churf. *Residentz Stätte Berlin und Cölln an der Spree 1652*. Public domain image. Other images: Redrawing of public domain maps of Berlin by Sara Anna Sapone, 2023.

Notably Sola-Morales specifically cites Berlin to define this notion, recalling the condition of Alexanderplatz in the bombing aftermath to describe how these places are formed and transformed by society. These "unproductive" plots are vacant areas with no apparent use but hold significance in relation to their palimpsest or acquired meaning linked to the appropriation and engagement for local communities of humans, animals and plants alike. In Berlin these places are addressed with the specific name of *Brachen,* a word that literally means fallow land.

> *Stadtbrachen* emerged in Berlin after the massive bombings and the destruction of huge areas that could not be quickly rebuilt, impossible financially and not urgent. There was plenty of space. The ruined space became the *Brachen*. How could it be translated in English? Wasteland? No, because *Brach* in German is linked to agriculture, is referred to untilled soil, a field that is left fallow.
>
> Extract of the Interview with Hanns Zischler in the movie (Natura Urbana-The Brachen of Berlin 2017)

However, unlike anywhere else, there was an overall fascination towards these forgotten lands, unlawful places for nature to develop and people to enter.

In Berlin exist two main types of areas of neglect: the ones generated by the destruction of the Second World War and the ones temporarily void of function. This condition was possible due to the lack of development pressure, abundance of space and lack of inhabitants in the wartime aftermath. The permanence of these *stillgelegt* places in Berlin is unique, decommissioned areas still in time, places untouched for decades where nature is allowed to stay throughout the city, that making its distinctive character.

These spaces involuntarily became ground for nature reclamation, unique assemblages of local and adventive taxa and species, open-air terrariums studied by scholars, interpreted by artists, enjoyed by citizens and transformed by designers.

Furthermore, the architectural debate reflected on the city and its island, but with a different outlook. This is shown in the Manifesto *The City in the City. Berlin: a Green Archipelago* ⅄ (Ungers *et al.* 1977), which reflected on the condition of Berlin in 1977 facing the mentioned issues of depopulation.

In this frame, the city was understood as a collection of built islands, focusing on chosen fabricated plots to be consolidated through architecture, surrounded by undefined spaces, advocating for the need to rethink their edges instead of further expanding the city.

Looking at Berlin from Teufelsberg.
Overlay of an historical map of Teufelsberg's topography in 1969 and a photo from the US listening station by Sara Anna Sapone in 2016.

In the figure of this *archipelago* lies an overall strategy, an ordering principle that allows the coexistence of programmed decommissioning surrounding these islands, consolidation of the existing and planning for the maintenance of the territory (Protasoni 2022, pp. 37-41).

In this vision what is represented as solid, the islands, is what is built whereas its *Brachen*, the unbuilt, are represented as white space. The mentioned mappings of the ecologists can fill these voids with data, potentially complementing the archipelago vision with aspects that can play an active role in the city in relation with their ecology and development trough time, with a time and space dynamic unlike the one of constructed grounds.

MAPPING AND TRANSFORMING VOIDS – ECOLOGY, LANDSCAPE AND ART

There is an inherent fascination towards the flora growing in the aftermath of decay. This has been experienced in various territorial contexts and times, like for the aftermath of the bombed areas of London (Salisbury 1943), the one of the atomic bombs in Japan♾ or even the ecology of post-atomic wastelands of Chernobyl (Marder and Tondeur 2016). Ruins have the potential to stimulate creative power, push for a shift in established mentalities and change the way we perceive the world around us and its future. What made this tension stronger in Berlin was also a site-specific reaction towards the strict control imposed on society by its socio-political history, creating a yearning for the immersion in nature and unruled spaces. This can also be connected to the notion of *Heimat* (Eigler 2012, pp. 27-48), a sense of belonging traditionally linked to politics and defining property boundaries, that can also symbolize the special connection between the city's vacancies and its inhabitants. The latter tend to resist the potential disturbances to the traces left by the passage of time, both in the past and nowadays, building narratives to defend them and establishing new perceptual value.

Formerly, in the island city devastated by the war its citizens started to explore and enter its forgotten lands, after few years appearing as unexpected garden throughout the city. And this interest was widespread both for the artistic and scientific community alike. In this sense, it is particularly relevant to mention the history of Berlin's School of ecology and its role in protecting the *Brachen* of Berlin. Their recognition and inscription as areas worth preserving went through extensive lobbying and discussions between citizen and public authorities, following the abandonment stage and the renewed development pressure during the 1980s.

Since the 1960s, Herbert Sukopp, founder of the school, and other ecologists started to explore and document the urban flora, before being disregarded as object worthy of study in favour of naturally occurring habitats, shifting now the focus on man-influenced environments (Kowarik 2022, p. 141).

Instead, they considered the city of Berlin as an *"open-air laboratory"* where they could document the debris floristics and the plants that happened to colonize former anthropic lands altered by the Second World War or neglect. The *Brachen* were used as experimental laboratories that allowed monitoring without external pressure from the presence of local and adventive species, and their interplay in such unique environments.
In the 1980s, the Berlin School of Ecology mapped 142 significative wastelands in West Berlin as "biotopes dominated by wild nature"(Kowarik 2022, 139-145)⇓.

The importance of their discoveries led to the establishment of a new subfield, Urban Ecology (Gandy 2022, p. 91). Throughout the mapping and catalogue work with more than 6000 surveys in west Berlin, they were able to demownstrate how the city is a mosaic of different biotopes, with specific ecologies, ordinary plants with unlike assemblages, with a higher degree of biodiversity than many wilder or countryside environments (Sukopp 2003, pp. 295-316). The importance and role of local and adventive species was questioned, also engaging with the complexity of ordinary landscape as something to study and protect for its unique assemblages of flora and fauna and, ultimately, its role as cultural landscape withholding the site's anthropic past. In this frame, ecologist Ingo Kowarik defined a new concept that will also be very influential for the future city's transformation, the notion of *Fourth Nature.* Moving in the cultural debate around the anthropic understanding of nature, he built upon existing categories, spanning from the *first nature*, pristine wild space without human interference, to types of nature that see a progressive anthropic influence, with the *second nature* as productive land or agricultural fields and *third nature* linked to gardens or cultural artefact (Hunt 2000). To these he added *fourth nature,* the type of nature that emerges unpredictably from industrial remains, such as those developing in Berlin's post-industrial spaces, a unique mix of alien and native species formerly disregarded but crucial for the urban flora (Kowarik 1995, pp. 45-55).

The importance of urban ecology also entailed a political stance, opposed to the nativist and antiurban approach of traditional ecology, linking urban spaces to their specific socioecological dynamics.

Experimental maintenance techniques.
Signs and grazer in the Gleisdreiecke Park and the Tempelhofer Feld.
Photos by Sara Anna Sapone, 2022.

Former Brachen Tranformed into urban Parks.
Current pictures of three parks in Berlin (Park am Nordbahnhof, Südgelände and Gleidreieck Park) and the different solution to shelter nature conservation areas (fences, elevated path, signs). Photo by Sara Anna Sapone, 2022.

So public spaces could also host different nature types and uses, allowing less rigidly defined programs and planting design, accepting the unexpected flow of natural dynamics and working with it instead of against. Their work was also strictly connected to social engagement and political lobbying, to discuss the regulations at the time and inscribe also urban nature as worthy to preserve and not anymore as a weed problem to eradicate.

This became paramount at the end of the century, when the city was finally willing to reclaim its voids for new functions. To do so, it was going to completely erase the complex ecosystems developed there, which were considered unlawful since they did not fit the planning tools at the time. The debates between concerned citizens, ecologists and the city council were able to shift this mentality, bargaining the permanence of spontaneous nature in certain areas. However, this led to the sacrifice of some of these biodiversity hotspots, a tradeoff between plots more or less appealing for development, like in the case of Lützowplatz, an unassuming plot that was nonetheless the first place of urban flora documentation in 1953 and a model site for the Berlin school of ecology, transformed into a hotel (Gandy, Jasper 2020, pp. 18-21). Another area that was a recurrent object of study was Schöneberger Südgelände, a former freight station abandoned in 1946 that ended with an opposite fate. Here ecologists were able to carry out extensive mapping campaigns throughout the years⋀ that helped to advocate for its inscription as natural conservation area in 1994, fighting the will to reconvert it in infrastructural space at the beginning of the 80s. Another aspect that made it possible was the consideration of the site as compensation for the closeby Potsdamer Platz, more economically appealing to investors. Thanks to the cooperation between public authorities, ecologists, artists and landscape designers a new type of park was conceived, a hybrid between a natural conservation area and fourth nature, protecting biodiversity whilst allowing human access. A pivotal aspect of this place's success lies in its interplay with art, which creates moments throughout the park to observe natural dynamic and makes the place perceived as cared for. The key for this park, and many other successful interventions in Berlin, was the interplay between natural preservation and accessibility for users, considering ecology as a driver for spatial design, whilst using art as mediator ⅃.

The acknowledgement of ecological succession and the spatial condition it entails, with open areas, thick forests and in-between patches, creates interesting views throughout the

The preservation of Fourt Nature in the Südgelände *Park.*
Former railyard transformed into park devoted to the preservation of urban nature. Picture of the eleveted path and the viewpoint ideated by the artist group Odious. Photo by Sara Anna Sapone, 2022.

park, with quieter or more socially active parts that contribute to its success, both for public uses and biodiversity preservation. Overall, at that time many other transformation projects for former infrastructural areas or smaller plots were channelling this view with more or less successful output, both in relation to art and in giving more or less space to nature preservation, with formal or informal interventions. These *Terrains vagues* also contribute to higher urban floristic diversity, acting as connective habitats and providing sources of plant species to colonize newly vacant sites (Mariani, Barron 2013, pp. 1-24).

They also can imply cost-effective creation of biodiverse green spaces, fostering space justice in accessing green spaces and the provision of valuable ecosystem services, like CO^2 sequestration, heat island effect reduction, phytoremediation and human well-being thanks to biophilia (Kowarik 2023).

Finally, the ecologist's interest in these voids was paramount in shaping the city's transformation, considering that the mapped biotopes ended up shaping the Landscape program of Berlin since 1988, with guidelines for biodiversity preservation and the development of open spaces (Kowarik 2022, p. 143). Overall, the constant experimentation with the maintenance of the city's green spaces, that aims for biodiversity protection is notable. This is also due to the creation of a dedicated entity, Grün Berlin, in charge of the upkeep of such places [4]. The latter manages most of the city's public spaces, among which the Südgelände Park, Gärten der Welt, Park am Gleisdreieck, Tempelhofer Feld and many others. In some of them, like Tempelhof and Südgelände, they are experimenting with alternative maintenance techniques that are less impactful on the biotic community, like the use of grazers, minimal pruning intervention and mowing with rotational techniques. In many of these places there are areas dedicated to biodiversity protection, with different devices designed to protect them: in some cases in the form of walls and fences, like in the Park am Nordbahnhof, in others separated through elevated paths, like in Südgelände, or simply indicated by signs, like in Gleisdeieck or Tempelhofer Feld (Fig 04). Some have been proven more effective than others, since it also varies according to the park extension and the maintenance funds, with the one in Südgelände more successful in terms of biodiversity preservation thanks to the combination of reduced size and careful maintenance.

Ultimately, Berlin was and is a unicum, both in relation to the sensitivity towards spontaneous nature and the political-economic background that supported it, with many designers that engaged with wilderness as material for design in its open spaces.

We are familiar with the notion of terraria as spaces for beauty, perfect reconstructed environments with a tailored setting to allow chosen assemblages of plants to thrive, for aesthetic, productive or scientific purposes.
If we think of them metaphorically as places, picturing them in the form of greenhouses or even parks, they become places of retreat and comfort, displacements within cities where we can rest and enjoy beauty. Here the development of something unpredicted, a plant spontaneously growing by chance, is usually regarded as a weed problem to eradicate, ruining a perfect tailored image of the place or controlled environment.

We tend to imagine these enclosed environments as ideal laboratories offering one singular result.

Nature is seen as a museum that we look at.

Berlin offers a different notion of terrarium: a place in the aftermath of destruction, where nature reclaims the anthropic use and humans observe it from the outside, expecting the unexpected both in time and space dynamics. It is an experimental ground to make discoveries and test new theories, both scientific and in relation to experimental spatial practices.

These *Terraria* are not only made of plants and soil but have humans in them, reflecting on the anthropic influence on urban flora and the importance of conserving it.

In the contemporary age, to escape the anthropocentric outlook, we are realizing that we are and need to consider ourselves as part of our environment and that our worldview doesn't necessarily coincide with the one of the rest of the biotic community. With a certain given environmental condition, *Umgebung,* each species can interpret its ecosystems, *Umwelt,* differently (Uexküll 1934, pp. 5-80).

Looking at the biotic community, like the ecologists in Berlin, allows us to appreciate how animals and plants have different life rhythms, temporal scale as perceptive potential. We usually consider plants as still, but if we change our perspective possibilities through technological tools, like photographs or videos, we can appreciate their movement (Mancuso and Viola 2013, pp. 49-52). There is a potential today to evaluate and recognize even more on the smaller scale the presence of such spaces, engaging firsthand with wild nature and documenting it with our smartphone.

The *Brachen of Berlin* are therefore enclosed microcosms seen as testing grounds for ecologists, evaluating the anthropic influence on spontaneous nature to acknowledge the contemporary urban condition and predict the future of natural development.

Terrarium of Debris.
Former infrastructure conquered by spontaneous vegetation in Berlin.
Photo by Sara Anna Sapone, 2022.

In hindsight, looking back at their work today, they could also see which taxa were likely to spread and survive in the Anthropocene and the environmental changes entailed by climate change and anthropic contexts. An experimental terrarium where few information are known, like former uses, soil type, and sun exposure, whereas other are partially known or unpredictable, like seed dispersal paths, in an interplay between "natural and cultural determinants" (Gandy 2022, p. 225).

Therefore wastelands, or better yet *Brachen*, can also assume in other contexts the role of testing ground for the future city and its biodiversity, to evaluate and rethink our role on and in it. They can be landscapes under a magnifying glass, transformed through designs that tell a story about the past and the layering through time, about the future of urban flora and the indeterminate spaces within urban contexts, in contrast with the sharp edges of modernity.

This Manifesto was the result of a summer workshop of 1977 held in Berlin by the Cornell University. Here Ungers, together with other colleagues, presented their vision for the polycentric city, focusing on the interplay between the built and unbuilt in the shrinking city, after the depopulation phenomena as consequence of the wartime. The emphasis here was on the role of architecture to shape and sharpened the built environment, leaving what is outside its action as less ordered and organized, a space for decommission and nature.

A relevant instance in this sense can be found in Arata Isozaki 's collages in "The city of the future is the ruins", part the XVI Triennale exhibition of 1968 *Electric Labyrinth*. Here he combined traditional Japanese cultural imageries with pictures of the atomic bombs in Hiroshima, showing the displacement of the society in the aftermath of this tragedy combined with architectural utopias, potential for new futures.

The Biodiversity atlas, Kostler Biotoptypen Berlins, is still visible today and constantly updated as open access datasets. It collects the different biotope type in Berlin and their protection measures. It can be accessed at https://www.berlin.de/umweltatlas/biotope/ [accessed 15 December 2023].

Specifically, the first floristic campaign was carried by Ulrich Asmus in 1980 and then repeated in 1995 by Ingo Kowarik, as ÖkoCon, and the landscape firm Planland. See for more details (Kowarik, Langer, 2005)

Exemplary of this outlook is the quote on the park's entrance: *Die Kunst ist der nächste Nachbar der Wildnis.* Karl Ganser ". Meaning that Art is the closest neighbor to wilderness, linking metaphorically art as medium able to connect humans to nature.

For further info see https://gruen-berlin.de/projekte/parks [accessed 15 December 2023].

In fact, as stated by Ingo Kowarik in his interview with Matthew Gandy in (Gandy 2022, p. 225): "In the 1960s Herbert Sukopp developed a model that divided the city in zones to examine what type of vegetation would occur on what type of substrate. That was very innovative because we considered not only unusual and rare biotopes but also urban habitats as whole. We really wanted to find out where plants and animal existed, in what patterns, and the relation to climate, soil and water availability. We mapped the whole west Berlin through fieldwork [...] it shows that Berlin is a mosaic of different biotopes".

MACHINES

TRENCHES, WELLS, AND BOULLÉE'S PYRAMIDS

ALESSANDRO ROCCA

Ce genre d'architecture formé par des ombres est une découverte d'art qui m'appartient. (Etienne-Louis Boullée, *Architecture. Essai sur l'Art. Folio 87*)

TRENCHES ᛯ, WELLS ⍜, AND BOULLÉE'S PYRAMIDS

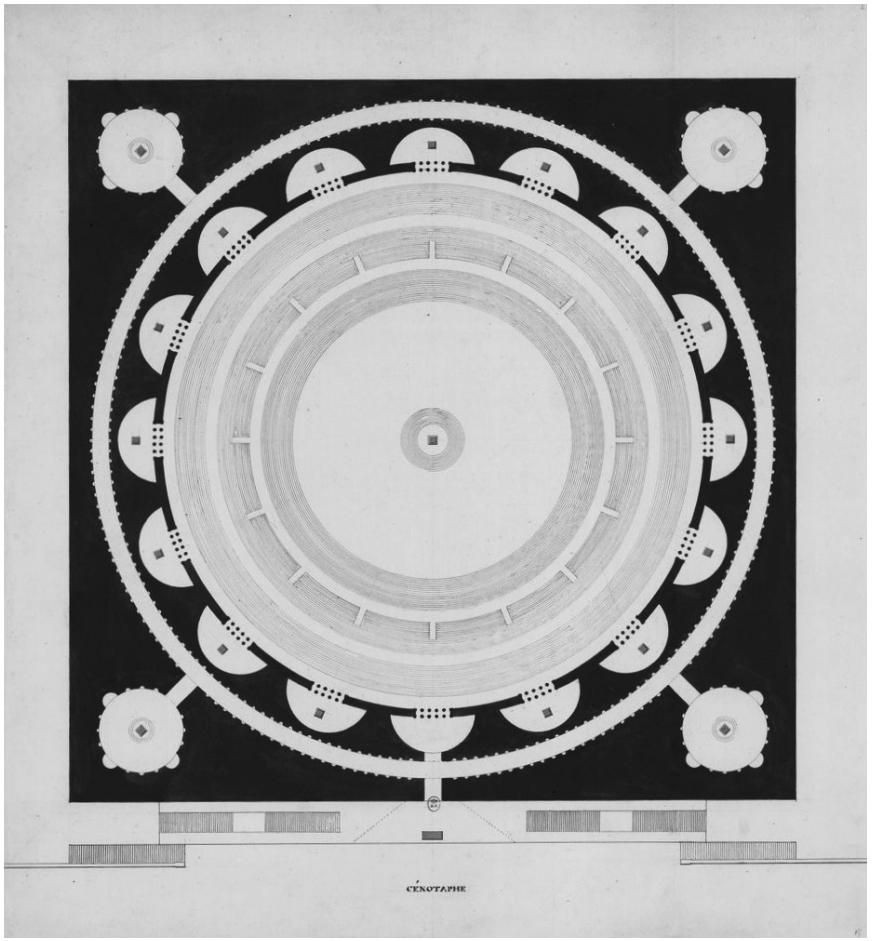
The Terrarium is a microworld, an artificial, controlled environment, where the architectural form's geometry and materiality define the climate, light, and space. Therefore, The Terrarium is an interior, a separate place where matter prevails over the void, where stereometry serves to exclude, seclude, isolate, and preserve. Adolf Loos indicated the tumulus as the most effective and synthetic representation of architecture, especially by two factors: the truncated pyramid section, which uses the property of the earth to remain stable until the slope of the wall exceeds approximately forty-five degrees, and the measure, "six feet by three" which contain the dimension of the human body⇓. In the Egyptian pyramids, the most impressive and exalted (Rossi 1967) interpretation of the Loosian tumulus, the first character remains, the inclination of the wall necessary to make the accumulation stable, while the reference to the human body (or corpse) is lost and replaced by the immeasurable relation to the greatness of the divine. The pyramids are enigmatic because they are among the few constructions in which the relationship between inside and outside is incomprehensible and can be intuited, but not revealed, only by advancing into the tunnels that cross the darkness of the enormous compact mass. Observing the section of the pyramid of Cheops (aka Khufu), one reads a slender network of paths and rooms that occupies only a minimal part of the uninhabitable volume. The corridors drive to three superimposed rooms: the king's and queen's rooms and an underground, unfinished room about thirty meters below ground level. The access path to the rooms forks shortly after the entrance: the upward path reaches the queen, and further up, the king, the descendant, takes to the underground and mysterious, unfinished room. Ventilation ducts take fresh air to all the rooms, crossing the mass for tens of meters and piercing the monotonous continuity of the external surface in hatches placed over half the height of the building.

The pyramid crosses the history of architecture with countless reminiscences and reinterpretations. One of the most interesting cases is the project of the *Cénotaphe de Turenne*, designed in 1782, where Etienne-Louis Boullée reformulates the enigma in completely reversed terms.

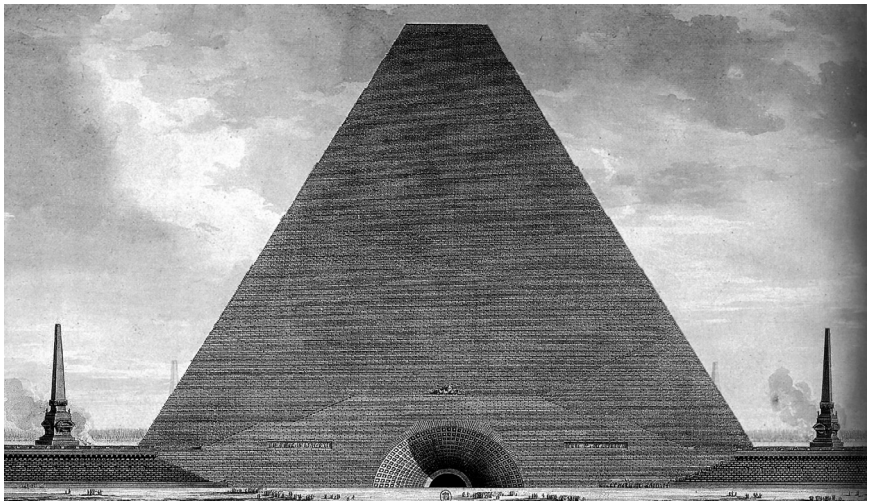
Proposed as an entry for a consultation launched by the

Etienne-Louis Boullée, *Section of the Turenne Cenotaph*, 1782;
Source: Bibliothèque Nationale de France.

Etienne-Louis Boullée, *Plan of the Turenne Cenotaph*, 1782; Source: Bibliothèque Nationale de France.



Etienne-Louis Boullée, *Elevation of the Turenne Cenotaph*, 1782. Source: Bibliothèque Nationale de France.



Academy of Architecture, the monument looks like a pyramid, just on the outside. In his text *Architecture, Essai sur l'Art* (Boullée 1953, pp. 105-106), in the chapter dedicated to "Funerary Monuments or Cenotaphs," Boullée recognizes that "The Egyptians have left us some celebrated examples. Their pyramids are truly characteristic in that they conjure up the melancholy image of arid mountains and immutability". Moreover, later, he points out that the patriotic value remembered by the cenotaph led him to the Egyptian reference: "I have assumed that the monument where the pyramid as formed by a quadrilateral has been erected in honor of a Hero who has saved his country by winning an important battle, during which he has met his death. The glorious death of the Maréchal de Turenne suggested this to me". About the choice of the pyramidal shape, Boullée adds another point, strictly architectural: "I have given the pyramid the proportions of an equilateral triangle because it is perfect regularity that gives a form its beauty." Further on, Boullée specifies: "I will not go into detail with regard to the cone-shaped Cenotaph" and this is a shame because the drawings, powerful and expressive as they are, leave essential aspects of the project in the shade. The plan, somewhat schematic, and the section, much more elaborate and surprising, have a complicated relationship and could correspond to two different buildings. The section displays a vast interior with a conical shape, while the elevation clearly states a pyramidal volume with a square base. The cenotaph has a circular funerary hall, a vast crypt sunken under the ground level, with a diameter of 160 meters (Hwang 2017), covered by a hemispherical dome and surrounded by a theory of semicircular chapels overlooking the central vault with round arches. The dome occupies the lower part of a conical pyramid, which continues upwards as a vast hollow volume, perhaps an acoustic and luminous resonance chamber. The only connection between the crypt and the conical volume is the oculus at the top of the dome. Then, it is difficult to understand why this immense, inaccessible space surmounts the dome.

Furthermore, it is even more challenging to interpret why this conical void is inserted or excavated inside a pyramidal container. Since the section line coincides with one of the two axes of symmetry, the thickness of the masonry that divides the conical interior from the pyramidal exterior is relatively thin. However, if we draw a section, for example, along one of the square's diagonals, we should represent a consistent thickness, probably hollow, between the external wall of the pyramidal envelope and the internal wall of the conical void.

Considering the drawings, Boullée elaborated the composition without caring about these four three-dimensional leftovers, which could be solid masonry or further interstitial spaces with other transparency effects. Looking at his other projects, we find a comparable solution in the design for a theater presented in 1781 following the fire that destroyed the Opera House of the Palais Royal. In this case, the roof is divided between a large, lowered vaulted roof and a ceiling with a central cusp. We find the opposite choice in the cenotaph dedicated to Isaac Newton (1784), where the virtual space between the vast spherical void and the square base is a solid mass. The compact mass is pierced by long and thin tunnels, as in the Egyptian pyramids, connecting the external to the lower point of the sphere, the center from which to contemplate the planetarium.

An unusual ambiguity remains in the Cenotaph of Turenne, compared to the Enlightenment programmatic rationalism that permeates Boullée's architecture. Aldo Rossi helps decipher this apparent contradiction between light and shadow, clarity, and obscurity, introducing the category of exalted rationalism: "Conventional rationalism claims to derive the whole process of architecture from principles, while this exalted rationalism, by Boullée and others, presupposes a trust (or faith) which illuminates the system but is outside it" (Rossi 1967, p. XXV).

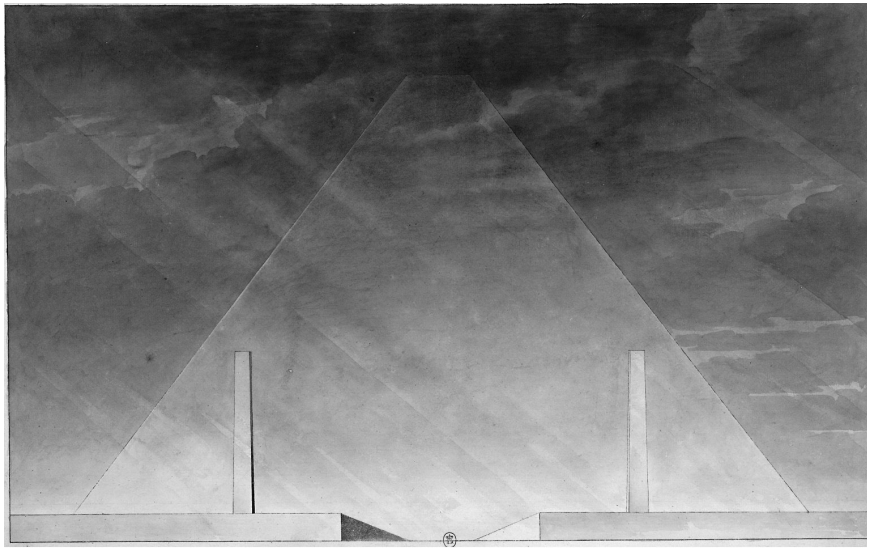
Moreover, it is incomprehensible how Boullée misses emphasizing his bold choice of including a cone inside a pyramid by introducing a geometric and typological hybridization of theoretical solid evidence; it could be a stunning demonstration of the centrality of the primary geometric elements. It is perhaps to bring order to an unresolved contradiction that four years later, in 1786, Boullée designed a *Projet de cénotaphe de style égyptien* in conical shape with a section that reproduces, almost entirely, that of Turenne, while the plan and elevation show a decidedly more coherent and straightforward building, thanks to the elimination of the coexistence of square and circle, in plan, and of pyramid and cone in section. However, in the same series of the Egyptian Cenotaphs appears the design of a pyramid with a square base which reports, on the triangular facade, a series of superimposed vertical elevations, like giant isolated steps, which could be a more elaborate variant of the three mysterious inaccessible galleries engraved on the walls of the pyramid of Turenne.

As it appears evident from the reading of Turenne's section, "the cenotaph was designed without the possibility of admitting the natural light" (Hwang 2014, p. 8), a point that has been explored carefully through virtual modeling processes.

However, doubt remains when observing how three gal-

leries with semicircular sections, strangely ignored by Hwang's modeling, run through the interior of the conical upper part at three different levels and seem to face outwards. Indeed, it is interesting and challenging to imagine the design of the galleries included in the space that separates the cone enclosed in the pyramid from the external wall. These galleries could seem to exist in another building where the conical shape is left naked, without the pyramidal cover. Looking at the elevation, one can read a network of symmetrical diagonal paths that go up the facade and meet at the possible entrances to the circular galleries. In any case, it remains surprising that the oculus, the large opening in the center of the dome, overlooks an immense space entirely, or quite entirely, blind. Boullée's section explains the Turenne interior spaces, inserting a fictional natural light penetrating the darkness from a non-existent source. The cenotaph, a monumental and commemorative version of the sepulcher, is therefore interpreted by Boullée as a modern version of the Egyptian pyramid, a colossal building mostly, even not totally, raised above ground. However, the underground condition of the sepulcher, earthy, chthonic, and humid, where the body returns to the vital cycle through the biological cycle of corruption and regeneration, is denied and replaced by a purely spatial cognition, "the architecture of the shadow" (Boullée 1968, p. 90) where darkness, stillness, and geometry are called upon to represent the absolute nothingness.

Etienne-Louis Boullée, *Cenotaph in the shape of a truncated pyramid*, 1781-93. Source: Bibliothèque Nationale de France.



One of the more significant monuments dedicated to the memory of the First World War's fallen soldiers is the Redipuglia memorial, designed by Giovanni Greppi and inaugurated on 18 September 1938. It is a colossal staircase of twenty-two steps, two and a half meters in height and twelve meters in depth. Embedded in the vertical walls of the steps are the bodies of over 39,800 recognized fallen soldiers, arranged in alphabetical order in niches covered with bronze plates; at the top of the ascent lie the remains of over sixty thousand unknown soldiers in two mass graves. At the foot of and around the memorial are trenches of various types, the armored one, with stone walls and concrete vaults, and others built with less refined technologies and probably more hastily. Other Austro-Hungarian trenches and tunnels, which Italian troops conquered and reused, are found on the hill of Sant'Elia, where the first necropolis of Redipuglia, inaugurated in 1923, was established. The transition from the necropolis to the memorial is based mainly on the reversal of the relationship with the land; the necropolis retraces, after the war, the excavation work undertaken in the battle for the construction of the trenches, a fundamental tool in the Great War, making it regular, architectural, maintaining and expanding a relationship with the land based on the descent into the subsoil. On the contrary, the memorial is an extroverted structure that transcribes the terrain into an architectural dimension, canceling its natural features, which remain irreversibly covered and hidden. In the necropolis, the burial of the bodies enhances the relationship with the ground; in the memorial, the earth is replaced by a series of gigantic stair risers and treads, a purely architectural and serial sequence decorated with sculptural elements and inscriptions, devoid of hierarchies and pauses, ordered according to the mechanical binary rhythm of the staircase, the hypnotic alternation between horizontal and vertical. The natural landscape, the woods that rise on the gentle slopes of Mount Sei Busi, remains as a frame that accompanies the warlike ascent of the terraced steps, like a bucolic context, on the two lateral edges.

In appearance, the memorial seems to have a landscape dimension and perhaps an intention; its visual impact from a great distance is powerful and has a geographical dimension. However, up close, walking the steps, the landscape idea disappears in the face of something more precise and more substantial: an architectural, constructive, and spatial coherence of the artifact, which presents itself as an infrastructure, as a colossal unitary object. The radical aspect, undoubtedly indebted to the futurist utopias and experiments, lies in the complete disregard for any relationship with nature. The memorial of Redipuglia is, in some respects, the premise of the project that Alberto Burri, about fifty years later, will carry out in Gibellina with his Cretto (1984-1989), covering with a cement blanket the compacted rubble of the ghost town, destroyed since the earthquake in 1968. As in the memorial of Redipuglia, the entropic, incoherent, wild aspect of the terrain is erased and re-transcribed in geometric, if not correctly, architectural terms. In the Redipuglia trenches, we perceive just the cleared land; in Gibellina, the design follows the incoherent and tragic chaos of the houses knocked down by the earthquake.

We can recognize a further interpretation of Burri's idea in the Berlin Memorial to the Murdered Jews of Europe, designed by Peter Eisenman after an initial collaboration with Richard Serra between 1997 and 2005. Again, the design invests the terrain's structure, matter, and geometry.

As in Gibellina, the ground follows the natural trend, but the vertical elements obey, here more than in Gibellina, a purely architectural logic: "The design begins from a rigid grid structure composed of 2,711 concrete pillars, or stelae, each 95 centimeters wide and 2.375 meters long, with heights varying from zero to 4 meters". The exhibition space occupies a limited area of the entire square and remains hidden underground. Crossing the expanse of stelae is, therefore, a completely abstract space-time journey devoid of any geographical and historical reference, a formal synthesis of emotional efficacy but also, in the radical conceptualization, a labyrinth capable of placing a distance between the experience of the visitor and the memory of the Holocaust.Covering the ground, as in the monuments of Redipuglia, Gibellina, and Berlin, represents one of the most disruptive actions for the ecological balance: the infrastructures, starting with the cities themselves, must always at least pose the problem of disposing of rainwater, which they no longer have direct access to the permeable layer. Canals, lamination tanks, and spillways are some elements that guide the waters out of the anthropized space, hide them below ground level, and convey them into safety basins. Therefore, the relationship between water and land represents a theme that the project has always addressed, at least since agriculture has existed. Embankments, basins, cisterns, and irrigation ditches are essential for cultivating the land. The Lombard Canal system plows through the land of the Po Valley, carrying water from river to river, crossing and overlapping the network of waterways that descend from the Alps to the Po. In Milan, there is a plastic representation of this overlap, for example, in the intersection between the Naviglio della Martesana, which carries the waters of the Adda up to the Darsena, and the Lambro, which descends towards the Po, reaching it not far from Piacenza. In the north-eastern edge of the municipal area, not far from Cascina Gobba, the Martesana flows over a bridge that crosses the Lambro in an orthogonal crossing that plastically renders the double structure of the Lombard waters, the natural north-south, and the artificial east-west. One of the most iconic photographic series of the twentieth century is the collection of images that represent, in their nudity and, one could say, poverty, a large number of Water Towers scattered in the European and American countryside photographed over forty years starting from the sixties of the twentieth century. The towers are part of over two hundred collections dedicated to infrastructures and industrial objects such as gas holders and high voltage pylons, always treated according to the comparative principle of typological classification. Even independently of the Bechers' art of classification, the water towers are imposing artifacts, stereometric constructions that give shape to formless matter par excellence. Pillars, partitions, concave surfaces, and abstract volumes free in space remove the water from its

natural destination and keep it up there, isolated, suspended, and preserved, available in case of need, following a management criterion and a precise distribution plan.

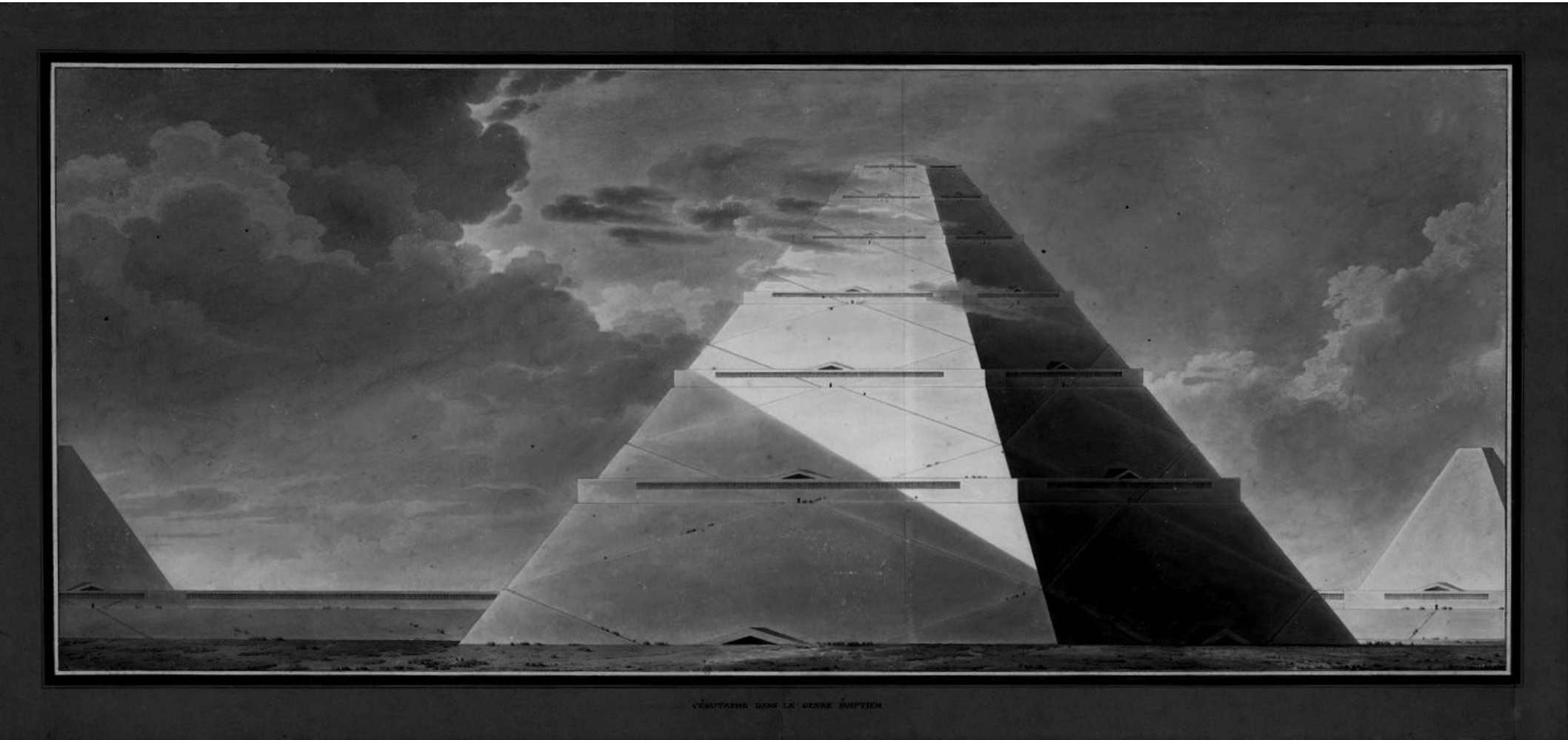
Digging and accumulating are two primary actions that become architecture when pursued with explicit formal aims.

For the excavation, in addition to the many examples of architecture and underground cities, we can recognize a moment of excellence in the Indian typology of the stepwell, the accessible well which, in many cases, in terms of size and, above all, for its spatial and constructive complexity, becomes a monumental presence exceptional that far exceeds the purely functional purposes of the hydraulic infrastructure. In the most important examples, densely present in the states of Gujarat and Rajasthan, the stepwells are extraordinary inverse architectures that grow downwards in the excavation of the ground and develop by organizing a void through an accurate spatial organization; the paths are vertiginous promenades architectures that allow to experience the difference in height and reach the bottom of the depression, while the walls of the excavation become wings with a theatrical impact, of great design and executive quality (Setti 2022). The most common plants are those with an elongated rectangular shape and the square ones; in both cases, the descent of the excavation necessarily follows a steep stepped profile, and, above all, in the case of the square shape, the stepwell looks like a real, inverted pyramid both in the inversion of top and bottom and in the inversion between full and empty. The vertical section is the fundamental drawing to understand the architecture, quality, and space of the stepwells, precisely the same for the pyramids. The mystery of the monumental constructions of Giza and the Mesoamerican temples is in the vast and inscrutable interior, in the immense mound of earth crossed by slender paths and air wells of which the pyramidal shape, smooth or stepped, is only the casing.

Digging the earth also always means piling up the earth.

As has been investigated by Chiara Pradel's research, the residues of excavation activities, for example, those to house the railway conduits that cross the Alps, produce accumulations of such a volume as to impose substantial changes in the landscapes which stow them; the project articulates in two interconnected but also autonomous actions that proceed in parallel: the excavation activity and the activity of moving, locating and drawing the material withdrawn (Pradel 2022). The process is the reverse of the quarry activity where the goal is not constructing a specific space but obtaining material from the earth. Mining is an intermediate situation where the extracted material is only a part of the material moved, which largely derives from the opening of passages, descents, tunnels, and equipment housed in the bowels of the ground. The accumulation of incoherent materials, ready to become "earth," is recorded following destructive events, such as earthquakes, wars, large-scale demolitions, or the deposit of waste materials, the waste which has become one of the protagonist themes in the chronicle of the contemporary landscape (Corner 2005; Geroldi 2017; Hutchinson 2017; Lynch 1990; Melosi 2020). The architecture dug into the earth has an ancient military and defensive tradition: the catacombs excavated for early Christians, the secret tunnels that connected the fortifications underground, as in the admirable circuit of Verona (Zorzi 2019), the trenches of the First World War, the bunkers of the Second World War (Virilio 1975), the dystopian translation of daily life in American fallout shelters (Colomina 2006).

Etienne-Louis Boullée, *Cenotaph in Egyptian style,* 1786.
Source: Bibliothèque Nationale de France.



CABIN FEVER

VALENTINA NOCE

> What kind of miniaturist enchantment would lead someone to end the world? (Mohaghegh 2019, p. 1)

The simulation of the contingent conditions of a closed environment is a recurring expedient in space-profiling. The insertion of breathing creatures renders these blank volumes into disguised planets, artificially functioning through technological operations. The project “Cabin Fever” is an allusive mention to technology that generates an autonomous platform, “a supra-territorial catalyst that no longer recognises shelter, habitat, colony, or hive, shattering the glass terrarium and its unqualified principles of adaptation and evolutionary teleology”. (Mohaghegh 2019, p. 159)Expanding the reading of reptile enclosures - tanks, terrariums, cages, cabinets - as a visual device for investigation, the five images are annotating the technological fragments that compose these environments. The spatial consequence of this accumulation of devices - artificial lights, plastic props, dusty glass facades - mediated through superimposed technological planning, is the folk syndrome of cabin fever, the psychological distress connected to confinement in a closed area, causing anxiety, irritability, boredom. Alluding to the ambiguity of authenticity in certain spaces within the blurring sphere of architecture and nature, the project resembles the restlessness of entering a technological miniature of the outer world.

ARCHIVE

I once asked a friend if the reptiles he breeds recognise him. “They just learned to trust the outside presence that feeds them”. The body of the carer is the only honest interaction they entertain with nature (Fig 01).

Decorative gypsum skulls and frozen mice: primary and recreation requests are adapted through an artificial set of disposition. The establishment of a controlled environment is managed by technology, performing a pervasive layer that generates space: timed neon lights, structural glass, electric vents, temperature control (Fig 02).

Technological system and solutions provide a resolution for space, solving a closed environment from the inside, but yet are not embraced in their intimate meaning; some props are required - plastic logs, meditation rooms, a poster of Paris, dusty succulents, coffee-break area, cinnamon candles - for a taste of memory of the IRL (Fig 05).

Fig 01 Scales, skin, pupil. Image by Valentina Noce, 2023.

Exerting a hypnotic effect / Working by means of ritual incantation and repetition / insidious rhythmic patte

Fig 02 Assortment of objects. Image by Valentina Noce, 2023.

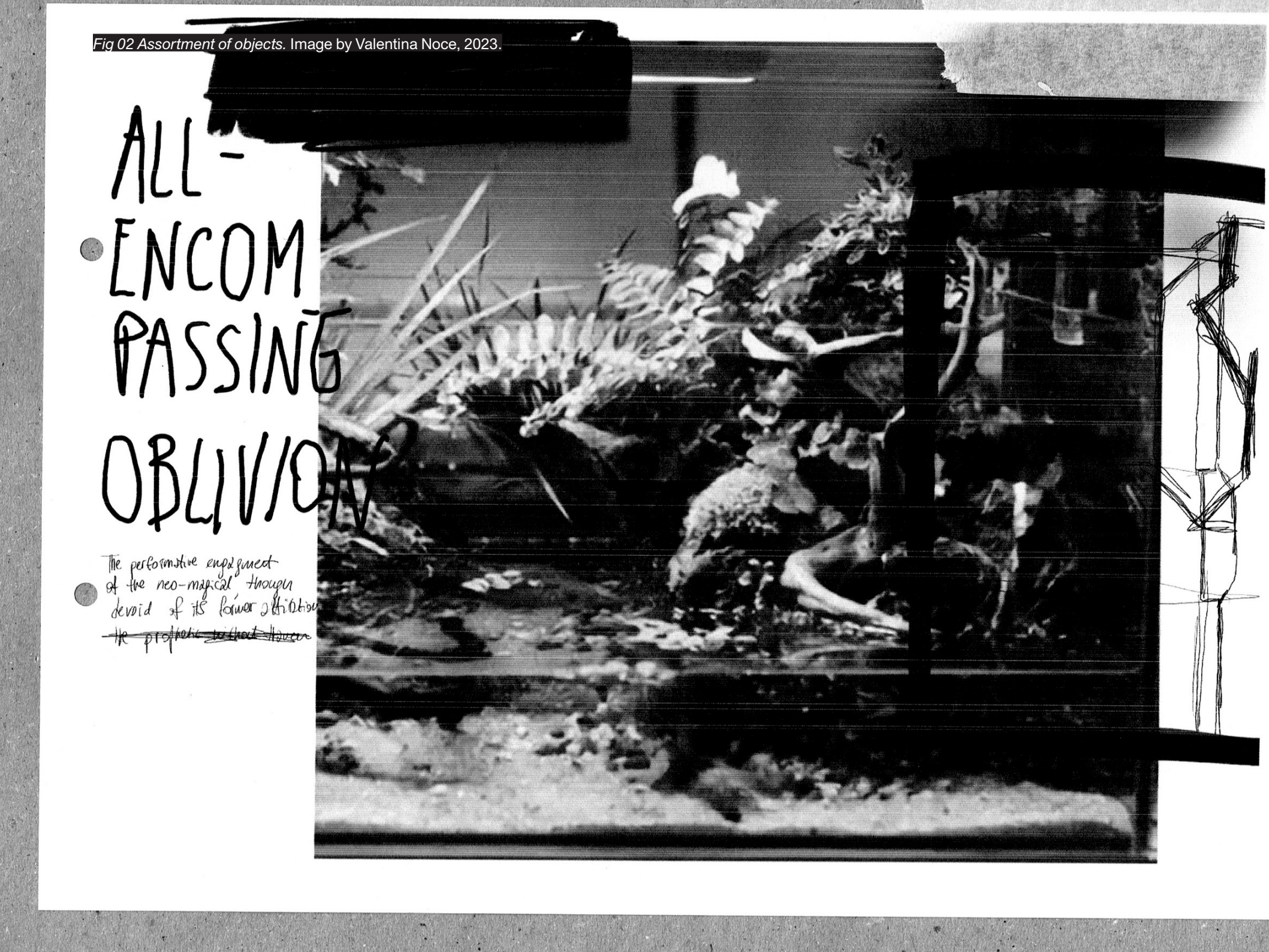
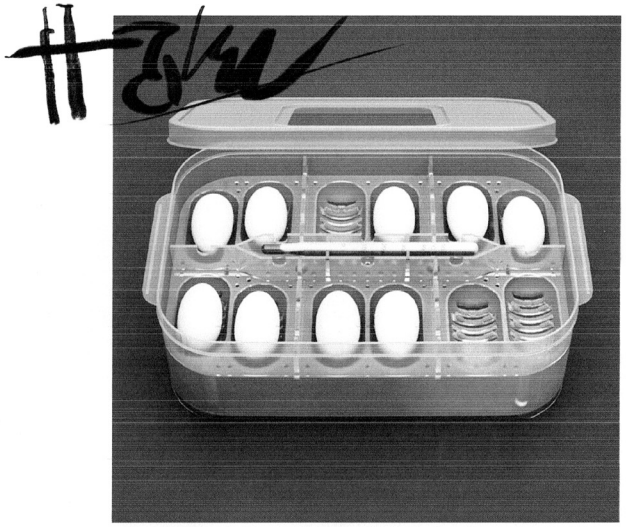


Fig 03 Controlled system for hatching eggs
Or, natural replicas inserted in an ecosystem simulation.
Image by Valentina Noce, 2023.



Valley of the diamonds and the giant snakes - nest of the devil bird - man //

Fig 04 Stacked glass units for reptiles
Hygienic transparency stimulates cabin fever, the restlessness and irritability condition of being inside.
Image by Valentina Noce, 2023.

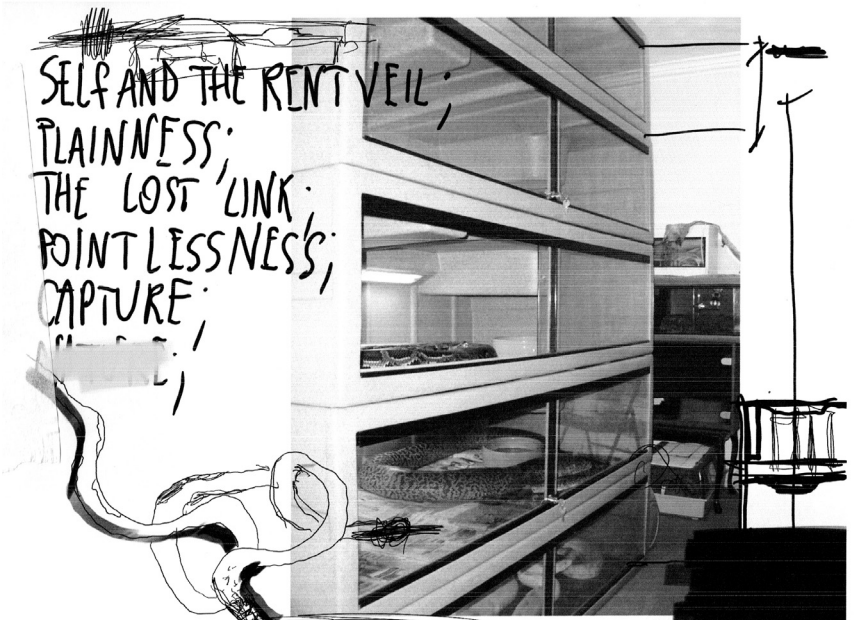


Fig 05 Visualisation of the Author's Reptile Terrarium Project.
Image by Valentina Noce, 2023.

FOUNDATIONS. ROOTS OF AN ECOSYSTEM

GINO BALDI

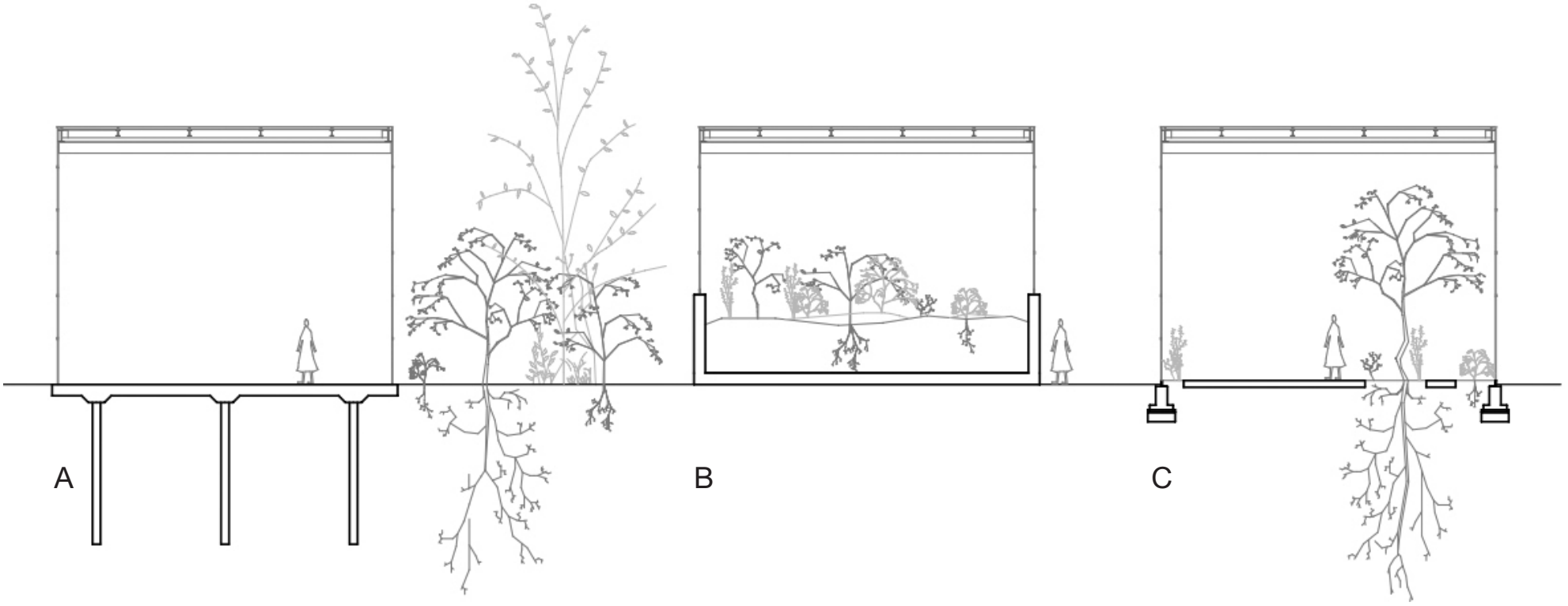
In the terrarium, the canonical relationship between soil and architecture is reversed; this container becomes the content, so what normally surrounds the architecture becomes its inhabitant. In this inversion, roots identify permanence.

The critical reading starts from a shift in concept, a reversal of meaning. In a canonical view, the relationship between artifact and landscape sees a separation, where the outside is divided from the inside. It is true that, as defined by Toma Berlanda, the artifact plays not only the role of a spectator within the landscape, but it is an active element to transform the space in which it is placed (Berlanda 2013, p. 23).

However, it is necessary to make a simplification or translation from architecture to object, as a terrarium, capable of containing the landscape within it. As an object it is an end in itself. It is no longer interesting to understand its surroundings, since it is all contained in the body itself. In this separation and reversal, the subsoil identifies the key to understanding seemingly missing relations between object and place. It is a matter of identifying an intermediate way, of cooperation and definition of an ecosystem, in a collaboration between mineral and plant roots. An interval or anomaly in the well known order of separation between things. A separate space is studied, enclosed but in continuity with its surroundings, on a perceptual and physical level in the subsoil. It is an ambiguous space, which makes this ambiguity its quality, shifting the theme from the conditions already known, to others. After making this paradigm shift from architecture as a relational element to the body capable of condensing different natures within, it is possible to consider a real project to return to the field of architecture: *House with plants* by Junya Ishigami (Tokyo, Japan, 2012).

The intended method of reading identifies the subsoil and in particular the roots, the foundations as the main comprehension tool of the architectural phenomenon, shifting the line of reading and understanding of the building from the canonical ground floor to the subsoil. The intent is to take roots as an element that can explain architectural form, through the deep relationship between artifact and soil. In this sense, Prof. John Weaver, in his book "The ecological relations of roots" (Weaver 1919) developed research on plant organisms starting from the reading of roots as key components in explaining ecosystems, growth mechanisms of different species and the conditions that determine them. Roots, whether natural or artificial, become a spy (Ginzburg 1979), a hidden element that can explain conditions, characteristics, and qualities of a soil and the environment in which they are inscribed.

Three design variations of the case studies named in the text,
highlighting different terrarium types, starting with roots.
Drawings by Gino Baldi, 2023.
A - traditional condition, separation of architecture
and nature independent roots system;
B - traditional terrarium condition, nature
inside a container and human outside with no foundations,
terrarium as an object;
C-terrarium architecture; natural and artificial space are
inhabited by human alternating natural and artificial roots



In fact, the term "foundation" ("fondamento"), does not identify a component of the construction, but the place where the construction is located (Ambrosi 1994, p. 306).

Founding is an excavation work, it goes deeper, and it works with soil and the place to find the solid layer on which to rest the structure (Ambrosi 1994, p. 306). So, it is evident how the role of foundations is linked to place. Steven Holl, in his essay "Anchoring" (Holl 1989), emphasizes how the artifact is linked with the experience of a place. The construction site is not just one data among many in the project, but constitutes its foundation in both a physical and metaphysical sense (Holl 1989).

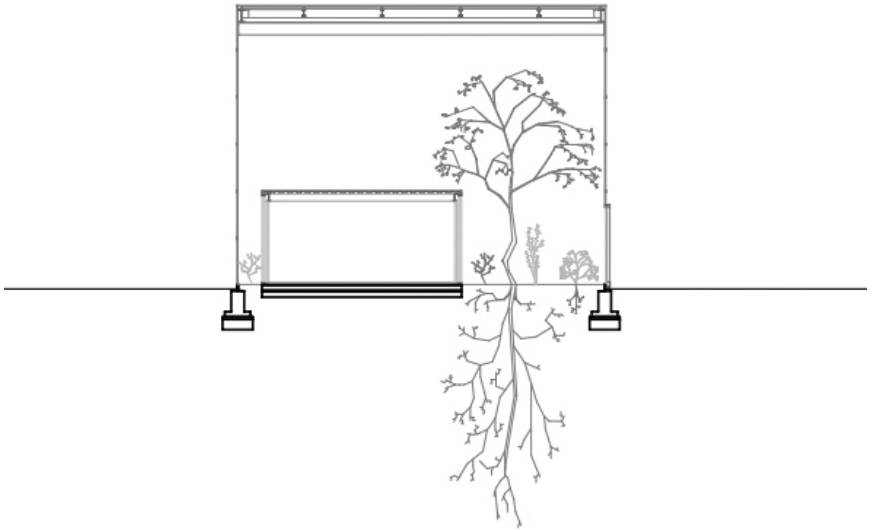
The question that arises is whether it is possible to understand and modify an ecosystem in its environmental identities, starting from its hidden conditions, its roots. To try to answer this question, a parallel between artificial and plant roots turns out to be interesting.

According to Luigi Snozzi (Croset 1990; Berlanda 2013), the basement floors of buildings, cellars and by extension foundations, as the places in direct contact with the soil, are those where it is possible to understand the entire architectural phenomenon of any building. In parallel, John Weaver (1919) identifies plant foundations (roots) as an indicator of soil conditions, type of organisms and symptom of an ecosystem. Roots become a possible tool for interpreting the "terrarium," an indicator and metaphor for an ecological way of colonizing the soil. The terrarium is a protected place, separated from the rest of the world, a reduction to an object of natural growth, as in a laboratory experiment. Junya Ishigami's project (House with Plants, Tokyo, Japan, 2012) when observed from the outside appears as an ordinary volume. In the underground, however, one understands how mineral plinths merge with plant roots in a new coalition. The floor plan of the foundation identifies the transition from an anonymous, or monotonous condition of mineral plinths or plant roots to a continuous interval, a dotted line and alternation of natural and artificial roots, united in a terrarium-architecture.

This research intends to integrate nature and artifice within the available perimeter. This principle is first visible in the foundations of the building, which are isolated and distinct between the different areas. A perimeter curb defines the anchorage of the main volume, while point foundations define the mineral platforms. The rest of the space remains natural, with earthly and plant elements of different species. This principle is based on the negotiation between natural and artificial space, visible in the foundation.

The foundation becomes an edge, a transitional condition, between an inside and an outside, an above and a below, visible

Junya Ishigami, *House with plants*, Tokyo, Japan, 2012
The project highlights the C condition characters of terrarium architecture by alternating mineral platforms with natural platforms.
Drawing by Gino Baldi, 2023.



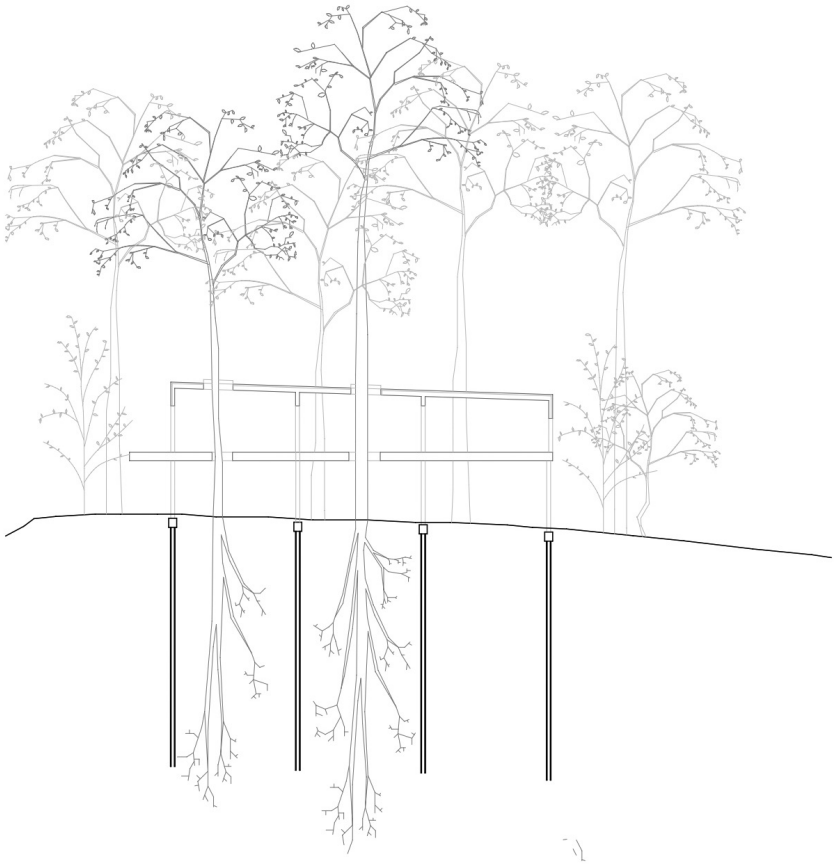
and invisible, capable of explaining the meaning of the terrarium itself. Another negotiation project between plant roots and mineral roots can be seen in *House in Lege-Cap Ferret*, by Lacaton Vassal (France, 1998), reason whereby reading only the foundation plans one can see the continuous negotiation of existing and imposed roots. In this sense, it is important to point out a difference between natural and artificial roots, which allows one to understand the point of reading the terrarium. Artificial roots always seek solidity and compactness in the soil; the act of appropriation, while changing depending on various factors (economic, soil conditions, program needs) seeks to limit the proliferation of roots in the subsoil.

In contrast, plant organisms to enable the growth of aboveground components regularly and healthy, proliferate, grow and expand as much as possible in the underground, contaminating and overcoming obstacles they encounter.

Elements that work on the vertical (Y) axis, such as roots, going deep into the soil are analyzed to explain horizontal (X), threshold, and transition between one condition and another, between inside and outside the terrarium. To explain the content of the terrarium, it is necessary to identify its distinction from its surroundings through the transition, the threshold that separates it, and detects its inclusive characters by defining it as a closed ecosystem.

Thus, the terrarium becomes a piece of machinery, a mechanism capable of creating a microcosm in its own right, functioning with its own logic but in contact with the soil on which it settles, in a concept of terrarium-architecture, comprehensible through its deepest roots.

Lacaton Vassal, *House in Lege-Cap Ferret,* France, 1998.
The project highlights the characters of condition C of terrarium architecture by contracting domestic space with natural space.
Drawing by Gino Baldi, 2023.



THE LEGACY OF THE ITALIAN NATURALISTIC HYDRAULICS SCHOOL

CHIARA TOSCANI

Alexandre Koyré defined the 17th century as a transitional historical age – *From the Closed World to the Infinite Universe* – in which scientific disciplines became increasingly more defined in their epistemological structure (Koyré 1957). The birth of modern scientific disciplines prompted an increasing dismissal of the humanistic approach to knowledge which was previously prevalent. Philosophical, ethical, and artistic thought was shunned in favour of disciplinary specialization which could provide an axiomatic model for interpreting natural phenomena. As explained by Stephen Edelston Toulmin, a refusal "of every particular knowledge in favour of the universal one" was articulated, and any kind of unofficial or impure empirical approach slowly came to be overshadowed (Latour 2013, p. 7).

In the hydraulic discipline, and in the work of the protagonists who continue to explore the inherent fragility of the Italian landscape, the beginning of a bifurcation between a purely mathematical approach and broader forms of knowledge can similarly be discerned. The investigations of the first experts, such as Venetian *proti*, Marco Cornaro, Cristoforo Sabbadino, and others, were followed by Benedetto Castelli's *Discourse of the Mensuration of Running Waters* written in 1628. It provided a first understanding of water movement in rivers through a scientific mathematical approach. In this sense, this work cannot only be viewed as the first and foundational Italian hydraulic treatise, but also as the catalyst for this split.

The Italian scenario, however, did not manifest this bifurcation as sharply and definitively. Instead, a tension between closed and infinite worlds was vivid for a long time. Treatises incorporating a broader system of knowledge into a compendium of multitudes of knowledge, empirical interpretations, informal and local practices, and technical solutions regarding water phenomena have continued to be valuable sources of information. Among them, *Della scienza et dell'arte del ben regolare le acque,* written around the same years as Castelli's text by Giovan Battista Aleotti, is considered the first systematic and dedicated Italian attempt into hydraulics and water management.

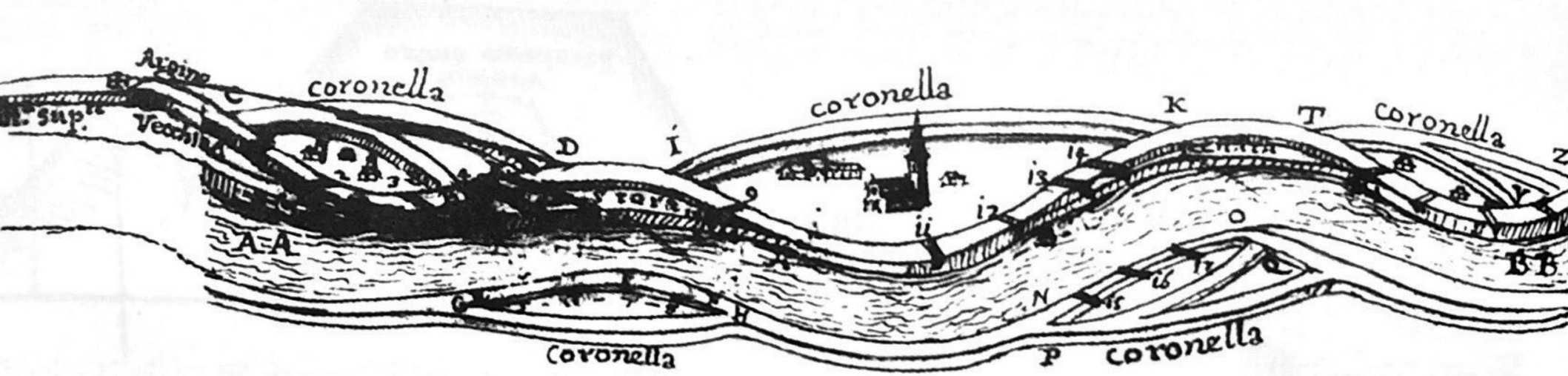
The legacy of the unique approach of Aleotti can be recognized in the particular characteristics of the Italian naturalistic hydraulics school, which was vital until the 19th century, when it was gradually swept away by technological advances and, above all, by French hydraulic school's approach, which was entirely centred on mathematical approaches.

However, according to Giulio De Marchi,

> in addition to hydraulics, which is mathematics but which we prefer to refer to as physics, there is also natural hy-

In this drawing, Giovan Battista Aleotti illustrates the method that was used to design embankments using river soil. The new embankments were not composed of a single element, but rather of a complex structure that included flat parts parallel to rivers. Thanks to this design, a certain amount of water was allowed to overflow in areas called restare; then, forming a secondary embankment further inland, cornelle were constructed to provide additional protection. In addition to reducing flooding, this type of flood control often served the additional purpose of creating new paths and buffer zones, which could be cultivated or reforested by landowners.

Aleotti G.B., *Della scienza et dell'arte del ben regolare le acque*, a cura di Mario Rossi, Panini, Modena 2000, p. 322.



draulics, which applies its techniques and is almost entirely dependent on observation and experience. Instead of the logical attitudes that distinguish mathematicians, the second necessitates intuition, which is a trait of naturalists and physicians (Di Fido, C. Gandolfi 2014, p. 59).

In this sense, the Italian naturalistic hydraulics school offered a remarkable and peculiar contribution. This was not just historically, but as a valuable treasure trove that still resonates with contemporary ecological strategies used for strengthening the relationship between humans and the natural environment.

THE ITALIAN NATURALISTIC HYDRAULICS SCHOOL

In addition to all related events, such as the diversion of the Brenta river (1610), the Sile river (1683), the Piave river (1641) and Taglio di Porto Viro (1604), which prevented Venice from draining the Lagoon, the instability of rivers throughout Italy, such as the Reno, the Arno and the Tiber River, kept mathematicians, engineers, and governors engaged over the centuries, trying to find methods to prevent erosion of riverbanks and the rivers' diversions.

The most relevant element of this Italian naturalistic approach was the idea that any solution required in-depth investigation into the state of the health of rivers and their idiosyncratic features. Consequently, a few empirical and informal practices, which belonged to collective memory deeply rooted in local communities, continued to be discussed in treatises as a relevant part of hydraulic science. Among these was *Trattato della direzione de' fiumi*, written in 1664 by Famiano Michelini, an Italian mathematician. The text investigated various theories and methods used in the protection of riverbanks from erosion, such as *paradori, pali, pennelli,* and *pignoni*, which were preferred to the rigid and orthogonal reinforcements of the banks along with forced diversions. Along with Michelini, other scholars can be cited, such as Giovanni Battista Barattieri, an Italian engineer, who wrote *Architettura d'acque* in 1669, which beautifully illustrated the corrosion along rivers.

However, the contribution of Domenico Guglielmini, a doctor, chemist, and hydraulic engineer, was crucial to defining the school theoretical approach. From the works of Barattieri and Michelini, Guglielmini moved towards a more detailed investigation of rivers and an understanding of water movement based on inherited medical-naturalist traditions.

In one of his most significant works, *Della natura dei Fiumi*, a mathematical and physical treatise written in 1739, he defined rivers as a body of water, applying the metaphor of the human

body's circulatory system of blood. Contrary to what one might think, the application of this metaphor, which had its roots in the tradition of 16th-17th century Italian hydraulic studies, such as Sabbadino and Aleotti's works (Sabbadino 1919; Aleotti 2000), did not hinder the effectiveness of scientific investigations.

This was the key to integrating innovative physical-mathematical principles with empirical approaches in order to identify the best interventions to be used to protect the rivers and surrounding areas. According to Cesare Maffioli, Guglielmini had a medical perspective, treating the river as a living organism with its own unique personality, a clinical case, to be investigated (Maffioli 2010, pp. 271-278).

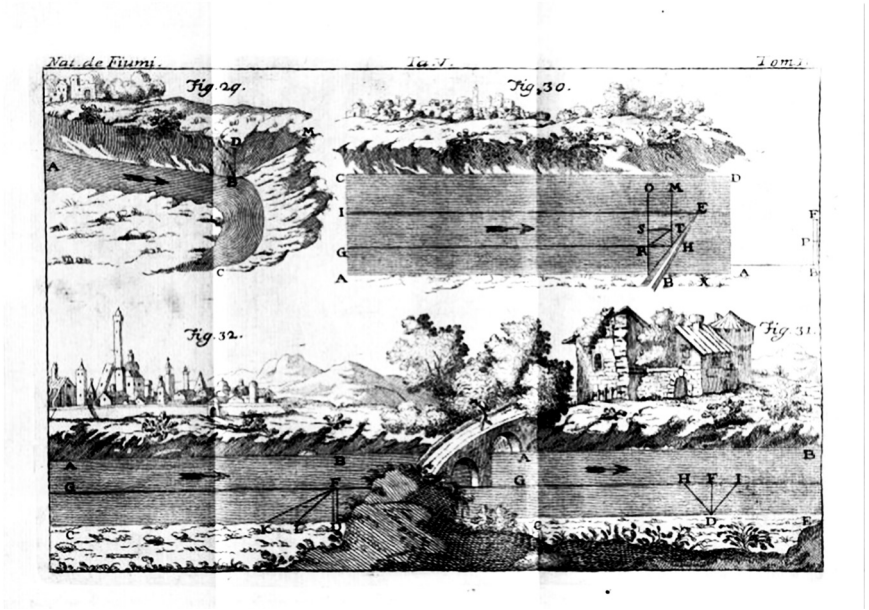
This perspective was essential to finding out the causes of its "illness": those internal, such as its innate morphology, its course of water, its dimensions, the orography of the ground, and the density of sand within it; and those external such as attributable to human interventions, which often complicated the understanding of water motion and its management.

In this sense, the approach that emerged from Guglielmini's text regarding the channelization of the Reno River in response to the incessant flooding that occurred in Bologna and Ferrara's countryside at that time, was enlightening. In fact, although the flooding phenomenon was well-known, no definitive solutions were found due to local governors debating two opposite perspectives, which necessitated different diversion projects; Bologna argued for the diversion of the Reno directly into the Po Grande, contending that this intervention most respected the natural topography of the territory. However, this solution would have caused considerable damage to Ferrara, since the maximum slope of the water pointed directly at the city, which had long since defended itself against flooding by building riverbanks resembling walls. Having already renounced the navigability of the proposed secondary branch of the Po, Ferrara instead proposed the divergence of the river on the east side, towards the sea, which favoured its commercial trade routes. Bologna became the champion of a perspective that promoted the principles of nature only for its own strategic, political, and economic advantages. Ferrara couldn't help but oppose it, evoking, on the contrary, the value of applying art over nature when it was necessary to protect its citizens and territories.

The text is a collection of Guglielmini's evaluations of various proposals that animated the debate around 1693. Despite the variety of arguments and subjects covered in the text, some of which are extremely technical, one cannot fail to notice how it is constellated by an uncountable amount of Guglielmini's

Considerations of water motion in rivers were based on their morphology. The drawings accompanied some geometrical demonstrations, corollaries and prepositions, explained on pages 130 to 136. However, it is important to note that there was still a preference for superimposing geometric figures, derived from the demonstrations, as opposed to beautiful engravings depicting rivers, characterized by their water textures, the varied roughness and topography of their banks, and their surrounding landscapes: the countryside in the foreground and the city in the background. It is, therefore, possible to make a comparison with the following treaties. Calculations and geometrical figures did not leave room for such representations.

Guglielmini D., *Della natura dei Fiumi,* Filippo Parmigiani, Parma 1776, TAV 5.
https://www.byterfly.eu/islandora/object/libria:11295#page/442/mode/2up



observations based on the concept of naturalness as a primary condition, not only to observe, but to define any practical proposal or artificial transformation of rivers. For instance, by answering to those opposed to the diversion of the Reno into the Po Grande, he stated that historically "the Reno River had always strived to unite its current with the Po River by its natural disposition" (Guglielmini 1776, p. 33).

Just as a good doctor who cares for their patients' needs with the primary objective of protecting their health, the care for the management of waters would be based on the adoption of those artistic principles consistent with the nature of the river and its features. A naturalistic approach, therefore, that would cause no fractures between the human and natural realm and no conflict between science, art of water management and nature (Newman 2005, pp. 23-24). Rather, it would be a combination of rationality and empiricism, which was crucial with the complexity of the hydraulic discipline.

In addition to Guglielmini's work, other minor authors of the time also provided important contributions. Among these, Vincenzo Viviani, an Italian mathematician and engineer, wrote two discourses in 1688: one intended to protect Florence from the Arno's floodings, *Discorso intorno al difendersi da'riempimenti e dalle corrosioni de'fiumi, applicato ad Arno in vicinanza della Città di Firenze;* and a second, *Discorso intorno al difendersi da'riempimenti e dalle corrosioni de'fiumi.-Relazione intorno al riparare la città e campagne di Pisa dalle inondazioni*, which focused on the same subject but with Pisa's countryside as a case-study (Viviani 1668).

These texts are extremely relevant, as they demonstrate Viviani's intuitive and empirical approach from the outset, developed from more than just theoretical work. The book was addressed to Cosimo III, the Duke of Florence, who requested suggestions for protecting Florence and its surroundings from the increasing expansion of the Arno.

On the one hand, Viviani realised that the rising water level was already a phenomenon present in the city. Through archaeological findings, he reconstructed how the city changed over time due to this reason: ancient floors and architectural ornaments located at different heights on buildings and blocked-up windows. On the other hand, the rapid increase in the water levels of the Arno was unnatural; therefore, Viviani claimed this could be partially due to the morphology of the river, since the rise in water levels affected the surrounding countryside even before it reached Florence.

By widening the investigation's area, he determined that the primary cause of this rapid increase in the flooding phenomenon

in Florence was human-caused deforestation in the surrounding mountainous regions. Deforestation left lands bare and unable to hold back floods, which violently swept through the valleys, carrying stone and other waste materials downstream.

According to Viviani, firstly, in order to prevent flooding, locks would need to be constructed along the tributaries of the Arno to slow their flow. Secondly, he suggested replanting their banks with olive trees. However, he stressed that this process should not be hurried out of greed for acquiring new pastures. Rather, it would be necessary to wait for trees to grow naturally, in order to form compact soil that could withstand floods and retain water.

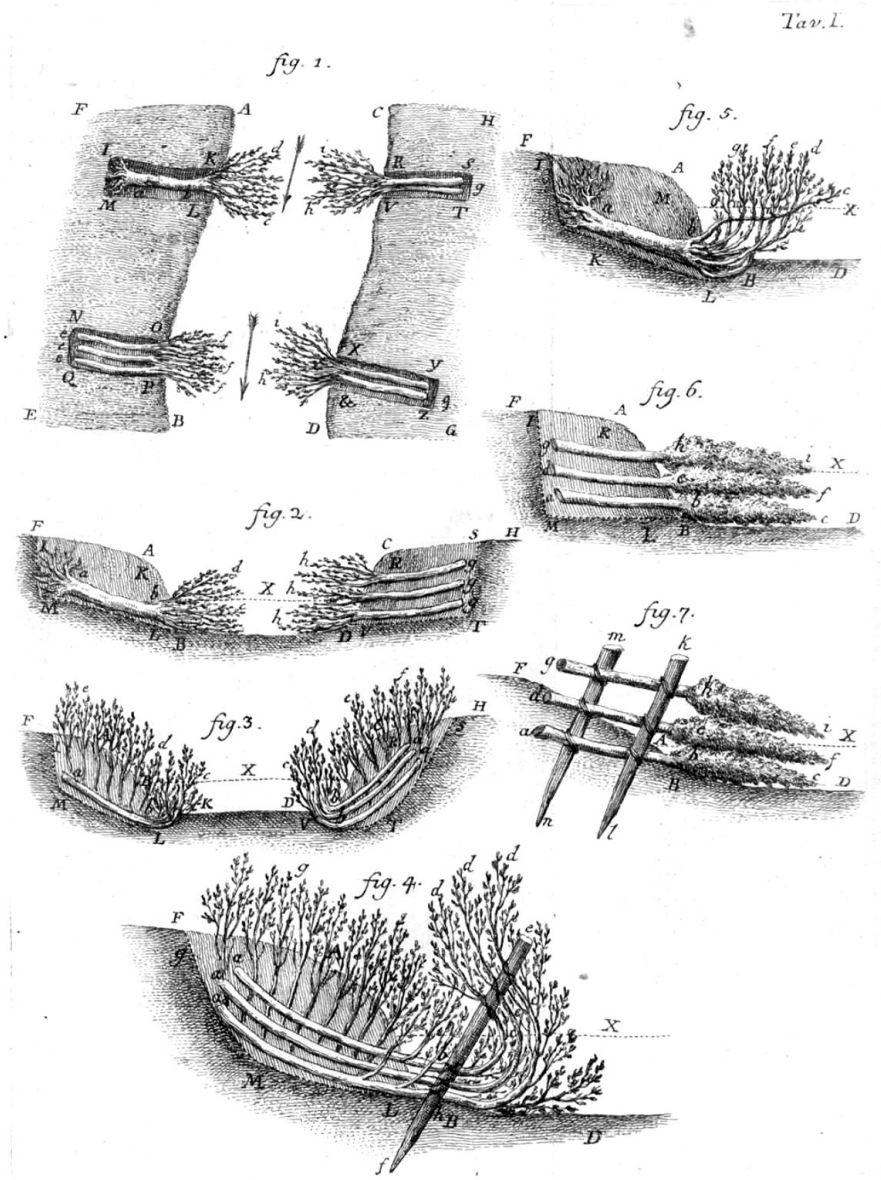
The idea that human greed was primarily responsible for environmental instability was not an original argument. Even before Sabbadino used it to describe one of three enemies of Venice's lagoon in his text on Venice and Aleotti used it to build his accusation against Bologna's government, Alberti had already theorized it in *Theogenius* and vividly repeated it in the tenth book of the *Art of Building in 10 books*. Therefore, like his predecessors, Viviani could only confirm the connection between the inner nature of human beings and the negative impacts on the environment.

Additionally, it is remarkable to note how ethical arguments were still joined with technical observations in hydraulic treaties, as if they were intrinsically linked. The benefits resulting from this strategy would not just protect the city of Florence and its citizens from flooding, but also meant landowners would see greater results from their crop harvest in the long run: "they would enjoy the goods of those valleys, consolidated and secure from landslides. they would enjoy the goods flowers and fruits from plants, and in due time, oil from the olive groves, timber, and livestock of all sorts and in greater numbers of pastures" (Viviani 1668, p. 36).

However, Viviani presented another argument that transcended the political and economic dimension, introducing an aspect often overlooked in territorial management policy: the aesthetic outcomes of care.

In attempting to demonstrate how the proposed practices would benefit community members and private interests, he asserted that these would provide not only material and economic safety for citizens, but also aesthetic enrichment. According to Viviani, through the restoration of riversides and adjacent areas, the forgotten *amoenus loci* would regain their aesthetics as a result of communal commitments. And, vice-versa, these practices would strengthen the intangible ties between human beings and their natural environment.

This is one of the visual plates that comprise the final part of Bettoni's treatise. Here are some visual explanations of Bettoni's experiments on stabilising and protecting a riverbank via intertwining the branches and roots of plants.
Bettoni C., *Pensieri sul governo de' fiumi,* Pietro Vescovi, Brescia 1782.



To conclude his argument, he invited one to apply this perspective, through transcending political boundaries, as well as temporal ones, and embracing the destiny of future generations: "there is no expenditure the most plausible, nor the most grateful, though very great, then that which is for the benefit of the next generations" (Viviani 1668, p. 37).

Whilst Viviani did not provide any drawings in his text, those contained within the book, *Pensieri sul governo de' fiumi*, written in 1782 by Conte Carlo Bettoni, made up for this lack (Bettoni 1782).Unlike previous authors, Bettoni was an agricultural reformer who, in order to secure his lands, developed an interest in protecting riverbanks. Beyond his words, the most fascinating aspect of his text consisted of a series of explanatory boards of various processes, drawn to illustrate the repair of eroded riverbanks using local plants and as a result of long tests and experimentations. Bettoni described which plants were most appropriate, along with different methods for intertwining their branches so that they could grow deeply rooted in the soil and compact it.

However, it is when reading the beginning of the last chapter of *Corrosioni dei Fiumi* by Francesco B. Ferrari, that one can still find the singular trajectory defined by the Italian naturalistic school in 1792. Referring to the embankments effectively designed by Guglielmini along the Po River near Piacenza, he stated that such a brilliant result "would never have been achieved if only theoretical notions or only practical ones would have been applied" (Ferrari 1792, p. 52). Mathematical calculations and theoretical assumptions should have been combined with careful "eye-observations" of the "quality, nature, and the place where the river is located" (Ferrari 1792, p. 54). In light of that, he dedicated this chapter to describing various local techniques to repair and protect the riverbanks.

CONCLUSION

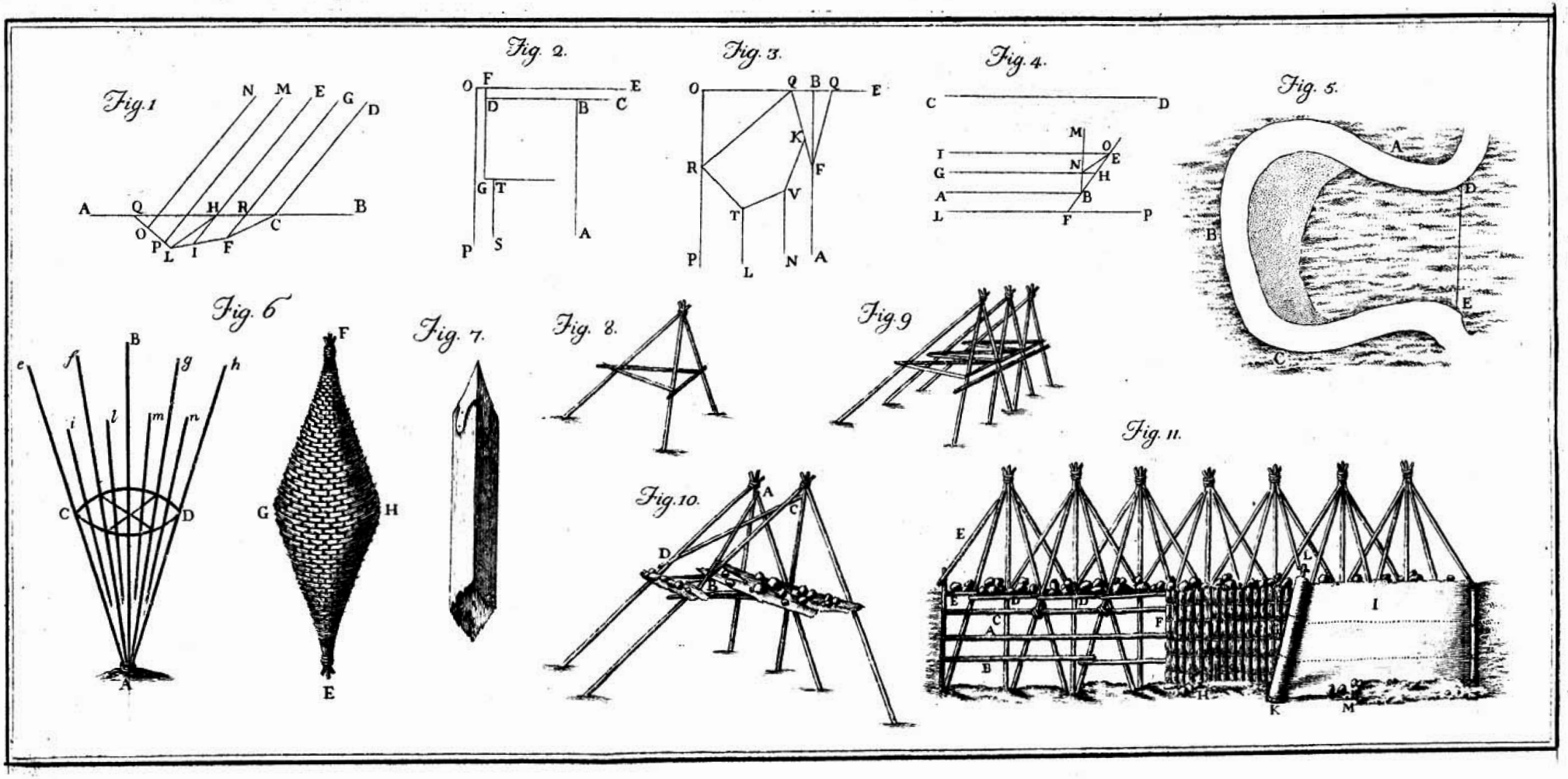
As already said, these contributions were slowly eliminated from the hydraulic discipline and its written scientific production, in favour of a purely theoretical and mathematical approach. Just looking at Bernardino Zendrini 's text, *Leggi e fenomeni, regolazioni ed usi delle acque correnti*, published in 1741, leaves one visually overwhelmed by mathematical calculations and diagram geometric and theorems.

It is important to note, however, that this approach and the comprehensive knowledge contained in these texts are extremely relevant to ecological issues we face today. In addition

to the relevance of hydraulics, which can be interpreted as a discipline regulating one of the first acts of ground transformation, including soil-water reparations, diversions, and ground shaping, the specific approach of the examined treatises also indicates a precedent in the history of land transformations where the bifurcation between nature and culture was not irremediably contemplated. This objective is achieved through the integration of a scientific and technical perspective with nature-based practices, as well as the consideration of ethical, political, economic, and social *concerns* (Latour 2004, p. 232). These visual and written documents perform acts of care, using local materials, multiple techniques, and historical knowledge, characterized by a holistic understanding of soil management and terracing (de la Bellacasa 2017). As a result, they constitute a valuable historical archive for contemporary ecological discourse, contributing to the broadening of its imaginary.

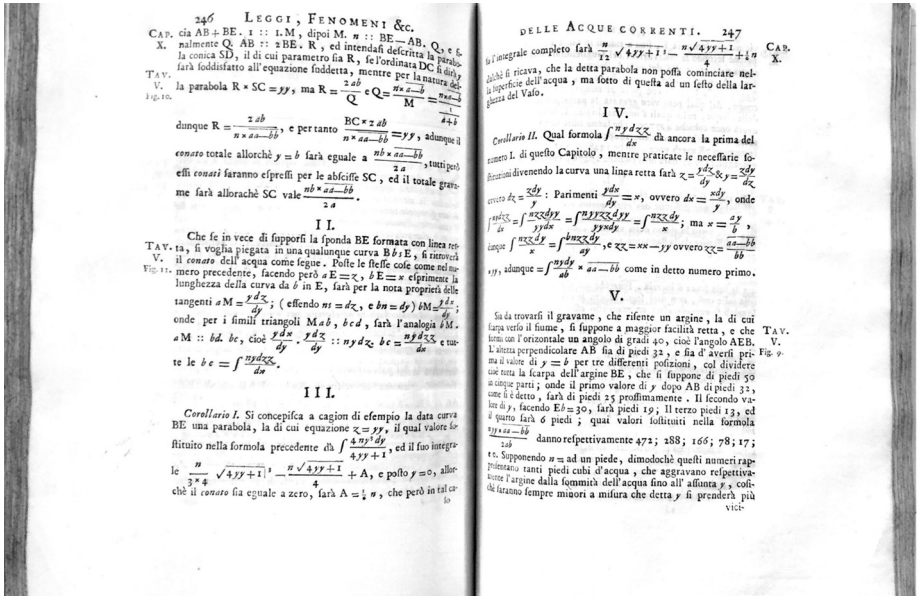
Explanation of tela o cavellotti used to protect the river along the Naviglio Grande and Mussa. Ferrari described this tool as affordable, efficient and safe. They were built using oak and elm timber for the main structure, as well as stones or gravel and cloth to complete the surface. Figures 8, 9, 10, and 11 show how it was constructed.

F.B. Ferrari, *Corrosioni dei Fiumi*, Giuseppe Galeazzi, Milano 1792, pp. 76-80.



Two pages belonging to Zendrini's treatise. Representations were unnecessary since calculations and geometrical figures were sufficient to describe phenomena.

Zendrini, *Leggi e fenomeni, regolazioni ed usi delle acque correnti, in Raccolta d'autori che trattano del moto dell'acque*, vol. 8, Stamperia S.A.R., Firenze 1741, pp. 246-247.



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CAP. X. cia AB + BE. 1 :: 1.M, dipoi M. n :: BE — AB. Q, e fi- nalmente Q. AB :: 2BE. R, ed intendafi defcritta la parabo- la conica SD, il di cui parametro fia R, fe l'ordinata DC fi dirà TAV. V. Fig. 10. la parabola R × SC = yy, ma R = $\frac{2ab}{Q}$ e Q = $\frac{n\times a-b}{M} = \frac{na-b}{\frac{1}{4+b}}$

dunque R = $\frac{2ab}{n\times aa-bb}$, e per tanto $\frac{BC\times 2ab}{n\times aa-bb} = yy$, adunque il *conato* totale allorchè $y = b$ farà eguale a $\frac{nb\times aa-bb}{2a}$, tutti però effi *conati* faranno eſpreſſi per le abſciſſe SC, ed il totale gravame farà allorachè SC vale $\frac{nb\times aa-bb}{2a}$.

II.

Che fe in vece di fupporfi la ſponda BE formata con linea ret- TAV. V. Fig. 11. ta, fi voglia piegata in una qualunque curva BbıE, fi ritroverà il *conato* dell'acqua come fegue. Poſte le ſteſſe coſe come nel numero precedente, facendo però $aE = z$, $bE = x$ eſprimente la lunghezza della curva da b in E, farà per la nota proprietà delle tangenti $aM = \frac{ydz}{dy}$; (effendo $mı = dz$, e $bn = dy$) $bM = \frac{zdx}{dy}$; onde per i fimili triangoli Mab, bcd, farà l'analogia bM. $aM :: bd$. bc, cioè $\frac{zdx}{dy}$. $\frac{ydz}{dy} :: nydz$. $bc = \frac{nydzz}{dx}$ e tutte le $be = \int\frac{nydzz}{dx}$.

III.

Corollario I. Si concepiſca a cagion di eſempio la data curva BE una parabola, la di cui equazione $z = yy$, il qual valore ſoſtituito nella formola precedente dà $\int\frac{4ny^3dy}{4yy+1}$, ed il fuo integrale $\frac{n}{3\times 4}\sqrt{4yy+1}^3 - \frac{n\sqrt{4yy+1}}{4} + A$, e poſto $y = 0$, allorchè il *conato* fia eguale a zero, farà $A = \frac{1}{12}n$, che però in tal caſo

o l'integrale completo farà $\frac{n}{12}\sqrt{4yy+1}^3 - \frac{n\sqrt{4yy+1}}{4} + \frac{1}{12}n$ CAP. X. dalchè fi ricava, che la detta parabola non poſſa cominciare nella ſuperficie dell'acqua, ma ſotto di queſta ad un ſeſto della larghezza del Vaſo.

IV.

Corollario II. Qual formola $\int\frac{nydzz}{dx}$ dà ancora la prima del numero I. di queſto Capitolo, mentre praticate le neceſſarie ſoſtituzioni divenendo la curva una linea retta farà $z = \frac{ydz}{dy}$. x. $y = \frac{zdy}{dz}$ ovvero $dz = \frac{zdy}{y}$: Parimenti $\frac{ydx}{dy} = x$, ovvero $dx = \frac{xdy}{y}$, onde $\int\frac{nydzz}{dx} = \int\frac{nzzdyy}{yydx} = \int\frac{nyyzzdyy}{yyxdy} = \int\frac{nzzdy}{x}$; ma $x = \frac{ay}{b}$, dunque $\int\frac{nzzdy}{x} = \int\frac{bnzzdy}{ay}$, e $zz = xx - yy$ ovvero $zz = \frac{aa-bb}{bb}yy$, adunque $= \int\frac{nydy}{ab}\times\frac{aa-bb}{bb}$ come in detto numero primo.

V.

Sia da trovarſi il gravame, che riſente un argine, la di cui TAV. V. Fig. 9. ſcarpa verſo il fiume, fi ſuppone a maggior facilità retta, e che formi con l'orizontale un angolo di gradi 40, cioè l'angolo AEB. L'altezza perpendicolare AB fia di piedi 32, e fia d'averſi prima il valore di $y = b$ per tre differenti poſizioni, col dividere cioè tutta la ſcarpa dell'argine BE, che fi ſuppone di piedi 50 in cinque parti; onde il primo valore di y dopo AB di piedi 32, come fi è detto, farà di piedi 25 proſſimamente. Il ſeconda valore di y, facendo $Eb = 30$, farà piedi 19; Il terzo piedi 13, ed il quarto farà 6 piedi; quai valori ſoſtituiti nella formola $\frac{nyyaa-bb}{2ab}$ danno reſpettivamente 472; 288; 166; 78; 17; ec. Supponendo $n = $ ad un piede, dimodochè queſti numeri rappreſentano tanti piedi cubi d'acqua, che aggravano reſpettivamente l'argine dalla ſommità dell'acqua fino all'aſſunta y, coſicchè faranno ſempre minori a miſura che detta y ſi prenderà più vici-

ACQUA VIVA E CORRENTE: INSIGHTS FROM RENAISSANCE FONTANIERI MASTERY

MARIANA PEREIRA GUIMARÃES, HERMANO LUZ RODRIGUES

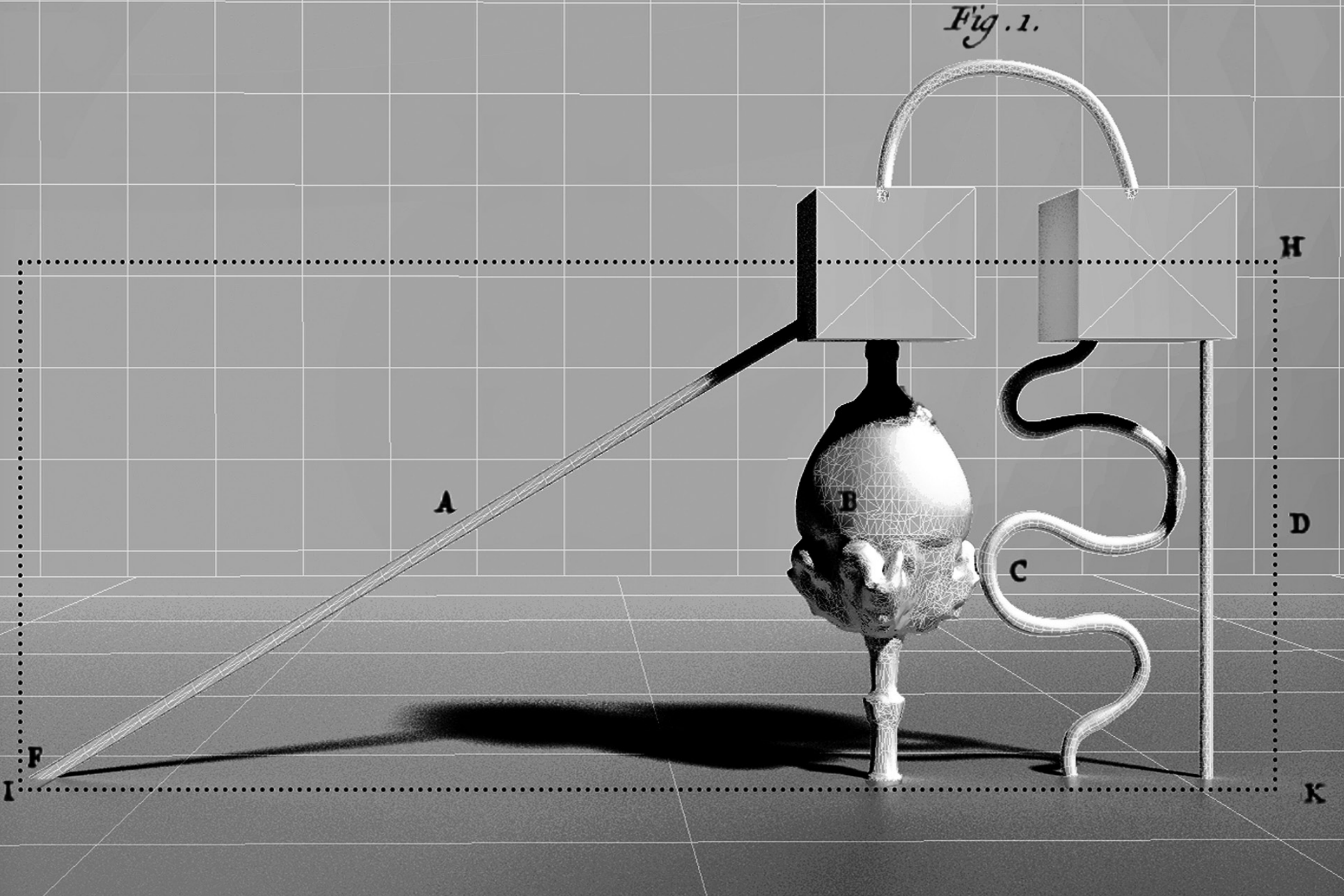
In a moment when climate, social, and racial activism has entered architectural criticism and theory with full force (see the theme of the 18th International Architecture Exhibition, La Biennale di Venezia: The Laboratory of the Future), to pause and look back at Renaissance Garden villas seems counterintuitive. From today's perspective, the Renaissance brings up ideas of an idealized nature that are too antiquated to look at when analyzing the emerging questions regarding the design profession. Perhaps this is true if considering habits of judgment that rely on notions that oppose human and nonhuman concepts of nature, or ideas of nature vs. technology. However, when we acknowledge the lack of clear boundaries between what we define as landscape and technology, and human and nonhuman (Lee and Helphand 2014), landscape as a field of study emerges as an array of complex systems that can be observed from different lenses.

Today, professionals and scholars largely struggle to predict, account for, or respond to climate impacts in contemporary design projects, despite the many computational tools and techniques at their disposal. This shortcoming urgently calls for an experimental approach to both design research and design practice. As such, there is a growing number of scholars interested in defining "Designed Experiments" (Felson and Pickett 2005) and "Research Through Design" (RTD) methods and techniques, given these concepts' potential for innovation in the field and to respond to pressing issues such as climate change. Surprisingly, during the Renaissance, the *fontanieri,* the professionals who oversaw fountains' design and hydraulic marvels, found themselves in a similar position. As Katherine Rinne (2011) and Rafaella Fabiani Gianetto (2008) noted, the *fontanieri* had to rely heavily upon onsite experimentation rather than precise calculations. Rinne points out that although there is a consensus among scholars that theoretical inquiry in classical texts and hydraulic treatises from this period had an impact on fountain and garden design, it is often overlooked the fact that the design practice performed by these architect-engineers also influenced and helped move forward hydraulic science and engineering.

It is striking to note how little attention the field of garden and landscape history has devoted to the incredible mechanisms and techniques that were employed to move water, even though water was considered the very soul (the *anima*) of these gardens and devices. When perceiving such bodies, the physical properties overshadow the inner works.

Terrariums, for example, present a useful metaphor, because they are, at the same time, ecosystems filled with bloom-

Water storage and movement. Image elaborated by Hermano Luz Rodrigues. Collage of images found in *Utilissimo trattato dell'acque correnti,* Fontana, Carlo, Roma, 1696. Source: ETH-Bibliothek Zürich, Rar 1070.



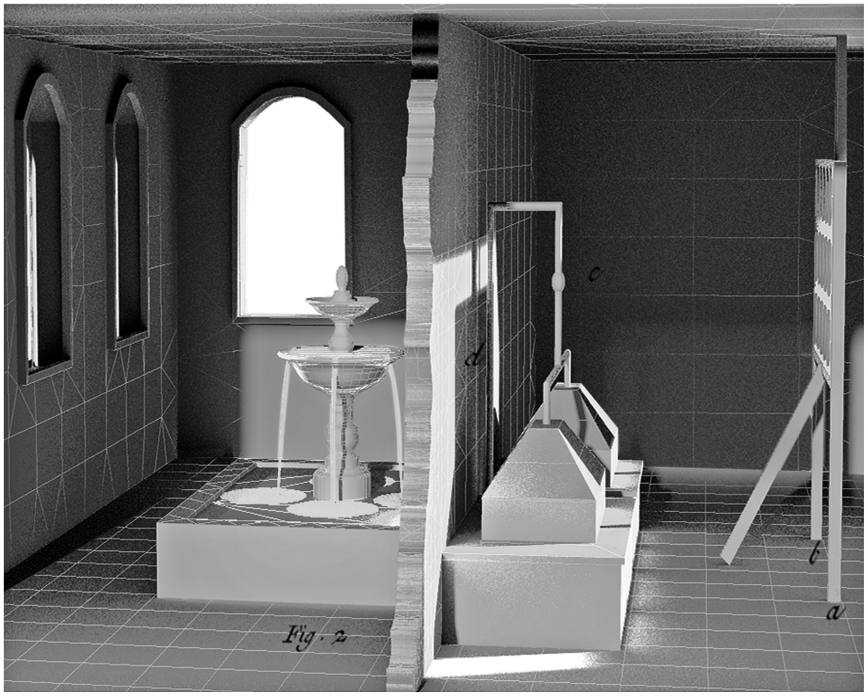
ing natural life and man-made inert environments. What attracts many people's attention often relates to their visible physical features: their mesmerizing and diorama-like appearance, a beautiful microcosmos of natural elements. Despite not giving the attention it deserves, the fascinating designs of both the terrarium and the garden villas were anchored by the control of water in a man-made system, the latter usually put underground and out-of-sight. Both are also evocative of the concept of a controlled nature, or a third nature as John Dixon Hunt refers to the garden villas: pleasant aesthetic landscapes (Hunt 2000, p. 34).

The control and transport of water are among the oldest challenges in human history, intrinsic to evolving notions of nature and its representation over centuries (Antoine Picon 2015). Even today, our relationship with water is not optimal, mainly because of the indiscernibility of water in everyday tasks: clean water comes out of the tap, or up in a fountain, after being transported and cleaned and transported again over kilometers of invisible underground pipes (Illich 1986; Graham 2009). Such is the nature of urban infrastructure that is conceived to mingle seamlessly in space to become invisible, as Graham and Thrift argue in "Out of Order: Understanding Repair and Maintenance" (2007). Antoine Picon re-states that the water crisis we find ourselves in today, be it scarcity or excess, is primarily political and technological (Margolis & Chaouin 2015).

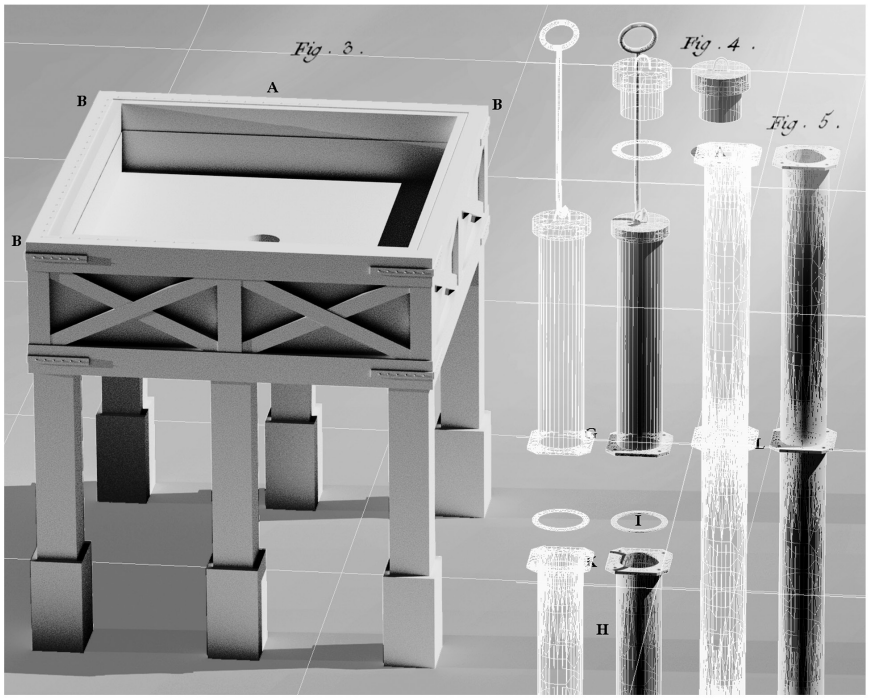
The political roots of the problem have been explored extensively in the works of Matthew Gandy, Eryk Swyngedouw, Maria Kaika, and Bruno Latour (Gandy 2006). Nonetheless, the technological historical thread is also broad: water can be placed in the center of urban technological innovation from the first Roman aqueducts to the 18th-century Industrial Revolution in Europe (Fischer et al. 2016). Until the mid-18th century, engineering was often presented as a discipline mostly focused on hydraulic problems; in fact, it was commonly known as "hydraulic architecture." *Architecture Hydraulique* is also the title of the 18th century's most crucial engineering treatise, by Bélidor, concerned with conveying, distributing, and managing water. In this long historical thread, a forgotten figure, the *fontanieri*, in Italian, or *fontainiers* in French (Santini 2019), central to the creation of the sixteenth-century Italian garden can shed light on current discussions about the idea of nature and technology in design (Gissen 2019).

These individuals had several interdisciplinary skills, usually being artisans, plumbers, hydraulic engineers, and architects. Although the first *fontanieri* were not acknowledged, some

Another way to augment the strength of a fountain using solar energy. Image elaborated by Hermano Luz Rodrigues. Collage of images found in Book One, Problem XV, *Les raisons des forces mouvantes* by Solomon de Caus, Frankfurt 1615. Source: Smithsonian Libraries and Archives, Natural History Building.



Cistern design to store water and provide water pressure to public fountain and details of cistern pillars.
Image elaborated by Hermano Luz Rodrigues. Collage of images found in Etching from *L'Art du plombier et fontainier* attributed to Claude Matthieu Delagardette, Paris 1773. Source: National Library of France, Rare Books Reserve department, V-3974.



achieved recognition such as Curzio Maccarone, known for completing notable masterpieces at Pirro Ligorio's Villa d'Este (1550-1572): the Tivoli Fountain, and the Fountain of Rome, or Rometta (Symmes, Breisch, and Astley 1998, p.139). Luc Le Clerc and Claude Venard were also known specialists in water automata, known for Villa d'Este's Water Organ (Barbieri 2020).

The fifteenth-century discovery of ancient texts, mainly Vitruvius' manuscript in 1408, led to a renewal of artistic and technological interest in fountain construction (Coffin 1991, p. 50-53), prompting a new stake in hydraulics. One century later, the restoration of ancient water networks and the new influence of popes and powerful families led to a revival in the construction of water devices, such as in Villa d'Este. Bernardo Buontalenti, well versed in humanistic topics, masterminded new water jets and automata for the Medici Villa (1569-1589) in Pratolino, near Florence, combining knowledge from classical texts and new construction technologies (Fabiani Giannetto 2008). Hydraulic expertise then migrated to France from Italy in 1598, when Tommaso and Alessandro Francini, who had worked with Buontalenti on Pratolino, were summoned by Henri IV and his wife Marie de Medici to design a great Italianate Garden for the Chateau of St. Germain-en-Laye (Coffin 1991, p. 54).

The commission of talented *fontanieri* in foreign territories certainly popularized these new inventions. Still, the primary means of transmitting practical hydraulic information throughout Europe was via published treatises and illustrated books, contributing to the evolution of scientific technology. Buontalenti's Norman apprentice Salomon de Caus (1576-1626) became an internationally renowned pioneer in hydraulics. de Caus published the "Principles of Moving Forces" in 1615, a fundamental text on hydraulic mechanics and garden engineering that influenced future *fontanieri* (Strong 1979, p. 73-79).

The Italian architect and engineer Carlo Fontana (1638-1714), who worked with Bernini redesigning the plaza in front of St. Peter's, and who designed the fountain pool for Rome's Fontanone for the Acqua Paola in 1690, also published an important treatise on hydraulics. Fontana's *Utilissimo trattato dell'acque correnti* (The Most Useful Treatise on Moving Waters), 1696, was based on an ancient text about Roman aqueducts by Frontinus. It also incorporated explanations of the most recent scientific discoveries. Fontana's text on aqueducts underscores that pipes are an essential component of the hardware that makes fountains work.

Likewise, the late eighteenth-century French book, *L'Art du plombier et fontainier* (The Art of Working in Lead and Foun-

tain Making), 1773, attributed to Claude Mathieu Delagardette, is an informative guide to forging lead, as well as to making pipes, joints, drains, gutters, cisterns, reservoirs, and other fountain fixtures. The book also notably covered the installation methods necessary for utilitarian and ornamental fountains.

Drawings that illustrate underground pipes and mechanics, like the ones by de Caus, Fontana, and Delagardette, are rare to find in contemporary landscape design books. Systems such as reservoirs and underground pipes are essential components of these projects, therefore should be presented as notable contributions and brought to the fore. Nowadays, like in the project of the Renaissance Garden villas, teams of hydraulic engineers and experts work together with architects and artists to conceptualize modern fountain waterworks, that are true artworks but later rendered invisible literally and figuratively because these covert infrastructures and their development are never seen or shown to the public. The figures responsible for designing these systems, the architect engineers, and the hydraulic experts behind these projects, remain largely hidden figures. In some ways, they bear similarities with Renaissance *fontanieri*. According to Stephen Graham, quoting Bernward Joerges, to become infrastructure, certain technology must become invisible, or at least culturally invisible in a process called "technology black boxing". Unboxing these mechanics and knowledge, however, even in experimental ways, may open or illustrate pathways to innovative thinking and further understanding in the contemporary design discipline.

The 'Starchitect' figure can be seen as a consequence of this black-boxing system, in which the hierarchies and lack of accreditation in productions end up venerating a single figure or type of profession. This has incited many students and prospective professionals to aspire to be in that specific role. Regarding design itself, in the twentieth century, the field of fountain hydraulics expertise has also incorporated digital and computer processing technologies combined with the traditional methods dating back from de Caus, Bèlidor and Fontana (Symmes, Breisch, and Astley 1998, p. 25) opening possibilities for innovative design conceptualizations but also new opportunities to incorporate fountains in public spaces as big as the 3,450 sqm Bordeaux's water mirror to Olafur Elyasson's fog rings.

Digital technology and the creative use of materials and mediums can help envision and make visible the complexities behind such systems and give them new meaning in a time of several environmental crises.

Acknowledging the unsung heroes and the necessity of their work can mitigate such pervasive issues in contemporary architecture and design culture and promote a more balanced professional ecosystem.

THE PALM HOUSE. A PROJECT OF DOMESTICATION

SILVIA MUNDULA

AN ARCHITECTURAL CLUE

A greenhouse evokes the terrarium in a literal way, as it is almost an architectural representation of it. A greenhouse is usually designed as a place to collect, grow and exhibit plants; however, in contrast to the terrarium, it is fixed in place. The Palm House at the Royal Botanic Gardens in Kew, in addition to being a literal interpretation of the terrarium, is also a piece of architecture which provides clues for studying certain design themes, such as the interplay between the interior and the exterior, as well as certain environmental themes. It emphasises the critical relationship between architecture and nature by nurturing plants that are almost extinct in the wild. It embodies various geo-political themes in regard to the relationship between Empire and the colonies. It is also an example of a cultural direction which evokes an anthropocentric way of thinking. When it was built in the mid-nineteenth century, the aim of the Palm House was to display the unusual species which came from the colonies and from other far-flung countries, as beautiful ornaments and also as the subject of scientific study; today, it houses plants which are at risk of extinction. The Royal Botanic Gardens at Kew have evolved over time. The existing collections, such as that of the Palm House, have been expanded and new gardens and research departments to enable scientific projects have been created. Indeed, the Palm House, evolved from being an expression of the culture of the British Empire into becoming an international research laboratory to study endangered species. In 2003 Kew Gardens became a UNESCO World Heritage site and was listed as a place to protect nature, in particular certain plants and fungi, which are necessary for life on Earth[1].

This paper explores the architecture of the Palm House, as a tool for speculating on the relationship between content and container and on the evolution of its meaning throughout history, by comparing it with other projects at Kew. The Palm House becomes a starting point to reflect on universal issues, from a certain cultural perspective.

A DISTINCTIVE DESIGN

The incredible lightness of its structure and the purity of its shape make the Palm House at the Royal Botanic Gardens in Kew one of the most iconic buildings in London. The character of its architecture is deeply dependent on its content: majestic, exotic palms which come from all over the world.

Indeed, this building appears to be made up of tropical forest and, once we are inside it, the glass and iron of the envelo-

Palm House at Kew Gardens - cross section.
Drawing by AHMM, 2022. Credits: @AHMM

pe somehow disappear, or, better still, seem to emphasise how unique this space, which recreates the conditions of an exterior space inside an artificial space, is.

Kew was created as a private garden in the sixteenth century, but the various collections of plants, including the exotics, were started in 1759 by Augusta of Saxe-Gotha, Princess of Wales. The plant collections were expanded by her son George William Frederick, King of Great Britain and Ireland from 1760 to 1820, with the aid of British naturalist Sir Joseph Banks. Finally, in 1844 when the Royal Botanic Gardens at Kew became a national institution, the director, Sir William Hooker, commissioned the Palm House. Sir William wanted to create a laboratory for scientific research but also "a permanent exhibition of landscape aesthetic" (Matveleff 1989). As pointed out by Catherine Matveleff in her thesis about Kew Gardens, the Palm House differed from other buildings designed in the nineteenth century because, in contrast to nineteenth-century architecture, its design did not take inspiration from the universal codes and aesthetic values of the past (Matveleff 1989, Vidler 2008). On the contrary, the style of the Palm House was based on techniques drawn from the development of engineering in Great Britain. Its spacious and minimal design was ideal for displaying the living treasures which were brought from the colonies. Indeed, this piece of architecture appears to be the result of a particularly English desire to collect exotic plants (Horwood 2007), combined with a desire to demonstrate techniques in advanced technology, which were partially borrowed from shipbuilding techniques. Crystal Palace, which was designed by Joseph Paxton for the Universal Exposition in 1851 and which became one of the symbols of modern architecture (Heynen 1999, pp. 95-117), evokes the structure of the Palm House, on a larger scale. The design is the result of a collaboration between the Irish engineer Richard Turner (1798–1881), who had considerable experience in iron structures and curvilinear glass, and the architect and member of the Royal Botanic Society, Decimus Burton (1800-1881), who had previously designed the conservatory at Chatsworth House and the winter garden glasshouse at the Royal Botanic Society in Regent's Park. The conversion from a royal garden to a public garden is also key to understanding the role and the special design of the Palm House. The glazed surfaces and the function of the greenhouse partly invoke the gentle architecture of orangeries of previous centuries, which are symbolic of the old aristocracy and their private property[8]. The dimensions and the function of the Palm House, however, are not that of a private orangery but rather that of a national institution. A variety of different elements led to the realisation of this greenhouse.

During that period, indeed, the interest in botanical and natural sciences was increasing. The study of the new plants which were found during geographical exploration, underlined the failure of the previous Linnaean system and showed that it required updating. In *nature Displaced, Nature Displayed: Order and Beauty in Botanical Gardens Botany*, Nuala C. Johnson suggests a link between the development of botany and taxonomy, and aesthetic staging, in architecture, as taxonomy reinforced a visual order that influenced different spheres, including garden design and architecture (Johnson 2011). Furthermore, a growing section of the population had access to leisure activities, such as visiting museums and parks, which were being expanded in that period. When it was built between 1844 and 1848, the Palm House was remarkable because of its large dimensions: 110 metres in lengths with a central section measuring 42 metres long, 30.5 metres wide and 21 metres high. Its size, however, was soon surpassed at Kew Gardens by the Temperate House (1860-1898), which was twice the size of the Palm House. What made this project distinctive was its innovative style, which was different from preceding greenhouses. In contrast to the other cast iron buildings, the Palm House did not have much decoration. It was very modern. Its allure, indeed, was dependent on the lightness of its structure, which allowed as much sunlight as possible to enter. To erect this bold and courageous structure, a specific technique which came from the shipbuilding industry was used: the more usual cast-iron ribs were replaced by wrought-iron ribs, which were narrower but had greater tensile strength. To build the vaulted roof, Turner used a very original type of purlin, which worked as a prestressed structure. The whole project was made possible because of the technological advances of the time. The heating system, for example, benefitted from the recent introduction of steam technology, while the quality of the glass was achieved due to improvements in national manufacturing. These improvements came about because of the necessity of competing with foreign imports after the tax on glass was abrogated in 1845. The abolition of this tax, furthermore, made the cost of the raw material much cheaper.

THE CONTAINER

The transparency, or more precisely translucency, of the glass allows the rays of the sun to pass through the walls, providing light and heat for the plants. At the same time, it allows us to see the plants from outside. This creates intriguing effects, as container and content overlap, somehow adding complexity to the pure li-

The Palm House at Kew Gardens - longitudinal section.
Allford Hall Monaghan Morris is assisting Kew Gardens with the restoration of the Palm House and other structures. The project will include the replacement of the building services systems with a net zero carbon ready solution for heating, cooling, ventilation, and all services.
Drawing by AHMM, 2022. Credits: @AHMM

The Palm House at Kew Gardens.
Palm trees are visible through the glass.
Photo by Charlie Porter, 2023. Credits: @Charlie Porter

nes of the building and revealing the function of the building. The Palm House clearly has a 'literal transparency', which means that it is possible to see through the building⇓. This kind of transparency is the same which characterised the period of architectural modernism and in some places, such as France, it also had political connotations, linking the idea of transparency with the idea of accessibility (Forty 2000, p 286). One could also find in the Palm House a 'transparency of meaning' (Forty 2000), as the signifier and the signified coincide⇑. During the sixties, Susan Sontag wrote about the 'transparency of meaning'.

> *Transparence* is the highest, most liberating value in art – and in criticism – today. Transparence means experiencing the luminousness of the things in itself, of things being what they are (Sontag 1964, p. 9).

In architecture, 'transparency of meaning' occurs when there is no distinction between form and function, or content. This kind of transparency constitutes the essence of modernist aesthetics in architecture, as well as in art. Walter Benjamin interpreted modern architecture by focusing on the use of glass, which is usually associated with 'literal transparency'. Benjamin saw in the glass architecture of the arcades in Paris, as well as in the glass architecture of the great exhibitions, 'the glorification of the phantasmagoria of the commodity', considering it an essential element of that period, as it expressed the 'poverty' which characterised that type of society (Heynen 1999, p. 112), moving towards issues of meaning.

However, it was only during the twentieth century that the use of glass in architecture included a new notion of dwelling, which had to do with transparency and also with lightness, brightness, airiness, and fluidity. Indeed, another interesting aspect of the Palm House is that it is a hybrid space, being a greenhouse, a museum and a space for leisure. It was designed to have different functions: horticultural - to grow tropical plants, didactic - to display plants, and aesthetic - to surprise its viewers. Even though, today, the technological aspect of this glazed structure is no longer notable, the pleasure of venturing into this tropical forest under the protection of an elegant glass structure, is still a feeling which is appreciated by the visitors. Of course, a slice of nature, which is enclosed in an artificial space with the goal of preserving plants which are becoming extinct, can be controversial and give rise to mixed feelings. It appears that human intervention is necessary in order to maintain an ecosystem, such as the rainforest, today. This implies that the Anthropocene wilderness no longer coincides with the untouched and the virginal, but rather with the artificial (Burckhardt 2019).

Or, more precisely, that there has been a shift in the environmental paradigm, from aiming to preserve nature in its prehuman state, towards a hybrid of pristine nature and human management (Marris 2011).

THE EXOTICS

The website of Kew Gardens presents the Palm House as an extraordinary indoor rainforest where one can observe tropical plants from some of the most endangered environments in the world However there is no reference to its architecture, except for a brief description in a short video by Sir David Attenborough. The website firstly provides some data about the collection of exotic plants, asserting that the vegetation of the rainforest includes 50% of the species which are vital to sustain life on earth, only 2% of which survive on Earth today. For this reason, the Palm House is still very important for scientists, as some of the species in the collection no longer exist in the rainforest. In addition to endangered and extinct species, the Palm House also includes exotic plants which are a precious commodity in tropical countries around the world, such as the rubber tree (*Hevea brasiliensis*), African oil palm (*Elaeis guineensis*), and cocoa tree (*Theobroma cacao*). On entering the Palm House, the vegetation is lush and the air is heavy and dense. This greenhouse reproduces a British version of the Tropics, which only includes plants. In the nineteenth and twentieth centuries, plants were essential elements in representations of tropical architecture ⌊.

> God of our fathers, known of old,
> Lord of our far-flung battle-line,
> Beneath whose awful Hand we hold
> Dominion over palm and pine—
> Lord God of Hosts, be with us yet,
> Lest we forget—lest we forget! (Kipling, *Recessional*, 1897)

In *Recessional*, the poem composed by Rudyard Kipling for Queen Victoria's Diamond Jubilee in 1897, palm trees are a synecdoche for the colonies, highlighting the connection between colonial architecture in tropical countries and plants. Exotic plants, indeed, were brought to Europe during this period of geographical exploration, they were domesticated ⌈ inside greenhouses, and then reinterpreted and used as decoration in tropical interiors, evoking a Western idea of the exotic but also a sense of comfort. Houseplants, indeed, are usually comforting elements in an interior, as they are a symbol of care and domesticity. If we think about the history of houseplants and consider the reasons why they have become so popular, one can see

Dense Air Inside the Palm House.
Photo by Cendrine Robert, 2022. Credits: @Cendrine Robert

that they may symbolise different things, for instance wealth, power, or love for the environment.

Tropical houseplants, indeed, contributed to the definition of the European idea of wilderness, evoking the idea of pristine nature in a portable version. The English, indeed, were particularly interested in wild nature for various reasons. In *L'invenzione della natura selvaggia* (2013), Franco Brevini focuses on the story of the English explorers in his search for the origins of the European fascination for wilderness. Brevini argues that among the reasons for English primacy in exploration is their sensitivity to nature, which has very ancient roots. This sensitivity is visible in the English taste for country houses, parks and gardens, in their love for animals such as horses and dogs, and in their practice of birdwatching and hunting. In addition to their sensitivity to nature, however, the English have a tradition of discovery and conquest, which was consolidated in the Victorian Age. The third and most fundamental reason to explain why the English were so interested in nature and particularly in wilderness, is the industrial revolution, which took place in Great Britain before it took place in any other country. At the end of the eighteenth century in Great Britain, "l'impoetica skyline degli opifici" (Brevini 2013, p. 111), the factories, the mines, the coal waste and the smoke, were irreversibly spoiling the gentle landscapes, which had been depicted by painters such as Thomas Gainsborough (1727-1788).

CONCLUSION

The aim of the Palm House was to impress the visitor with its grandeur, its size, the quality of its structure, and its talent for displaying the achievements of the Colonial Empire. Today, it still has a fascinating effect on visitors: the beauty of lush vegetation inside and the contrast between the enormity of the interior space and the slimness of the structure, between the height of its surfaces and the absence of thick structural elements, between the pure and rigorous image of the greenhouse outside and the hypernatural and complex perspectives inside. The importance of the cutting-edge technology used in the glass architecture has, however, been eclipsed by the importance of the botanical collection in this greenhouse.

At the Royal Botanical Gardens at Kew one can see how the interest in plants has evolved. In 1982, a grass garden was established to exhibit thousands of species of herbaceous plants, catering to the new interest in herbaceous perennials in garden design. As tropical plants during the nineteenth century

represented wild nature by evoking the dense and untouched jungle, so herbaceous perennials today represent wild nature by evoking the spontaneous and biodiverse meadow.

> Despite all our wonderful plantings and spectacular exotics, there is still a deep-seated and perhaps increasing affection for wild flowers as they look in nature. This gives us an opportunity to get across the message that conservation begins at home and to connect our UK audience with concerns about biodiversity in the UK. (Crane 2002, p. 7)

Herbaceous perennials, indeed, appear to be completely different from tropical plants, as they are usually part of the local vegetation. They are not evergreen species with lush flowers, but rather they change throughout the seasons and become particularly interesting in autumn and winter, when the flowering season is over. Furthermore, they don't need much care or much water, tolerate a wide range of temperatures and many of them are particularly loved by pollinators. Looking at plants from the lens of design, we can observe how the introduction of ecology into landscape design influenced the discipline, with sustainable projects becoming important because of environmental issues (Whiston Spirn 1997). This also resulted in a heightened interest in plants, as argued by Marc Treib in *The Aesthetics of Contemporary Planting Design* (2021). The artificiality of the Palm House is far removed from the image of nature described by contemporary post-anthropocentric and post-Eurocentric theories; however, it can be seen as the starting point for questioning the approach taken by architecture to environmental issues.

The Rainforest Inside the Palm House.
Photo by Giacomo Guzzon 2023. Credits: @Giacomo Guzzon

"The Royal Botanic Gardens, Kew's mission is to be the global resource for plant and fungal knowledge, building an understanding of the world's plants and fungi upon which all our lives depend" https://www.kew.org/sites/default/files/202105/Kew%20World%20Heritage%20Site%20Management%20Plan%202019-2025_1.pdf [accessed 29 December 2023].

The first greenhouses were created as simple shelters for citrus in Northern Italy during the Renaissance and then evolved into charming spaces, halfway between a living room and a garden, during the seventeenth century, when their function expanded, and they became spaces dedicated to leisure. The luxurious orangery at Versailles created during the reign of Louis XIV is an example.

About the 'literal transparency'see: C. Rowe, C., R. Slutzky, *Transparency*, Birkhauser Verlag, Basel 1997, (or. ed. 1963). About the 'transparency of meaning' See: A. Forty, Transparency, in Idem (ed.), *Words and Buildings. A Vocabulary of Modern Architecture*, Thames and Hudson, London 2000, pp. 286-288.

The signifier is 'the architectural form', the signified is 'the architectural function'. About this definition see: C. Jencks, G. Baird (edited by), *Meaning in Architecture*, Barrie & Rockliff the Cresset Press, London 1969.

To cite one example, the Pegu Club, which was founded in Yangon, Myanmar in 1871, was a Victorian-style Gentlemen's club that was represented on postcards as surrounded by exotic potted plants.

By 'domesticated' I mean that that these plants were taken from the rainforest, which was perceived as wild, exhibited in the greenhouses, and then transformed into decorations for interior spaces, such as houses, hotels and restaurants.

Plants have always been part of the human existence, as medicines, as spices for cooking or just as beautiful things to collect. During the Tudor period in Britain, when different events transformed the interiors layout and several aspects of domestic life, the new lightness and the development in building techniques allowed to grow plants inside the house. And the renewed taste for decoration gave to indoor plants a particular added value: plants became desirable objects to show.

Franco Brevini points out that the European concept of wilderness developed, particularly in the eighteenth century, through the idealisation of two places: the Alps and the New World, see: F. Brevini , *L'invenzione della natura selvaggia. Storia di un'idea dal XVIII secolo a oggi,* Bollati Boringhieri, Torino 2013, p. 96.

'Hypernature' is as an exaggerated version of nature, which is designed to recreate the perception of wilderness within a small urban space. See: J. Amidon, *Hypernature*, in MVVA (edited by), *Allegheny Riverfront Park*, Princeton Architectural Press, New York 2005, pp. 57-72.

The term *protected* is put between inverted commas, because one could argue that the reasons why many plants are endangered are due to a wrong use of natural resources, which started with the colonies' exploitation.

A number of garden designers started to experiment with herbaceous perennials during the 1980s, starting a particular tendency in garden design. This tendency became known under different names, from *Naturalistic Planting Design*, to *Dutch Wave*, to *New Wave*, to *Perennial movement*, etc. to indicate a design direction in which garden designers look at wild nature as a source of inspiration for their planting schemes.

VEGETATION AS ARCHITECTURAL FORMS. SITE'S IRONY AND DESIGN PERSPECTIVES

KEVIN SANTUS

The project of architecture, susceptible to the issue of the environment – defined as the ecological sphere – hence embedding elements of sustainability, becomes an intermediary between cultural and political stances and the biotic system. This relationship is inherently part of the architectural project, whether it is a contextual necessity or a cultural stance, as recently stressed by Barber with the notion of "a longue-durée engagement with buildings as physical, conceptual, and cultural mediators of the environment." Moreover, "The discourse […] [recognize] that all architectural activity has registered, or directly engaged, environmental issues both by professional necessity and as an expression of cultural desire." (Hochhäusl et al. 2018, p. 4). Reflecting on the contemporaneity, we could hazard to say that these two elements are nowadays become one. A form of new *zeitgeist* seems to meander through the words of many scholars and practitioners, which is nothing more than a mirror of the society, and an awareness of the climate crisis in which we live. Hence, a question can be opened concerning this condition and how it can affect the architectural project, touching not only the process of architecture but also its formal composition and inner meaning.

With a similar cultural background, a new exhibition opened in September 2023 at the Museum of Modern Art in New York, titled *Emerging Ecologies: Architecture and the Rise of Environmentalism*, organized by Carson Chan and Matthew Wagstaffe, as an initiative coordinated by the MoMa's Ambasz Institute. The exhibition moves from the standpoint of placing the climate crisis as a crucial topic to investigate, not only in terms of catastrophic dismay but also as a field of research and practice for architecture. Without focusing on specific authors, the exhibition is more of a collection of various projects that try to detect the roots of environmentalism in the '60s and '70s in the United States. Through this compendium, the retrospective oversights the relationship between ecology and architecture, investigating and narrating some ideas from which it is possible to glimpse key design questions that still today – or perhaps especially today – could be central to the project of space. Even more, the collected projects in the exhibition seem to highlight what a series of researchers such as Daniel Barber, Barnabas Calder, Jeremy Till, and Dipesh Chakrabarty have pointed out, namely that the climate emergency opens up new design opportunities (in terms of form, narrative, scale, technology, etc.), and at the same time shows a new interpretation for design expressions of the past.

Based on that, detecting those experiences that stress a certain attitude of the project in entangling nature and architecture is not only the demand to establish the modern origins

of environmentalism in architecture. Indeed, studying those projects could reveal those utopian beliefs, enabling the drive and building of architectural modification in the face of climate breakdown. In other words, this is what Marco Biraghi called the necessity to find an ideality behind the project to contrast the often ideological attitude, which we can seize in many contemporary approaches.Going beyond the greenwash, or the use of vegetation as technocratic fixes, the relationship between vegetation and architecture can stimulate a debate within contemporary design culture, to envision a way of doing architecture that could enable more than the coexistence between the two, approaching a proper form of project in dialogue with the environment. In this context, the collection of projects at the MoMa's exposition could be distinguished by identifying two dialogue conditions between nature and architecture. The first could be synthesized in the concept of *technology shaping the space* as visible in the experiments conducted by figures ranging from Buckminster Fuller, where his domes define closed systems and create microcosms that are the spatial interpretation of a complex culture, ecology, and technology; to Murphy & Mackey's *Climatron* (1960), in which the lush vegetation is confined in a controlled space, where the microclimate it is regulated by human technology. A second condition of the project, instead, investigates the blurring border between artifice and nature, as exemplified by Ambasz's *ACROS Fukuoka* (1992) or even more by the work of James Wines and his office SITE, in which vegetation becomes a constitutive element of the project (Fig 01). Therefore, the relationship between nature and architecture is not transmitted based on technology but as an inner spatial bond. Vegetation in this condition it is not an added aesthetical apparatus but an element determining the character of the architecture itself.Focusing on this interpretation, SITE's work can renew a debate on some studio projects and suggest a fertile seed for the project through the irony⅄ of the solutions adopted.

THE EQUIVOCAL PROJECT OF VEGETATION IN SITE

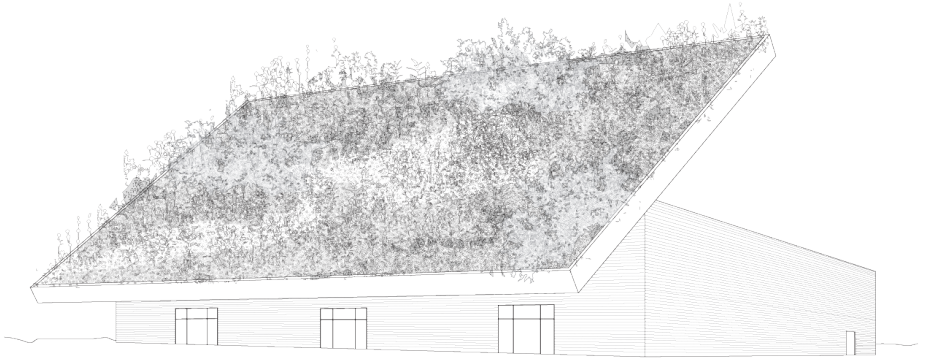
It is interesting to note how the visionary experiments of SITE and the ideas of James Wines partially draw inspiration from the world of art and sculpture. The same name of the office, funded in 1970 together with Alison Sky, Emilio Sousa, and Michelle Stone, is an acronym for Sculpture in the Environment.

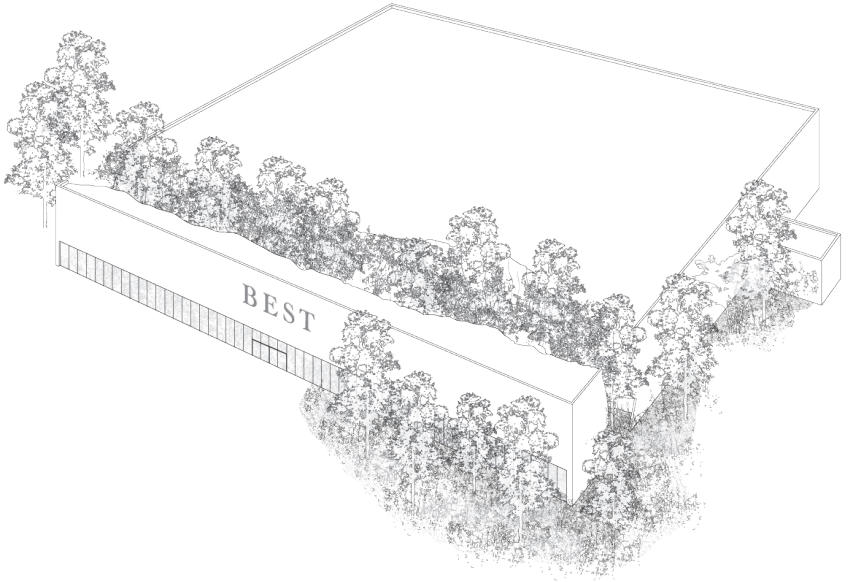
Indeed, the artistic attitude of Wines returns strongly in his works, as visible in some of the most celebrated projects for the BEST company⍝. However, amid modernism and post-modernism architectures, SITE developed peculiar experimentation, which, observed nowadays, could reveal a new interpretative key to the project and its relationship with the vegetation. Indeed, among their projects, it is possible to note the intention of overcoming the functionalistic approach to architecture while searching for a deeper interpretative relationship with the contiguous environment, transforming the typological essence of architecture.

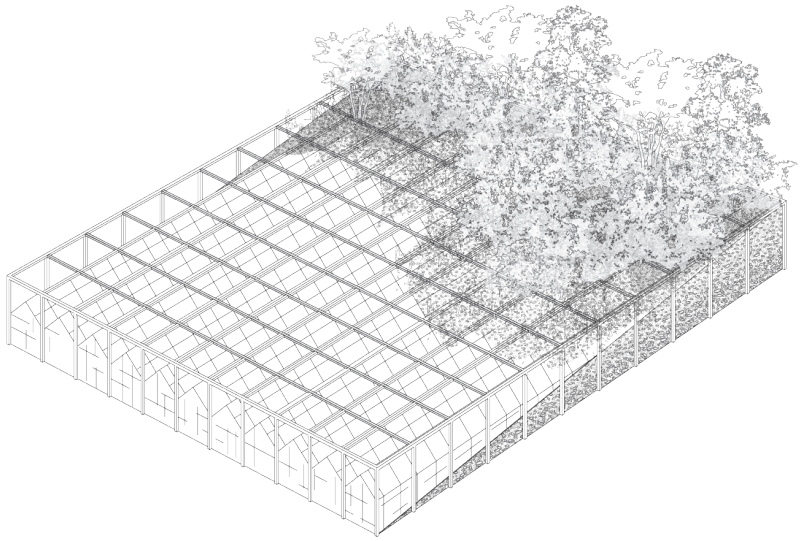
This attitude is particularly visible in the studio's explorations between the 70s and early 80s. Those were the years when the already-spread ideas of the utopian and anti-establishment Radical Architecture propagated in the US⇓, and the ecological awareness of man's actions on climate and environment was rising. Among the others, the 70s were the years when the Club of Rome published the *Limit to Growth* (1972), Ungers's *Kommunenin der Neuen* book to analyze utopian communities, and later in 1977 *The City in the City – Berlin a Green Archipelago* was developed; and again the concept of "deep ecology" was introduced by Arne Naess (1973), and Jane Drew and Maxwell Fry published *Architecture and the Environment* (1976). During this fervent decade, SITE was commissioned by the catalog merchant Best Products Company to design a series of showrooms in the suburbs of various American cities. Hence, between 1972 and 1980, SITE transformed those debates and ideas into architecture, where, through the irony of their buildings, they turned the project of space into a speaking manifesto. The showrooms turned the functionalist approach and showed how, in the suburbs, and despite the usage of the building, the architecture could establish a new discourse on the environment and form. An interesting attempt to blend vegetation and architecture is the *Landscape Parcel Preservation* (1978), where the crowning part of the building – which is a simple box volume – becomes a detached, diagonal element hosting a verdant green roof. The project has an inner will to preserve the existing soil, transforming the crowning into an open terrarium, where the green roof becomes a distinctive architectural element. Moreover, the idea that resides in this attempt to intermingle vegetation and architecture also shows a certain sensibility toward the conservation of the ground. Indeed, the whole surface covered by the building is then reproduced as an artificial ground, thus reflecting on soil consumption that was devouring the fields supplanted by new conurbations.

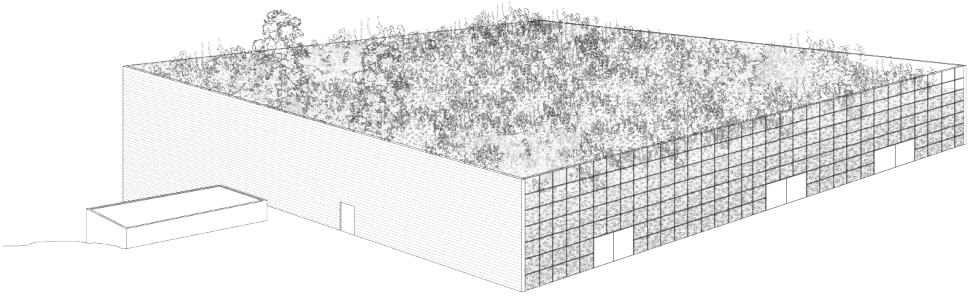
In the same year as this drawing, SITE developed the so-called *Forest Building* in Richmond, Virginia (1978), presenting a

Fig 01 *SITE's explorations of vegetation as project character*
The drawings represent four projects of SITE, James Wines, produced for the BEST Company in the 70s and 80s. Landscape Parcel Preservation, 1978 (top left); Greenhouse Showroom in San Leandro, 1984 (bottom left); Forest Building in Richmond, Virginia, 1978 (top right); Terrarium Showroom, South San Francisco, 1979 (bottom right).
Drawing by Kevin Santus, 2024.









peculiar relationship between the project and vegetation. The site for the suburban construction saw the presence of an arboreal thickness composed of oak trees, which became, for SITE, an ecological and geographical presence that functioned as a pivot for the development of the project. Consequently, in the *Forest Building*, the vegetation runs through the architecture, simultaneously creating a constructed border that allows the flora to be perceived as a contained space of nature. The composition of the architecture is simple. The volume of the showroom is split into two parts, with the façade being physically dethatched, creating an architectural intermezzo of approximately 60 meters in length and 7 in width, where an oak's forest grows. To stress this idea of ambiguity, the freestanding façade presents glass windows and openings, accentuating the perception of this space as if the architecture built the perimeter of the wood. Containing this forest fragment transforms an ecological and environmental sensibility into an architectural feature that is not just a "green addition." As described by Gallanti in *Harvard Design Magazine* (2018) the *Forest Building* resonates with the presence of this contained wood: the treatment of the façade, which seems to be broken by telluric movement, plays with the rows disposition of bricks; the opposition between the flat and simple surfaces of architecture and the lust of the vegetation generate a contrast which highlights the presence of plants as a living matter of the project. This thickness is transformed into something more than a simple threshold between outside and inside; it becomes a space where one perceives nature and shifts the role of trees into the real protagonist of the project. In a certain sense, also in this project, the architecture generates an interpretation of the terrarium: a contained space for nature to grow, where humans can perceive a delimited ecological system. From this hint of entangling plants and architecture, Wines draws a further proposal for the BEST showroom as an extreme conclusion of this process: the *Terrarium Showroom* (1979) (Fig 02)⩚. The drawing shows a completely integrated construction with the ground and surrounding vegetation. The architecture becomes a mound of earth, a box of vegetation. The project is again a simple box, where greenery is enclosed in glass facades filled with earth stones and growing shrubs. Larger and heavier stones appear at the base of the building, while a thinner soil layer constitutes the crowing element; on the top and surrounding the building, trees of various dimensions take the space, creating a complete merge between the surrounding environment and the green roof of the building. The construction vertical sequence recalls the typical arrangement of classical architecture,

here transformed into vegetation, where it is still possible to detect all the typological elements of the construction (base, body, and crowing), nevertheless interpreted through nature. So, the architecture appears to be reduced to a thick glass layer. Here, vegetation and architecture blend in an ironic construction that seems to be "a ruin" of modernity. The architecture as a whole reproduces nature, while the building becomes part of the Earth itself. Echoing Paul Virilio's *Bunker Archeology*, the project hints at remembering the "revelation that architecture can be found in unlikely combinations of mass and bulk in geological forms and 'allowed' to sink into their sites." (Wright 2021, p. 46). As a new ground thickness, the architecture hosts soils, plants, and a new biotic sphere. Blending with the Earth's crust, the object of architecture becomes part of a planetary architecture (Trévelo, Viger-Kohler 2021), a living machine itself. Moreover, in the *Terrarium Showroom*, SITE demonstrates a non-decorative way of using vegetation, at the same time displaying nature and making it the character of the building, moving beyond modernism and the stylistic dogma, and searching in the ecological sensibility the ideality to construct new forms of architecture. Again, Wines' experimentation shows irony and equivocality as part of the design process, dealing with the environment as a living, geological, and geographic fact.

If we could consider this project as a manifesto of an architecture entirely transformed into a terrarium, further experiences of the studio tried to develop the same idea of the contained nature and see the project of the building as the possibility to reproduce forms of naturality. In this regard, it is highly relevant to cite the *Highrise of Homes* (1981) (Fig 03). Here the architecture of a skyscraper breaks with the formal research of the object, preferring a utopian form in which each floor of the building composes a new urban ground. The project is a clear critique of the American sprawl, aiming to save hectares of land from the soil consumption of hundreds of new single-families houses. At the same time, *Highrise of Homes* takes to the extreme and reinvents the idea of the horizontal plane of architecture as a new urban ground, where each floor can become a new living environment. The new building constitute a self-functioning system, looked from the outside it seems an open structure, free to grow and transform.

Also, in this case, Wines proposed the presence of vegetation as a complementary element of the living, which still finds a functional and integral character for the whole architecture.

Not a mere decoration but a fundamental feature of the project. As Wines stated in a conversation:

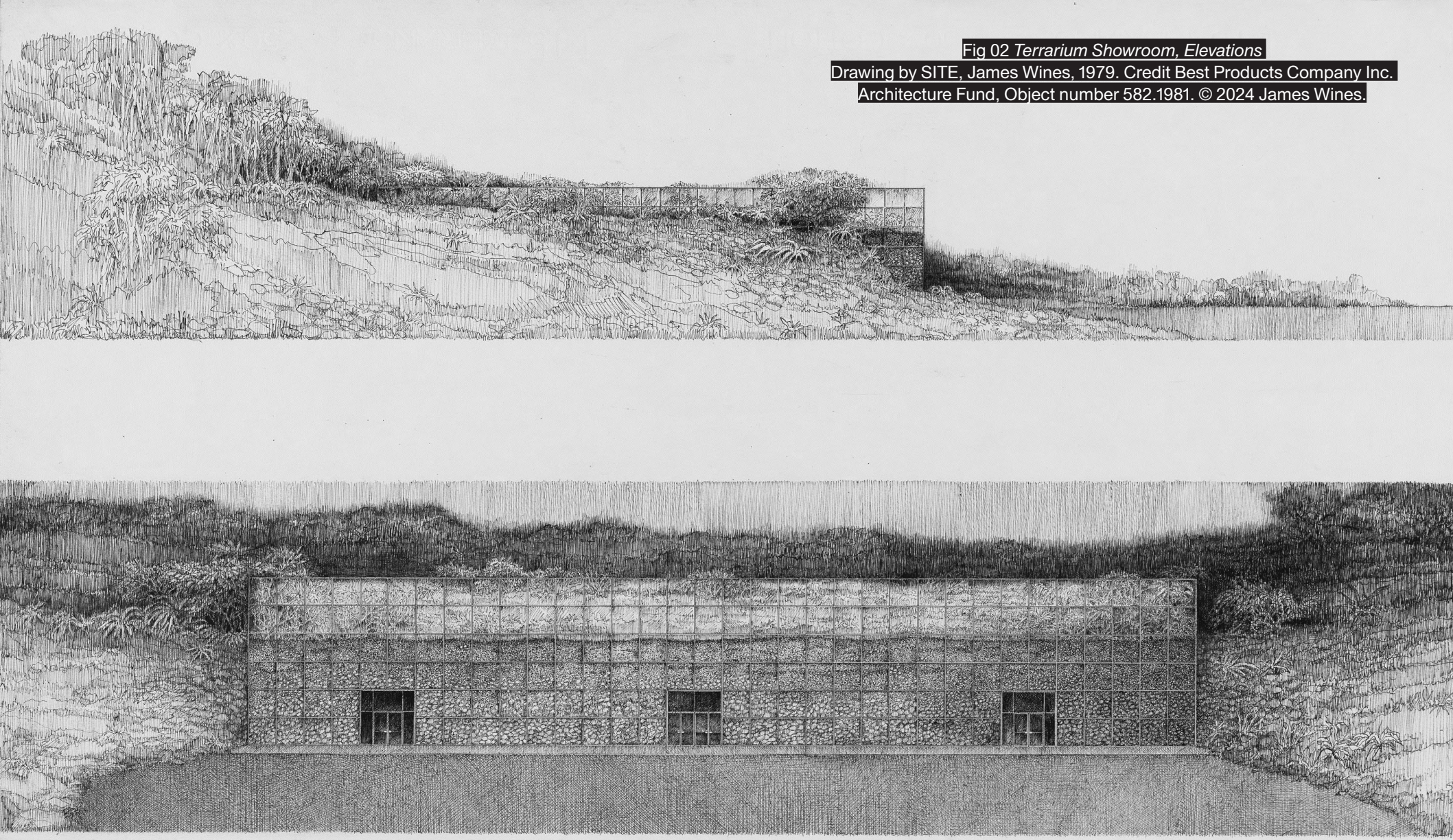


Fig 02 *Terrarium Showroom, Elevations*
Drawing by SITE, James Wines, 1979. Credit Best Products Company Inc. Architecture Fund, Object number 582.1981.

> SITE's work is always involved with some kind of dialectic; often a dialogue between natural and artificial oppositions. There are a lot of buildings now constructed as attractive objects, encrusted with plants and trees. If the whole ensemble idea seems to invite nature as an intrinsic element – either through function or aesthetic imperatives – I tend to feel comfortable with this kind of structure. On the other hand, I don't like vegetation used as some kind of applied décor. This reminds me too much of all that decorative excess in Post-modernist architecture. In the hard line view, vegetation is deemed an 'intrusive diversion', or, even worse, as evidence of 'pastoral sentimentality'. (Rapanà 2009, pp. 156-157).

If these explorations done by SITE are certainly positioned into a stream of architectural research that tried to see the object of architecture over the discipline, combining sculpture, environment, and construction, reading these projects nowadays can reveal a further layer of interpretation. Moving away from the possibility of salvation made by a heroic figure of the architect, SITE's architectures show us a potential relationship between architecture and vegetation, working on that border between what is nature and what is artifice. Architecture and environment become a unique space, a complex form of dialogue that constitutes a rich potential for the architectural language and even for its typological transformation; in a way, answering a question posed by Howe and Pandian, who referring to the impact of the climate crisis wonder if could be possible to "learn new ways of being in the face of this challenge, approaching the transmogrification of the ecosphere in a spirit of experimentation rather than catastrophic risk" (2020, p. 22).

Furthermore, it is crucial to spotlight the intention of SITE, embedded in the irony of their work, to present the architecture project as a political and ecological message, where the responsibility is translated into the forms and relationship of architecture, not as a technical solution but as a cultural position. As Wines said during an interview to DOMUS in 2018:

> The recent surge in interest for that period in time – for the Radical movement and its ideology – is justified by the need to experiment. For me, the priority has always been art over technique. If the technical execution is perfect, but there is no idea guiding its meaning, then there is no interest, because art is lacking [1] .

Fig 03 *Highrise of Homes, Project (Exterior perspective).*
Drawing by SITE, James Wines, 1981. Credit Best Products Company Inc. Architecture Fund, Object number 581.1981. © 2024 James Wines.

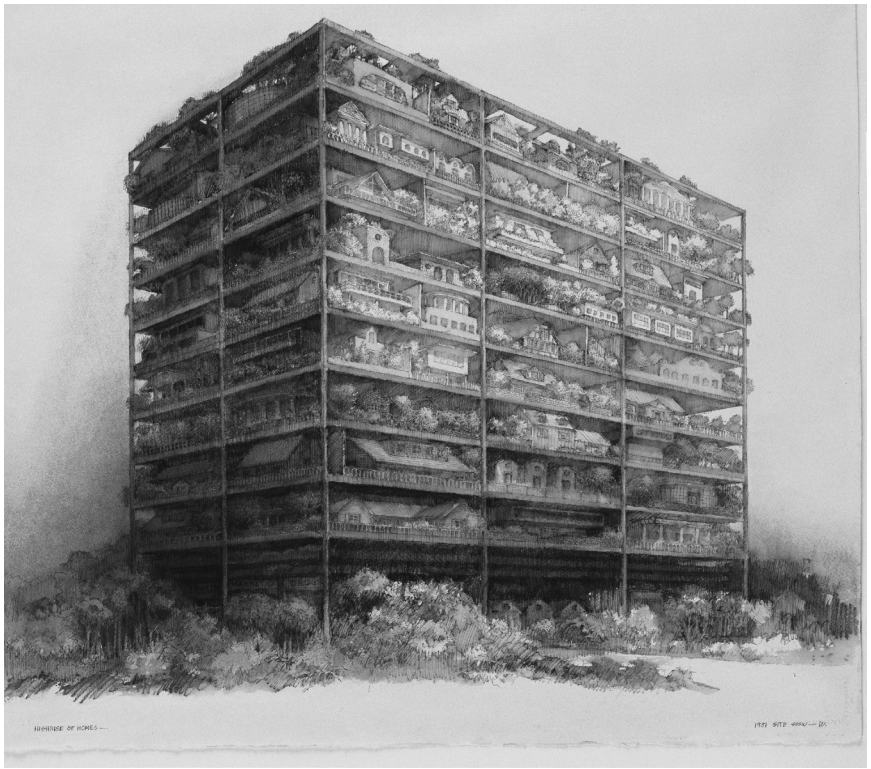
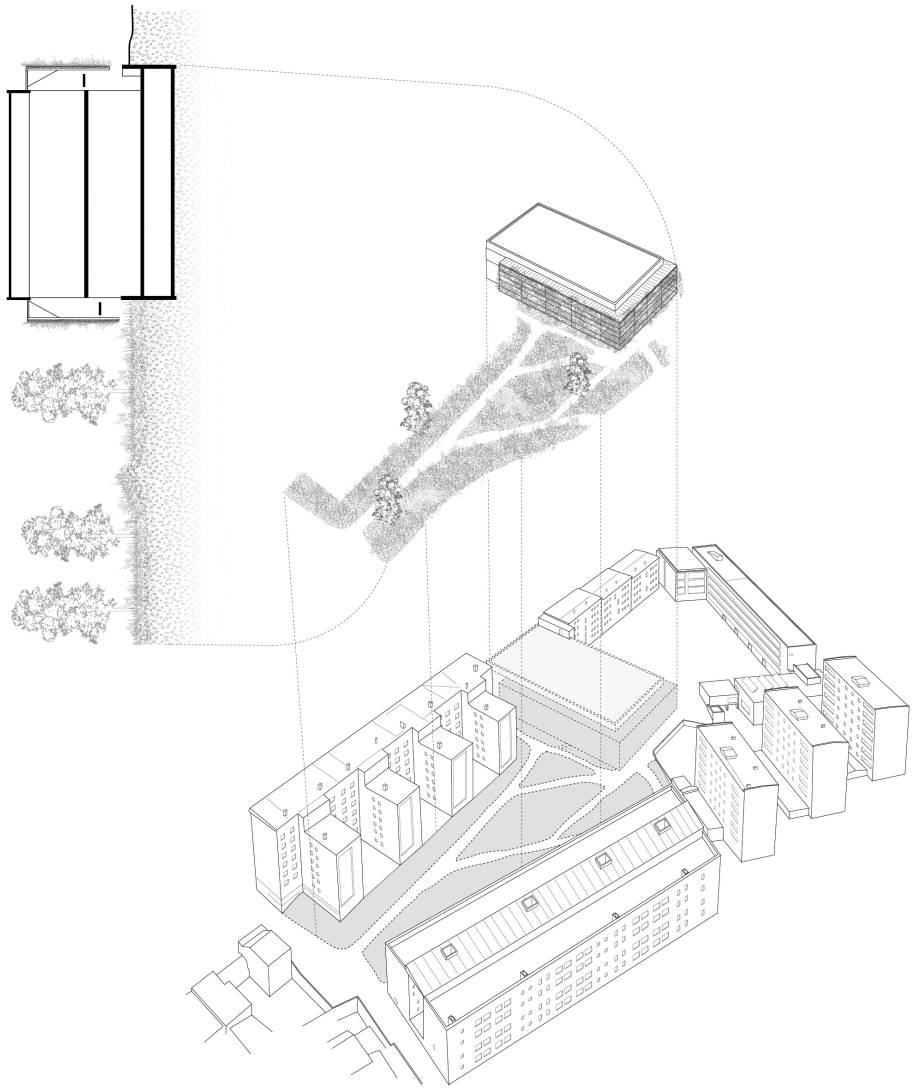


Fig 04 *Sport Center in Turo de la Peira.*
Drawing by Kevin Santus, 2024.



If, on the one hand, it is clear the link between Wines' projects and the concept of a terrarium as a reproduction of nature – a halfway between exhibiting nature and making vegetation a living and typological element of architecture – it is also crucial to detect how his approach could be of interest for the contemporary elaboration of the project. SITE's experimentations present a radical position as dramatic plant-building blends and as constituent elements of some of his utopias. Chan and Wagstaffe proposed that looking at these projects shows how they are

> wryly critical—of suburban retail stores and the anonymity of conventional urban high-rises, respectively-neither looks with scorn on their intended users. Instead, these buildings generously deploy humor and surprise to provoke the public into rethinking some of our standard ways of drawing the boundary between the built and natural environment and even more spotlight that architects interested in the environment can't simply rely on technocratic solutions and "finger-wagging"; they must also produce interesting buildings with which people will want to engage. (2023, p. 197).

Therefore, looking at this experience of fifty years ago could inform the contemporaneity in a method of using vegetation as a mix of environmental interpretation and composition tools. However, we could try to take a step forward. Indeed, nowadays, due to the climate crisis and the urge to bring back vegetation in fragile contexts where anthropic action has deleted it, the same projects could reveal something new. Not only architectural terrariums of vegetation, but climate machines capable, through nature, of influencing the urban microclimate and, therefore, operating actions of mitigation and adaptation to climate risks.

In a way, Wines' visions can be considered antecedents of an architecture capable of bringing morpho-typological reflection into tension with environmental care and action.

Similarly to James Wines' experimentation, in 2018 A. Noguera and J. Fernandez designed the *Sport Center in Turo de la Peira* (Fig 04), in the outskirts of Barcelona, where an interior urban block in Barcelona was renovated, hosting an enclosed vegetation space. Here the project is trying to knit vegetation into the very essence of the building (Cook 2014), defining its substance and character. Also, in the sports center project, the role of greenery acquires a typological relevance, without any mimic intention, rather a proper "reconstruction of nature" – to use the words of David Gissen (2009) – characterizes the intervention.

Avoiding the decorative mannerism, the project traces the lines of a closed ecosystem through architecture. The former impermeable soil has been transformed into permeable ground, with a garden that helps drain water during storm events and supports biodiversity. Moreover, the vegetation takes part of the building definition, composing three of the four facades of the sports center. In this way, the building also becomes part of the garden, with climbing plants defining a threshold between the outside and inside. The whole project rises inside the built block, protected and isolated from the city, but at the same time, becomes a climate agent, a machine (Barber, Putalik 2018) for the local micro-climate to mitigate the heat-island effect, and defining the character of the building.

Learning from these cases could enlighten a cultural depth and a typological consistency of using vegetation as an architectural feature. In a way, both the work of Anna Noguera and Javier Fernandez in Barcelona and the ones of James Wines could be described as terrariums, not only in the aesthetic assumption of it but as a form of space in which the vegetation and architecture work as a living system. Considering the emergence of climate risks and the inescapable need to structure a new reflection on architecture, SITE's irony could serve as a revelatory key to interpreting the environment and the ecological crisis. Perhaps looking at their projects, we could already see a glimpse of that concept of "*architecture as form* that climate has yet to change radically" (Andraos 2016, p. 299). Lastly the architecture as a terrarium could reveal an approach to architecture, blurring the project's contours, physically embedding vegetation in the typological and changing form of architecture.

In SITE's architecture, the concept of irony could be described as an attitude of humor and distance from the world (Petit 2013) that, at the same time, becomes a way to express a critique of the same, imagining a vision of unexpected constructions. Therefore, irony becomes a physical characteristic that constitutes provocative architecture, going beyond the stylistic features of post-modernism and embedding elements of criticism.

Among the others: *Peeling Building*, Richmond, Virginia (1972); *Inside-Outside Building*, Milwaukee, Wisconsin; *Tilt Show Room*, Towson, Maryland (1978); *Best Products Showroom*, Miami, Florida (1979).

Exemplary are *The Twelve Ideal Cities* by Superstudio, Cristiano Toraldo di Francia, Alessandro Magris, Roberto Magris, Gian Piero Frassinelli, Adolfo Natalini in 1971, but also the *Cubo di Foresta sul Golden Gate (Cubic Forest on Golden Gate),* from *L' Architettura Riflessa (Architecture Reflected)*, 1972, in which the relationship between Architecture and nature is questioned and become a semantic feature of the project.

From this drawing was later developed the *Rainforest Building* built in Hialeah, Florida, still for the BEST showroom, where a glass wall thickness contained a terrarium.

From an interview by Giulia Ricci for DOMUS, 2018.
See: https://www.domusweb.it/en/architecture/2018/10/22/james-wines-modern-day-radical.html [accessed 5 January 2024].

BIOMES

THE PHILOSOPHICAL CITY. THE BECOMING-WORLD OF THE *CITTÀ VECCHIA* OF COSENZA

FELICE CIMATTI

Bernardino Telesio opens his major work *De natura iuxta propria principia* (1570) with a statement that obviously applies to nature, but perhaps even to the way we (believe to) perceive a city:

> those who before me have scrutinized the structure of this world and the nature of things seem to have investigated them [...] without having succeeded in truly observing them. [...] It seems, in fact that, having perhaps too much confidence in themselves, when they examined things and their forces, they did not ascribe to them that nature and those faculties [rebus ingenium easque facultates] with which they appear to be endowed, […] but imagined the world at their own will (Telesio 2009, p. 3)♅.

Bernardino Telesio (1509 -1588) is perhaps the most important philosopher of Italian Renaissance Naturalism, but he is also, and in this case especially, the philosopher of a quite particular city, Cosenza, located in the still (luckily) unknown south of Italy. In fact, if there is still a city, in Italy, that shows quite clearly the ties that bind itself (in the case of the old city of Cosenza, to the point of suffocating it) to the 'natural' territory on which it stands, this is the old city of Cosenza. By historical contingencies the old city of Cosenza is intact (to give just one example, while the 'new' Cosenza is a triumph of reinforced concrete, in the historic city there is almost no trace of it), and precisely because it is intact the 'historic' city is slowly unraveling (following the fate of so many other Calabrian cities; cf. Teti 2022). The triangle bordered by the Pancrazio hill and the Crati and Busento rivers, on which the historic city of Cosenza stands, seems set to return to what it was before the settlement (around the eighth century B.C.) of the Bruzi communities that originally settled there (Rubino, Teti 1997). In this sense, Cosenza is a philosophical city ♌, because if we try to follow Telesio's implicit indications - and not what we already think we know about the city or even what we believe that a city should be - the link that binds it to the natural world is revealed in an absolutely unequivocal manner. The city is not opposed to the so-called extra-urban world; the world gives itself through the city, which, sooner or later, will become the world again. This means that the proper sense of Telesio's statement is that the city has never been separated from the natural world. The world and nature have never ceased to be there.

URBAN BIOME

As Ladislav Mucina writes, "plants form and dominate biotic communities. These communities are structured along

La città vecchia dal Crati
Photo by Felice Cimatti, 2023.

spatial and temporal scales. At very large scales, we call these biotic communities and their environments form biomes" (Mucina 2019, p. 97). According to such a definition, a biome is first and foremost a spatiotemporal living entity. This means that a biome is not a particular habitat, but rather a complex dynamic network of relationships between animal and plant life; however, from a broader and less bio-centric perspective, a biome is also a kind of 'community' of living and non-living entities. It is worth stressing that the biome is primarily a temporal relation: a biome is time developing and insisting on a more or less precisely delimited portion of space. That is, that of biome is somewhat a historical notion: "form is simply a short time-slice of a single spatio-temporal entity […] and this spatio-temporal structure is the activity itself" (Needham 1936, p. 6) of this same form. From this point of view, the very notion of 'biome' renders the traditional metaphysical division between the living (and humans at the head of the living) and the non-living useless. Indeed, since the non-living plays such a relevant role in relation to the living, a biome is neither properly living nor non-living.

Understood as a multifaceted entity in its own right, the biome can be considered as a distinct form of life, even if it is not a living (neither non-living) entity in the strict sense.

What defines a biome is, above all, the radical, dynamic interconnectedness of all the entities involved. Take the case of the vegetation of a biome:

> vegetation is not a passive entity under the control of the environment. Across spatial scales, feedbacks between vegetation and climate, soils and disturbance regimes create new environments (Mucina 2019, p. 102).

As a result, each biome has a distinctive and specific "physiognomy" (*ibid*., p. 101), i.e. it presents itself in a clearly recognizable form. In this sense, it can be said that each biome is not just a place, but rather a 'someone' which is inseparable from the place or the places where it 'lives.' This means that a biome - even if, as we have seen, it is neither a living nor a non-living entity in the strict sense of the word - feels and does something. What is at stake in the notion of a biome is the possibility of an 'entity' - the existence of which the metaphysical tradition considered impossible - that feels and does, even though it is not part of either the living or the non-living:

> A biome is generally characterized by a typical physiognomy (combination of plant and animal life forms), yet ecological feedback processes and disturbance may produce multiple stable states coexisting in the same geographic space. […] A biome undergoes assembly (and disassembly) at both ecological and evolutionary timescales;
> the processes underpinning the assembly shape the functionality of the biome by selecting for the biota equipped by the best-fitting set of traits matching the challenges of the environment (*ibid.*, p. 110).

In this paper, a specific urban biome (Pinceti 2015) is analyzed. The idea is to consider a particular city, the ancient and quite abandoned part of Cosenza, as a peculiar biome. The *città vecchia* (old city), as it is commonly called by the inhabitants of the 'modern' city, presents itself as a coalescence of multiple agents where human and non-human, living and non-living, historical and natural elements blend together to form a 'new' form of life, the urban biome. Moreover, by using the suggestion that the ancient part of Cosenza is one of the very few cities which dedicates its main street – the current Corso Telesio, which runs from the confluence of the Crati and Busento rivers, across the city's Cathedral Square ending at the Government Building and Rendano Theatre at the city's southern end - to a philosopher, the aforementioned Bernardino Telesio (Cosenza 1509–1588), the idea is to consider such a peculiar city as a true philosophical city. In particular, Cosenza seems to perfectly exemplify Telesio's ideas about nature. Therefore, a city is not philosophical when is the result of an *a priori* design (as in many philosophical utopias), quite the contrary, the *città vecchia* is a philosophical city just because a) it is not a city planned by design (starting from a blank sheet of paper), and b) it is a city where the borders between the natural and the human not only are not neatly traced but, on the contrary, are porous and quite indistinguishable. In this sense a philosophical city, following the ideas of Telesio, is not a place designed for and populated by human beings, an exclusively human habitat; quite the contrary, in a philosophical city like the *città vecchia* of Cosenza, the human trace on the surface of the planet is always on the verge of coming back to the same earth from which its construction materials (mainly stones and timber) have been taken away. That is, the *città vecchia* is re-becoming world and simply nature.

The philosophical city as the post-anthropocentric and anthropocenic city. It is a city that, by its own intrinsic decadence, unintentionally shows the temporal, and therefore contingent, character of any *a priori* project.

A city is philosophical when it stops believing to be exclusively a spatial entity - that is, a dead entity - and 'accepts' its own intrinsic temporal nature (as many other Calabrian citys; Placanica, 1999).

Piazzetta Totonno Chiappetta.
Photo by Felice Cimatti, 2023.

In the same vein a city can be considered a "urban biome" only when it ceases to resist time, that is, the 'life' of the world.

A 'life,' as the case of any biome clearly shows, that places itself beyond the living-non-living divide.

This is the most difficult aspect posed by the notion of "biome" because in our metaphysical perspective it is extremely difficult to even imagine that a 'thing' could feel anything. Indeed, the distinction between person and thing (Esposito 2014) lies at the heart of our metaphysical tradition, and it does not stop at speaking unconsciously through 'our' voices.

It is such a tradition – which is the stronger the less we are aware of being spoken by such an impersonal voice – that makes us consider it impossible that a set of non-living entities could be somehow alive.

In fact, according to Telesio such an impossibility is not so much a problem of unquestioned metaphysics but a problem of lack of imagination:

> it seems that they [those who do not question the metaphysical tradition] did this because, perhaps having too much confidence in themselves [which means they did not try to think of the world in other than traditional metaphysical terms], when they examined things and their power, they did not ascribe to them that nature and those power with which they appear to be endowed (as it was necessary to do), but [...] they imagined the world according to their own will [actually, according to the traditional patterns of metaphysics, which those philosophers could not even remotely imagine to change]. And to the bodies – which seem to compose the world - the philosophers did not attribute that greatness, dignity and power with which they proved to be endowed, but with the features that they should be endowed with according to the philosopher's reason [*propria ratio*] (Telesio 2009, pp. 3-5).

What does it mean not to "attribute" to those form of 'life' "that greatness, dignity and power with which they proved to be endowed" if not being completely entrapped into the traditional metaphysical view that explicitly excludes the possibility of a non-living 'life'? Telesio, on the contrary, proposes a vision of nature as intrinsically endowed by agency, affects, and passions (Bennett, 2010):

> as a consequence he breaks away from the traditional metaphysical divide – a divide that is still operative in our modern scientific time – and proposes to investigate the world and its parts, and the passions, actions, and

Photo by Felice Cimatti, 2021.

> operations of the parts and the things in it; each part, if rightly examined, will reveal its own greatness and form, while those passions, actions and operations will reveal character, power, and nature (Telesio 2009, p. 5).

HEAT, COLD AND MATTER

> Three, then, are the principles of things: matter, which seems to suffer because it assumes different dispositions and different forms; and its opposites [heat and cold], which act upon it and are received by it. Therefore, matter is one. The opposites are no more than two⇓.

In order to understand what a philosophical city could be one has to begin from such a simple foundation: the matter is at the bottom, and two principles, heat and cold, put it into motion, and together they produce all the entities, their effects, and their passions. Why just heat and cold? If one considers the actual geographical collocation of Cosenza the answer to this question is pretty straightforward. In summer the temperatures in Cosenza easily reach over forty degrees Celsius during the daytime, without varying too much at night; on the contrary in winter the cold air blowing from the frosty and snowy plateau of Sila is extremely rigid. These two poles rule life in the city and in the nature surrounding it. At the same time, one must not forget that when Telesio, who had a good knowledge of Greek philosophy, writes about matter (*materia* in Latin) cannot forget that the name 'Sila' comes from the Roman name *Silva Brutia*, which means 'forest of the Bruzi' and that one possible origin of this name is the Greek *ὕλη* [*yle*], with the same meaning of 'forest,' and in general of 'things,' and above all 'matter.' The matter of the *città vecchia* is of such a nature – at the same time living and non-living – that is alternatively put into motion by heat and cold.

Therefore, if exposed to an extremely intense heat, all very solid and hard things, such as stones, iron, and even the earth itself, eventually melt into water and ultimately turn into vapour and smoke; on the contrary, one sees them thickening or at least freezing and compacting, in short, becoming harder and more corporeal, when all things are occupied by the cold; and therefore, very slight vapours condense into water and snow, and water, even seawater, condenses into ice, into crystal, and finally into the earth, when there is an extremely intense cold (*ibid.*, pp. 27-29). As a consequence, the *città vecchia* is the dynamic result of a peculiar matter: stone and timber from which all its buildings are constructed, and which is constantly

affected by hot summers on the one hand and cold winters on the other.

In this sense, the "biome" of the ancient city breathes and changes according to the seasons and the mutations of nature. This city is the direct transformation of the materials that are naturally present on the ground (if one takes a comprehensive look at the city, one can perceive how the colours of the walls and roofs are similar to those of the surroundings) and it cannot stop changing. It is a city that has never ceased to be linked to its 'original' material.

In this sense, it is important to note that the city seems to have never been surrounded by protective walls. This means that the *città vecchia* has never tired of severing its links with its non-human roots. For this reason, it can be considered a philosophical city – that is, a truly Telesian city - because it has never fallen into the overly humanistic and anthropocentric dream of becoming an exclusively human entity.

The main characteristic of such a city is not only that it does not resist change, but that it makes its own features out of these changes. In this sense, Cosenza has always been both an ancient and a modern city. In fact, the non-human history of the material it is made of is an integral part of the human history of the city itself.

At the same time, because it has never ceased to be a natural-unnatural city, Cosenza is always on the verge of becoming inhuman or posthuman, that is, of returning to be a "natural" place. In this case, 'natural' means a part of a space-time continuum in which the presence of the human has never caused the presence of the non-human to cease.

For this reason, which is apparent for all those who live in Cosenza, Telesio states:

> And it must be held that the heavens and the Earth have the power to act on each other, that is, both can change the other's substance, and that neither the Earth nor the heavens themselves, or the Sun itself, or any other being, despite appearing to be in the highest degree homogeneous, simple, and unique, are really simple and unique but that they are all composed of a dual nature [duplici natura], that is, of a nature that remains and of one that goes. As it appears, neither the Sun nor any other agent creates anything from non-being, but everything comes from another entity, and the things that are corrupted are not corrupted at all into non-being, but all in another entity; so that the generation or corruption of any entity cannot be held to be real generation or corruption of the whole

> entity, but to be a transformation of it.
> That is to say, the entity that is generated is not generated and is not born as a whole, being nothing previously, but, existing from before, it takes on a new form, and the entity that is corrupted does not fully die, but only its form and nature, while its mass and body remain (Telesio 2009, pp. 15-17).

AN HAPTIC CITY

The key characteristic of a philosophical city, according to Telesio's radical naturalism, is that it is a city "at hand", that is, a city in which all presences - human and non-human, living and non-living, water trees and stones - are always in contact with each other. In this sense, the *città vecchia* is a haptic city, because in it there is no entity that is completely separated from the others. Take the case of a modern, designed city, where there are residential and working areas, cultural spaces and communication routes, green spaces and built-up areas. And above all, there is a distinction - at least in principle - between the city and its own periphery. Such divisions do not exist in the *città vecchia*, where, on the contrary, one can walk without noticing any change from one functional space to another. In this sense it is a haptic city, because it is the direct relationship among the different presences that populate it that makes it a peculiar "urban biome". In the *città vecchia*, the periphery is in the "centre", namely the square of the Cathedral, which at night is crossed by stray dogs that spend the day in the woods surrounding the built-up area. At the same time, the "centre", the Government Building, is on the edge of the old town, close to the woods that extend towards the southern part of the city. In fact:

> nature rejects emptiness in the highest degree, it indeed cannot tolerate emptiness at all, it means that entities delight in touching each other and benefit from each other's contact, while hate and reject being separated in the highest degree (*ibid.*, pp. 5-7).

What is a haptic city, after all? It is a city that is not separated from the environment in which it is built; to be more precise, and more faithful to Telesio's idea of nature, a haptic or philosophical city is a city in which the distinction between urban and non-urban space is porous and constantly changing. Such a city is mainly haptic because the entities touch each other, i.e. in a haptic city there are no absolute boundaries or closed spaces, all parts touch all other parts. At the same time, it is a city in which the different life forms of the urban biome merge.

Ponte di Calatrava.
Photo by Felice Cimatti, 2023.

Photo by Felice Cimatti, 2023.

And what is fusion if not a temporal process? Therefore, the haptic city is not only not afraid of time, but it is also a spatio-temporal process. That is why the philosophical city, despite being human, has always been non-human.

This means that the typical habitat of men, the city, has never ceased to be essentially sun, cold and matter:

> all things are created and brought into being through the Earth by the action of all the celestial bodies, and especially of the sun; and they have nothing in the one that is not in the other; but all of them are akin to the celestial bodies and to the Earth. […] Since it has been seen that they do not act with any other nature than that of heat or cold, and that they only suffer and are changed by heat or cold, it is to be judged that they are all constituted by heat and cold (*ibid.*, p. 39).

[1] The English version of Telesio's quotes are translated by the Author of this paper.

[2] It is worth noting that in a book with a very similar title (Rossi, Viano 2004) dedicated to the cities where the main Italian philosophical traditions were developed in the nineteenth century, all the cities considered - except for Rome and Naples - are cities of northern Italy. On the contrary, in this paper we believe that the peripheral position of Cosenza, today as well as in Telesio's times, represents an opportunity to think in a very inactual way.

[3] This quote is taken from the first edition of the *De rerum Natura*, 1565, quoted in R. Bondì, *Introduzione a Telesio*, Laterza, Roma-Bari 1997, p. 23. The Parmenidean origin of such a dualism has been stressed by many commentators. It should be noted, however, that Parmenides of Elea is a philosopher who lived in the same South as Telesio (Elea-Velia is in the region now called Basilicata, less than 200 km North of Cosenza): "[Diog. Laert.] This man (i.e., Parmenides) was the first to declare that the Earth is spherical and is situated at the center; also that there are two elements, fire and earth, of which the former has the rank of creator, the latter that of matter; that [..] the hot and the cold are causes and all things are composed of these" . In A. H. Coxon (ed.) *The Fragments of Parmenides*, Parmenides Publishing, Las vegas 2009, p. 138.

FORT ECOLOGIES AND THE PLANETARY TERRARIUM

MARCO FERRARI,
SARA FAVARGIOTTI

Terrariums are fragments of the world that are able to depict complexity, synthesizing a few of its elements or features: they reproduce specific environmental conditions in a sort of micro-wunderkammer with an enclosed atmosphere, usually characterized by an object-like scale. Components are usually obtained through a solid supporting base – on which different mineral and soil strata are layered upon – and by a glass case, whose walls define the inner environment and surrounding this aerial counterpart. But besides their pure material configuration, the design of the terrarium is essentially based on the interplay between mineral-animal-botanical features and on a continuous exchange between inorganic and organic matter, animated and unanimated (Morton 2013). In fact, etymologically, terrarium comes from the Latin word *terra* plus *-arium,* referring to what comes from or belongs to the land. Terrariums introduce, act and keep unfolding a specific ecological behavior based on a closed-cycle set of processes condensed onto their scale, and they could surprisingly offer an ecological perspective for inhabiting the world in architectural and landscape terms. Indeed, if we consider a terrarium in performative terms (not focusing on dimensions but only on its characteristics) we see how some of its behaviors can be retraced in architectural objects and elements encompassing different landscape dimensions, acting on geographic – or even planetary – scale. Thus, the terrarium is not intended as a passive-receptive box but as an operative concept that can help to re-conceptualize architecture's role inside a dynamic and environmental condition, inscribing its functioning within an expanded planetary (Brenner and Schmid 2013) and ecological notion and responsibility (Colomina and Wigley 2017), revealing the need and opportunity for a disciplinary expansion. With this outlook in mind, an old mountain military heritage could represent the example of an extraordinary century-long unconscious experiment of interaction between nature, design and their intertwined components.

In the eastern Italian Alps, the boundary once separating Italy from the Austro-Hungarian empire where WWI took place – with its archaeology of traces and material presences of military landscape – could be regarded as an emerging hyperobject (Morton 2013). Modifying the mountains, opening new roads, building defensive structures, concrete forts, and hundreds of kilometers of trenches, it was able to encompass opposite geological times and factors and fuse together artificial and natural features (Leoni 2015) in a sort of alternative mountain range. In particular, abandoned WWI forts of the Trentino-Alto Adige alpine region have, over time, constituted platforms for encoun-

Fig 01 Geographical localization of WWI forts in Trentino by Livia Sassudelli, realized for the exhibition “Paesaggi Forti”, 2022. Key: X: main existing forts and remains of military structures; +: disappeared forts and military structures.

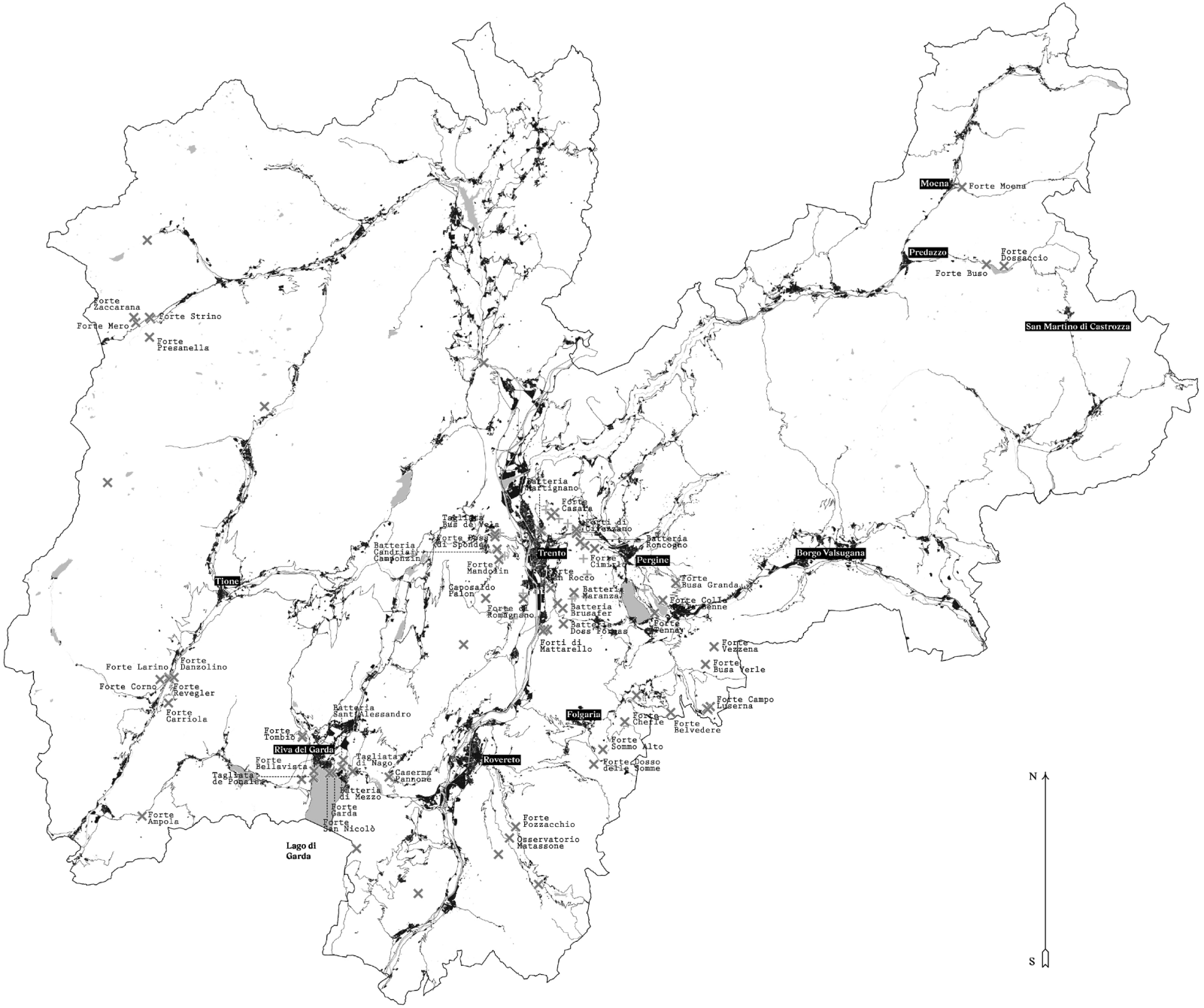


Fig 02 Maquet in felt inspired to Forte Valmorbia (TN) from the maquette series *Soft Landscapes* realized for the exhibition "Paesaggi Forti" by Cristina Gallizioli. Photo by Riccardo De Vecchi, 2022.

ters between artificial matter and botanical or animal species, a base for the emergence of a complex ecosystem. The remains of the forts are today the most recognizable architectural elements of this system: about 60 structures are still evident, and offer the possibility to be interpreted as terrariums on an architectural scale (Fig 01). In over one hundred years, they became sites of infestation, encrustation (Ingold 2013) and creolization (Glissant 1997) in which abandonment unfolded as a possibility and as a model for inhabitation. The ruin became a project, a building site where the actual configuration is the result of a radical co-design process in which authorship was continuously spread along its lifespan, shared between human and non-human agents, forces and phenomena. This design of the abandonment gave rise to the emergence of a series of punctual environments, fort ecologies (Ferrari and Favargiotti 2023) that found and made home within the once autonomous artifact, in a condition of *condominium* and reciprocal domestication (Metta 2022). From their original conception and fixed configuration, they were able to adapt over time becoming starting points for the emergence of new geo-ecological formations, turning aggressivity into welcoming openness and integrating alien approaches and influences. Each fort – shipwrecked over the mountains as a sort of dystopian Noah's arch – gave host and refuge to specific natural species, influenced the local environment, and stimulated a hybrid co-habitation (Morton 2013). based on the interplay between conflicting forces and agents. Today, their image is something in between a futuristic ikebana, an architectural terrarium and a failed reliquary of curiosities (Vogt 2015) in which waste cohabits with relics, artificiality merges with geology, botany, and biology, giving rise to a sort of unconscious alchemy. Designed as concrete independent shells and impermeable shelters, the abandoned forts were colonized and invaded by a springing and adaptive ecology, able to discover domesticity and inclusion inside buildings meant to exclude and protect. From cages, they turned into containers, ironically re-applying to military architecture the conceptual inversion proposed by Elizabeth Fisher's *carrier bag theory* (Fisher 1979). Besides war, drama, death, and history, an alternative narrative emerged, repurposing these artifacts into ecosystems able to host life and integrate, collect, and accommodate instead of secluding, preserving, and limiting (Fig 02).

Filled, surrounded, crossed, buried, superimposed by incoming presences and components, the original artifact turned over the years into a container, a recipient, a holder, or quoting Ursula Le Guin, into:

> "a thing that holds something else [...] a leaf a gourd a shell a net a bag a sling a sack a bottle a pot a box"
> (Le Guin 2020, pp. 28-29).

As terrariums create a parallel environment and separated ecosystem, these artificially manipulated mountain parts emerging from the earth's crust are now analogously acting as geologic substrata for incoming soil layers supporting the formation of local ecologies (Fig 03). In fact, the originally self-sufficient and closed system of the fort has turned into a porous one, infiltrated with thresholds, permeable boundaries and leaks allowing various degrees of communication and exchange with the surroundings, properly characterizing it as a vivarium. Defined platforms operating at the intersection between an 'inside' (Schneiderman and Campos 2018) and the outside world, the forts today are configured as objects spontaneously introducing an abacus of contact situations and interface between alternative components. In this sense the periphery of this once autonomous anthropic environment now deploys a series of spatial solutions and strategies of inside/outside interaction: like the walls in a terrarium, the edge is the place where contact happens, working as an outer skin (Zaera-Polo and Anderson 2021) where substances and strata coming from the landscape blend with the inner materiality of the fort. Analyzing its characteristics, we are confronted with a catalog of architectural situations of contact, support and relationship between the landscape surrounding the fort and the new-natural one, stimulated by the artificial intervention and the processes following its subsequent abandonment. The fort is not still or autonomous anymore but is a dynamic system acting as a terrarium: architectural features re-adapted over time and nowadays the solid base provided by horizontal surfaces and structural elements constitute the foundation for mineral and soil strata (Czerniak 2006), while the porous concrete or stone walls encapsulate and define the ecological boundary of the inner environment as the glass case would do in a terrarium. Through its processes, landscape infiltrated inside-over-around-beside the original structure, giving rise to different typologies and terrarium designs, each characterized by a different degree of interface and reception. We propose to divide the whole corpus of this collection into two main categories: stratigraphy | ecologies-on-top built on the element of basement and characterized by accumulation, incremental ground stratigraphies and vertical approach; boundary | around-the-ecologies emphasizes the different walls' designs and the expanded surrounding and horizontal configuration.

Fig 03 *Forte Carriola* from Gian Piero Sciocchetti archive, Università di Trento. Photo by Gian Piero Sciocchetti, 1980s

Each structure of this collection thus deploys different degrees of integration and landscape/architecture, natural/artificial, organic/inorganic interface, a specific spatial or design strategy (expressed by the action) and content/container logic (expressed by its name).

STRATIGRAPHY | ECOLOGIES-ON-TOP

The typologies of this category are the ones that work with a top approach, the structure stays below, and the organic part is generally more exposed than in the following category:

- *platform (supporting):* in this typology of terrarium – one of the most common – soil and vegetation are hosted on top of the fort/container, which in this case characterizes as the supporting base of a sort of dish garden more than as a proper recipient. Its almost flat surface provides a raised ground-floor for an elevated soil, exchange and air circulation are enhanced, and plants are favorably placed in direct contact with sunlight. Examples of this typology can be found in Batteria Candriai, Batteria Doss Fornas, Batteria Brusaferro, Forte Carriola, Forte Cherle, Forte Larino, while Forte Colle delle Benne, Forte Moena, Forte Pozzi Alti and Forte Luserna offer a less radical design: here the terrarium is only partially present and occupies a defined portion of the whole surface.

- *stand (holding)*: compared to the previous one, this typology combines the advantages in terms of light exposure with the presence of an inclined element oriented towards a preferential direction. Here the flat part is actually minoritarian and the inclined surface constitutes the main support for soil and vegetation to grow: the resulting composition is thus strongly affected by its general orientation, extension, width, inclination and angle. Forte Tenna is almost completely designed around this strategy, Forte Mero and Forte Zaccarana are mainly oriented towards south-west, west Forte Sommo Alto, east Forte Verle and Tagliata Superiore di Civezzano, south Forte Garda, Forte Belvedere and Cima Vezzena which, due to its extreme altitude and peculiar soil structure, characterizes more as a dry terrarium.

- *coffin (burying):* this typology does not differ much from the first in terms of possibilities to host the organic part, but here the structure is particularly integrated into the overall configuration and separated from its organic counterpart by thick soil and mineral layers (while they were still in direct contact in the previous typologies). This typology particularly fits those situations in which there is a need to enhance and highlight the

Fig 04 *Forte Dosso delle Somme in Altopiano di Serrada* (TN)
From the photographic series Remnants realized for the exhibition
“Paesaggi Forti” by Mark Wilson, 2021.

soil/vegetation component, maximizing the mineral and inorganic presence and leaving the base structure almost in the background and not visible. If Forte Busa Granda and Forte Valmorbia still offer a well-designed botanical composition on top, Tagliata Inferiore di Civezzano and Tagliata del Ponale developed a sort of dry terrarium or Japanese garden approach.

BOUNDARY | AROUND-THE-ECOLOGIES

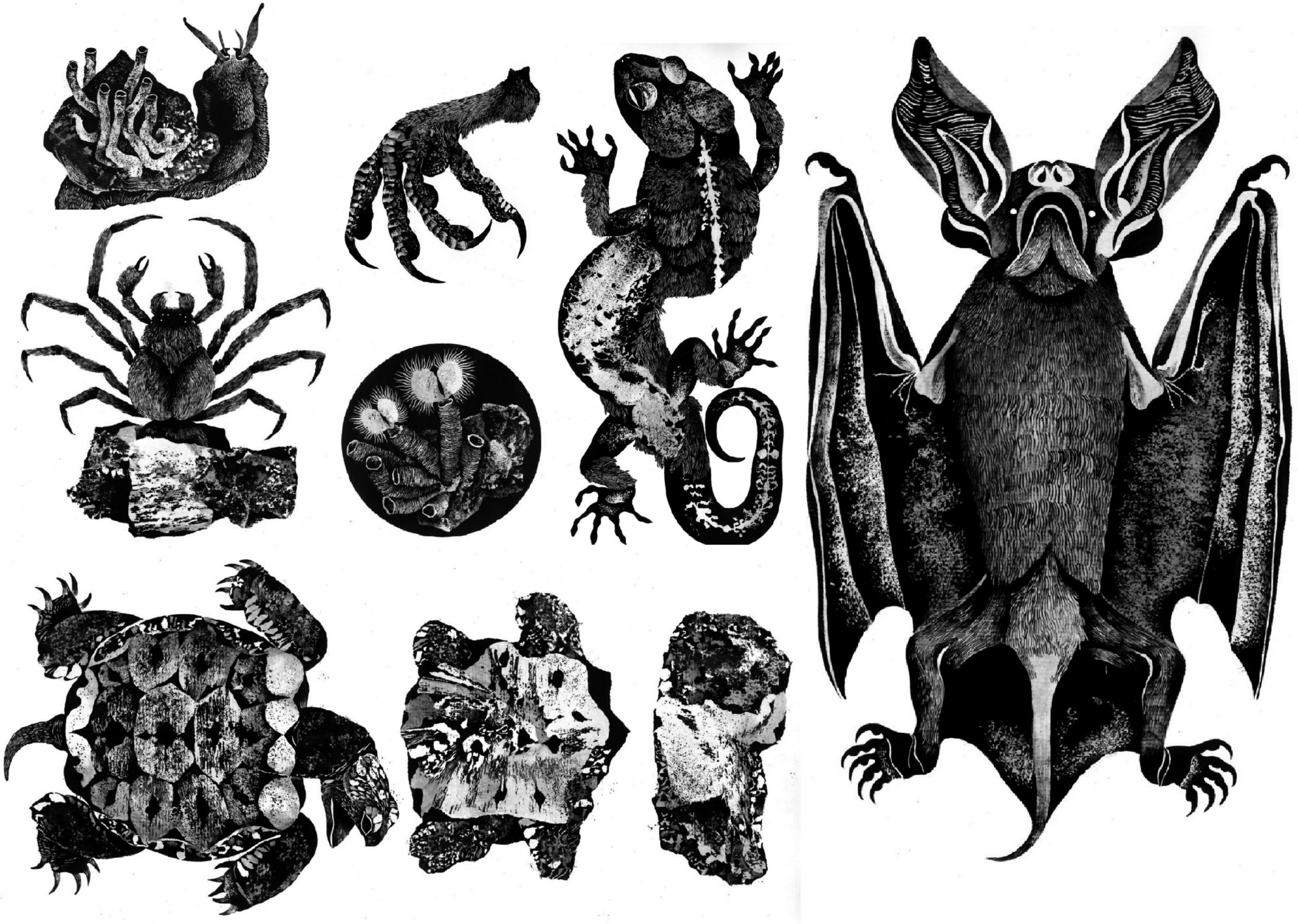
The typologies of this category focus on the case element and on a spatial development based on surrounding and enclosing more than on stratification, constituting proper or partial indoors:
- *skeleton (surrounding)*: in this category, shading plays an important role, the terrarium's walls completely envelop the ground and are elevated up, providing a good habitat for low vegetation. Usually, the proper terrarium is just a portion of the overall structure, which includes other spaces/environments: this is the case at Forte di Martignano, Forte Doss di Sponde, Forte Dosso delle Somme (Fig 04) and Batteria inferiore di Mattarello. Only Forte Ampola and especially Forte Barbadifior still offer pure examples, where the walls are completely dedicated to the terrarium and the fort is constituted by a series of open-air rooms. Often integrated with a *platform* or *support*, it could be seen as the first step of a *bowl* typology. A sub-category of this typology is *moat*, in which the open room (singular in this case) differentiates for its elongated shape and predominant orientation, surrounding one or more walls from the outside. Forte Alto di Mattarello is an example of particularly prolific vegetation, while Forte Dossaccio only partially envelopes the structure from two sides.
- *bowl (hosting)*: set halfway between *platform* and *skeleton,* this terrarium design could represent a sort of intermediate development phase between the two typologies. The soil's level is noticeably higher than in the latter, almost filling the walls' height to the top, while opposite to *platform* - where the ground could get considerably thin and is simply layered upon the elevated platform constituted by the structural base of the terrarium - here the result is obtained through a careful accumulation of organic material reached over time, possibly alternating different soil's granulometries and consistencies. The best application is at Batteria Superiore di Mattarello, where most areas along the outer walls display good examples of this technique.

- *enclosure (merging)*: one of the rarest terrarium designs, it can alternatively be seen as a development of *bowl* and *skeleton* typologies, with which it shares some of the same logic. In this case, the enclosure is incomplete, and the walls fade into the

organic part, making it sometimes difficult to understand where the terrarium's walls end or where the outside environment starts. Great part of the attention is thus taken by the mineral and botanical part, only comparable for predominance with the *coffin* typology, while the terrarium's elements (base and walls) almost withdraw and merge with the surroundings. In both Forte Sant'Alessandro and Forte San Rocco the walls seem to disappear and are almost conquered by the lush vegetation, fading the terrarium into landscape.

Over time, many typologies overlapped, mixing the different designs, and it is nowadays easy to find different terrarium solutions coexisting in the same structure. Amongst other examples, a particularly rich and peculiar case is constituted by Forte Tombio, in which *contour*, partial *platform* and *skeleton* logic are equally evident at the same time. We can now look at this heritage of military artifacts as a collection of cases from an imaginary museum of terrariums on a planetary scale, lost architectural ikebanas and emerging ruin ecologies set halfway between nature and design. Spread over the Alps as geographic objects (Turan 2020), they share an anthropic origin and the capacity to integrate nature artificially (Corrado 2012) through all these different strategies. Here, the usual scale of the terrarium is magnified to include environments whose spatiality is able to resonate with the size of mountains and valleys, directly shaping the landscape's portions that confront earth, soil, and geological factors (TVK 2022). As a system of man-made ecosystems, each of these elements unfolds a specific bestiary, lapidary and herbarium generated by the dystopic combination of features with contrasting origins and intermingling temporalities, giving rise to a unique and hybrid blend (Fig 05). The variety of these animal, mineral and botanical presences is affected by typology, altitude, soil's composition, relation to built materiality (stone, concrete, etc.) and spatiality (interaction between artificial and natural part, indoor or outdoor predominance). Set between architecture and landscape, these places created a specific and self-perpetuating ecological state, thus characterized by a performative design behavior. Proper terrariums are usually self-sufficient and constitute a sealed environment with a closed atmosphere and dynamics, but this kind of partially-open geographical terraria present a more complex logic (Graham 2016): nature works as a force that makes no difference between man-made objects and surrounding substances. In fact, in this case, the water cycle is influenced by exchanges with the outside, too, and informed by moisture evaporation from soil, buried structure, and surroundings.

Fig 05 *Bestiario from the illustration series by Simone Carraro, realized for the exhibition "Paesaggi Forti", 2022.*



Thus, while open terraria usually constitute more arid environments compared to closed ones, this architectural version still offers additional humidity in relation to the outside: humidity is kept in the underground parts of the fort and in soil layers, the vapor condenses onto the walls, and water gets stored inside their extreme thickness. Moreover, the now porous enclosure allows for heat and light to enter, guaranteeing a constant water supply and encouraging photosynthesis, besides the income of nutrients for plants and soil. This unique water cycle is paired with a solid one, in which organic waste, artificial ruin, and discarded elements are all digested together with scraps, memories, and organisms from the fort's past and present (Lowenhaupt Tsing, Bubandt, Gan and Swanson 2017), resulting in a comprehensive decomposition process that affects the structure and keeps regenerating it. So, besides the dichotomies between organic and inorganic, animate and inanimate, artificial and natural features an additional narrative unfolds: a narrative involving cycles of life and death, waste and construction, building and decomposition. The whole fort turns into a cyborg organism (Haraway 1991), a *detritophagus* being continuously assembling and disassembling substances and matter, digesting them into a sort of hybrid humus.

From an architectural perspective, this *ruin-as-a-project* conception calls for the application of a terrarium-logic to the design process, and for the introduction of architectural decomposition – opposed to classic architectural composition – amongst the other disciplinary fields. The ruin can be interpreted as the only architectural typology capable of becoming compost (Haraway 2019): often able to introduce more processes than those interrupted by its presence, it shows the possibility of stimulating biodiversity (Barchetta 2021) instead of reducing it. In this sense the aim of the imaginary museum of planetary terrariums we propose is to raise awareness on the whole range of actors involved in the formation of living spaces and in the reconfiguration of the built environment, constituting a catalog of self-contained laboratories, open-air tests, and co-design solutions depicting a series of mutual adaptation and assemblage strategies. Learning from the ruin and trying to replicate this approach means acting towards the promotion of a paradigm of indistinctness between architecture and landscape, where both dimensions find an integration as a way to cohabit the world. Expanding terrarium's behavior to architecture could also imply understanding architectural objects as terrariums already from the design phase, conceiving them not as purely human constructions but even as possible platforms of support for the emergence of specific geo-ecological formations (Escobar 2018).

Merging artificial space with the notion of ecosystem in the way we design and build could help us bridge the spatial inside/outside gap and detachment from the surrounding environment, promoting a more comprehensive fusion between local landscape, architectural elements, and emerging ecology (Steiner, Weller, M'Closkey, Fleming 2019). In this perspective, the unconscious ecosystems of the abandoned WWI forts of Trentino-Alto Adige offer the example of a century-old ongoing spatial experiment based on a self-driven evolution process and the radical coexistence of opposite forces, inhabitants, and dimensions, materialized in a series of more than 60 terrariums on a planetary scale.

A NEED FOR CHANGE. VIENNA, A PERFORMATIVE BEAUTY

CASSANDRA COZZA

Cities' actual and future livability – including healthiness and life quality – depends on their preparedness to tackle climate change and biodiversity loss, crucial issues of the Anthropocene. Contemporary open spaces need design actions for new aesthetics capable of conveying values through architecture by combining spatial quality, environmental performance, and sociality. Each new project must aim to take part in a broader transformation, taking into account, and tackling, the urgent challenges of a precise historical moment due to the *urban or higher-order paradigm* (Cozza 2017, p. 73).

The city of Vienna is one of the European best practices with a long pioneering tradition in promoting holistic planning and project design actions capable of guiding design choices with a multidisciplinary approach. The city is no longer the compact urban structure of the Nineteenth century only; to improve its spatial quality and livability, it has built the Danube Island, ambitious social housing projects with superb green and open spaces, and springwater mains for water supply, it has expanded the district heating network, preserved its green belt with specific legislation and made huge investments in public transport.

In 2022 the municipality presented the Vienna Climate Guide (Municipal Department 20 2022), a roadmap that has set out the path to achieving climate neutrality by 2040 by promoting climate protection and climate adaptation actions at different levels, including "Buildings", "Ecosystems, natural and recreational areas", and "Public space and buildings" (*ibid.*). The declared goal is "that Vienna will still be the most livable city worldwide in 20 years from now" (*ibid.* p. 4).

The *Climate Protection Programmes* begun in late 1999 – *KLiP 1* (1999-2009) and *KLiP II* (2010-2020) – and the *Urban Heat Island Strategy* (Municipal Department 22 2015) was launched in 2015 enacting changes to mitigate the effects of heat waves, which are also connected to a higher mortality ratio (Kaltsatou, Kenny 2018, p. 053). This choice was moved by the awareness of the effect of the climate crisis on the city which, according to scientific studies, was following a dangerous trend:

> Vienna will be among the European cities most affected by the climate crisis [3]. Since the 1970s the annual mean temperature has increased […] by even three degrees in Vienna [4]. […] Scientists expect that Vienna will further warm by up to four degrees Celsius by the end of the century. Heat spells that only lasted for an average of five days in the past 30 years may extend for up to 28 days towards the end of the 21st century [3; 8]. (
> Municipal Department 20 2022, pp. 15-16).

Esterházy-Park. The plan of the eastern part, redesigned by the team of Carla Lo, Landschaftsarchitektur (on behalf of MA42 Stadtgärtner), Breathe Earth Collective and Green4Cities GmbH in 2019-2022, Vienna. Courtesy of Carla Lo, Landschaftsarchitektur.

Moreover, recent landscape architecture and open space design dialogue fruitfully with the local contexts, enhancing their spatial quality, environmental performance for people, animals and plants, and promoting sociality through complex inclusive programmes of various uses.

In February 2022 the Vienna City Council adopted *The Vienna Smart City* Strategy (City of Vienna 2022) aimed at Vienna becoming "a model climate city" with the mission to achieve a "high quality of life for everyone in Vienna; through social and technical innovation in all areas; while maximising conservation of resources" (*ibid.*, p. 23). Important targets of this strategy, such as adaptation strategies to climate change are setting quantitative and qualitative goals (*ibid.*, p. 43)⇞ related to landscape architecture and open and green spaces.

Esterházy-Park is representative of this city's capability; it is a public park with a long history and a complex inclusive programme of uses, located in Mariahilf –in the sixth district. The plot is on an embankment surrounded by slopes, has a triangular shape and is wider than 10.500 square meters. It actually hosts various outdoor leisure amenities in the western area for hosting different category of users, animals and plants – a big playground with various games, sandpits and water for little children, another one for a different group age, a training park, a dog park, a garden, ping-pong tables, sports courts, etc. –, different typologies of seats are located in all the areas, and an innovative experimental *Cooling Park* is located on the eastern side ⇞. Other functions are hosted in the former World War II air-raid defence tower *Flakturm* which has been enlarged and re-designed several times – the aquarium-terrarium *Haus dees Meeres* in the main renewed building since 1956, the climbing gym on the southern façade, and the torture museum *Foltermuseum* in the underground air-raid shelter –; moreover, there are a school complex and a huge green wall on the northern façade. In Vienna there are 6 "flak" towers, part of the totalitarian power apparatus of the Nazi regime; five of them are listed monuments and are largely preserved in their 1945 condition with the only exception of this one which has seen numerous proposals for conversion or expansion: from the shell of flats of the Fifties to Hans Hollein's sculptural superstructures of the Sixties and Christo's proposal for a temporary cover in the Seventies and the conceptual installation of Lawrence Weiner of the Nineties (Kühn 2018).Originally *Esterházy-Park* was a suburban noble palace garden constructed around the year 1695, even though today "not much has been left from the original park compositions (Baroque and later landscape ones)" (Staniewska 2016, p. 16) ⇓.

Indeed, the garden was subjected to many transformations during the last 250 years due to property changes, the Mariahilfer district context's development and the effect of decay, buildings demolitions (the palace in the Seventies) and constructions (the tower in 1942-43 and the school in the Seventies).

As mentioned, this garden went through a stratified modification across the centuries, which transformed its design from the garden palace of the Albrechtsburg family into a landscape park till the moment of its opening as the first public park of the city in 1868 ⋀.

The layout of the historical landscape composition has been definitely damaged by the construction of the *Flakturm* in 1943-44; its shape, dimension and position in the centre of the plot have disrupted the fluidity of the original triangular shape cutting the remaining open spaces into two main portions. Indeed, the actual composition is irregular and heterogeneous; there is a perimeter path next to Gumpendorfer Strasse – higher than the road level – which starts with a ramp and ends in a staircase, and there is also a perpendicular one connecting the end of this path to Schadekgasse at a point coplanar with the road at the end of the slope. The park is organized into two main parts: the square with the *Cooling Park* in front of the *Haus dees Meeres* with the monumental staircase and the big ramp, and the area with the leisure amenities at the back, facing the fences of the school complex and connected with the irregular fabrics of the context by smaller ramps, stairs, and paths. The programme of this area is extremely rich, and intended to be accessible, inclusive, and livable to people of all ages; it is equipped with many high-quality furniture of different types and greenery: traditional and experimental seats of various shapes (that characterize all the areas), games, sports equipment, etc.

The whole park (10.600 square meters) has been retrofitted according to the project by Dimitris Manikas and Auböck and Kárász in 1997- 2002 which improved both the accessibility (a monumental staircase, a big ramp with a fountain and antique sculptures plus many other devices to solve the gap between the embankment and the various heights of the surroundings) and the design of the amenities; the eastern plaza and the borders were more regular, playing with lines following the geometry of the plot generating modular squares and rectangles, while the other parts were plenty of curves and diagonal lines to provide good accessibility and identify the different functional areas. In 2019-2022 the eastern area (2.400 square meters) was redesigned by the design team of Carla Lo (on behalf of MA42 Stadtgärtner), Breathe Earth Collective and Green4Cities GmbH, taking part in the research

Esterházy-Park. An innovative experimental Cooling Park in Mariahilf. The cool spot capable of refreshing the summer temperature of 6 degrees Celsius, Vienna. Photo by the Johannes Hloch.
Courtesy of Carla Lo, Landschaftsarchitektur.

Esterházy-Park.
Various seats along the perimeter of the embankment facing the city, located at a lower level, Vienna. Photo by the author, 2023.

project *Tröpferlbad 2.0* aimed at the evaluation and adaptation of the technical measures and the transfer of knowledge between research and practical implementation [6]. This area of the park is a pilot project that does not renounce beauty and is based on microclimatic simulations with a *cool spot* of about 30 square meters, capable of cooling down the surroundings by up to 6 degrees Celsius on hot days. Aesthetics, technical, ecological and social aspects were addressed in the design and construction of the *cool spot,* including participation design measures tested and developed for different target groups of users and residents, with vulnerable groups among others. Several serpentine benches that can accommodate an entire school class and over 30 new benches and chairs create additional seating for visitors. Findings about microclimate, materials, and energy as well as data on usage behaviour were collected and summarized in a planning guide [7]. Concrete and asphalt surfaces have been unsealed, allowing the addition of new grass, perennial beds, and trees to the existing plants. The water technology has different features, such as mist showers, a drinking fountain, an irrigation system and a circular *cool spot* with misting nozzles. There are climate trees, planted and shaded places to stay consisting of three rings with almost 3-metre-high mist showers of up to 2.20 meters in diameter that cool the surroundings with a fine spray. Low-tech measures are also important: a special assortment of trees, a new approach to pavements and green joints to keep low the degree of sealing and increase water permeability [8]. The project combines vegetative and hydrological elements of cooling, thus providing shade through a mix of artificial shading and vegetation, and cooling by spraying water. [9]

Esterházy-Park is representative of Vienna's attention and capability of promoting changes in a precise chosen direction through a multidisciplinary design approach that combines architecture, landscape and open space design, planning and participation but this is not the only example. Many new developments and districts are experimenting with this approach, from *Biotope City Wienerberg* to *Seestadt*, as testified by the IBA Vienna 2022 *New Social Housing* [10] with the slogan *How will we live tomorrow?*, thus demonstrating the emergence of a new *performative beauty* for contemporary open spaces, capable of conveying values through architecture by combining spatial quality, environmental performance, and sociality.

[1] "Adapting to climate change: • To mitigate and protect against summer overheating, new green and open spaces are created and existing ones expanded and structurally upgraded to improve the urban microclimate. • All citizens of Vienna have access to high-quality green space within a radius of 250 metres. […] • Greening measures, shading features and other installations in the public space substantially reduce the (perceived) ambient temperature in summer and provide the backdrop for vibrant, climate-proof neighbourhoods. • In Vienna, as much rainwater as possible is fed back into the local natural or near-natural water cycle. […] Urban ecology, environment & water: • The share of green space in Vienna is safeguarded on long term at over 50%. • Vienna creates additional new woodlands and green spaces as recreation areas for its growing population and to improve the urban microclimate. • The natural functions of the soil are maintained through preservation of existing unsealed surfaces and creation of new ones. • Vienna promotes biodiversity. […]" (City of Vienna 2022, p. 43).

[2] See also: https://www.wien.gv.at/umwelt/parks/anlagen/esterhazy.html [accessed 22 December 2023].

[3] The article provides an interesting description, supported by historical data and maps, of the garden's transformations from its construction to 2016, and states that currently, Esterházy Park "resembles more a city square than a reconstructed historic garden" (p. 28). According to the author, this is justified by the "significant lack of preserved substance" that did not allow "to undertake admissible reconstruction of the garden" (p. 26).

[4] The garden palace was owned by the Albrechtsburg family, who had a summer residence and park built here in 1695-1698; from 1754 to 1794, the park was owned by state chancellor Wenceslas Anton Prince Kaunitz, who had it redesigned several times (a A view of the garden from the palace is represented in the painting of Bernardo Bellotto (Canaletto) *Vienna, Panorama from Palais Kaunitz*, (1759- 1760), oil on canvas, Museum of Fine Arts, Budapest), while under Nicholas II, Prince Esterházy (1814-1833), the garden was partially transformed into a landscape park (Blaschek 1926, p. 136; Faber 1989, p. 24). After having being purchased by the state in 1868, the palace was turned into a gymnasium (Staniewska 2016, p. 21 and 23) while the park was opened to the public on 11 May 1868, thus becoming one of the first public parks of the city.

[6] See also: https://presse.wien.gv.at/2020/04/26/esterhazypark-bauarbeiten-in-wiens-erstem-cooling-park-schreiten-zuegig-voran [accessed 22 December 2023].

[7] See also: https://urbaninnovation.at/en/projekte/troepferlbad-2-0/ [accessed 22 December 2023].

[8] See also: https://www.nextroom.at/beilage.php?inc=beitrag&id=548 [accessed 22 December 2023].

[9] See also: https://www.green4cities.com/en/troepferlbad-2-0-2/ [accessed December 22, 2023].

[10] See also: https://www.iba-wien.at/en/ [accessed December 22, 2023].

STOLEN LAND. DISAPPEARING ISLANDS AND THE MALDIVIAN PARADOX

BEATRICE AZZOLA, ANNALISA AZZOLA, IRENE PANCRAZI, HASSAN AHMED

The impact of human activities on Earth has spread across the planet's environment, to the point that researchers are theorizing the emergence of a Technosphere[1]. In the Anthropocene, environmental protection has become urgent; however, ecological sciences are required to consider human activities and natural processes as integrated. The question arises as to how to reconcile the inherent creative nature of humans with the preservation of life on Earth. In the Maldivian archipelago, the "technology versus nature" paradox is so extreme as to generate a hyperconcentrated inquiry microfield, like a terrarium in a glass bell jar. Humans named "Earth" the planet, establishing a primacy of land over water. However, Earth could instead be called *Water* or *Oceanus*, oceans being at the center of water and nutrient cycles and atmospheric and thermal regulation (Roff et al. 2011). The preservation of marine ecosystems plays in fact a key role in the survival of the human species. Coral reefs, in particular, are one of the most productive and diverse coastal marine ecosystems, supporting about 500 million people worldwide, providing crucial ecosystem services (food, tourism, protection from coastal erosion, etc.), valued at about $10 trillion (Knowlton et al. 2021). However, they are highly exposed to co-occurring local anthropogenic pressures, such as coastal works, pollution, and overfishing (Halpern et al. 2007), due to their proximity to anthropized areas. Maldivian atolls are especially endangered by the consequences of the decline of coral reefs. For thousands of years, their islands have continuously changed in shape, depending on monsoon cycles and climate fluctuations, while coral reefs represent one of the main defenses against coastal erosion (Kench et al. 2023). In recent decades, sea levels have risen steadily, threatening to permanently submerge low-lying islands (Lindsey 2021). With their maximum elevation of 2.4 m above sea level (Stevens and Froman 2019), the consequences for the Maldives will be so devastating that, by 2050, they will become uninhabitable, unless drastic measures are implemented (Storlazzi et al. 2018).

The disappearance of an island is not new to the Maldives. While they are officially divided into "inhabited" and "uninhabited" islands,[2] a third unofficial category exists: the "disappeared islands" (McConnell 2022). These are the ones that have been completely eroded by the sea and only survive in local history. Nowadays, the government uses two tools to counter the loss of habitable land: people resettlement, and land reclamation. Resettlements are part of the history of the Maldives, since the past, the government has moved populations from one island to another for climatic reasons, with various social repercussions.

In 1968 the Giraavaru people were forced off their ancestral island and relocated to Hulhulé, except to be moved again to make way for the airport (Gnanadesikan 2016). Land reclamation, or the act of snatching a few acres of land from the sea, albeit an immediate solution, presents inconsistencies as well.

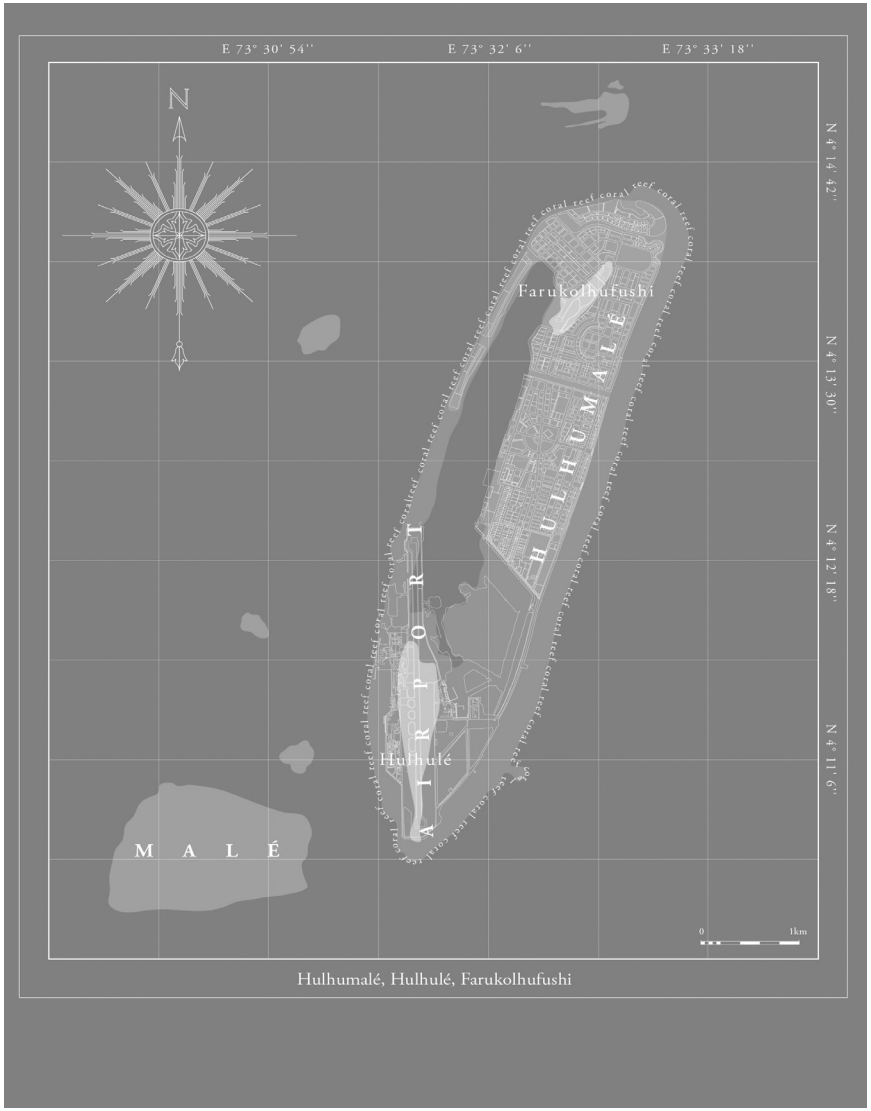
Our case study includes the natural islands of Hulhulé and Farukolhufushi, and the reclaimed island of Hulhumalé (Fig 01). Hulhulé is where Velana Airport, the most important of the nation, is located. Its birth dates back to 1960, when, during the British protectorate, a Royal Air Force plane landed on a slotted steel runway, built directly on sand⇊. In an act of military colonization, infrastructural colonization of the sea began. The future of Hulhulé and Farukolhufushi was written: tiny islands, destined to become engulfed in the most ambitious reclamation project in the Maldives to date. In the late 1990s, when space in the capital Malé began to run out, the government started a project to acquire new land. Thus, Hulhumalé was born,⇑ a city intended to accommodate 240,000 people⇂. The official motivations for the project were linked to climatic conditions, although some researchers argue that politico-economic reasons prevailed (Gussmann and Hinkel 2020; Kothari 2014).

In the 21st Century, a positivistic attitude of blind trust in technological evolution, as an intrinsic source of economic growth has become prevalent worldwide. Human alienation from the environment (Vogel 2011) has corroborated a capitalist value system, in which the monetary calculation of the wealth of a community supersedes its members' well-being. Land reclamation policies in the Maldives seem to follow this trend. According to the developer's website of Hulhumalé, their goal is "investing for the long-term future, nurturing the youthful talent and most of all forming new traditions" and that "the City welcomes people from all the Islands of Maldives." It seems like a (commercial) attempt to create a cultural and historical identity, which can also be detected in the name of the resort built on old Farukolhufushi: "Heritage Island."⇇ It is ironic, that precisely one of the causes of disequilibrium in the system, tourism, comes to represent (even if only in name) the last remnant of the primordial *genius loci*.

The paradox between economic interests and ecosystemic health seems to be irreconcilable in the Maldivian atolls, tiny terrariums drowning in ever-warmer waters. Due to the destruction of coral reefs, land reclamation is both a solution and a concurrent cause of the environmental imbalance.

An alternative to land reclamation are floating cities (Moosa et al. 2020), infrastructure and architecture specifically designed

Fig 01 *Hulhulé* lagoon after the Hulhumalé reclamation.
Drawing by Beatrice Azzola, 2023.



for rising sea levels. Although the impact of floating structures on aquatic ecosystems is unclear, as research is still scarce, it seems that they have both positive and negative effects on aquatic ecosystems and that the system has potential for implementation (Pedroso de Lima 2022). "Maldives Floating City" is a project co-financed by the Maldivan government and a Dutch developer, which will cover 8 million square meters of water with floating architecture. The narrative is that of a real estate operation rather than a solution to various environmental and social issues. A slogan on the developer's website eloquently states, "Where there is nothing, anything is possible"[*]. Coral reefs, however, are very much present in the project site and must be recognized for their vital role in the country's well-being.

In the Maldives, few coral restoration and rehabilitation projects are being put forward. Still, many more will be needed to fully sustain these fragile ecosystems (Fig 02). During land reclamation two main mitigation measures should be put into place: before the beginning of the project corals should be moved from the area of intervention to a safe site; and secondly, once the project is finished, 40-50% of the coral reef that was destroyed should be restored by creating a new artificial coral ground[‖]. Once again, relocations will occur, this time not of humans but coral populations. A reversal of roles, in which nature and human beings must share slender spaces and ever-scarcer resources. In this framework, a broader integration of landscape and architecture with ecological practices will contribute to a more harmonious coexistence of built environment and natural ecosystems.

If the road ahead seems clearer from an ecological perspective, the answers to architectural and housing issues appear more complex. Further research in floating architecture and innovative building technologies is crucial to better understand how to rebalance the disproportion caused by uncontrolled construction and the abuse of the land reclamation tool. However, the question of how to solve the Maldivian reclamation paradox remains open. Common ground must be found, for human, animal, and plant communities to thrive on the islands, so that no land will come to be stolen.

Fig 02 *Reef profile*: a) healthy reef before reclamation; b) impacted reef after reclamation; c) integration of reclaimed land with restored ecosystems. Drawing by Beatrice Azzola, 2023.

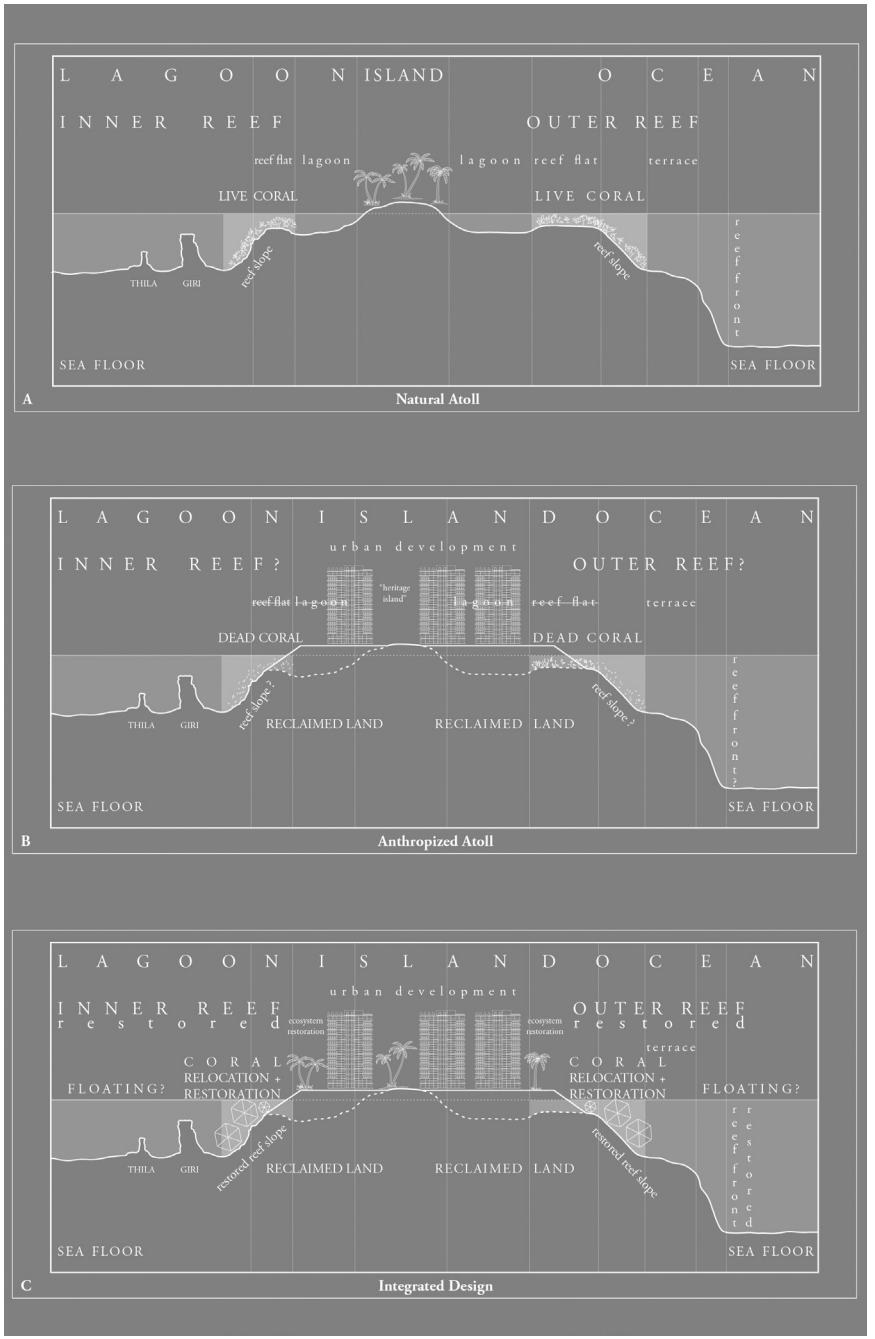


Fig 03 *Resort "Heritage Island" on Farukolhufushi.*
Photo by Irene Pancrazi, 2023.

The term was introduced by John H. Milsum in his 1968 text *The technosphere, the biosphere, the sociosphere. Their systems modeling and optimization* to indicate all technological objects (machines, cars, infrastructure, computers, etc.).

The database of Maldivian atolls can be accessed on the Ministry of Fishery and Agriculture website: https://www.atollsofmaldives.gov.mv/ [accessed 15 December 2023].

Historical photos and dates can be found on the MACL (https://macl.aero/corporate/about/history) and government (https://archives.gov.mv/en) websites [accessed January 15, 2024].

Crasis of Malé and Hulhulé.

Data taken from the Urbanco website (https://www.urbanco.mv/hulhumale/) [accessed 15 December 2023].

Ibid.

Details of the project can be found on the website of *Dutch Docklands - Christie's International Real Estate.* https://www.dutchdocklands.com/ [accessed 15 December 2023].

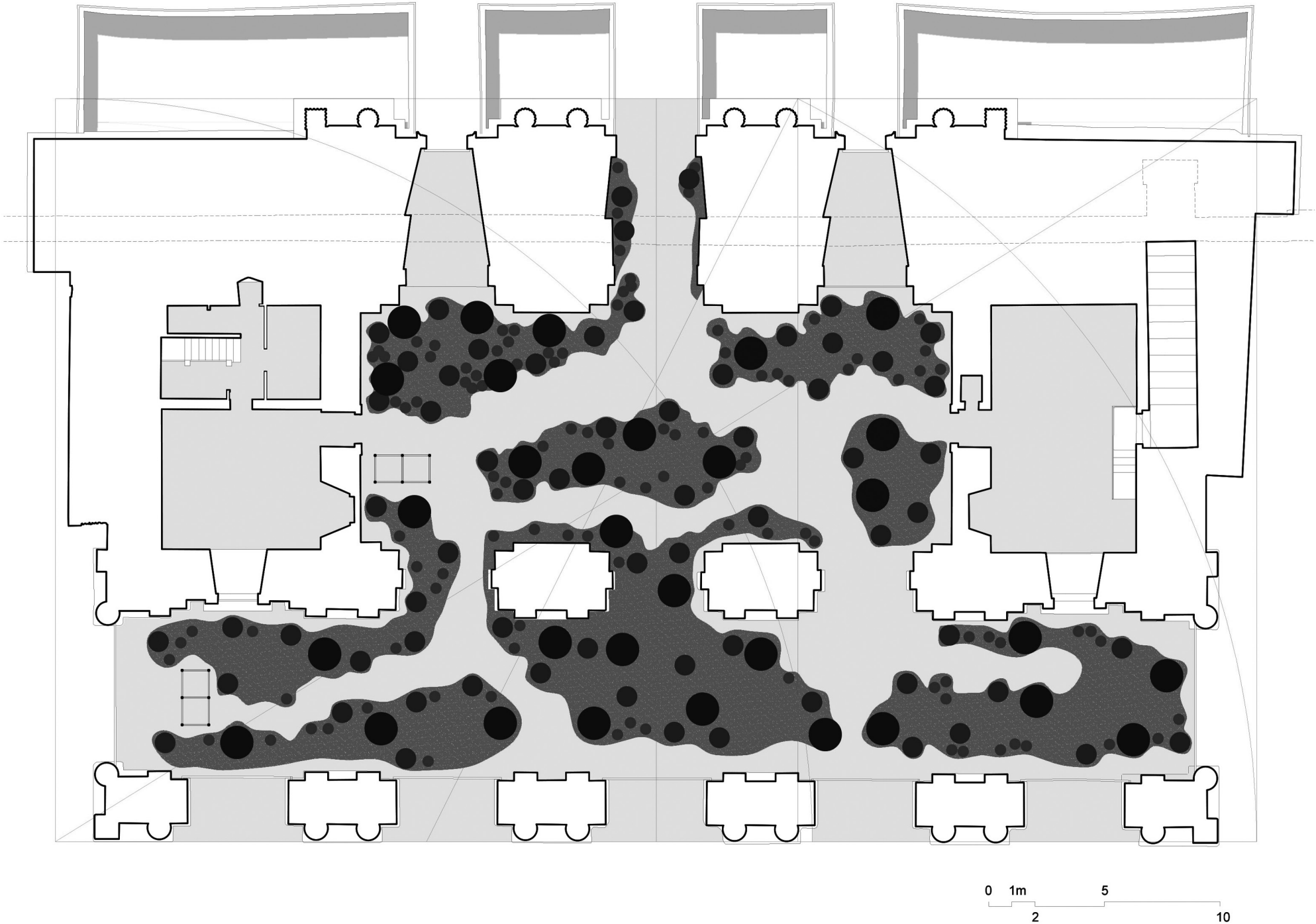
Information on coral restoration can be found on the *Save the Beach Maldives* website https://www.savethebeachmaldives.org/ [accessed 15 December 2023].

ALLEANZE. A TERRARIUM AS AN UNFINISHED MONUMENT

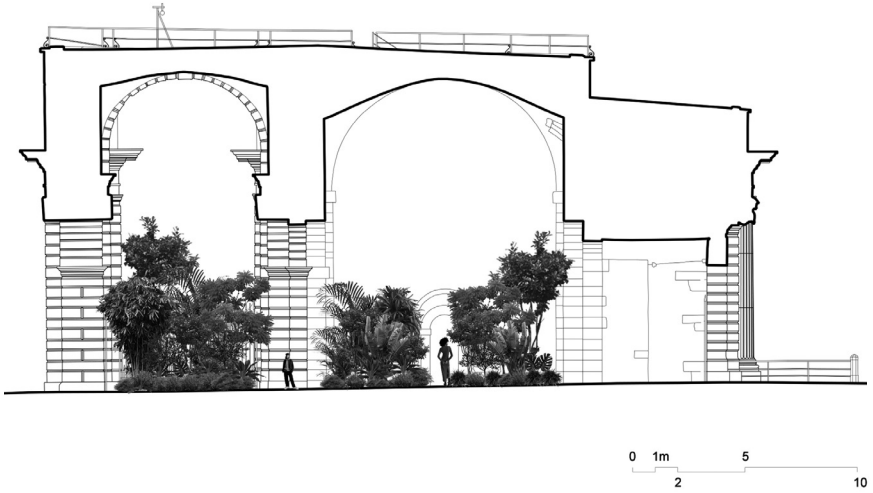
MICHELANGELO PIVETTA, GIACOMO RAZZOLINI, MATTIA BALDINI, LAURA MUCCIOLO

Alleanze ⅄ is a time-fixed project that ventures the possible scenario of a monument where the interaction between biological and the unfinished architecture of *Porta Palio* is envisioned. The human senses are understood as instruments of observation and perception, occasional and voluntary, of the prefiguration of the architecture's fate: the monumental meant not as it was or as it is, but as it may be, perhaps as it will be. Following on the heels of previous short-time experiences that have seen plant starring staged in anthropic settings, this installation is composed of two acts: the saturation of the cavities of *Porta Palio* through "second life" plant existences and the conversion of the preeminent user from human to non-human. These antithetical and paradoxical actions contribute to a different interpretation of the monument, subverting the state of the art through the accelerated grafting of time as a substantial category of architecture. From a useless monumental object in which the void excludes life to a *terrarium* in which the biological fullness is life itself. The non-human becomes a sensual subject, in perpetual becoming, and addresses the monument by questioning the principles of its composition and its own evident artistic condition. Thus, *il Sistema Sanmicheliano*, verified through other entities, rediscovers itself as the subject of a broader in motion of escape from anthropocentrism to verify usually unprogrammed and unspoken realms. The human finally moves to the register of guest and witness, a possible but not immanent part of a dialogue ready for its rewriting. In this way, architecture also rediscovers itself in the dimension of "useless" object destined to abandonment, already a strategy in the arcadian project of Sanmicheli, an inevitable state of a path of transformation that *Porta Palio* and its wounds show to have already glimpsed. Immersed in a present capable of foreseeing the future only in easy digital instrumentation, *Alleanze*, contrarily, interprets everything in analog form, feeds physical observation, the uncanny knowledge of the verisimilar. Finally, *Alleanze* is not interested in scientific verification using the *terrarium* as a functional paradigm, empiricism is not his field of interest; instead, it proposes the truth of an ephemeral scenography, it stimulates the clearest interpretation of the meaning of multiple biologicals Being as a fragment of the possible rather than the certain. It frames a limited portion of time, endless or undefinable, an unknown state that no one, evidently, will ever be able to verify as valid.

Concept design. Ground Floor.
Drawing by the authors, 2023.



Concept design. Section.
Drawing by the authors, 2023.



Alleanze served, during its three-month lifetime, as a scenography/backdrop for the architectural exhibition *Spirito Zoo* as result of an architecture workshop organized by Sara Marini (IUAV), some theater shows (*A Midsummer Night's Dream*) and DJ sets (*Ablakh DJ*) in which the plants themselves collaborated in the production of sound tones.

Concept design. Render.
Drawing by the authors, 2023.

Alleanze, during the “Spirito Zoo” exibition.
Photo by Fabio Mantovani 2023.

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IN VITRO LANDSCAPES

SARA PROTASONI

In recent years, driven by the growing global ecological awareness, the landscape disciplines have practised unprecedented forms of contamination between architecture, art and science (Capuano et al. 2023) in the search for new, more effective images to understand and represent the set of transformations that coexist in a place and that are the always unstable result of the relationships between visible and invisible, macroscopic and microscopic elements (Kepes 1956). This new research dimension signals that ecology is entering the field of landscape design as a combination of practices and knowledge aimed at exploring the link between nature, technology, living systems and interpretive subjects, It becomes, as Timothy Morton (Morton 2018) has pointed out, a functional hybrid space for the formation of a reticular thought that can contribute to the definition of an environmental consciousness that is more aware of the interrelationships between human and non-human, and of the need to remove rigid boundaries between the two worlds, together with the idea of Nature with a capital N, and to renounce the imposition of a human order on the biosphere (Morton 2016). Central to Morton's position is the metaphor of *The Mesh*, intended as a sprawling network of interconnections without a centre or edge (Morton 2010, pp.28-38), a term that conveys the idea of the substantial and inextricable interrelationship between human beings and a wide range of non-human entities, from microscopic forms such as bacteria to *hyperobjects* (Morton 2016), such as global warming.

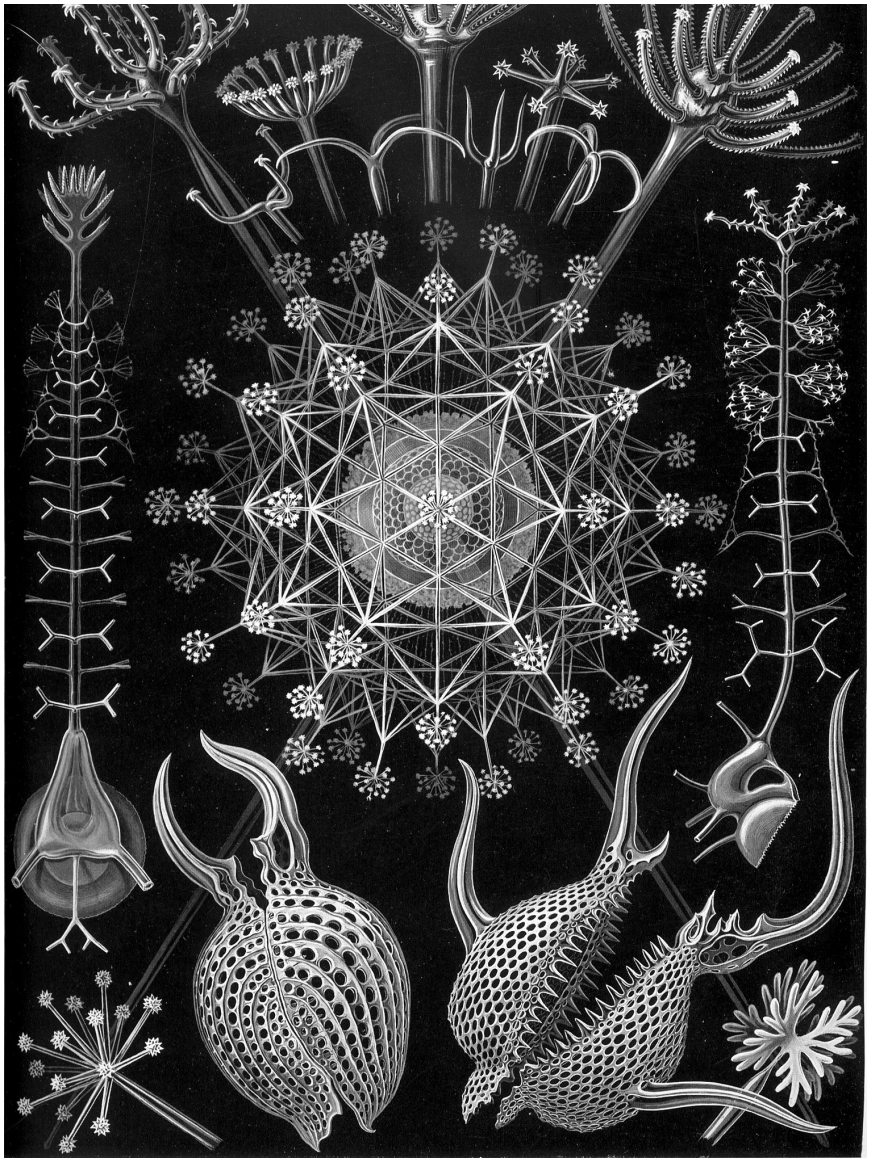
Coexistence becomes the key word for a philosophical and political manifesto that theorises the need to practise a relationship with the world that is centred on contemplation and the search for a possible coexistence between the different entities that make up the biosphere. Today, there is a widespread awareness that no organism is self-sufficient and can exist and sustain itself outside of an exchange relationship with a favourable environment. Every living thing – be it a human organism, a bacterium, a virus or a moss – modifies its environment and is at the same time profoundly influenced by it. In space and time, life reproduces and maintains itself by means of sophisticated self-regulating mechanisms in a continuous selective relationship with the physical environment. This is an extremely stimulating image, which reinterprets and extends to the plant world Pyotr Alekseevič Kropotkin's (1842-1921) idea of mutual support, according to which a key factor in evolution is "mutual support and mutual defence between animals belonging to the same species, or at least to the same society" (Kropotkin 1902, p. 83).

At the beginning of the 20th century, the biologist Jakob von Uexküll used the term *Umwelt* to identify an individual environment or world as defined by the interaction of a living organism (von Uexküll's model is limited to the animal world) with its surroundings, in which the organism and the external environment are essentially inseparable.

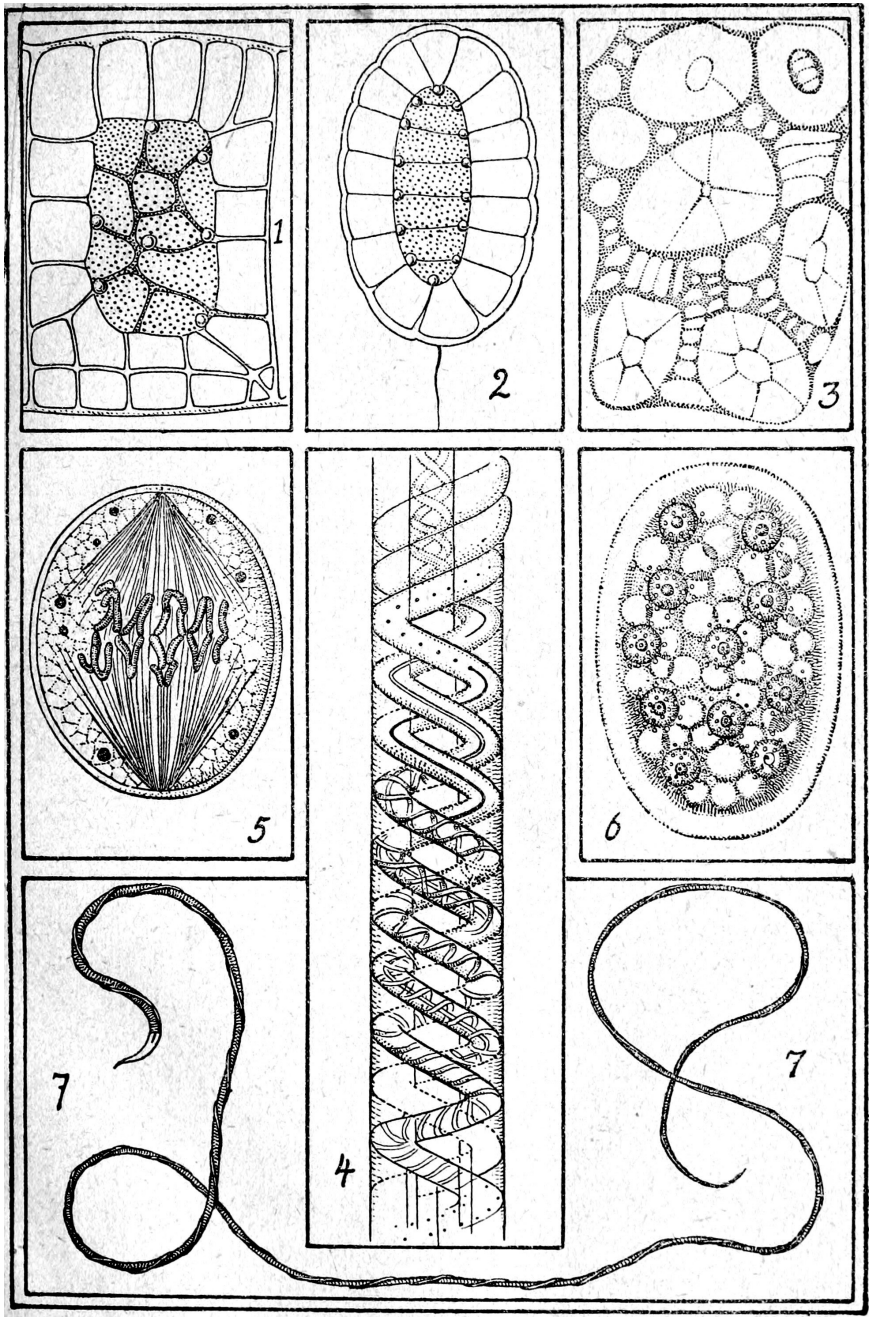
> […] we can represent all the animals living around us (beetles, butterflies, flies, mosquitoes or dragonflies) as enclosed in a kind of soap bubble that circumscribes their field of vision and encloses everything that is visible to them. Each bubble contains the dimensional axes of the working space and what we have called *places*, thanks to which the space of each animal maintains the solidity of its structure (von Uexküll 1934, p. 74).

Von Uexküll schematises the relationship between the living subject and its environment by means of two functional circuits in perfect balance with each other: the receptive system and the reactive system. The receptive organs filter the characteristics that the external environment exerts on the organism, while the effector organs allow the organism to react to stimuli on the basis of what von Uexküll calls the *Bauplan*. The *Bauplan* can be interpreted as a system that generates a particular perceptual tone in the organism, is supersensible, and is located outside of space and time. In this way, the *Umwelt* and the *Bauplan* define the construction of each perceptual sphere. The sphere surrounds and delimits the entire life of each specific living being, which is stimulated and moves coherently from within it. What lies beyond it simply does not exist, because, in von Uexküll's formulation, it is infinitely concealed. The bubbles are included or interfere with each other because they are interdependent and complementary, thus embodying von Uexküll's idea of a network of living things.In a recent essay, Emanuele Coccia, a professor at the Ecole des hautes études en sciences sociales in Paris, goes further. He breaks down not only the human/non-human boundary, but also the animal/plant boundary (Mancuso 2019) on which Western culture has based its dominant conception of nature. *Plant life. Metaphysics of Mixture*, suggests thinking of the world as a "reality of mixture in which everything breathes" (Coccia 2018, p.82). The image that initiates this new cosmology is one that characterises plants as having no hands "to handle the world, yet it would be difficult to find artists more skilled in the construction of forms" (Coccia 2018, p. 23) since "their body is an unstoppable morphogenetic factory" (Coccia 2018, p. 24). In Emanuele Coccia's reflection (which is not easy to decipher), *atmosphere* becomes the key

Plate 4: Diatomeae.
Source: Ernst Haeckel, Kunstformen der Natur, Verlag des Bibliographischen Instituts, Leipzig und Wien, 1904.



The structure of protoplasmas: 7 different configurations
Source: Raoul Heinrich Francé, Die Pflanze als Erfinder, Kosmos, Gesellschaft der Naturfreunde, Stuttgart 1920.



word: the space of mixing without losing one's identity, where through breathing a complicity/intimacy between the elements is realised that goes beyond the mechanisms of fusion:

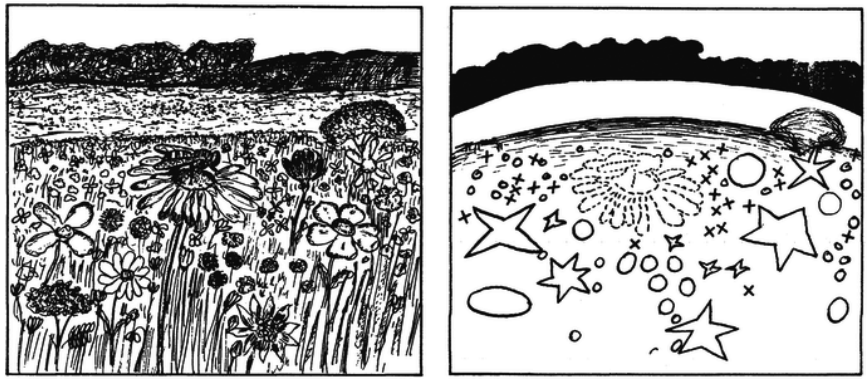
> If living is breathing, it is because our relationship with the world is not that of being thrown, nor that of the domination of a subject over an object: to be in the world is to experience transcendental immersion (Coccia 2018, p. 89).

In this view, indulging in the breath of the world is the only sustainable dimension of existence, in an *immersive, totalising and instantaneous* state.What the role and responsibility of the project (especially the landscape project) can be, and what its tools can be, are questions that have yet to be addressed, since this *immersive, totalising and instantaneous* condition seems to exclude the necessity and possibility of the project as an anticipation of a different future condition, as far as architecture and landscape are concerned. An anticipation based on the study of the present conditions and the reasons for the conformation of places, capable of activating an attitude and a gaze through which the project can trigger processes of modification, making contact with the physical space, its morphologies, the different environmental systems, its technical and infrastructural endowments, its economies and its intangible dimension linked to the sphere of meaning: with the soil, the materials, the forms, but also with the idea of nature and the idea of history.As we will see in more detail below, the figure of the *terrarium* makes it possible to define this question in a concrete space that requires contamination between different fields of research and reflection: the study of the biological processes that run through the different biota, traditionally reserved to the world of science alone and almost always condemned to invisibility; the identification of the multiple systems of relationships that organisms and other entities weave within the biota itself, which belongs to ecology and landscape ecology and only rarely reaches the dimension of the visible; the perception and imagination of the spaces in which ecological processes unfold in the realm of the visible, which has opened up and continues to suggest interesting areas of formal and artistic research (Kepes 1956).

LITERALLY: IN VITRO ENVIRONMENT

But what are we referring to when we use the term *terrarium*? Literally, it denotes a miniaturised environment in a more or less hermetically sealed container designed to house specific communities of plants, insects and certain animal species. The soil, presented in its layering of different materials, is artificially

The Umwelt of a bee. From Jakob von Uexküll, Ambienti animali e ambienti umani. Una passeggiata in mondi sconosciuti ed invisibili, (Streifzüge durch Umwelten von Tieren und Menschen. Ein Bilderuch unichtbarer Welten, 1934) Quodlibet, Macerata 2011, p. 94.



composed to give life, nourishment and shelter to living communities that share the need for specific environmental conditions.

When hermetically sealed, water vapour produced by plants condenses on the glass and falls back to the soil, returning to the roots. Oxygen emitted by the leaves through diurnal photosynthesis is used by the plants for respiration while the reverse happens for carbon dioxide, and the leaves as they age and fall contribute to fertilising the soil.

The miniaturisation and *mise-en-boîte* invite the eye to recognise the minutest detail of this miniaturised environment. As happens in the perspective boxes, created as anamorphic devices in the genre of 17th-century Belgian interior views (Brusati 2013) then disseminated throughout Europe in the 18th century, in the *terrarium* miniaturisation produces a kind of reverse microscope, which highlights because it shrinks, stimulating curiosity to look beyond what we know. In addition to this, the rarefied and mysterious atmosphere generated by the in vitro dimension produces an alienating effect: a self-sufficient microcosm is discovered enclosed in it, but saturated with references, whose mystery is accentuated by the contrast between the glass envelope and the mutability of the life forms enclosed in it, in a process frozen for an instant under the observer's gaze but always on the point of resuming its own becoming. It suggests a different dimension of space and time, inducing a sort of oneiric passage in the observer who is as if sucked into a different cosmos, in which he is no longer in front of a landscape but becomes part of it. In this sense, miniaturisation and *mise-en-boîte* make possible a perspective that goes beyond the anthropocentric paradigm by placing the human being on the same ontological level as animals, plants, stones, mosses, clouds, viruses, bacteria, etc. This is a powerful metaphor for the posture taken in recent years by some of the most interesting landscape architects (including Günther Vogt, Descombes and Rampini, Teresa Galì-Izard, Catherine Mosbach) who

> take on nature not as a repertoire of forms to be reproduced, but of behaviours to be interpreted and with which to collaborate in dialogic terms. Of the prairie, as of the river, one does not define the form, but rather the possibility of occurrence (Metta 2022, p. 161).

These landscape architects do not speak of nature with a capital letter, but of a totality that can only be understood in parts, with a wide margin of approximation. The meticulous preliminary studies that underpin their projects often operate through the construction of collections and classifications based on the order-disorder dialectic typical of scientific research.

The structure of protoplasmas: 7 different configurations
Source: Raoul Heinrich Francé, Die Pflanze als Erfinder, Kosmos, Gesellschaft der Naturfreunde, Stuttgart 1920.

But their work is not, as in the sciences, a search for a hidden order on which to build a theory, but rather the construction of a repertoire of figures on which to base a poetics.

A fascinating example of this is Catherine Mosbach's project for the park of the Louvre Museum in Lens, which is based on a meticulous sampling of the different soils resulting from mining activities, crossing different relational scales: from the vast one that reads the different morphologies of the terrain to the minute one of textures and ecological successions.

In his book *Landscape as a Cabinet of Curiosities* (Vogt 2015), Günther Vogt illustrates the importance of his own collecting activity in constructing a specific attitude towards landscape design, emphasising the difference between his collections and scientific collections.

> My own collection is completely different, more like private tinkering. I find the collecting principle of the cabinet of curiosities very interesting. They were actually archives of knowledge in which very different objects from nature, the animal kingdom, the sciences and the applied arts were assembled according to personal interests and tastes. I'm fascinated by this non-hierarchical collision of very different things that have no fixed order, but lend themselves to being constantly rearranged in new constellations and relationships (Vogt 2015, pp. 165-166).

. MINIATURISATION. THE LANDSCAPE PROJECT BETWEEN ART AND SCIENCE

Inside Outside, Catherine Mosbach's installation created in 2016 as part of the Architecture as Art exhibition in Milan - Hangar Bicocca, well represents this direction of research. The work consists of a series of incisions carved into a plaster panel, designed according to a figure articulated in straight paths, joints and curves. A complex system of lighting and humidity control makes it possible to produce atmospheric variations of the various organic substances contained in the etchings, which, over the course of the months following the exhibition's opening, are capable of creating an ecosystem of different mould inflorescences. The result is a theoretical landscape constructed as a layered, changing and essentially unpredictable ecosystem.

> This work is a web of desire. We wanted to make invisible works visible. As landscape artists, the landscape we want to deal with is a process, it's just the beginning of something, it's not the end. There are a lot of bacteria, which means they need a little bit of food to do their work and transform the air and moisture to create new forms. So we hope that in a few months we will be able to see what has happened in the channel that we proposed to follow. The purpose of the light is to make the biological effects of the process visible, because they're very microscopic and very subtle landscapes (Mosbach 2016, p. 86).

The installation proposed by Catherine Mosbach highlights an important conceptual shift in which space (the object of choice in landscape architecture) is redefined as a field, a place open to all kinds of relationships, through which different living things pass and modify it.

Animals, plants, stones, mosses, clouds, viruses, bacteria, but also words, objets trouvé, images, capable of constantly re-founding multiple processes, interact to produce new forms, mutated forms that coexist with ancient, sometimes very ancient, resistant entities.

Indeed, it is understood that the space in which we operate as researchers and designers is inhabited, traversed, modified, cultivated, constructed and devastated not only by humans but also by animals, plants, bacteria.

Multiple events and trajectories imprint the terrestrial environment with the traces of the presence and passage of different entities (animate and inanimate) interacting with each other. In this interweaving of dynamics, time (in its multiple dimensions, from a single event to the geological era) plays an essential role as a measure of transformational processes that always raise the question not only of the survival or extinction of living beings, but also of the inertia and modification of the elements that make up physical space.

Understanding landscape in this way involves a systemic description based on relational scales that open up meaningful worlds beyond the visible, in the dimensions of the infinitely small and the infinitely large that transcend our perceptual capacities. The scales of landscape are therefore multiple. We have to take into account the microscopic scale when we refer to organisms such as viruses and bacteria; or even the macroscopic, if not planetary, scale when we refer to the worlds described by geography or geology, as nineteenth-century geography, and in particular Alexander von Humboldt, had already fully understood (Willmann 2023; Botar 2017; Mertins 2001; Protasoni 2021).

This awareness is not the same that extended the discovery of the infinitely small or the infinitely large between the nineteenth and twentieth centuries, for which architecture between Art Nouveau and Modernism found inspiration in the drawings of Ernst Haeckel (Haeckel 1904) or in the microscopic research of biologists and naturalists such as Raoul Francé (Francé 1920).

In that moment, the reassuringly logical construction and even the mechanically functioning model of human-scale entities was extended to imaginary worlds.

Today ecological awareness is shaking our faith in the anthropocentric idea that there is one scale that governs all; the human scale.

It is beginning to be recognised that each entity exists in its own time, on its own scale, as In the, György Kepes pointed out in 1950s

> The obvious world that we know on the gross levels of sight, sound, taste and touch can be combined with the subtle world revealed by our scientific instruments and devices. Seen together, aerial maps of river mouths and road systems, feathers, fern leaves, branching blood vessels, nerve ganglia, electron micrographs of crystals and the tree-like patterns of electrical discharge figures are connected, although they are very different in location, origin and scale (Kepes 1956).

The small garden (about 200 square metres) that Catherine Mosbach has created in Ulsan National Park, on the banks of the Taehwa River, moves in this direction. The aim is to represent the landscapes that have been shaped over time by the dynamics of the river "against" the resistance of the land, between erosion and deposition.

The narrative dimension of the project develops both along the temporal sequence of the processes and along the spatial line of the different landscape units, evoked through a process of miniaturisation and abstraction aimed at recalling the salient features of the different phases and places.

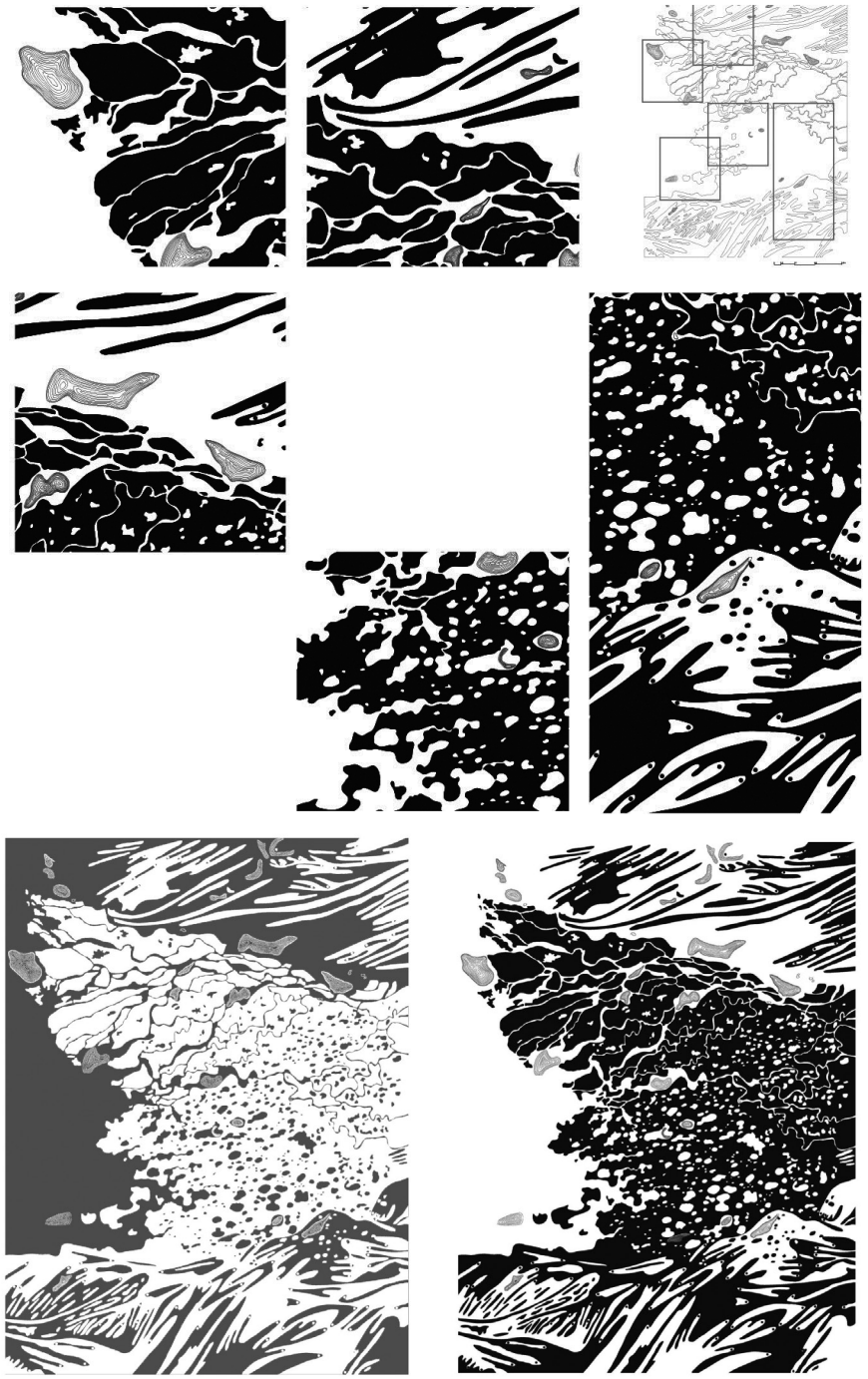
The narrative thus takes place in a multidimensional time: the long time of geomorphological transformations, the cyclical time of the seasons and the sudden time of crises and catastrophes. As Catherine Mosbach has written (Mosbach 2023), the spaces evoked are located between the distant peaks of Mount Taebaek - a reservoir of water, seeds and fresh air - and the deep lands of the seabed - a reservoir of cultures and continuous migrations of marine and terrestrial creatures. The garden is traced as a receptacle for these phenomena, which manifest the river's incessant morphogenetic power.

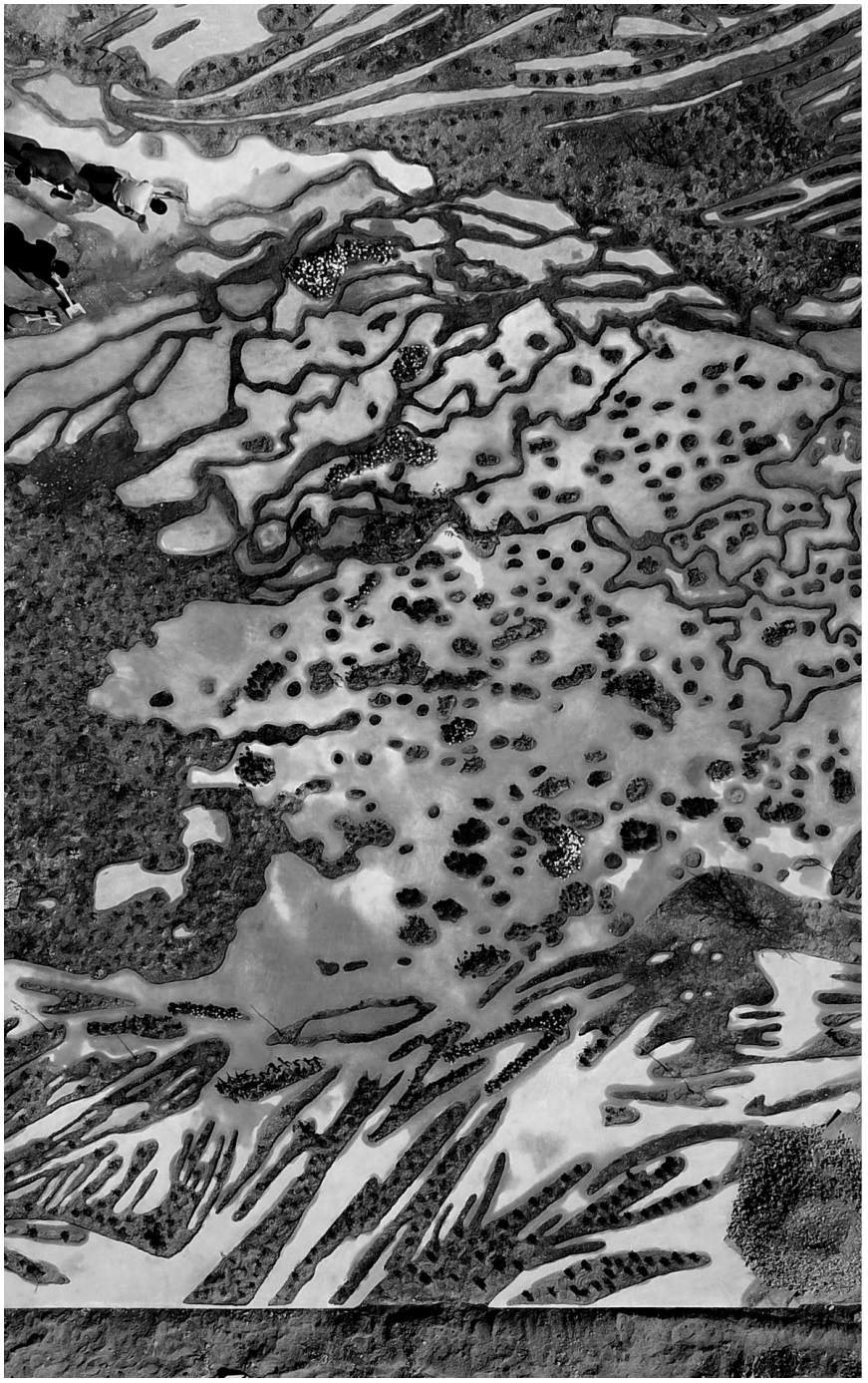
The title (*Lost in Transition*) underlines the desire to represent, in the form of an apparition, those passages of this gigantic and continuous transition that have been erased.

> Water sneaks into the folds on the riverbank and crevices. Foliage filters stripes of light to the ground reflections. Mosses cling to the asperities of the deposits. Sheers protect

> an interlude of relaxation amidst the plants. Shoots of the year and their umbels communicate vigor of fertile soils. Footprints and handprints of the men who build up the garden invokes the tradition of petroglyphs flush with the rocks of Ulsan, which exposes the terrestrial food, in grateful of their benefits. Lost in transition retains the alliances between humanities and environments relaying beyond the strictly human temporalities (Mosbach 1923).

Lost in Transition, Mosbach paysagistes landscaper,
Ulsan – South Corea, 2018.





WILDNESS

EARTHLY EMERGENCES: SPONTANEOUS ENTITIES

DAMIANO DI MELE

Masses of trees, rocks, leaves, and trunks are involved and overwhelmed in the same motion, in the most vital and miraculous *continuum* of the human story: the place of living' acts as the landing place of a millennial journey. The house, in its broadest sense of the term, in this narration seems to allude to a double tendency: on the one hand it expresses its empathy with the landscape, in which man slows down to such an extent as to contrast the rhythms of contemporary society; on the other, it seems to alter the balance of nature to submit it to our needs. The house's theme is, of all themes, perhaps the most complex: we can come to think that everything is a house, even a forest, a museum or a place of worship. Just as happens in the Islamic religion where the word "mosque" derives from the Arabic *masjid*, with a literal meaning "place where one prostrates oneself" (before God); this word is recurrent in the Koran but in no case does it seem to refer to a new type of specifically Muslim building. The Koran states a rule addressed to all Muslims, of crucial importance for the architectural history of the mosque: the obligation of prayer as a private act, to such an extent that tradition states that there is a *masjid* wherever there is someone who prays.

In an editorial of *Domus* magazine, Ernesto Nathan Rogers, in the opening issue of the management writes:

> I want to have a house that looks like me (in beauty). A house that resembles my humanity. […] Let us all help each other find harmony between human measure and divine proportion (Rogers 1946, p. 3).

With the term "humanity," Rogers suggests everything that belongs to nature, to the origins of man, therefore alluding to an undefined, uncontaminated place that coincides with the ideal of paradise on earth. By applying to the theme of the "house" the same principle previously mentioned for the "mosque", *mutatis mutandis*, it can therefore be said that there is a house wherever there is a place that reflects one's soul, one's nature, ultimately a space that ennobles the man. Between the 1960s and 1970s, the union between the natural and the man-made landscape was brought into focus by the Spanish architect Miguel Fisac through twelve architectural episodes in the Balearic Islands in Mallorca. He explored the *Costa de los Pinos* following the Hotel Costa de la Luz commissioning in Santa Ponça in 1959, the first of the large complex of urbanization works. The main objective is to trace and stage the relationships that link the resources of the surrounding environment with the authorial narration that the creative process puts into shape. The numerous watercolors by Fisac – which portray Mallorca – show the attraction that

Miguel Fisac, *Earthly emergences, photograph of the project area* – seen from the water – of the single-family house for Antonio Garcìa Hidalgo in the Punta Rotja area along the Costa de los Pinos, Son Servera, Mallorca 1969. Courtesy Fundación Miguel Fisac.

this landscape exerts on the designer's thinking. It is a landscape that coincides in all respects with the poetics of the "wilderness": a portion of territory, in a wild state, in which natural forces predominate.

He is convinced, like Thoreau, that the concept of *wilderness* is a treasure to be safeguarded rather than plundered. This is how nature is reflected in the drawing as a preparatory exercise to fully understand the roots of the place, even before giving shape to the project. In this panorama, the soil – custodian of experiences that time has left to settle – represents the first resource for the transformative action of the area. The single-family houses built in the municipality of Son Servera are divided into individual independent volumes arranged along the rocky edge of the coast, in favor of the pre-existing orography.

> Each has a different privileged view that overlooks the sea.
> The set of houses designed and built in the urbanization of *Costa de los Pinos* constitutes a suggestive field of experimentation for Fisac. Every single house embodies the form, the technique, and the rigorous limits of the topography and climate of the place (Ferrer Forés 2009, p. 17).

The supporting structure, for example, is made of *marés*, a limestone typical of the Balearic Islands historically used to construct both public and private buildings.The object of investigation of this complex reflection is the design – in the Punta Rotja area – of the house for Antonio Garcìa Hidalgo, an entrepreneur in the naval sector. Miguel Fisac in 1969, develops a singular idea that differs from the formal characteristics of the previous projects. The latter represents a "dreamed fantasy" by the architect, it is an idea of an "other space" that emerges from the earth, set among native crops. The project (which has never seen the light) abandons various unedited visions before assuming the physiognomy of *Terrarium*. Among the many design proposals by Fisac, two antithetical solutions emerge: the first, from 1966, corresponds to a rectangular plan rotated with respect to the orientation of the lot. An access leads to the small entrance that overlooks an internal square patio which leads to the living area and the dining room, separate from each other and slightly set back in front. In the second version, a few years later, the project takes on a radically different form with curved spaces and environments that revolve around elliptical patios. While maintaining the previous distribution and organization, Fisac proposes a completely new project. Borrowing the words of Bruno Zevi, it could represent a work of "intuitive imagination" (Zevi 1945, p. 66). The main element – from which the idea springs – is the large, pre-existing monumental staircase that leads from the area where the house should have been built to the beach below (Peris Sànchez 2016, p. 236). As can be seen from the project drawings, the wall delimits nature, closes,

Miguel Fisac, *Underlying sign, substratum,* detail photograph of the access ramp to the beach below the project area, Son Servera, Mallorca 1969. Courtesy Fundación Miguel Fisac.

Miguel Fisac, *Terrarium, spontaneous entities*, photograph of Aleppo pine trunks and native vegetation of the Balearic Islands, Son Servera, Mallorca 1969. Courtesy Fundación Miguel Fisac.

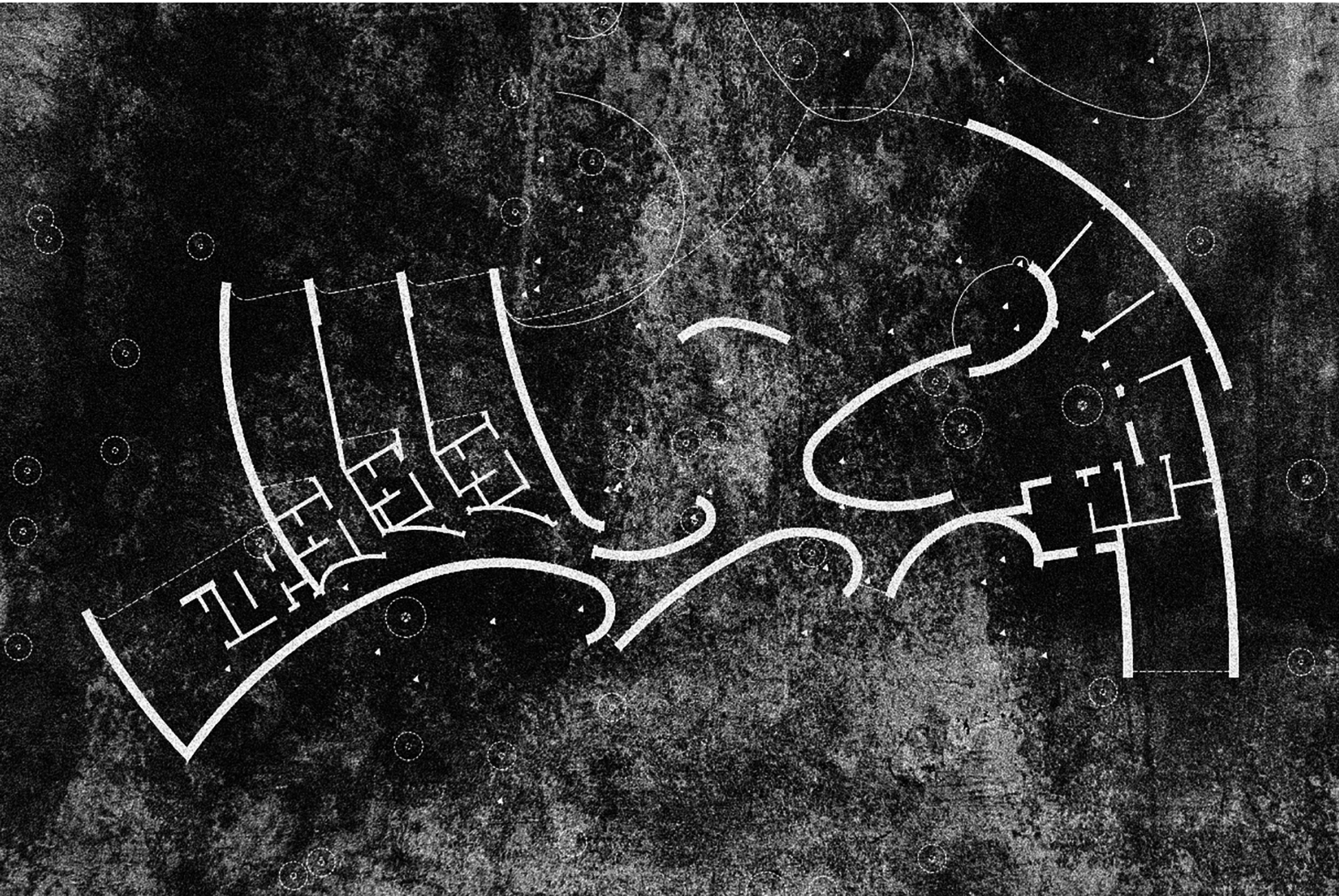
becomes the primary act of architecture, content and container of the landscape and human life. To all intents and purposes, it constitutes a threshold, sometimes impenetrable, which arises as a sense of protection from everything that takes place outside it. There are no more volumes, facades, perspective hierarchies, privileged points of view, detachments between an "inside" and an "outside."

The internal spaces of the house are projected, and the external ones are magnetized and absorbed.

The forms of the ground, intended as original data, orient the planimetric system and establish the trajectories of the routes. The curved walls, orchestrated according to a geometry bound by the position of the pre-existing trees, tangle the plant elements evoking that imaginary that refers to the formal synthesis of a *terrarium*. The latter is intended as a protective shell of an ecosystem that often feeds on itself. The proposal envisages that one day, through the systematization of the signs that emerge from the earth, if the natural traces had been erased, it would have been possible to go back to the invisible, as well as to the design process and to what has been buried for some time now. Many years earlier, Paul Klee's reflections in the book *Theory of Form and Figuration*, reopened the study of the curve and its formal characteristics. They have, therefore, made it possible to reformulate the importance of large curvilinear organisms with new meaning through the character of stillness of the figures of the circle and the ellipse very often present in this design proposal. Each "vegetable room" corresponds to a view or a different tree species, spontaneous or artificial. In this place, building and nature integrate into a total magnetic field. The house-*terrarium* is destined to be "consumed" one day by its gardens and by the vegetation that surrounds it.

The natural landscape along the *Costa de los Pinos*, meant as a "blank sheet," is actually imbued with the millenary traces, folds and perhaps even lacerations that Miguel Fisac - through the design of single-family houses intended as a pretext - has tried to mend. At the conclusion of the entire urbanization and retracing his entire career, he claims to be prouder of his unbuilt projects than of the completed works (Fernández-Galiano 2022, p. 10). Finally, within this horizon, a narrative potential could be drawn that helps to outline new imaginaries and new forms of living.

Miguel Fisac, *Invisible signs and constellations of trees*, single-family house for Antonio Garcìa Hidalgo, Mallorca 1969. Ground floor-plan. Image elaborated by Damiano Di Mele and Olga Barbulat.



PILING, MENDING, REASSEMBLING: AESTHETIC AND POETIC OF THE SUBALTERN LANDSCAPES

NADIA BERTOLINO

In 1982, Agnes Denes' pioneer project *Wheatfield* shone a light on the disruptive meaning of planting and harvesting within the city. It stood as a symbol, a universal concept, representing food, energy, commerce, world trade, and economics while also alluding to issues of mismanagement, waste, world hunger and ecological concerns. Forty years later, Wheatfield still stands as a paradigm of ecological resistance in the city, where market-driven real estate developments continue to spread, reiterating and spatialising forms of intersectional inequalities and exclusion. Nevertheless, alternatives are emerging to reclaim a profound connection between the city and its inhabitants. These alternatives aim to foster the development of civic institutions for collective resource management, in line with De Moor's *Silent Revolution* framework ⅄ (2008). This paper theorises that grassroot forms of urban mobilisation give rise to landscapes of informality- microcosms where social practices of environmental care are creatively produced, established and nurtured. These subaltern landscapes are made of piled waste, mended objects and fragile assemblages of man-made devices and botanical subjects. It signifies the emergence of a new spatial poetics, moving beyond the "wilderness in the city" concept theorised by Metta and Olivetti (2019) which draws from the biological and formal self-determination of the living species. In fact, subaltern landscapes arise from new collective imaginaries, they result from collaborative processes informed by a spatial vision. This vision entails a preliminary, yet adaptable, design agency. Due to their inherently low-tech nature, these subaltern landscapes propose a semantic approach to define an urban "terrarium," invoking a material attachment to the earth, the terrain: greenhouses, rainwater tanks, phytopurification devices, solar energy and biogas technologies, aquaponics crops, seeds libraries, scarecrows, anaerobic digesters, moss walls. Inhabitants of the subaltern landscape engage in everyday practices of growing, seeding, planting, ploughing, weeding, harvesting, composting, fermenting, cooking, and eating. These practices contribute to reshaping the imagery of our urban environments. Thus, the urban terrarium becomes an embodied geography materialising the interactions between humans and non-human factors that co-produce non-commodified forms of landscapes (Fig 01). This proves that collective life and agency can persist and emerge within the interstices of capitalist systems (Tsing 2015). Despite their apparent disorder, the spatial composition and anthropized devices found in the subaltern landscape suggest that the ideal of a meticulously planned and ordered city was flawed, likely to result in a fragile and constric-

tive urban environment (Sennet 1970). Instead, processes of collective mobilisation can generate alternative urban landscapes that challenge traditional hierarchies:

> "less a politics dominated by a framing imagination of linear progression (and certainly not singular linear progression), and more a politics of the negotiation of relations, configurations" (Massey 2005, p. 147).

The discussed theoretical stance can unfold into various spatial configurations, each necessitating distinct and contextually tailored design interventions. These, guided by diverse collective aspirations, yield a diverse array of alternative urban settings: this is precisely why I opt to employ the term 'landscapes' in the plural form. One paradigmatic example is the instance of collectively managed urban agriculture initiatives (Fig 02), wherein the profoundly relevant notion of food production within the city becomes intertwined with the urban environment.

The urban agriculture landscape engenders contemplation regarding alternative conceptualizations of agrarian life and ecological sustainability, both of which come to the fore within the subaltern landscapes. In *The Wretched Earth: Botanical Conflicts and Artistic Interventions* cultural theorists Gray and Sheikh (2018) notice that grassroots forms of urban agriculture encompass not only the transient process of uniting individuals but also the conscientious utilization of raw materials and resources, devoid of exploitation. Consequently, the subaltern landscape, which can serve as a host to informal grassroots agricultural practices, reveals a distinctive spatial configuration and material geography. Within these microcosms, creatively repurposed tools, low-tech irrigation methods and ecological apparatuses abound, giving substance to a collective imagery that subverts established aesthetic norms and forges novel spatial poetics. In truth, community-driven urban agricultural initiatives can be viewed as small-scale alternatives to the Plantationocene, as defined by Haraway: a geological epoch marked by the radical disruption of humanity's capacity to care for place (2015). In the Plantationocene, "plants play as mediators of habitability in a landscape" (Barua 2023, p. 13). In these instances, the emphasis rests on inter-relational expressions of 'caring,' positioning a 'caring-with' ethos ahead of a 'caring-for' approach. This perspective envisions an enduring sequence of caring acts wherein we oscillate between the extremes of giving and receiving, occupying different positions within this spectrum (Tronto 2015).

As mentioned previously, subaltern landscapes encompass a diverse spectrum of planning and design.

They can be entirely informal, adapting to contingent con-

Fig 01 View of *Comunità delle Piagge*, Florence.
Drawing by Nadia Bertolino, 2023.

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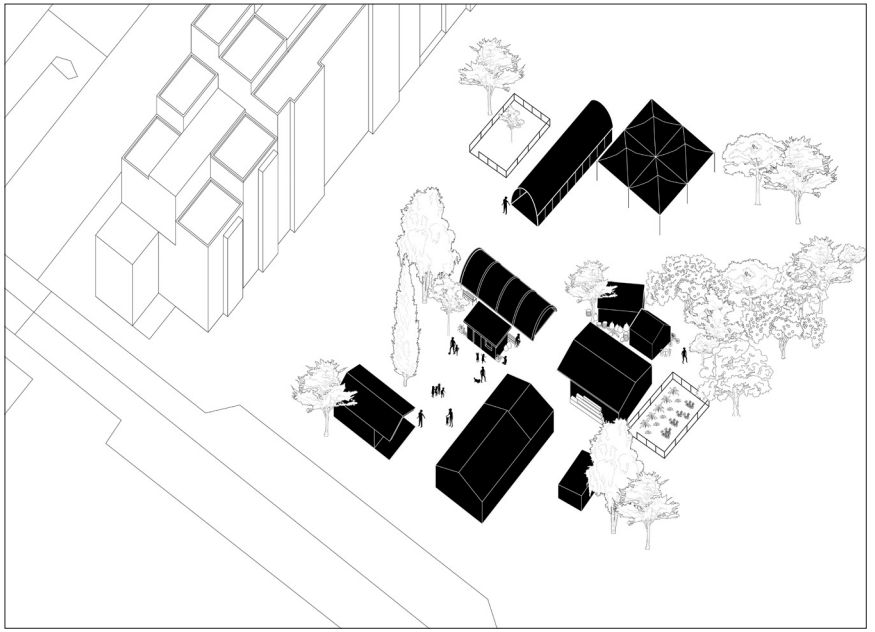
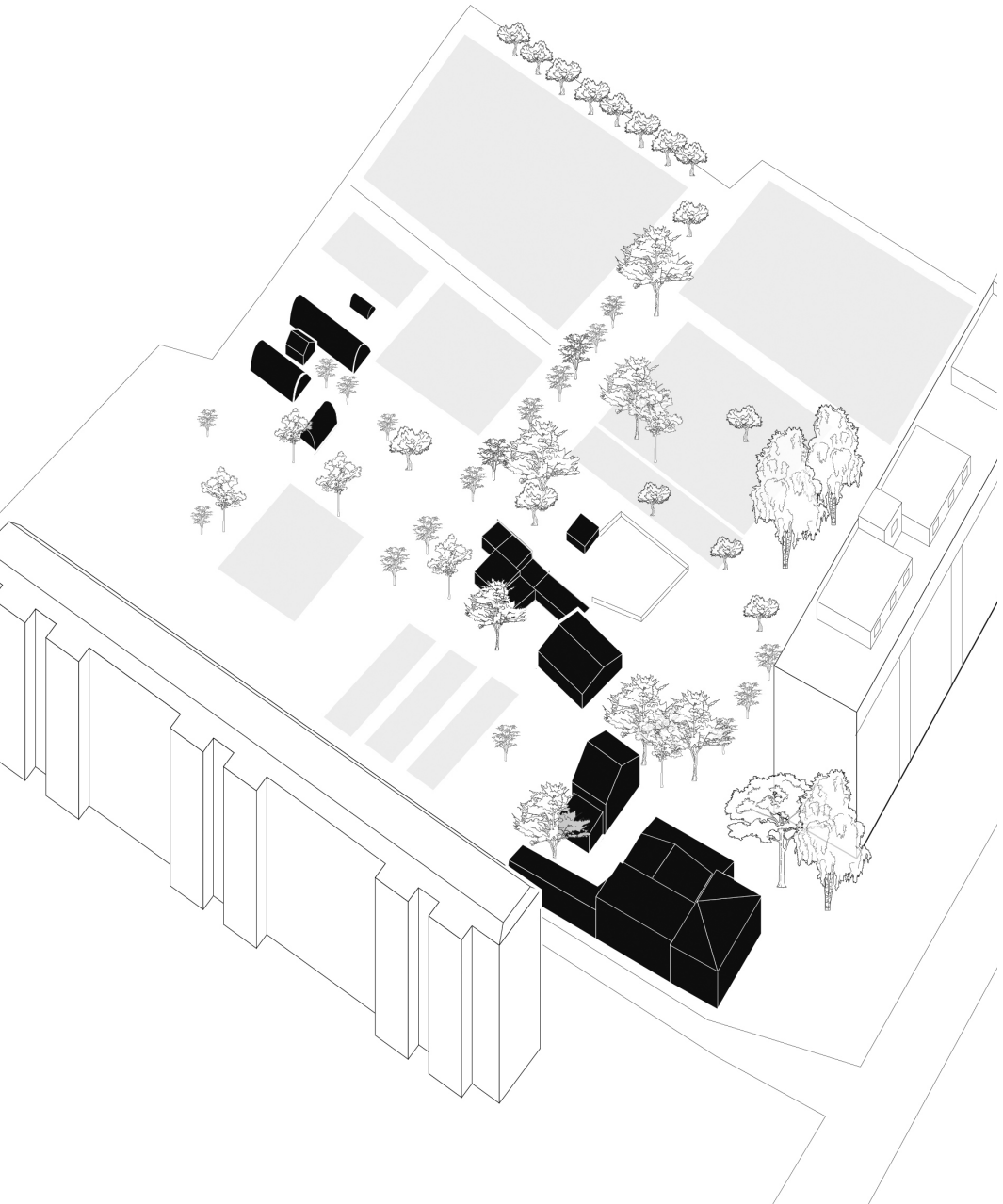


Fig 02 *Fattoria dei Ragazzi*, collectively managed urban farm at Isolotto social housing neighbourhood, Florence. Drawing by Nadia Bertolino, 2023.



ditions, expanding or shrinking through iterative, incremental or decremental processes. However, they can also arise from a precise, site-specific design approach stemming from architects' engagement with local contexts and processes.[8] An interesting recent instance is the Holy See Pavilion by Studio Albori titled *Social Friendship: meeting in the garden* at the XXVIII Architecture Biennale in Venice (Fig 03) (Fig 04). A lemon treehouse, a chicken coop, a seed store, and the parasols: these are entirely crafted from waste materials collected from a former construction site, then repaired, upcycled, re-assembled to create a communal garden and orchard. The botanical elements engage in a dialogue with the architectural components scattered throughout, engendering a sense of intimacy and inviting social interaction.

The subaltern landscapes under consideration, whether they emerge as spontaneous outcomes of collective labour or as deliberate design interventions, foster multi-species microcosms wherein novel, occasionally fragile, correspondences take shape. Their thresholds can range from hazy and permeable to well-defined, yet in all cases, they delineate the borders of unforeseen spaces: the urban terrarium evolves into both a reservoir of collective life and a venue for experimental ecology simultaneously. Such thinking and practices showed the extent to which environmental thinking needs to take into account nature's absolute non-anthropocentric status , and to raise questions about the technological instrumentalization of natural systems. Armed with these enduring political frameworks, we can unveil the intricate political, material, and temporal relationships that have led to the designation of our era as the 'anthropocene'—a geological epoch characterized by the significant impact of human interference on the planet's ecosystems. This comprehension facilitates the development of optimistic and sustainable futures, addressing various levels of society, from the built environment and urban landscape to the human, corporeal, and biological realms.

Fig 03 Detail of the sitting area in the communal orchard designed by Studio Albori as part of the Holy See Pavilion “Social Friendship: meeting in the garden” at the XXVIII Architecture Biennale in Venice.
Drawing by Nadia Bertolino, 2023.

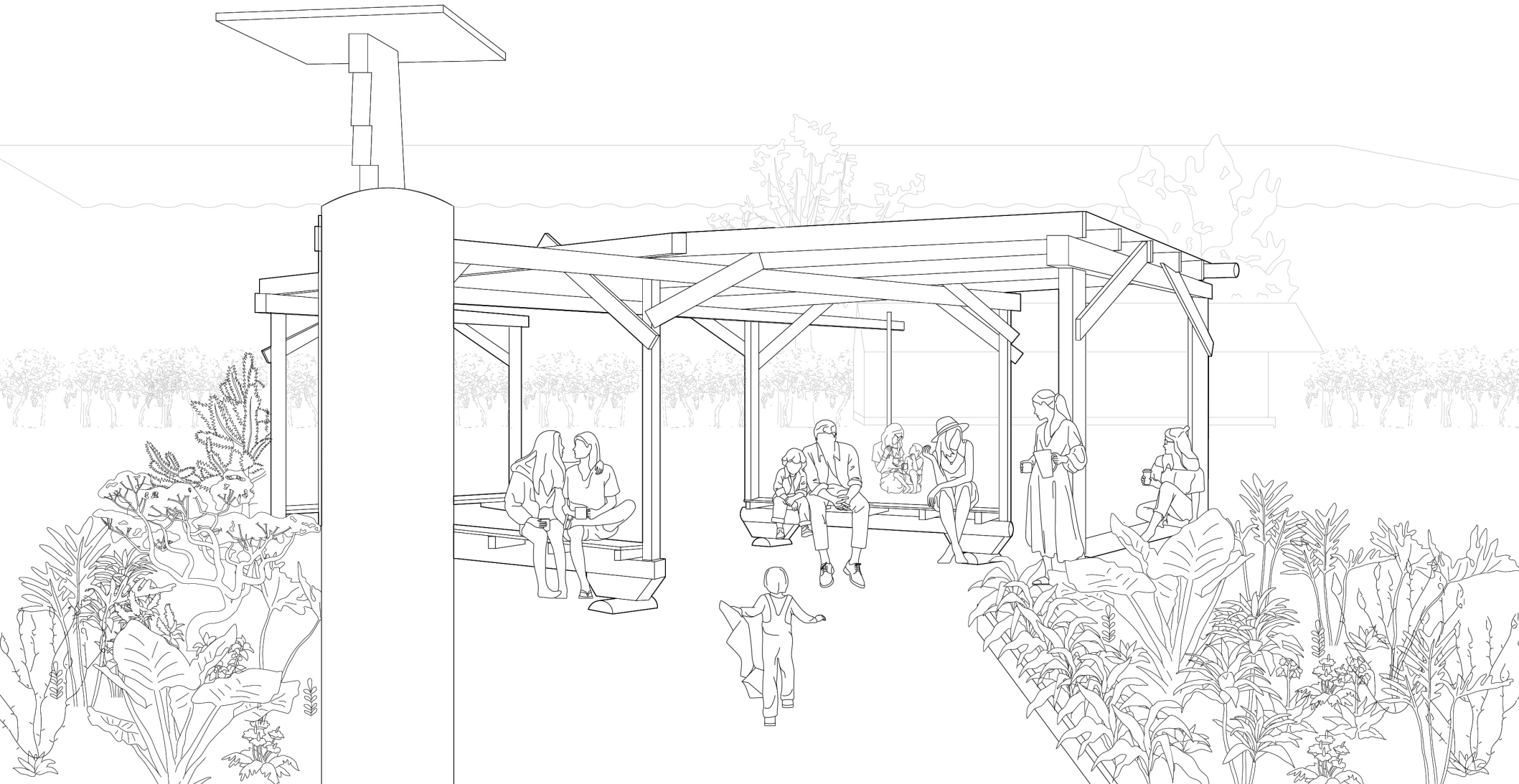


Fig 04 Detail of the communal orchard designed by Studio Albori as part of the Holy See Pavilion “Social Friendship: meeting in the garden” at the XXVIII Architecture Biennale in Venice. Photo by Nadia Bertolino, 2023.

In her guest lecture at the Sheffield School of Architecture in November 2014, Peg Rawes defined Agnes Denes’s Wheatfield as a paradigm of what she describes as a “relational architectural ecology.” Rawes emphasized that within this site-specific artwork, various subjects are encompassed, including geometry, economics, urbanism, history, crisis, resources, and aesthetics/colour field (referred to by Denes as ‘amber field’). According to Rawes, relational architectural ecologies “are the diverse concrete and ephemeral spatiotemporal habits, patterns and rhythms of daily life which individuals, communities and societies develop within their cultural contexts and milieus. They are the critical, poetic, political and ethical strategies and imaginaries through which new spaces and places of occupation and inhabitation can be constructed. They are the economic, technological and material constructions of western culture, of digital and global organization, and in this respect they are not always necessarily positive relations.” In P. Rawes (edited by), *Relational Architectural Ecologies. Architecture, Nature and Subjectivity*. Routledge, London 2013, p. 11.

On the relevance of the *Silent Revolution*conceptual framework to understand the role played by grassroots movements and the civic society in shaping the urban environment, see also N. Bertolino, *Architects of the “Silent Revolution”: Empowering Local Communities through Commons-Based Resilience Strategies*, in "New Geographies: Commons", Vol. 12, Harvard University Press, 2022.

The pioneering project in this case is “*R-Urban*” by Atelier d’Architecture Autogerèe in Paris: a bottom-up strategy that aims to enhance the capacity of urban resilience by initiating a network of resident-run facilities. R-Urban sets up locally closed agricultural and, more broadly, ecological cycles that will support the emergence of alternative models of living, producing and consuming. See also: C. Petcou, D. Petrescu, *Co-produced Urban Resilience: A Framework for Bottom-Up Regeneration*, in “Architectural Design”, 88, 5, 2018, pp. 58-65.

AN ASPHALT TERRARIUM. THE HIPPODROME OF TOR DI VALLE

FEDERICO BROGGINI

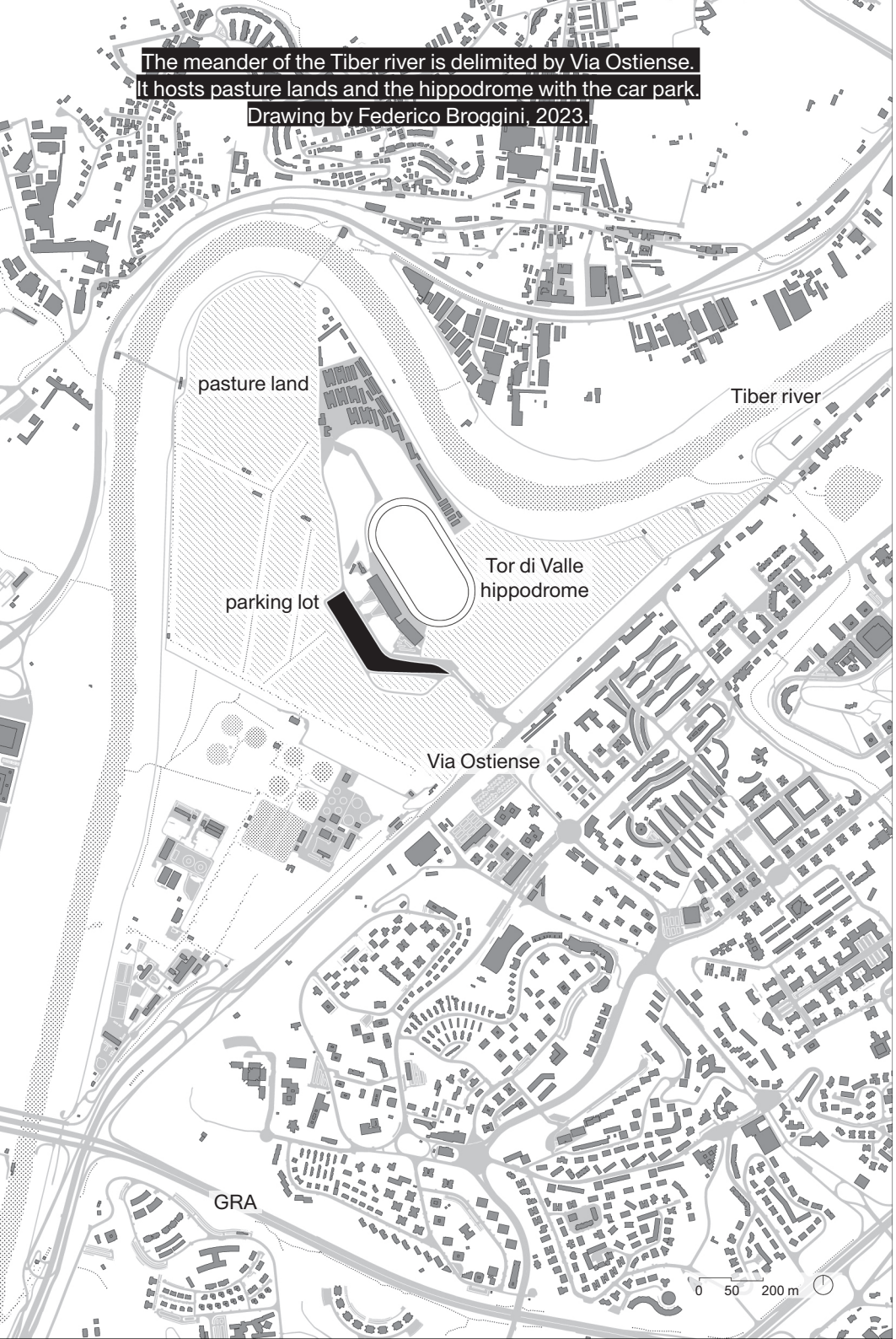
On a meander of the Tiber River in the south of Rome lies a vacant land, once the hippodrome of Tor di Valle. The horses and the humans who respectively used to race and work there ceased their activities in 2013, fifty-four years after the architect Julio Lafuente designed the entire complex. Once I entered the site from Via Ostiense, the feeling of suddenly being immersed in the Agro Romano was intense: the hippodrome lays on a vast sweep of pasture land that is still present in the meander and extends around and inside the complex. The alternation of different soils conditions characterises the site. There, pasture lands, tree plantations, stabilised soil for the racetrack and asphalt coexist side-by-side. Walking down the main street towards the grandstand, the first encounter is with the asphalt mantle of the parking lots that extends over 60.000 m^2. At first glance, it is difficult to recognize it. In ten years, the asphalt started to undergo through pedogenesis processes as a geological layer: weathering, accumulations, erosions, breaks, moss formations, growing of grasses, shrubs, and trees. Nowadays a lush garden is growing from the asphalt.

Tor di Valle racecourse manifests itself as a *terrarium*, an environment isolated and separated from human interferences. But, as a *terrarium*, it is also a hybrid and ambiguous entity that, through separation, makes human entanglement in the world explicit: its capacity to transform and interact with other organic and inorganic matter and, vice versa the way it is influenced by them.

In July 2023, three people entered the racecourse by making their way through the wilderness. They removed one square metre of asphalt from the car park and ploughed the ground underneath. Under 5 centimetres of asphalt and 8 centimetres of substratum a red soil emanated immense heat accumulated throughout the day, one of the hottest of that scorching summer. The soil and stones were hard to hold so much was the heat. The roots of pioneer plants such as *Daucus carota* and *Inula viscosa* sank their roots into the cracks in the asphalt until they reached the ground. A second, very dense system of tiny roots separated the upper asphalt layer from the substratum, making it easier to break up the surface. Asphalt is also a living soil.

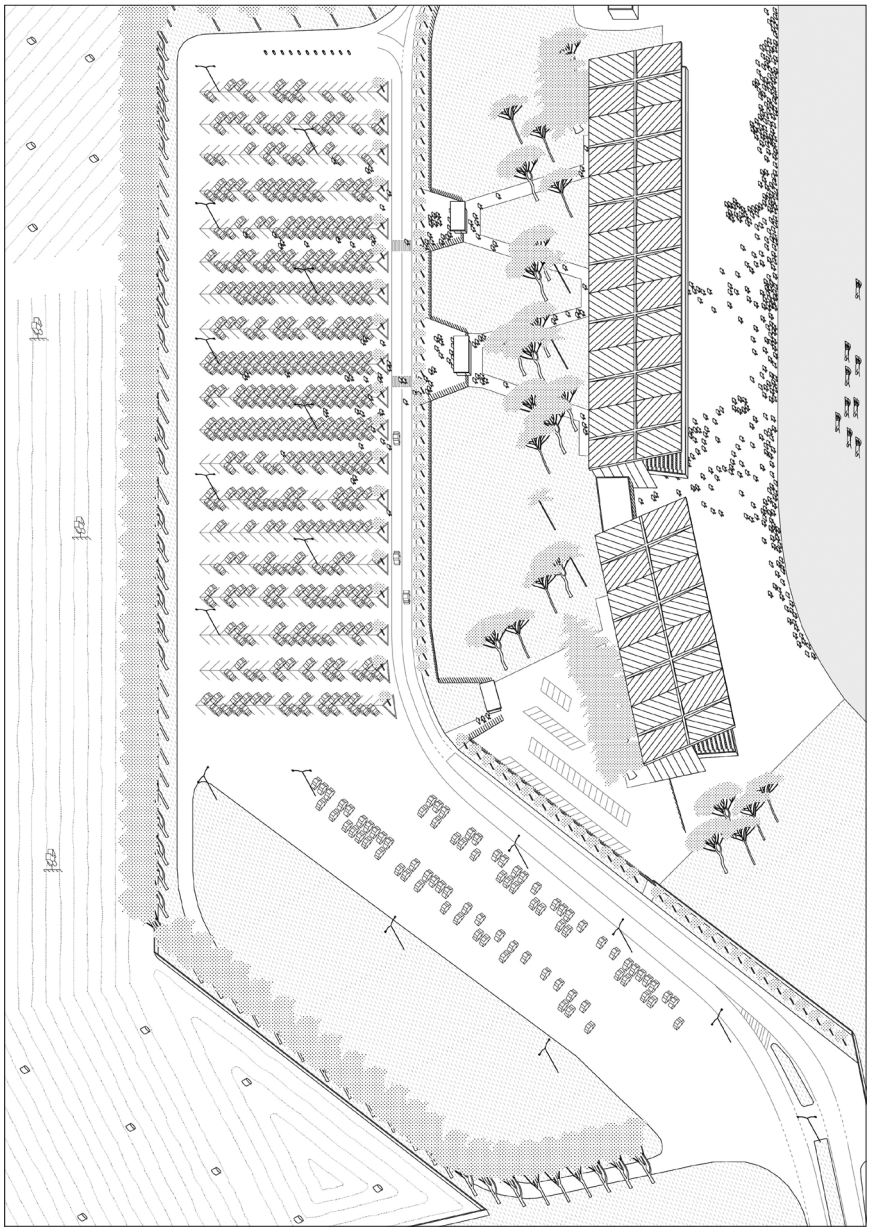
The removal of bituminous rock and soil tillage accelerates the processes of pedogenesis. Like the racecourse car park, the square metre of reddish soil is another terrarium ready to display the entanglement of lives and matter.

The meander of the Tiber river is delimited by Via Ostiense.
It hosts pasture lands and the hippodrome with the car park.
Drawing by Federico Broggini, 2023.

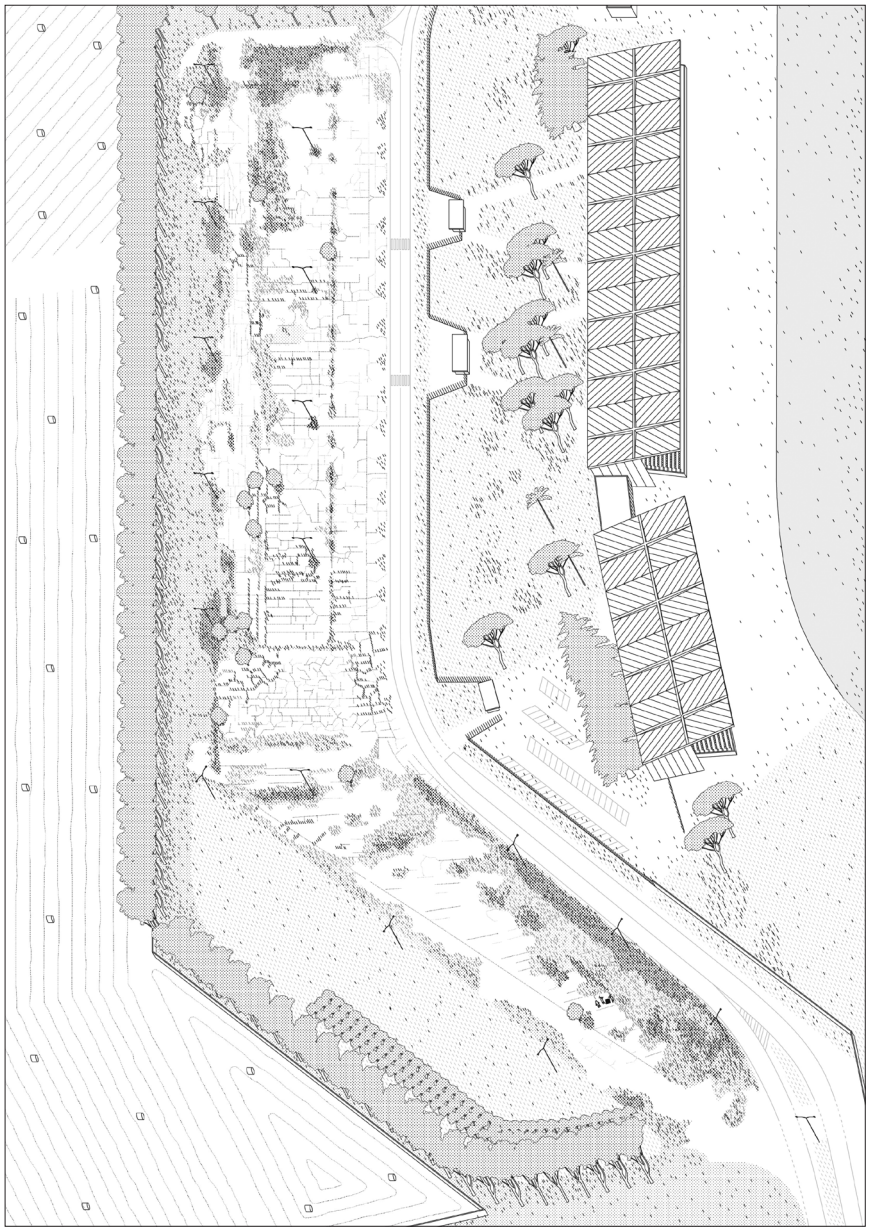


View of the stratigraphy of the asphalt mantle and
the vegetation growing through it.
Photo by Federico Broggini, 2023.

The hippodrome ceased operation in 2013.
The drawing depicts the functioning of the car park during horse racing activities.Drawing by Federico Broggini, 2023.



After abandonment, the asphalt surface began a new process of pedogenesis. The drawing shows where the breakage, erosion, accumulation and growth of vegetation began. At the bottom right, three people remove 1 sqm of asphalt from the car park.
Drawing by Federico Broggini, 2023.



One square metre of asphalt before being removed.
Photo by Federico Broggini, 2023.

One square metre of asphalt is removed.
The bituminous rock and part of the soil underneath are accumulated aside. Photo by Federico Broggini, 2023.

INFRASTRUCTURE AS A TERRARIUM. BETWEEN DISCOVERY AND RE-DISCOVERY OF THE INVOLUNTARY

ANDREA OLDANI

ANTEFACT

The object - the terrarium - was the product of curiosity. In fact, the original device, known as the 'Wardian case', named after its inventor, Nathaniel Bagshaw Ward (1791-1868), was born almost accidentally from the desire to follow the process of transformation of a chrysalis into a butterfly inside a glass container. This led to the discovery of an efficient device capable of replicating the mechanisms that govern the water cycle and the process of evapotranspiration in a closed atmosphere capable of sustaining itself with an initial input and external solar energy. This property ensured the success of the 'Wardian boxes', as they made it possible to transport living plant species without the need for freshwater, especially during long ocean crossings[1].

The terrarium thus became a medium capable of increasing the world's plant collections to an extraordinary degree. It also encouraged the contamination and proliferation of species, including invasive ones, with little regard for their fate.

FROM THE WARDIAN CASE TO THE INFRASTRUCTURE

A few years later, the same curiosity led Ernesto Schick (1925-1991) to discover another type of terrarium. He was a Swiss forwarding agent with a passion for botany. In 1969, while working at the Chiasso railway station, which had just been fully opened after a long period of expansion (1957-1967), he began to question the nature of this space. Schick recognised the uniqueness of a situation in which a dense infrastructure network extended over more than sixty hectares of an ancient, poorly cultivated and partly marshy agricultural palimpsest. He was also truly overwhelmed by the power of nature to allow certain plants to reproduce and survive in this vast expanse of inert material, constantly traversed by trains and challenged by the intensive use of herbicides. Thus began a careful and long period of observation that lasted from 1969 to 1978, during which he drew a series of botanical illustrations of the flora identified in the railway area. He became aware of its succession, its ability to persist, its dominance mechanisms and the presence of pioneer species (which he innocently called pilot plants). The results show the resilience of the plant species associated with the old agricultural palimpsest, the wetland habitats of the area and the colonisation capacity of the flora, including invasive species. The study focused mainly on herbaceous species, because the control carried out by the railways, with herbicides and even manual weeding, prevented the emergence of arboreal species, of which he mentioned only a few plants.

Schick's studies, collected in *Flora Ferroviaria,*♾ mark a fundamental point both in interpreting the anthropogeographical landscape and in identifying a new interest in the spontaneous, the accidental, and the unexpected. This will be decisive in orienting a then undeveloped approach and sensitivity to the landscape. In the same way, they break with tradition and show that it is no longer necessary to represent the world in a small terrarium or even in a large botanical garden, because modernity and progress have unconsciously made the world smaller, introducing a new form of heterogeneity that can be discovered in the most ordinary and unusual landscape.

INFRASTRUCTURE AS TERRARIUM

The research described in *Flora Ferroviaria* thus becomes a pioneer in considering infrastructural space as a site of diversity, highlighting its richness at the expense of technicality, function, and management. We can thus advance the hypothesis of infrastructure as a terrarium, recognising in the contradictory characters and dynamics that govern it a spectrum of the forms that diversity takes in the Anthropocene. In fact, infrastructures offer characteristics that influence both the spread of species and the formation of peculiar habitats capable of overturning the nature of places. It is helpful to describe some examples to clarify and show the different possibilities that characterise infrastructure. The first characteristic of roads, railways and other means of transport is related to speed and the movement of goods. The dynamism of the industrial age accelerates the spread of things traditionally entrusted to wind, water, animals, and people. Each vehicle and what it carries can catch seeds, release them in unpredictable ways and consign them to an unexpected fate⇓. However, the future of these seeds is significantly influenced by the character of the technical space.

> Infrastructure lines, corridors and bundles are rich in embankments, cuttings and small areas of ground cut off from other uses at junctions and sidings create untamed spaces with sometimes distinctive and localised geological and environmental conditions in which plants and wildlife may thrive. (Revill 2012, pp. 223-224)

Such environments are also influenced by the nature of the infrastructure's construction technology, its use, atmospheric events, and environmental phenomena. In railways, for example, interactions may depend on the dry and stony environment created by the ballast. However, it is not uncommon for run-off from rain and storms to create wet environments downstream of embankments.

The intermediate space of the infrastructure: site of species proliferation in the margins of Milan. Re-elaboration by Andrea Oldani, 2023.

The result is a particular and unusual environment, sometimes enriched with nitrogen compounds due to the direct discharge of wastewater from trains. In this way, species alien to the context in which they migrate can find excellent hospitality.

This is the case of *Senecio squalidus*, originally from Sicily, which has spread throughout the United Kingdom, from Oxford to Scotland, adapting to the local climate by hybridisation with similar native species. This has happened in parallel with the construction of the railways, to which the plant has entrusted its seeds and ballast, which, together with the cinders and clinkers of steam locomotives, have been able to recall the characteristics of the volcanic environments of its native lands⩚.
In a slightly different way, it is recognised how the tree of heaven (*Ailanthus altissima*), after giving its samaras

> to the wind, to the gutters, to the small gaps between the windscreen and the bonnet of cars, to the radiator grills and the folds of lorry curtains, to the railway tracks ⅂

can establish itself and multiply in the most hostile environments, becoming dominant by numerous biological means, from its root system to its leaves. Paradoxically, this ability has made it the symbol of the railway that accompanies travellers halfway around the world. Similarly, this type of process has led to the colonisation of other non-native invasive species, particularly along railway lines, such as *Robinia pseudoacacia*, *Paulownia tomentosa*, *Ulmus pumila* and *Acer platanoides*, as well as shrubs such as *Reynoutria japonica*, *Buddleja davidii*, *Impatiens glandulifera* and others.⊦ In addition, other studies show differences between the types of species found along roads or railway lines in terms of the vectors and dynamics of the actual wind action and the nature of the substrates, edge conditions, nutrient regimes and water distribution (Szilassi et al. 2021).

Infrastructure thus becomes the subject of a specific ecology,⋇ which is not exclusively based on natural factors but receives its initial input from purely human events. This applies to the constructed support (road, railway, airfield, waterway, etc.) and the activities there. Both factors influence the outcomes regarding species presence and proliferation in a highly dynamic whole. Fences also play a role in this process, providing artificial support for various climbing plants and as a barrier to clearing operations. They also serve as refuge lines for various woody species.

The infrastructure thus becomes a device comparable to the original Wardian box or terrarium but dominated by involuntary or unconscious processes that cannot be foreseen but only observed.

In this sense, the vegetal universe that gathers around infrastructures better than others manifests the essence of the Anthropocene and explains the manifestation of unprecedented patterns in the human-nature relationship.

This is a central theme in the reflection on infrastructure as a terrarium. The appearance of flora and the dynamics of development and succession that characterise infrastructural contexts demonstrate the illusiveness of the most diffuse ecological policies based on a perspective of ecological balance. In fact, it is well known that the more adaptable an organism is, the better it is prepared to face the unpredictability of the future. ⫴ As a consequence, observing the evolutionary processes of nature in contexts subject to disturbance-intensive practices, which present themselves as prototypes of new emerging ecosystems, becomes extraordinarily stimulating at a cultural and design level.

CULTURE OF THE ACCIDENTAL

However, some aspects of these phenomena are already part of a new tradition in an interdisciplinary culture related to landscape architecture. It is, therefore, useful to trace some significant stages that allow us to identify the attention paid to the theme of the spontaneous, which today can find new development paths. The experiments of Louis Guillaume Le Roy (1924-2012), particularly the creation of the *Ecocathedral* (ca. 1970-3000), are significant if we go back to the late 1960s and 1970s. This experience, in which humans, plants and animals co-exist without any one of them dominating, created a linear park approximately one kilometre long and twenty metres wide. The idea, which Le Roy also wanted to export as a universal model for the urban landscape, was revolutionary and completely unprecedented. In addition to the reliance on the processes of nature, the hypothesis changed the interpretation of the time factor in design and placed the need to deal with complex and dynamic systems at the centre of attention. The result was sensational, offering the visitor more "a neglected piece of woodland plus a dump for the rubble from excavated streets and pavements" than the conventional idea of a park. Furthermore, the *Ecocathedral* was based on "permanent change; it is never 'completed'; indeed, it is never designed to be completed. It is a process in time and space" (Vollaard 2001, p. 77). More recently, Le Roy's work inspired Gilles Clément (b. 1943) to develop a more articulate and less artistic theory of the unintentional and the accidental (Brunon, Mosser 2011).This led to the definition of the *Jardin en movement* (Clément 1991) as an approach that aims to allow ecological processes to define the garden's architecture while being surprised

Terrarium and palimpsest.
Vegetation colonises and proliferates on the pentagram offered by disused railway tracks. Re-elaboration by Andrea Oldani, 2023.

by the power of the unexpected. Later, he arrived at the concept of the 'third landscape' (Clément 2004) as a fragment of diversity to be formalised through a manifesto in which the hypothesis of finding nature reserves in the margins forgotten by contemporaneity becomes extremely plausible and demonstrable.

Clément's theoretical reflections and realisations have had an extraordinary power in fostering the emergence of a new attention to the casual terrarium offered by the spatial wastes generated by modern forms of urbanisation and development models. Meanwhile, studies similar to Schick's work have proliferated, seeking to explore the diversity and nature of the flora of a given urban reality, with both affinities and evolutions. As a result, there has been a proliferation of publications on the subject, not always widely available. Thus, we come across extensive surveys of the flora of the urban fringe, offering a conceptual and practical framework that is useful for 'finding the wild in the city', offering a botanical initiation between the everyday folds (Muratet et al. 2017). Similarly, from a very local perspective, Mariasole and Mario Calbi walk the traditional streets of Genoa, known locally as crêuze, in search of 'street herbs' capable of resisting and telling sensational stories in a port city open to the world but artificial, compact and stratified, where they have heroically adapted to survive (Calbi, Calbi 2021). Complementing this, with a less scientific and more artistic approach, Anne Geene makes us aware of the astonishing wealth of flora and fauna that can be found in a single plot of land of less than three hundred square metres in Rotterdam, demonstrating how a limited space can enable an almost encyclopaedic form of knowledge (Greene 2015).

There is also plenty of evidence of how casualness can become the dominant motif of a landscape project. This is the case, for example, of Berlin's famous Natur-Park Südgelände, which, more than any other site, has an affinity with the subject of this essay because it is built on the remains of the Tempelhof railway yard. Here, the existence of the space-time relationship evoked by the Echocathedral is practically demonstrated, resulting in a total coincidence between design intentions and the unfolding of natural processes. There is also a form of interaction between the present nature and the infrastructural past that has favoured the emergence of a particular ecosystem, influenced by all the factors discussed in the opening, where the dynamism of the railway is the trigger for extraordinary diversity⅄.

Old gardens and paradoxes of the infrastructural terrarium.
Young specimens of *Ailanthus altissima* colonise the premises of the Magenta (Mi) railway station. Photo by Andrea Oldani, 2022.

Thus, all the elements discussed above illustrate how specific attention to spontaneous ecological processes gradually developed following Schick's pioneering studies, fostering the birth of innovative and interdisciplinary interpretations. In this respect, understanding the emergence and succession of spontaneity gave new meaning to what had previously been completely overlooked because it appeared to be merely unqualified, uncontrolled and wasteful.

However, the current situation and living in the full Anthropocene pose new challenges, for which infrastructural terrariums have the potential to offer a significant area of research and experimentation. Indeed, global warming suggests a very uncertain future for vegetation. In particular, the migration of species[11] and the new consequences of plant pests and diseases[12]. Therefore, an open field of possibilities could include a complete revolution in the plant world as we know it.

Consequently, by their boundary conditions, infrastructural terrariums become unique observation sites where the dynamics can be understood and translated into innovative projects.

This is a major challenge for landscape design: taking the most resistant and rejected plant material as the only possibility in inhospitable places with no alternative. In this way, the indispensability of conservation is abandoned and the unexpected is welcomed, giving some value to living organisms endowed with extraordinary capacities that are normally relegated to no one's space.

From the infrastructural terrarium, diversity proliferates between margins and spaces of abandonment. Re-elaboration by Andrea Oldani, 2023.

The infrastructural terrarium is a place of struggle and resistance. The species most able to adapt and survive will triumph. *Ailanthus altissima* colonises the premises of the Magenta (Mi) railway station. Photo by Andrea Oldani, 2022.

For a detailed examination of the history and impact of the device, see: L. Keogh, *The Wardian Case: How a Simple Box Moved Plants and Changed the World*, University of Chicago Press, Chicago 2023.

The volume was first published in 1980 under the title: *Flora ferroviaria: ovvero la rivincita della natura sull'uomo. Osservazioni botaniche sull'area della stazione internazionale di Chiasso, 1969-1978*, for the editions of the Credito Svizzero in Chiasso. This was followed in May 2010 by a revised and expanded edition edited by Simonetta Candolfo and Nicoletta De Carli and published by Edizioni Florette in Chiasso. This edition, in addition to including some critical and framing contributions to Schick's work, contains a scholarly revision by Nicola Schoenenberger, who updated and clarified some inaccuracies in the original version. An English translation of this second edition was published in 2015 by Florette in collaboration with Humboldt Books.

The variety of effects resulting from this possibility is described among many others by S. Mancuso, *L'incredibile viaggio delle piante*, Laterza, Roma-Bari, 2018. See in detail pages 44, 47-50.

See: Mancuso, cit. and Revill, cit. for an extended examination of the subject, cf: R.J., Abbott et al., *Recent hybrid origin and invasion of the British Isles by a self-incompatible species, Oxford ragwort (Senecio squalidus L., Asteraceae*), in "Biological Invasions", 11, 2009, pp. 1145-1158.

An exceptional study of *Ailanthus altissima* in relation to the urban environment can be found in: S. Boudvin, *Ailanthus altissima - Une monographie située de l'ailante*, Éditions B42, Paris, 2021. Quote translated from the original French on p. 11.

There is a large body of literature worldwide linking the presence of infestation to the railway network. The following study is fascinating because it combines the numerical distribution with a series of maps able to show the spatial dimension of the phenomenon under study: M. Pfeiffenschneider, P. Gräser, C. Ries, *Distribution of selected neophytes along the main rivers of Luxembourg*, in "Bulletin de la Société des naturalistes luxembourgeois", 115, 2014, pp. 95-100.

The existence of these specific ecologies is demonstrated by extensive studies focusing on a particular type of infrastructure. The book provides an example: L. Borda-de-Água, R. Barrientos, P. Beja, H.M. Pereira, (edited by), *Railway Ecology*. Springer, Cham, 2017. The rich content offers an understanding of the environmental dynamics affecting a specific type of infrastructure, with multiple impacts on the landscape.
The same issues, seen from a different vantage point, more inherent to the space disciplines, have led to the spread of interest in urban ecology, which partially overlaps with the issues addressed in this paper. Two books have been a relevant reference for the development of this paper and deserve to be mentioned: M. Gandy, *Natura Urbana: Ecological Constellations in Urban Space*, The MIT Press, Cambridge Mass. 2022; M. Gandy, S. Jasper, (edited by), *The Botanical City*, Jovis, Berlin 2020.

This topic is well covered by: P. Del Tredici, *The Flora of the Future*, in C. Reed, N.M. Lister, (edited by), *Projective Ecologies: Ecology, Research, and Design in the Climate Age*, Actar, New York 2020, pp. 242-261. The concept of inclusivity versus the stereotypical way of understanding the native/non-native question is also addressed, beyond traditional notions of accessibility, by: D. Gissen, *The Architecture of Disability. Buildings, Cities, and Landscapes beyond Access,* University of Minnesota Press, Minneapolis, 2023. See in particular the second chapter entitled: "Of a Weaker Nature: Wilderness, Urban Landscapes, and Biocapacity".

P. Boschiero, T. Folkerts, L. Latini, (edited by), *Natur Park Schöneberg Südgelände e la natura urbana berlinese*. Premio internazionale Carlo Scarpa per il Giardino 2022, Fondazione Benetton Studi Ricerche, Treviso, 2022; A. Burg, *Natur-Park Südgelände, Berlin-Schöneberg: una imprevista vittoria della natura*, in "Lotus", 144, 2010.

View among many others: M. Lurgi, B.C. López, J.M. Montoya, *Novel communities from climate change*, in "Philosophical Transaction of the Royal Society B", 367, 1605, 2012.

View among many others: M.M. Raza, D.P. Bebber, *Climate change and plant pathogens*, in "Current Opinion in Microbiology", 70, 2022.

INFRASTRUCTURE OF THE UNEXPECTED. CORVETTO FLYOVER AS A TRANSGRESSIVE TERRARIUM

ANDREA FOPPIANI,
DAVIDE MONTANARI

> The encounter with a habitat different from the one of origin produces inventive adaptations that trigger new cultural and biological forms, prompts the production of hybrids, and generates innovation […]. (Metta 2022, p. 34).

Terrariums have the power to embody the human fascination for unknown ecologies, encasing a desire to recall different geographies within ordinary conditions. The result is a miniature of an ideal ecosystem able to perpetuate the life it contains: a diorama that displays an invisible set of biological processes involving air, soil, and other living organisms. The terrarium is, therefore, a medium that unveils primary relations between ecology, architecture, and landscape by looking at a fundamental material: soil. By shifting the perception of soil as a static object to an active subject with power, we move from an "ego-centric" to an "eco-centric" perspective where the possibility of a collective inhabitation with living beings – where humans are only one kind of participant – opens.

"Acting with the soil" (Besse 2020, p. 43) produces a paradigm shift where this agent is no longer conceived as a mere surface but as a living body: a volume, understood in its thickness, capable of supporting and regulating relations within a fertile environment where both "life and decay are possible" (Galí-Izard et al. 2022, p. 71).

Interpreting soil as a vital matter open to change offers the tools to overcome the dualism that, in Western culture, "structures by negation the very idea of urban" (Protasoni 2022, p. 33). To see the city from the perspective of soil requires a radical change: an approach towards design capable of working with the unexpected – into a dimension of acceptance of what is uncertain or unknown – traceable to the *anti-fragile* concept introduced by Nassim Nicholas Taleb. This pushes us to widen the boundaries of what we consider soil to be, including a mixture of hard materials and artificial topographies that – in the common understanding – would belong to the sterile dimension of the infrastructural landscape.

In a time where the state of crisis related to climate change is imposing a new normal, the way we look at the urban palimpsest recalls that "the real place of the improbable is the city" (Tafuri 1979, p. 96), considering unforeseen urban scenarios and recognizing a spatial value to seemingly meaningless fragments. If adopting this vision, the figurative meaning of the terrarium can be expanded to include physical objects able to relate to phenomena crossing different scales and involving diverse agents within the urban environment, from living particles to large-scale artifacts.

The perimeter of this representation may coincide with an object bearing the character of an unexpected terrarium, a space to be considered in its three dimensions, exposed to sunlight, crossed by breaths of wind, collecting rainfall: the architectural-infrastructural typology of the flyover.

THE ARCHITECTURE OF THE FLYOVER AS AN INFRASTRUCTURAL ISLAND

> The dialogue between wilderness and infrastructure is drawn between contrast, which separates antagonistic environments, and correspondence, which occurs between places that are complex, layered, and equally foreign to the scale of human habitation. (Pradel 2021, p. 187).

Following this correspondence, the flyover – isolated recipient for unforeseen natural expressions – gains a generative power, leaving room for unpredictable urban ecologies in the form of self-sufficient miniatures. In this dynamic, the artifact's function from a utilitarian perspective does not entirely determine its character. To understand it as a terrarium, this *infrastructural monument* has to be studied "not as a system but as an object; not as a logic but as an artifact; not as a tube but as a space" (D'Hooghe 2010, p. 78). Beyond the scale of the transportation network, referring to the city as "an idea and structure of coexistence" (Lee 2016, p. 27), the flyover can therefore be read as something other than its asphalt-covered surface.

Like an emerged land, in its separation from the surrounding environment, the flyover is an atypical space: an elevated artificial ground. Outside the functionalist logic underlying its existence, such space might resemble a *deserted island*, "remote, separated, intimately *alternative*." (Ghidoni 2011, p. 3).

This capability of the architecture of the flyover to generate alternatives eluding the control of design emerges through close observation. Across its cracks, fractures, and discontinuities, in a minimal thickness and along a Deleuzian *fold*, space remains for pioneer forms of vegetation to emerge: an opening to possibility, an opportunity for biological processes to be triggered. Under these conditions, such an architectural object proves a strong captive potential. It can intercept vagabond species and – incorporating them into its structure – leave room for transgressive "spaces of unprecedented natures, whose forms and functions are reconceptualized." (Metta 2022, p. 148).

DETACHED URBAN GROUNDS BEYOND THIRD LANDSCAPE

> As soon as there is 'room' available, life is ready to take over and activate – with its own resources – an autonomous series of regeneration processes. (Bee, Clément 2022, p. 145).

Moving from the line of research initiated by Gilles Clément and established through crucial concepts such as the *third landscape* and *planetary garden*, this reflection recognizes the value of residual urban fragments as repositories for unexpected and unplanned ecologies. Facing this topic, an object such as the flyover embodies a dichotomy: on the one hand, the artifact, in its detachment from the main ground, belongs to a set of quiet "backyard" spaces characterized by the absence of interaction with the human body. The lack of this direct perception interposes a filter between the control practices usually adopted to maintain the structural integrity of urban artifacts and the infra-natural dynamics taking place in its discontinuities. As a parallel to the inaccessible Île Derborence located at the center of the Parc Matisse in Lille, the flyover retains a degree of autonomy from the rest of the urbanized soil.

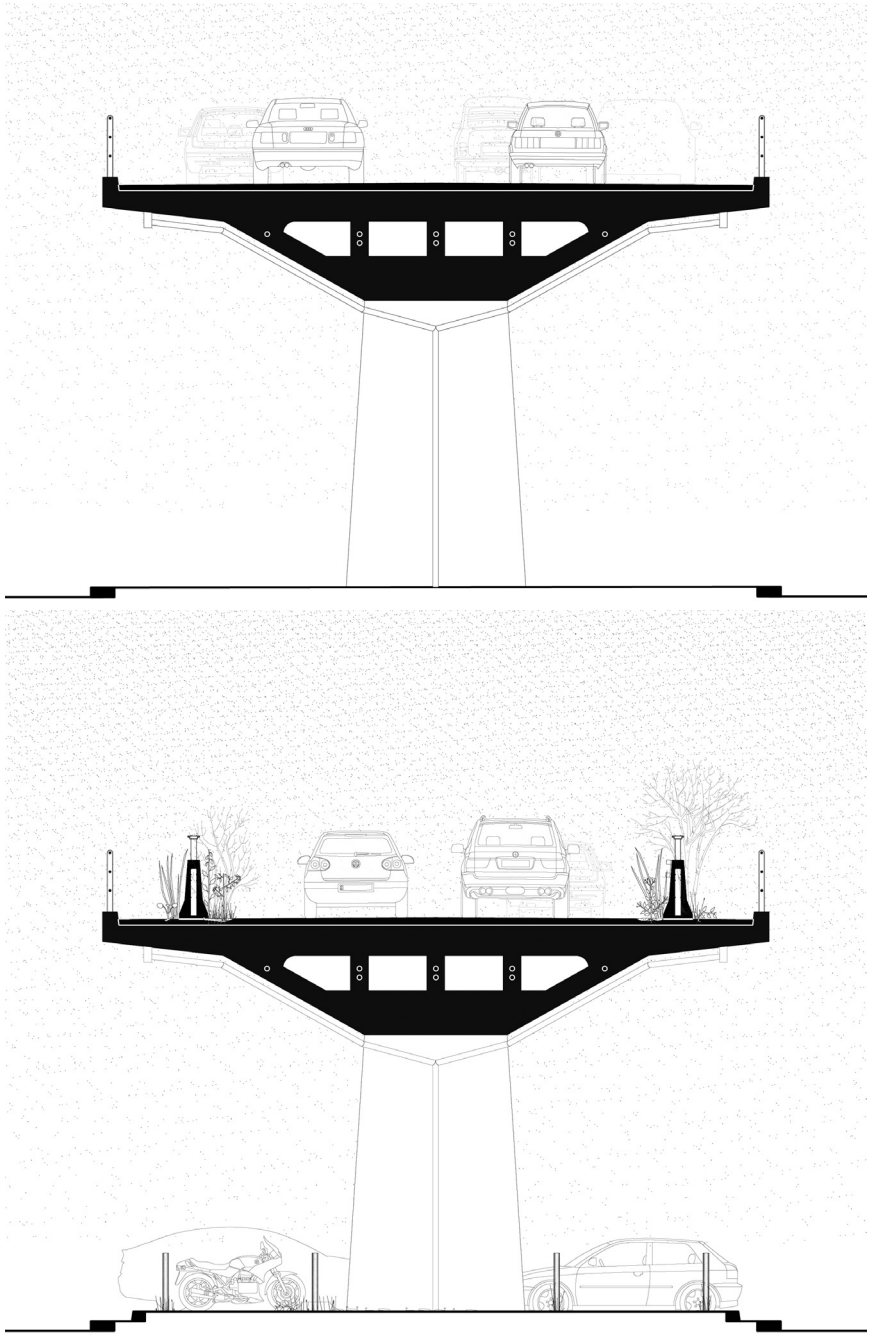
On the other hand, such a space – far from being abandoned or forgotten – is continuously crossed and stressed by mechanical agents simultaneously responsible for its inhabitable character – pedestrians are forbidden – and contributing to the development of an unplanned ecosystem. Along the elevated roadside, motor vehicles act as carriers and triggers in the dissemination process.

Like animals and atmospheric or artificial agents, humans can act as "fundamental vectors" (Clément 1999, p. 45) of biological encounters across different ecosystems; accordingly, we recognize the role of cars in propagating wild nature in the city. A principle of transgressive coexistence is already taking place – and gaining space – against functional rules and in the absence of any project or remediation plan.

DRAWING FUTURE SCENARIOS FOR THE CORVETTO FLYOVER

The Corvetto Flyover lies at the core of an ongoing public debate around the future of such spaces included by the PGT "Milano 2030" in a broader network of regeneration areas. As the flyover's destiny stands between its reuse or demolition, several proposals foresee a transformation traceable to the New York High Line offspring. Facing such a genealogy, this contribution takes a step back. The aim is to bring light to the ecological potential of the flyover concerning its use before contemplating its abandonment and any consequent design operation.

Corvetto Flyover, cross sections. From top to bottom, left to right:
The original structure: form follows function.
State of affairs: the unexpected sets its roots.
Short-term scenario: the roots grow
Mid-term scenario: transgression as a new ecology
Drawings by Andrea Foppiani and Davide Montanari, 2023.



From a critical re-examination of the artifact – started from a redrawing process and a study of the typical flyover section – the imaginative potential related to future scenarios of further convergence between machinic landscapes and urban nature emerged. Representing the Corvetto Flyover through its transverse section unveils – in the relationship between its structural solids and voids – a hidden stratigraphy: asphalt, reinforced concrete, roots, ground, and water infiltrations, altogether contributing to "initiate the biological processes that transform a mineral substrate into a living soil." (Galí-Izard et al. 2022, p. 67)

Studying unforeseen flyover ecologies within the Milanese context allows for a more systematic reflection. As a recurring typology in the radial set of high-speed infrastructures grafted directly into the urban fabric, flyovers like Ghisallo, Monte Ceneri, and others share the same hidden potential of Corvetto.

The spontaneous dynamics acting over time on the flyover microcosm expand its role beyond the technical-infrastructural perspective, making it a terrarium. A future where these artifacts, triggered by urban ecological processes, gain a condition of autonomy from their original meaning represents a relevant act of transgression. Such behavior grants transgressive terrariums a degree of biodiversity and antifragility that can challenge the urgency and the field of action of any planned design action.

Corvetto Flyover, *unexpected infrastructural ecologies outside the car window.* Photo by Andrea Foppiani, 2023.

POST-INDUSTRIAL SYNANTHROPIA. SPONTANEOUS VEGETATION AND ARCHITECTURAL DECAY

THOMAS CABAI, MICHELE PORCELLUZZI

Shihlin Paper Co. is one of the first companies that were founded in the industrialization phase of Taiwan at the beginning of the XX century. Established in 1918 in downtown Taipei City, its main factory became a symbol of progress and economic development. However, as the industrial landscape evolved, the need for modernization and expanded production processes prompted a transformative move in 1990.

The original factory was dismissed, giving way to a new facility in another part of the city. The historic building was left abandoned, a silent witness to the passage of time, inaccessible and untouched for years.

In 2010, the dismissed structure underwent a phase of renovation. Its doors were opened again, and it was turned into a cultural venue. A section of the building became an exhibition space, while another part – featuring an open-air area – was transformed into a café. A third area of the ensemble was involved in a renovation process led by Interbreeding Field, a research and design collective founded by Li Huang Lu. Originally conceived as an educational program at Tainan National University of Arts in Taiwan, where Lu served as an associate professor, Interbreeding Fields was active from 2004 to 2021. The collective's focus on projects and installations aimed to invigorate collective life in urban public spaces within Taipei City (Vercelloni 2005).

The project that they developed for the former Shihlin Paper Factory constitutes a reflection on the building as an aging organism, an environment capable of hosting a multitude of life forms once intensive human presence and functions retreat.

The concrete and brick walls were damaged by the exposure to atmospheric agents, while sections of the roof's metal plates had collapsed, forming openings that allowed natural light to stream into the space. Unavoidably, these apertures, along with the high levels of humidity that characterize Taipei city, created a favourable environment for the flourishing of a diverse array of plants within the factory's previously desolate confines.

Reflecting on the spontaneous nature flourishing on the walls of the abandoned factory brings to mind Chinese art criticism's emphasis on spontaneity (tzu-jan) as a key element of valuable art. Dušan Pajin's insights into landscape design, particularly the use of rocks eroded by water, echo the notion of natural spontaneity embodied in the very fabric of the building (Pajin 1997).

Approaching the space with the idea of establishing a dialogue with the emergent vegetation, Interbreeding Field made a conscious decision not to erase or disrupt the natural spread of greenery.

Wooden pathway and platforms enveloping spontaneous vegetation
In the intervention by Interbeeding Field, the value of spontaneous vegetation within architectural decay is acknowledged and exposed, barycentric to the project. Photo courtesy of Li H. Lu, 2010.

The design, meticulously executed in wood, manifested as a raised pathway from the floor level, accompanied by platforms that explicitly address the topic of birth and decay by being located and oriented towards the phenomenology of birth and decay in this place.

The essence of this project lies in assigning value to the narrative etched during the years of abandonment, breathing new meaning into the clandestine garden that had taken root within the former paper factory. While the exhibition space and bustling café attracted lively crowds, the segment touched by Interbreeding Field's intervention exuded a quiet and contemplative atmosphere. Visitors were immersed in the symbiosis between human design and nature's reclamation, weaving a narrative that transcended the physical reconstruction of a space into an exploration of coexistence.

Interbreeding Field's intervention in the former Shihlin Paper Factory was not merely an operation of redesign of the space; it was an effort to engage in a dialogue with the natural elements that had taken over the space in the absence of human intervention. The wooden structures integrated with the aged elements as a grafting: it became a story of interconnectedness.

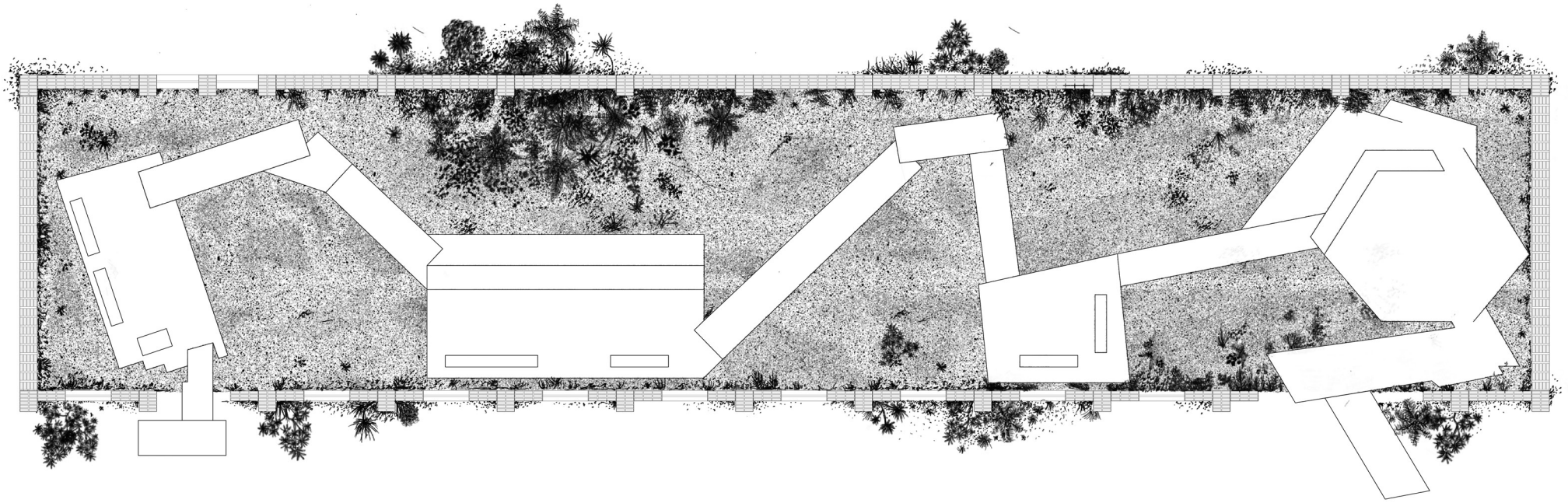
To conceptualize the transformative process from the building's dismission to its renovation, it is crucial to delve into two key concepts: the multiscalar nature of the phenomena shaping the building's condition, and the idea of the value embedded in its abandonment.

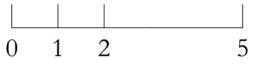
Investigating the multiscalar dimensions of this process involves both a macro and micro level.

From a macro perspective, the vacant, abandoned structure assumes the role of an urban ecosystem, a unique entity capable of encapsulating spontaneous nature within its confines. The apertures in the roof become conduits for life to flourish within the building, allowing processes such as photosynthesis and air circulation. Moreover, the building's perimeter acts as a frame, embedding the vegetal elements and giving rise to a spontaneous vegetal area in the heart of a Taipei City's densely populated neighbourhood.

On the micro scale, the specific stratigraphic layout of the walls, coupled with their construction characteristics, has facilitated the growth of natural elements within the space. The degradation of concrete allowed water to permeate the interstices, creating optimal conditions for plant growth. The chemical properties of bricks and mortar (whose limestone basic composition improves the pH of the soil) further contributed to nurturing vegetation.

Floorplan. *Spontaneous vegetation defining the interior space of the abandoned factory.* The project follows the hierarchy defined by the deterioration of the building and the consequent vegetation growth.
Drawing by Thomas Cabai and Michele Porcelluzzi, 2023.





Therefore, viewed both macroscopically and microscopically, the condition of abandoned building becomes a haven for optimal plant development. Interbreeding Field's project seeks to acknowledge the intrinsic value of this spontaneous growth and proposes the notion of an unconventional urban garden. As in a microcosm – which is a notion deeply rooted in artistic and garden design tradition – the vegetal elements inside the abandoned Shihlin factory reproduce the life cycle of natural elements: through the sunlight entering by the roof holes and the humidity of the walls, natural phenomena are replicated. Dušan Pajin discusses how the microcosm of a garden mirrors the macrocosm of nature itself, emphasizing the profound interconnectedness found within these crafted spaces (Pajin 1997).

Interbreeding Field's project, situated at the intersection of these macro and micro perspectives, transcends the conventional notions of urban revitalization. Instead of erasing the signs of degradation, it embraces the intrinsic character of the building's transformation in a spontaneous hybrid of organic and inorganic elements.

Considering the transformative process, it aligns with the tradition of Chinese gardens, where an idealized miniature landscape expresses the harmony that should exist between man and nature. As Michel Baridon notes, these carefully crafted landscapes encapsulate a vision of unity, resonating with Interbreeding Field's endeavor to harmonize urban decay and nature's resilience (Baridon 1998).

The second conceptual instance raised by the design process of the intervention by Interbreeding Field in the former Shihlin paper factory is related to the value of the abandonment. As highlighted in the previous paragraph, the specific combination of conditions that allowed nature to grow is related to the conditions of the materials and construction elements of the building, but another important factor is the fact that it was inaccessible to people for 20 years.

In contemporary Chinese urban 'beautification' processes, the predominant tendency is to remove spontaneous plants and replant all the vegetal elements from scratch (Hu & Lima 2019). Interbreeding Field's intentional preservation of spontaneous nature challenges prevailing notions of urban renewal, presenting a unique perspective that values the inherent richness found in the abandoned structure's overgrown embrace.

The intervention does not aim to deny the dismissal of the building, it rather aims to show that from this kind of process new life can develop: the project reframes the narrative of the urban space production as continuous renewal and redesign,

advocating for the recognition of the abandoned structure as a fertile ground for a new kind of public spaces. In doing so, the project challenges preconceived notions of decay and abandonment, proposing an alternative vision where neglect becomes the catalyst for vibrant, spontaneous growth. In essence, the project becomes a built manifestation of the symbiotic relationship between urban decay and nature's resilience, urging the visitors to reconsider the value embedded in abandonment. It beckons us to see the neglected building not as a mere relic of the past but as a layer open to reinterpretation – a canvas upon which vegetal elements play an active role.

SUPER TOXIC TERRARIUMS. SPERIMENTAL SCENARIOS FOR TOXIC LANDSCAPES

CHIARA PRADEL

Terrariums are typically designated to display a controlled and captivating micro-ecosystem within a small environment, which can include soil, plants, and even specimens of amphibians, insects, and reptiles.

Moving from the Victorian age, the era in which this instrument became known to transport and preserve botanical specimens, to more recent reinterpretations, the terrarium has not lost its evocative power and still represents a powerful gateway for imagination or, at least, a means of "collecting manias" of an entire era[1].

For example, a window-greenhouse reproducing a fragment of Tintern Abbey appeared as an illustration for the second edition of *On the Growth of Plants in Closely Glazed Cases* (Ward 1852, p. 15), effectively expressing Ward's romantic idea of nature and embodying the bourgeois gothic aesthetic of his time. More recently, the blown glass containers evolved into biomorphic objects hosting delicate tropical gardens, as the ones proposed by the New York artist and landscape designer Paula Hayes,[2] or into the immersive biospheres created by Vaughn Bell,[3] that allow for a close sensorial experience of soil, moss, ferns, small living creatures.

SUPER TOXIC TERRARIUMS

In contrast with the flourishing ecological focus of the above-mentioned terrariums, a sealed display-cabinet holding a strange interweave of polyurethane, acrylic, and nylon was spotted at the Görlitz station, in Germany, during the summer of 2016. In particular, the *Super Toxic Terrarium* (Nadine Baldow 2016) was part of a series of images and artifacts resembling corals and lichens growing on a conglomeration of plastic waste, that were spread throughout the city. According to the author, they prompted consideration of the need, for living beings, to adapt to the impact of plastic, microplastics and widespread polymer invasions, and highlighted the agencies of synthetic and chemical matters, as well as the inner strength and vitality of living beings that inhabit the Earth.

A radical change of perspective thus occurs. Ward's original experimental terrariums held imported botanical species that, thanks to proper care, survived and flourished in contrast with a heavily polluted environment (the nineteenth-century industrial city of London), seeking for a sort of recovery of an Edenic harmony and shaping an image of a pristine, "exotic" idea of nature.

Baldow's disquieting compositions, made of polyurethane,

acrylic and nylon, instead exalt the vibrant matter of inert materials and rather resemble a collection of Plastiglomerate living sculptures,[7] recalling the famous pieces of rocks and plastic found by geologist Patricia Corcoran and artist Kelly Jazvac on a Hawaiian beach in 2012[8].

The magma of harmful materials therefore moves away from the reassuring perfection of manicured lawns and tropical species, and alludes to the pervasive contamination of lands. It implicitly stresses the idea that toxicity is present in all human, animal, and plant porous bodies, as well as in the environment that surrounds them, suggesting the urgent need to rethink and study new possible "toxic ecosystems," as well as to reframe their aesthetic character.

MAKING THE INVISIBLE VISIBLE

On the one hand, Baldow's terrariums project us toward an idea of "toxic sublime"[9]. Bilious green pieces of plastic and deep black fragments of foam mixed with rocks earn our attention and transport us into vast geological temporalities, that are otherwise hard to grasp and comprehend. Indeed, as noted by Kirsty Robertson, the Plastiglomerate physicality can "makes the familiar unfamiliar" and can bring together "the human with the currents of water; with the breaking down, over millennia, of stone into sand and fossils into oil; with the quick substration of that oil into fuel; and with the refining of that fuel into polycarbons—into plastic, into garbage"[10].

From a socio-political perspective, toxic terrariums moreover help viewers to become conscious of what might otherwise be difficultly imaginable landscapes: visually enjoyable micro compositions no more refer to a peaceful nature of idyll, but rather are linked to ecologically devastating macro scenarios, and unfamiliar processes of alteration of soil, water, air and food.

From seemingly pristine island in Arctic Alaska, where local communities are exposed to high levels of persistent organic toxic chemicals that remain in the earth's crust for many years, giving shape to new, sculptural landforms, to the giant blob of oil that viscously soaked into the ground in Greenpoint, north of Brooklyn, a number of toxic landscapes and altered grounds indeed are scattered across the globe, giving rise to hotspot of pollution or to unnoticed "sacrifice zones."[11]

In this sense, the *Super Toxic Terrariums* become powerful tools of advocacy, raising awareness towards the otherwise hidden and geographically distant destructiveness of the global cycle of extraction, manufacture, disposal and of the related colonial histories.

Super Toxic Terrarium, terrarium in Görlitz Station.
Photo by Nadine Baldow, 2016.

On the other hand, looking at these contemporary terrariums one could observe how stunning and, in parts, fragile invasive species appear to have made room for themselves, testing their ability to survive perturbations and bringing forth the promise of possible new forms of relationality, interactions and life.

The emerging dystopic scenario, which could also be read as part of a narrative that does not include humans, indeed stages the potentiality of alien-communities to combine each other in new, composite versions, and to be able to survive on a damaged and wounded Earth.

In this regard, story of "ecological redemption," or of a cross-species medley of different embodiments and alien plant species that are able to survive, to adapt and to restore the "new wild" of forests and oceans, comes to mind[17]. But also, the emergent properties of microbial communities, as described in Haraway's vision on tentacular systems made by chthonic creatures, "that are monsters in the best sense of the word: they demonstrate and perform the material importance of earth processes and of all the creatures"[18].

> In times of climate crisis and ecological turbulence, many of us are indeed tempted to believe that the problem lies in constructing a safe, protected future, with the idea of avoiding any events that could threaten over tomorrow, and with the need to clear away both the past and the present in order to create new futures for generations to come [19].

Super Toxic Terrariums, on the contrary, bring us back to the present, redefine human's role toward responsive, cooperative, evolutionary change and are able to speak about mutations, contaminations, and about the synergy between organism and environment, between living and inert matters.

[1] M. Flanders Darby, *Unnatural History: Ward's Glass Cases,* in "Victorian Literature and Culture", 35, 2007, p. 647.

[2] N.B. Ward, *On the Growth of Plants in Closely Glazed Cases,* John Van Voorst, London 1852, p. 15.

[3] See the exhibition *Nocturne of the Limax Maximus*, Moma Museum of Modern Art, New York 2010-2011.

[4] See the exhibition *The Village Green*, MassMOCA Massachusetts Museum of Contemporary Art, Northhampton 2008.

[5] The term "Plastiglomerate" precisely refers to a multi-composite material made hard by agglutination of rock outcrops and molten plastic or at the combinations of basalt, coral, shells, and woody debris with grains of sand in a plastic matrix. See K. Robertson, *Plastiglomerate*, in "CSPA Quarterly. Queer Ecologies", 19, 2017/18, pp. 38-44.

[6] Describing the work of Edward Burtynsky, Jennifer Peepls uses the definition "toxic sublime" to evidence how the captivating aesthetic of his photographs could help in facing difficult landscapes and in counteracting the feeling of alarm and unease. See J. Peeples, *Toxic sublime: Imaging contaminated landscapes*, in "Environmental Communication", 5, 2011, pp. 373-392.

[7] K. Robertson, *Plastiglomerate*, in "CSPA Quarterly. Queer Ecologies", 19, 2017/18, p. 41.

[8] The definition quotes the research by Steve Lerner: "the label sacrifice zones comes from 'National Sacrifice Zones,' an Orwellian term coined by government officials to designate areas dangerously contaminated as a result of the mining and processing of uranium into nuclear weapons.... I have chosen to highlight 'sacrifice zones,' in the title of this book because it dramatizes the fact that low-income and minority populations, living adjacent to heavy industry and military bases, are required to make disproportionate health and economic sacrifices that more affluent people can avoid." S. Lerner, *Sacrifice Zones. The Front Lines of Toxic Chemical Exposure in the United States*, The MIT Press, Cambridge Mass, 2010, pp. 15-16.

[9] See F. Pearce, *New Wild. Why Invasive Species will be Nature's Salvation,* Icon, London 2010.

[10] D. J. Haraway, *Chthulucene. Sopravvivere su un Pianeta Infetto.* Nero, Roma 2019, p. 32. Translation by the author.

[11] *Ivi,* p. 85.

METAMORPHOSES

LAGUNARIUM. AMONG THE RUINS OF VALLI DA PESCA

AMINA CHOUAIRI, PIETRO CONSOLANDI

Lagunarium approaches the theme of the terrarium through a wet, more-than-human visual tale. The narrator is a juvenile fish who dwells in the ruins of Valle Olivara, a valle da pesca in Lio Piccolo in the northern Venice Lagoon following the wonders and curiosities of those left to inhabit this abandoned landscape. Valli da pesca compose the millenary productive landscape of fish breeding along the margins of the Venice Lagoon, at the interface between land and water. The authors argue that the shape, function and operational patterns of the valli da pesca frame them as humid, turbid, terrariums: controlled enclosures in which specific life conditions are replicated and maintained through technical human interactions with the environment. If in other cases terrariums are crafted for scientific, aesthetic or recreational uses, the valli da pesca answer tight productive needs: breeding fish extensively to earn profit. This renders Valle Olivara not only as a miniature, controllable, replica of the larger Venice Lagoon but also as an early productive landscape, engineered to answer to economic demands.

Valle Olivara is essentially a large-scale terrarium. Venturing into this area, a feeling that the authors tried to capture through the visual element and the human-like stream of consciousness of the scaly protagonist, is a hauntological experience. Here, the spectre of an early capitalist geoengineering model lingers—as new life and unexpected interactions settle and transform this now uncovered, mutant lagunarium.

The tale tells the story of a more-than-human narrator inhabiting a former valle da pesca, an early fish farm, in Lio Piccolo. Valle Olivara, built as a smaller-scale controllable lagoon, is now abandoned and reappropriated by the larger ecosystem.

IN THE FISH TANK

Once upon a time, the boundaries of this water world seemed somewhat enclosed. (Fig 1A; Fig 1B)
Sometimes I have *déjà vu* of places I have passed by already, but it is nice here. It resembles the big world out there, but predators, waves or the pale visitors seen through the turbid waters cannot get in. I had a great juvenile time here, with thousands of siblings. Besides having to escape hungry fowl, we did not have many thoughts. We were promised that one day we could have left to explore the greater blue, a limitless body of water beyond the gate. I never saw it myself, we all just knew it—our world was made in the image of a larger one, which may be called "lagoon".

A WET AND MUDDY TERRARIUM

One day, the water stopped flowing in the way it used to. (Fig 2A; Fig 2B)
We did not know what to think. All of a sudden those daily fresh replenishments ceased, while the gate that kept us safe and captive remained open, giving us the choice to stay or leave. We did not know what to do. Free from the action of those who kept it stable, our little world changed, became irregular: some parts were influenced by the greater world outside, some others became completely secluded, almost alien, transforming metamorphically.

A HAUNTED VALLE

All of a sudden, our world lost its lid. (Fig 3A; Fig 3B)
The decision was made by creatures we never spoke to—although we did communicate with them for a long time. Soon, the effects invaded us. We feared we would have been the last ones to populate these wetlands. The humming and singing and voicing at the other side of the water ceased. Some areas dried up in mazes of clay, and the weeds expanded reclaiming their spaces.

FOAMY FUTURES

Time flows, the world as we knew it no longer exists. (Fig 4A; Fig 4B)
In some districts, the tamarisks grew, keeping the banks stable, and the samphire thrived. New populations came, and we lived with them. Leaving the *valle*, we understood the mechanism that enclosed us from the bigger world, treating us as products, and now uncovered. Today, the very structure we live in hosts multiple species. We re-used our home, a beautiful one that was given to us, to host others and contaminate our structure. We are productive, we are alive.

Fig 1A *Underworld, others' world.* The story begins here.
Photo by the authors, 2023.

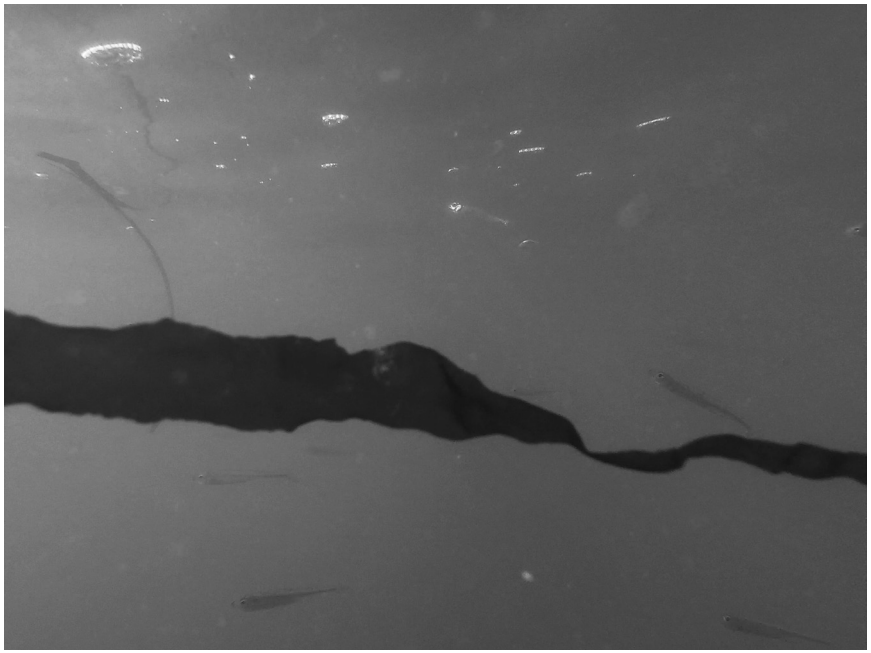


Fig 1B *Valle da pesca*. Ponds, bushes, dykes and marshes.
Photo by the authors, 2023.

Fig 2A *Chiusa.* Inside and outside.
Photo by the authors, 2023.

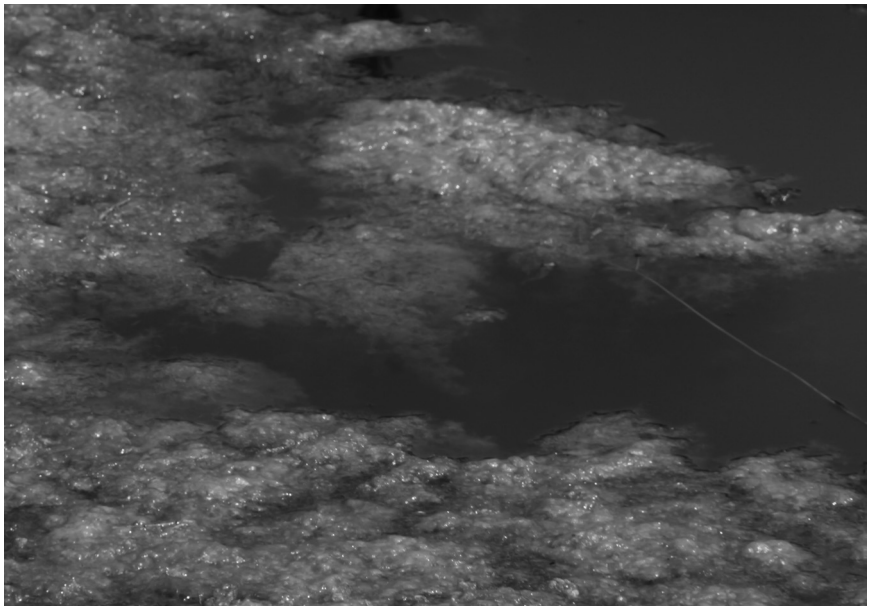
Fig 2B *Red tide.* Micro-algae blooming.
Photo by the authors, 2023.

Fig 3A *Casòn*. At some point, nature has taken over. Photo by the authors, 2023.

Fig 3B *Cracking clay*. In some places, water has stopped flowing. Photo by the authors, 2023.

Fig 4A *Tamerici salmastre*. Robust tamarisks protect waters and beings, break winds and consolidate grounds.
Photo by the authors, 2023.

Fig 4B *Mucilage proliferating*.
Photo by the authors, 2023.



RIVER IMAGINARIERS. THE RENATURATION OF THE PO REGION

GIULIA CAZZANIGA

The renaturation of river banks is a recurring theme in contemporary landscape practice and research, in response to many issues due to global warming, concerns over soil depletion, the reduction of lowland forests and their capacity for soil drainage, as well as the consequent need to better address water management. The National Recovery and Resilience Plan has approved a massive planning intervention in the Po River Region to protect biodiversity and provide ecosystem services: the Agenda aims at fostering the ecological transition to achieve sustainable, green, and inclusive growth. The project for the renaturation of the Po River banks was signed on October 29, 2021 by the Ministry of Ecological Transition (MiTE) in Rome. This project involves interested entities from Piedmont, Lombardy, Emilia Romagna, and Veneto and is valued at approximately EUR 360 million and will impact the entire river basin where 37 Natura 2000 sites and the MAB Po Grande and Po Delta Reserves are situated.

The project involves the Po River District Basin Authority and the Interregional Agency for the Po River, and aims to intervene in 56 areas along the river's entire course. Five types of interventions are planned: redevelopment, reactivation, and reopening of abandoned oxbows and branches; reduction of riverbed artificiality, including adapting the *groins*; diffuse naturalistic reforestation; and containment of invasive alien plant species. *The Action Program* was approved in the spring of 2022 and implements an alternative approach that considers the environmental context from an ecological, geomorphological, and landscape perspective while taking into account flood defense and water resource use and fruition. The project proposes an integrated approach that combines hydro morphological and naturalistic interventions, such as the decommissioning or reduction of works in the riverbed and the reactivation of secondary branches of the watercourse, and others considered *natural*, such as those referring to the recreation of river habitats and the control of alien plant species. This monumental intervention has the objective of satisfying the needs and requirements of individuals and communities in line with European trends. The success of these goals heavily relies on the environment's health and the natural capital's ability to support human life. Natural capital, like other types of capital, provides a flow of eco-systemic services that fall into four classes: Support, Regulation, Supply, and Cultural. To fulfill these needs, the plan involves a participatory process in the area to engage local communities and stakeholders.

PNRR Interventions.
This map displays the estimated positions of the 56 intervention sites along the Po River Axis. The *Medio corso* region will see the largest number of interventions, as it is the most developed area. Additionally, this section of the river has more curves and is where the majority of changes in the riverbed shape occur. Map elaborated by Giulia Cazzaniga, 2023.

According to the authors, the innovative character of the Po renaturation project is based on an interdisciplinary and integrated approach. The Scientific Committee is therefore made up of experts with proven knowledge and experience on the various aspects of the Po Valley territory and in particular of the Po River and with professional expertise in the following disciplines:

- Physical geography and geomorphology
- Stratigraphic Geology and Sedimentology
- Hydrology and Geomorphology
- Fluvial Hydraulics
- Hydraulic engineering
- River ecology
- Botany
- Natural sciences
- Ecology and Ecosystem Services
- Biology and Hydrobiology
- Ornithology
- Ichthyology
- Agronomic Sciences
- Forest Sciences
- Environmental Economics

After analyzing the available documentation, it becomes apparent that the planning aimed to control and organize the river area through technical solutions. However, the contemporary perspective questions the frameworks that shape our thinking about nature restoration and conservation. The fluvial landscape seems to be considered as a purely ecological or hydraulic matter. This contribution attempts to stress the cultural, narrative, and historical implications of the reconversion program on the natural imaginary and to bridge the gap between the current functionalist method and a multi-layered, multi-scalar interpretation of the landscape in which the soil is a living being beyond the faith in ecoculture, 'green' and settled nature.

ECOCULTURE AND LANDSCAPE DESIGN

If nature is to be considered a dynamic and evolving system rather than a collection of static objects, using the metaphor of a terrarium, then the various technical components involved in the approved plan require a direction and field of expertise to bring them together in a well-balanced relationship. However, there is a notable absence in the list of specialists involved: the discipline of architectural design.

There is no mention of an architect to manage the design phase or supervise the execution of works. Specifically, the exclusion of landscape architecture from the intervention plan for the Po Valley landscape reflects a certain scientific and cultural attitude within the Italian public administration. While the intervention plan provides authoritative studies and technical solutions, it fails to consider the cultural implications and the violent impact that the transformations envisaged by the PNRR will produce in the territory. Although the ecosystem and resources aims are addressed, the landscape - which serves as a mediator between nature and culture by invoking natural processes over time and stimulating imagery and representations that reveal transformations and dynamics⇓ - is often overlooked as an autonomous matter. It seems that the various disciplines involved in the plan have put the question of landscape interpretation in brackets, neglecting to consider what conservation and restoration of nature mean in today's context and whether they should be viewed as solutions to problems or adaptive responses to contemporary conditions. The extensive work carried out by the commissioned team competently and professionally addresses the challenges imposed by climate change for each specific area of expertise, but the overall coordination of the plan surrenders to a functionalist resolution that seems to renounce the contemplative, aesthetic and ethical dimension of the project. The Program approach tends to analyze the river issue as a hydraulic and ecological concern whose comprehension stops at the detection of problems. The punctual solution of these instances through a system of circumstantial interventions envisages a set of codified actions that endorse a method to measure the success of the transformations in terms of performance and capital. Some approaches continue to perceive the environment as a mere means of exploitation, where living beings and natural occurrences are regarded as tools for our own advantage. This outlook often results in targeted efforts with distinct limits that segregate them from the rest of the ecosystem. Unfortunately, taking such a narrow approach may result in overlooking the intricate interdependence of the environment as a whole. Mathur / Da Cunha's studies in their fundamental investigation of the forms of rivers, starting in 2001 with the publication Mississippi Floods, reveal how the approved project provokes a detachment from the dynamic reality of phenomena and struggles to interpret the signs of the land as a Palimpsest (Corboz 1983; Besse 2020) with which the landscape architect can interact, recreating a new system of values and polarities.

There is an absence of that audacity to imagine the territory as a fact more powerful than just mechanical and hydraulic implications, to act within the reality in which we are immersed

COROGRAFIA

DEL

FIUME PO

bacino ed influenti

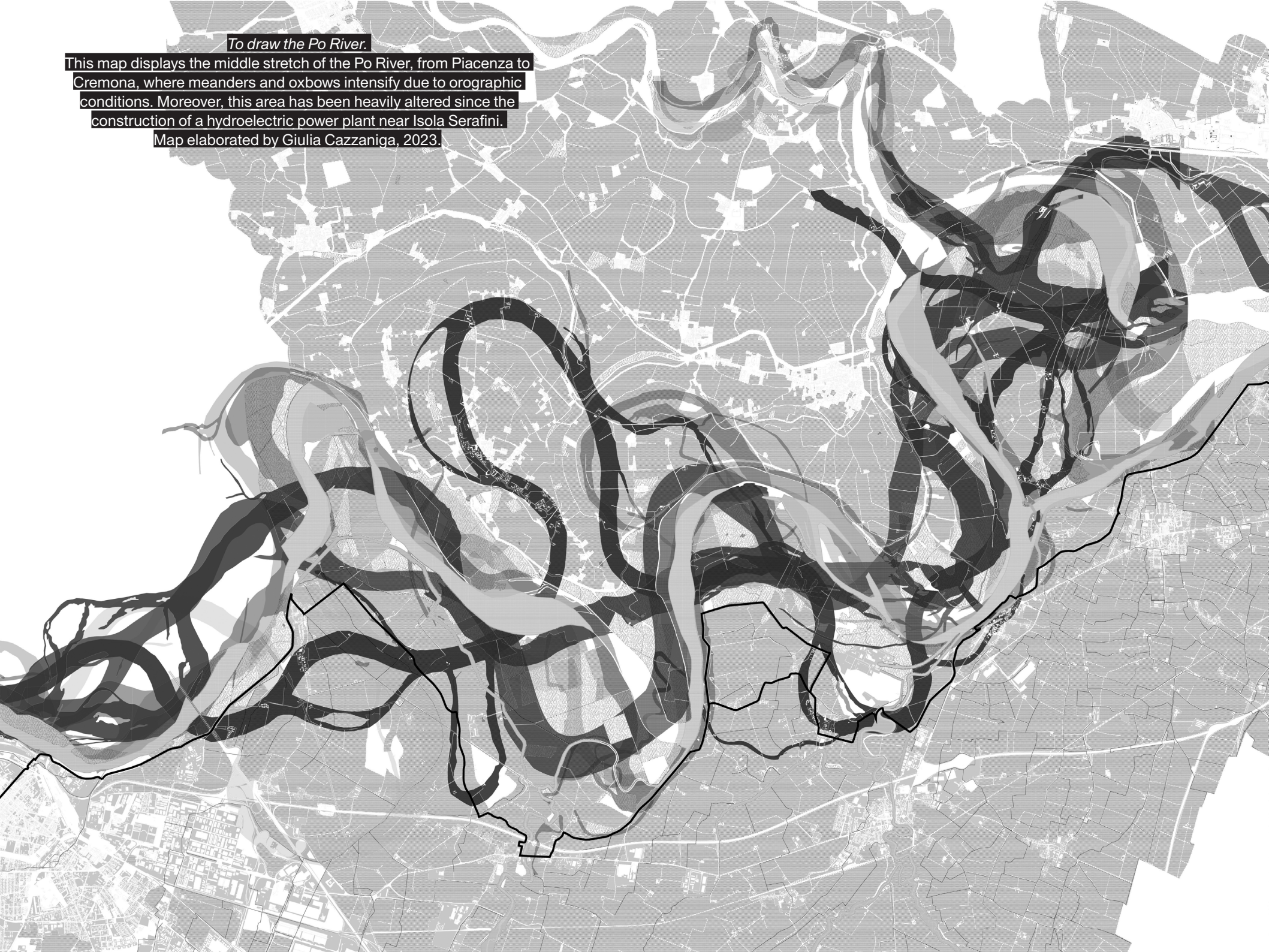
Scala 1: 400000

and of which we are a part. The project centers on treating the river as a purely engineering problem, as seen in the document. However, comprehension appears limited to identifying fragilities and resolving them through massive interventions that involve a set of predetermined actions. The interventions are identified on a map, but their clear boundaries seem to interrupt the relationships with what exceeds the perimeter. These actions aim to measure the success of the transformations in terms of performance and capital and the project tends to consider the landscape as a resource for consumption and management, where non-human elements like flora, fauna, and natural phenomena serve as subordinates to human well-being. Recent studies on river territories, particularly the extensive research on the Rivers phenomena by Mathur and Da Cunha, have established a landmark in the field of Landscape architecture. They highlight the importance of recognizing the dynamic nature of the landscape and engaging with the layers of history that shape it (Corboz 1983). In line with Mathur and Da Cunha's approach, a landscape architect can create a new set of values and polarities by envisioning the territory as a powerful entity beyond its mechanical and hydraulic implications where the ground is a subject to interact with, not a support to be manipulated. Banks, oxbow lakes, sediments, lowland forests and wetlands constitute habitats that, like a terrarium, we can replicate artificially, restore, reconstruct, and safeguard, but they also represent possibilities for imagining a new river territory that architects can help design. In light of climate change, it is crucial to explore and implement new techniques to adjust to changing circumstances and avoid disastrous consequences and, in this perspective, the involvement of a landscape architect is crucial, not only to execute the necessary changes but also to shape them in a way that takes into account their impact on the surrounding area on a regional and local level. In such an extensive context of intervention, it would be important to conceive of soil movement as a structural modification of the territory that, on the one hand, responds to defensive, containment, or protection needs and, on the other hand, represents an opportunity to relaunch an idea of territorial infrastructure that from a technical solution becomes an architectural matter.

THE UNFORESEEN FACTOR

Over centuries The Po Valley's river land has developed a complex system of fortifications that arms the territory against the floods. This system includes the riverbed and various overlapping planes, dams, dikes, incisions, elevation jumps and slopes but the five actions described in the Program tend to give mechanical and rigid solutions. These limited interventions focus on specific risk assessment areas, but paradoxically they are still bound to a generalized approach that lacks differentiation and context, resembling abstraction. On the contrary, this reflection tries to understand landscape architecture as the discipline for an open negotiation of transformations in which one does not assume "nature as a repertoire of forms to be reproduced, but on the contrary of behaviors to be interpreted and with which to collaborate in dialogic terms"[11]. Moreover, a comprehensive approach to territorial scale intervention necessitates a creative dialogue with history. When considering consolidating existing embankments, it's not just about the muscular intervention or using the latest technology to resist river floods. This task also presents an opportunity to design by creating a dialogue with new phenomena, by organizing them in a way that supports processes, acts and reacts to the dynamics and identifies aesthetic and ethical values within the process. This implies reflecting on what landscape means nowadays and exploring the broader concept of nature beyond environmental efficiency. For instance, the renovation of the River Aire in Geneva by Atelier Descombes provides an excellent reference. On this challenging renaturation project, Atelier Descombes demonstrated how the architect's task cannot be limited to the pragmatic application of ecological principles but, instead, they proved how geometry can be the tool to spatialize a technical solution. Before arriving at the lozenge design we know, in fact, the design went through several compositional phases of trial and error, experimentation and adaptation. The design engraved in the ground, in fact, responds to the functional mandate by understanding the ability of water to autonomously shape the surface needed to flow without causing damage to things, people and animals, and furthermore proves that architecture shouldn't be reduced to the pragmatic calculation of water flow. The project is ongoing and unfinished yet defined to the finest detail: it creatively negotiates practicality and beauty dealing in a dialogic way with the questions of space and time. The pragmatic aspect takes into account the size of the excavators and the possibility of maneuvering, while the creative aspect uses these tools as instruments for design, engraving, and chiseling the ground.

The renaturation succeeds in unveiling the traces of time taking the decision to re-signify the imprints of human/non-human interactions on the land and demonstrates a sensitive understanding and appreciation of the territory and river dynamics.


To draw the Po River.
This map displays the middle stretch of the Po River, from Piacenza to Cremona, where meanders and oxbows intensify due to orographic conditions. Moreover, this area has been heavily altered since the construction of a hydroelectric power plant near Isola Serafini.
Map elaborated by Giulia Cazzaniga, 2023.

"We must admit this paradox: the more the starting grid is defined, the more the river feels free to establish its new bed" ⌊. The project is an expression of a clear design will that extends its influence beyond the boundaries of practice to embrace an aesthetic result in an interweaving of technology and imagination, of function and representation.

The limitation with which the plan for the Renaturation of the banks of the Po River clashes is a Biologization of the landscape issue (Besse 2020): by focusing solely on practical necessities, the risk is to overlook the significant role that this kind of territory plays in producing imagery and representations. The gravels, sands, riverbeds, meanders, and defensive infrastructure systems all contribute to the ways in which different creatures experience the landscape, both now and in the future. The Program's model considers changing needs due to environmental conditions as a malfunction, underestimating its global and local impacts. To achieve the goals outlined in the action program, it's essential to implement a unified strategy throughout the entire Po River axis and streamline the process through simplified points. However, without considering a landscape architecture perspective, there's a possibility of reducing the project to a list of predetermined interventions that quickly resort to automated solutions. This approach is like reducing architecture to the mere fulfillment of minimum health requirements by inserting a correctly sized window. Instead, we must consider the form, material, and relationship between inside and outside, full and empty space, and possibilities of looking and being seen. Recognizing the significance of a site-specific crafted plan that comprehensively assesses the Po River cannot be overstated: through a careful examination of the topography and seizing the opportunity to gauge the undertaking's potential, a novel viewpoint of the river scenery can be envisioned. Rather than rushing towards the final result, traces and features already present in the area should be detected and redefined as a trigger for future trajectory. When it comes to the consolidation works, for example, it's unclear what role they can play in adapting to changes and being flexible elements. They have the potential to serve other purposes, such as providing viewpoints over the river, observation sites, or infrastructure to protect biodiversity and encourage its growth.

Instead, it seems that these edges are conceived and concretized as limits rather than thresholds for exchange and hybridization, a space that can establish new relationships and rediscover the marginalia as part of a value system that goes

beyond performative evaluation. The practice of participation is crucial, as well, but it must extend beyond gathering data; moreover, to truly understand the implications of all living creatures, including non-human entities like birds, fish, and rodents, is desirable to consider them as co-participating allies in the project, rather than mere components of an ecological system. While the current participatory process is well-organized, it still operates within an anthropocentric framework, where human actions direct the rest of the world from a privileged perspective. A well-designed terrarium should prioritize not only ecological, morphological, and geological aspects, but also sensitive, narrative, compositional, and space-enhancing elements. Regarding the PNRR-funded project, the terrarium metaphor could be employed to replicate a man-made ecosystem, yet the absence of artifice in understanding the potentialities is noticeable. The primary aim of the Program should be to construct the perfect condition for an evolving landscape that not only simulates optimal environmental circumstances but also acknowledges the complexity of the relationship between nature-related events and human actions. This should encompass a focus on the negotiation and on the unforeseen factor - the unpredicted element that sets apart artificiality from true artifice. The Action Plan for the renaturation of the banks of the Po River could be the catalyst in finding the artifice in the design and may lead to discovering ecology's expressive structures (Metta 2022) and utilizing them for the construction and creative organization of the landscape with site-specific design gestures. While there are no fixed landscape formulas to face the challenges of global warming, droughts, and floods, using a terrarium could be a helpful tool to test the architectural approach in a multi-layered, multi-scalar interpretation of the landscape in which the soil is a living being beyond the faith in eco-culture and settled nature.

Productive landscape.
This photograph was taken from SS9 Street, near the village of San Rocco al Porto. In the early morning, the fog covers the main embankment, giving an illusion of an infinite horizon. The fog is a distinctive characteristic of the region and its presence and thickness are linked to the abundance of water collected in the aquifer. It's also an indicator of the good health of the hydrogeological system. Photo by Giulia Cazzaniga, 2023.

As described by the Basin Authority, these are hydraulic works that act transversally on the current. By protruding from the bank to which they are rooted, they divert the current's impetus. They make an area downstream sufficiently calm and protected for a distance of approximately 1.5 to 2 times their projection.

It is an extensive document created by the Technical Secretariat of the Po River District Basin Authority in collaboration with AIPo, Piedmont Region, Lombardy Region, Emilia-Romagna Region, and Veneto Region.

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FUCINO: FROM WATER TO LAND

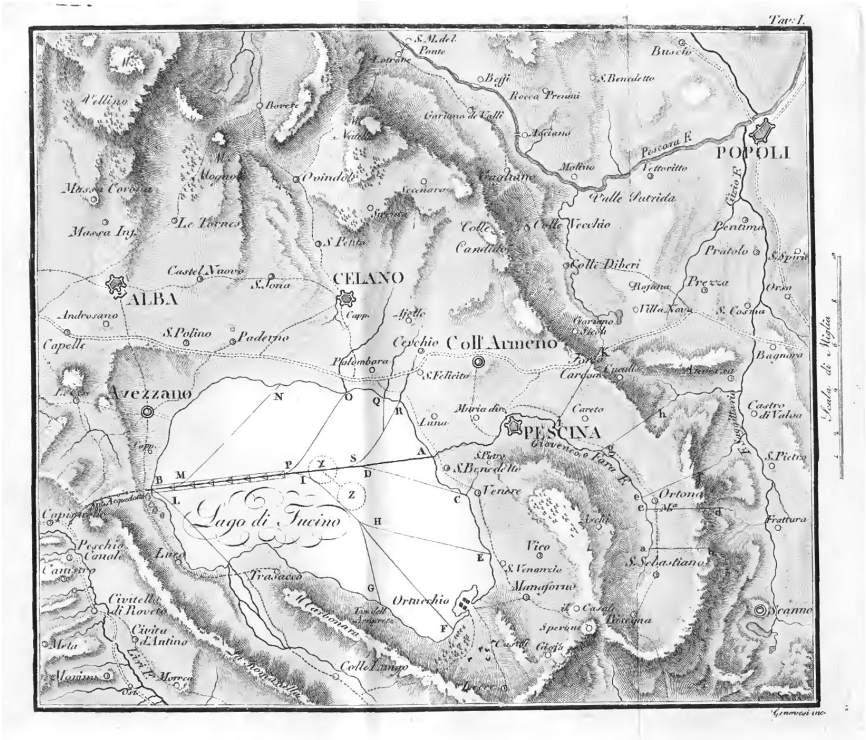
VALERIO MASSARO

In 1829, gardener N.B.Ward invented the first terrarium accidentally noticing a small fern growing in a bottle (Keogh 2017). In the 1870s, Charles Darwin cramped his living room with terrariums to understand worms' ability to transform soil (Montgomery 2012, p. 11). In those decades, terrariums came to embody the tendency to enclose, discern, and abstract the "natural laws" that were being instrumentalised in enormous territorial infrastructural projects. One such project was the draining and reclamation of Fucino Lake, the third Italian lake. (Fig 01) A project that, as its promoter noted "in the century of discoveries and grand enterprises … cannot fail" (Afan De Rivera 1845, p. 620). The word *terrarium* derives its etymology from the *Terra*, the Latin personification of Mother Earth, embracing the dynamic and relational complexity of multispecies coexistence within an ecosystem. Yet, its suffix describes a confined and abstracted version of the earth in which natural life can be controlled and its rules selectively comprehended.

How was a lake transformed into a 150-hectare terrarium for agricultural crops? Today, the Fucino basin is a 650 metres elevated plateau of fertile farmland (In the province of L'Aquila, in Abruzzo). The prevailing narrative uniquely celebrates the banker and entrepreneur Alessandro Torlonia for his pivotal role in the enterprise. In 1875, he earned the title of "*the Prince of Fucino*" for "extending the territory of the new born Italian state"[1] (De Filippis 1893, p. 57). While the efforts to regiment the unstable waters date back to the first century AD with a Roman infrastructure, the idea of total draining implies a fundamentally different idea of land, and desire for land. The Fucino project stands as a paradigm of a territory's ecological and social upheaval by design; its motivations and tools are to be found in the reconceptualization and abstraction of two components: land and water.

The reclamation of agricultural land exemplifies 19th century domestic colonisation: the European ethos of the time saw the private property and agricultural development as synonymous of civilisation (Mitchell 2002, p. 55). Borrowing Timothy Morton's vocabulary, the Fucino reclamation was yet another product of the *agrilogistic* society's struggle to reduce existence to sheer quantity (2016, p. 43). Such projects are contextualised by the emergence of modern nation-states' confidence in technological progress, which strived to control the outcomes of society, using quantification, legibility, and simplification (Scott 1998, pp. 11-15). For Fucino's water to be turned into farmland water, it needed to change in the realm of ideas first, using the abstract utilitarian logic of quantification.

Fig 01 Plan of the Lake
Published in Rivera, C. A. de, *Considerazioni Sul Progetto Di Prosciugare Il Lago Fucino e Di Congiugnere Il Mar Tirreno All'Adriatico per Mezzo Di Un Canale Di Navigazione*. Del Maggiore Cav. Carlo Afan de Rivera, Reale Tipografia della Guerra, 1823.



To imagine the annihilation of such a vast lake presupposes an existential question: how much water makes a lake? Who has the right to appropriate what's under it?

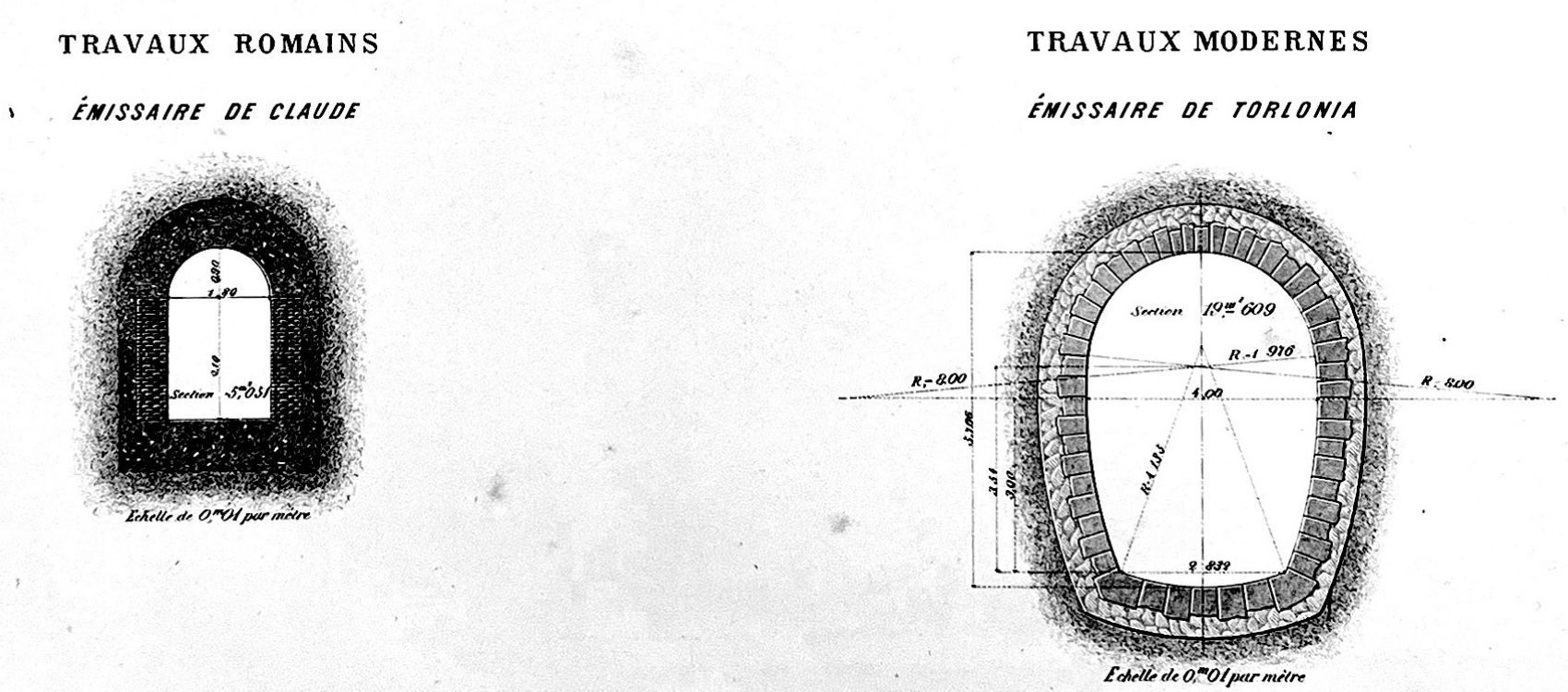
The emissary's infrastructure was the product of hydraulic innovation and a re-conceptualisation of water. The artificial outlet comprised a 6301,48-metre-long underground tunnel under a mountain (Parisi, Pica 1996, p. 122). The implementation was as challenging as it was conceptually simple. Montricher's project, Torlonia's engineer, was straightforward: the emissary would follow the path of ancient infrastructure, built by the Roman emperor Claudius. By the time of his intervention, the ancient tunnels had already been cleared and secured, and general calculations were approved (Parisi, Pica 1996, p. 109). Montricher's most significant design contribution was in the section of the tunnels (Fig 02). The ancient tunnels had a rectangular section surmounted by a semicircular arch. This shape, well-known by the ancient builders, adapted its height, width and materials to the different ground conditions (De Rivera 1836). In contrast, the modern infrastructure quadrupled the section to 20 square meters, to avoid "future flooding" by calculations. The piers and base of the new section are arched respectively 8,00 and 4,135 metres to resist the rock pressure better and facilitate water flow (Parisi, Pica 1996, p. 112). The new rectified tunnel, constant in section and materials, was a monument to the supremacy of objective science and its ability to harness water's properties. Only one hundred years before the effectiveness of the ancient emissary was questioned ♌; by the mid-19th century, it was deemed inevitable. Since then, the water became H_2O ⇊, turning into an abstract, non-social, and non-local scientific concept. Jamie Linton calls it the invention of *modern water* (2010, pp. 14-92). This ontological shift was entangled with the development of hydraulic sciences. From the perspective of a 19th century scientist, relying on machines was a way to see while blinding their inner eyes; a search for objectivity (Daston and Galison 2010, p. 140). Like in a terrarium, objects were deemed efficient in isolating and revealing the "rules of nature," collapsing reality with its measurements: The lake was merely an object to be dried. Torlonia claimed to have succeeded where emperors failed, ⋔ willingly confusing the aim of the ancient project.

The ancient Roman endeavours ⅃ reduced the lake's surface to a third. For Pliny the Elder (AD 23-79), water was the lord of all elements and entailed all beings (Linton 2010, p. 76).

Arguably, in classical times, the dismissal of an entire lake was unthinkable or, at the very least, undesirable.

After 7 years of water pouring out, the reclamation could

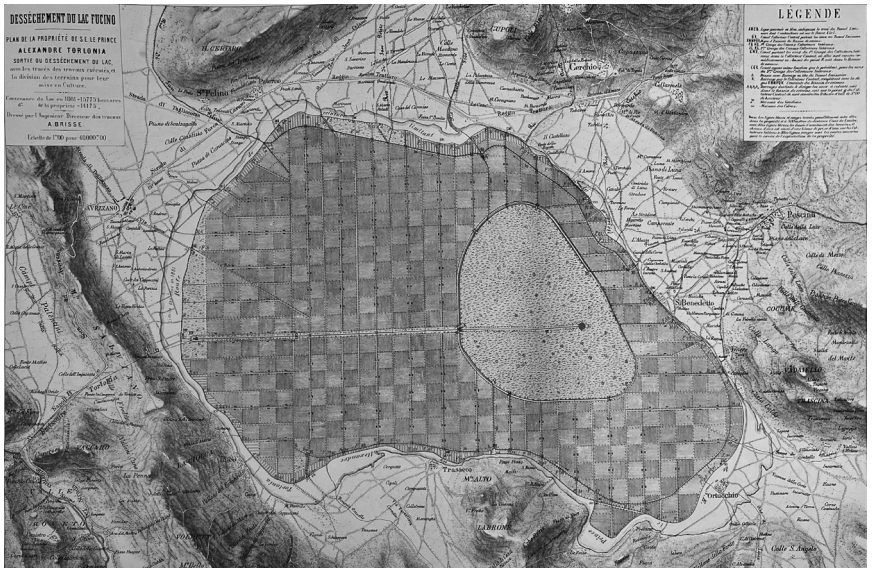
Fig 02 *Comparison between the ancient and modern section of the tunne*l. Published in Brisse, A., The Draining of Lake Fucino: Accomplished by His Excellency Prince Alexander Torlonia, Propaganda Press, Rome 1876.



begin. It took 16 years. The new form of the Fucino Estate was drawn by Alexandre Brisse's for Torlonia (Brisse 1876) (Fig 03). An ordered grid of channels, roads, and bridges shaped it. The grid's span created 25 hectares plots, a size that Tolonia's administration was already very accustomed to (Felisini 2022). This final design embodies the managerial and technical ethos of the time. The scheme refused any display of landscape sensibility and hydraulic knowledge, favouring the scientific certainty of future water management (and productivity). Critics at the time realised how the infrastructure coincided with a predictable future of centralised water (and land) control (Morachiello 1976, p. 159). A new perimetral road defined the estate and connected the shores towns. The colossal enclosure resulted from a contract that disproportionately favoured Torlonia over the local population. The Neapolitan state agreed to transfer "all the dried land" to the banker's company. After the Unification of Italy, the original contract was re-negotiated with the newly established Kingdom. The property's boundaries were established on the historically high-water levels in 1962, and the onus of proof of any challenges to the new ownership was left to local landlords and municipalities (Colapietra 1978). The contracts that concretised the transformation of water in land were rooted in the re-conceptualization of land as a quantifiable abstract commodity. Following the 1806 laws that abolished feudalism in the Italian South, E all land became privately owned, while state ownership of lakes remained unclear, in contrast to rivers (Rinaldi 1893, p. 112). The use value of land had given way to land as a speculative commodity. The intention to wipe out the lake became clear in 1838 (De Rivera 1845, p. 615). The ambitious reclamation projects of the Neapolitan Kingdom were driven by a bureaucratic and technical apparatus that prioritised infrastructural costs, land market value, and taxation. The promise of productivity guaranteed by understanding land as a legible and quantifiable commodity allowed the state to offset risks to a private company.

Torlonia completed the social and ecological transformation of the basin, successfully creating a gigantic terrarium: the estate was treated like a close object with inputs and outputs that could be manipulated. Written contracts appeared in the area for the first time, attracting many new settlers (Colapietra 1978, p. 14). The estate size allowed experiments with different forms of agriculture and land management that incited demographic growth and new forms of speculation (Felice 2023).

Fig 03 *Plan of the Estate*
Published in Brisse, A., The Draining of Lake Fucino: Accomplished by His Excellency Prince Alexander Torlonia, Propaganda Press, Rome 1876.



While grains, potatoes, and beetroots were successful, cultures like olives and almonds disappeared together with the fish due to local climate change.

Infrastructures and property contracts transformed Fucino into a terrarium thanks to the control and quantification of its elements: water was reduced to H_2O, and land was described as a contract. The Fucino Lake had to change in the mind of its executioners before disappearing. Regardless of scale, no terrarium truly exists in isolation; the self-contained nature of the system can be questioned with a shift in perspective. Fucino's hydrology still exists uninterrupted: Every year snow melts, rain drops, and local springs and rivers pour water into the basin. To these days, locks and canals, like one massive machine, prevent the lake from re-emerging. In some winter mornings the lake manifests as a ghost hovering over the grid of streets and channels in the form of a dense low haze. Cycles of flooding and droughts are a reminder of the lake's past. The accidental invention of the first terrarium relied on careful observation.

The same sensible scrutiny can challenge its boundaries, offering a broader ecological perspective.

The medal received mentioned "ITALIAE AGRUM AUXERIT".

In 1787 Engineer Nicola Carletti, surveying the infrastructures had clear opinions about its uselessness.

Louis Jacques Thénard rendered the now familiar H2O in 1836 for the first time in his Traite de Chime.

This narrative, still alive, has been put forward mostly by authors flattering Torlonia. First and forest his agent De Rotrou and his engineers.

There are mentions of Claudius (52AD), Tiberius (98-117AD) and Augustus (117-138) controlling the lake's waters.

The "Leggi eversive della feudalità" were issued in Naples during the Napoleonic government.

RECLAIMED LANDSCAPES. THE PONTINE MARSHES AS A DESIGN PROTOTYPE FOR A NEW ALLIANCE

ALESSANDRO RAFFA, INA MACAIONE

MODERN WETLANDS RECLAIMED LANDSCAPES AS TERRARIA. AN INTRODUCTION

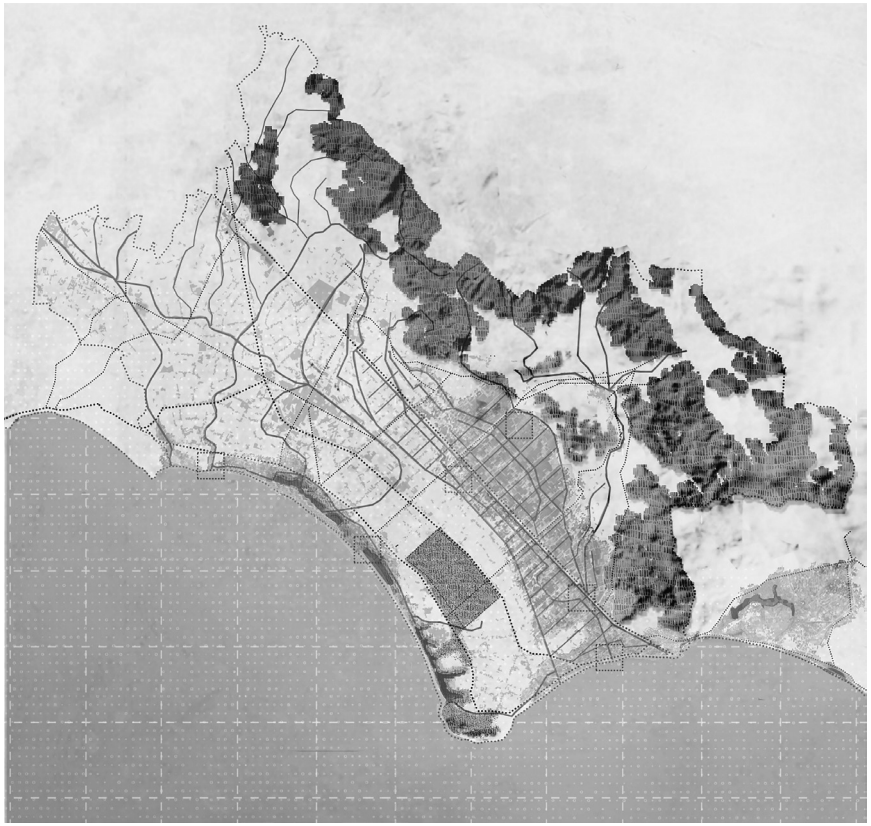
Terraria are artificial enclosed environments and expressions of men's power and supremacy over natural ecologies; they are also creative expressions of a modern divide, between nature and culture, human and no human, etc., which defines controlled ecological dynamics. Through this metaphor we have looked at modern reclamation landscapes built up from the deletion of wetlands and their ecologies. These globally diffused landscapes are today facing changes that let emerge more explicitly their asymmetrical and conflictual inner condition. Present and future changes ask us to reconsider them beyond their segregative nature and experiment design trajectories to support possible metamorphosis, which is political, ecological, cultural and spatial at the same time.

Modern reclamation had redefined and also erased wetlands complex ecosystems, through consistent land and infrastructural works to adapt to human needs and norm their hybrid and amphibious condition. Wetlands' Nature, perceived as uncertain, risky, and unproductive space, had to be normalized, reorganized, 're-generated'; this resulted in territorial re-foundation projects through which new ecologies and morphologies emerged, expressing human control over natural space. Modern reclamation projects aimed at transforming wetlands into self-sufficient territorial machines in which infrastructural networks, tecno-natural spatial devices, crop patterns and settlement logic established their otherness from the pre-existing wilderness. "Artificial enclosed environments" are particularly fragile landscapes, designed to maintain a specific socio-economic, ecological state. Today they are facing the uncertainties of contemporaneity, including the effects of climate change, which will make structural transformations unavoidable, defining new ecologies and new aesthetics by reconsidering the consolidated relationship between land and water, human and non-human, natural and cultural. Inside this framework, the Agro Pontino landscape is conceived both a hologram of wetlands reclaimed landscapes complexity; and a prototype to explore, through design, uncertain territories and design trajectories for envisioning "a new alliance between biology and artificiality".

THE AGRO PONTINO AS LANDSCAPE OF CONTROL

> "Man's conquest of water [...] took on a definitive value [...] the land is shaken as if in the proximity of a war. Man, metre by metre, will put a familiar and human order, establishing his customs of life."; "[...] the blue houses of the

Flooding risks foreseen in 2100 with a sea level rise gradient.
Map elaborated by Alessandro Raffa, 2023.



> settlers advance like an orderly army [...]; the agricultural machines stand in the corrals like herds of a new kind, the pyramids of coal are what remains accumulated here and there of the forest; they are the charnel-houses of it."
> (Alvaro 1934, p. 19-21)

In the story-chronicle *Terra Nuova* on the reclamation of the Agro Pontino, Corrado Alvaro ironically describes the "Battle of the swamps" (1926-1939), by which the Fascist regime transformed Pontine Marshes. The hybrid and amphibious nature of the marshes was perceived as ambiguous and interpreted as "an element of disorder, not only hydrogeological, but also social, sanitary and moral." (Gruppuso 2013, p. 230) The wilderness of the marshes acted, therefore, outside the political ecology of the regime (Armiero et al. 2022), it was narrated as a risky space, amid malaria, unproductivity and semi-nomadism of the local populations. In the Agro Pontino, reclamation involved the dissolution and reconstruction of existing relations between man and the environment through actions of conquest, occupation and re-organization of space. (Cooper 2001) Through extensive hydraulic infrastructure and soil modifications, the regime turned marshes into farmlands, nature into productive land, wilderness into "civilization," giving birth to a "second nature" (Caprotti 2006; 2007). That of the Agro Pontino is an infrastructured (Armiero et al. 2022, p. 17), techno-natural landscape, re-defined and crossed by material and immaterial networks, functional to expel the land-water ambiguity of the marsh (hydraulic reclamation), to eradicate malaria (sanitary reclamation) and to allow the stable presence of peasant communities that would sustain the daily struggle against Nature through fields works (rural reclamation). A "territorial machine" (Purini 2003, p. 93), the expression of a positivist vision of science and geographical knowledge aimed at the control (Caprotti 2006, p. 153) and the reorganization of Nature through the re-definition of its ecologies and the accelerated construction of the new landscape. Risky and uncontrolled wetland spaces had been completely normalized, reorganized through a territorial design made by a Cartesian weave of canals, roads and rows of trees, dotted with hamlets, towns and farmhouses as a means for widespread control. Between 1926 and 1939, the Fascist regime fully drained the Pontine Marshes. 16.165 km of drainage and irrigation canals were adapted or newly built; 18 water drainage systems and 4.500 pits were built; a 1.360 km network of roads and inter-farm tracks; a settlement system of 3.040 scattered farmhouses (Sottoriva 1977, p. 49); fourteen rural hamlets and five towns (Littoria, Sabaudia, Pontinia, Aprilia and Pomezia) were built .

To complete the hydraulic-agricultural systems, the coastal dunes and hillsides were re-modelled and reforested, and a territorial frame of windbreaks was created which, together with the areas dedicated to agriculture, were part of the techno-natural infrastructure of the Agro Pontino reclamation and its landscape. A superimposed design

> "that has taken on the evocative value of the geometric colonizing vocation of the Roman world" and that "relying on a previous system of strongly stratified traces [...] has contradictorily configured itself as the peremptory affirmation of the reasons for the new and as a sophisticated operation of archaeological deciphering of signs and paths." ǂ An ambivalent landscape design, "the production of a new original landscape and the cancellation, except the Selva del Circeo, of the true original landscape." ‖
> (Purini 2003, p. 43)

If, on the one hand, a fragment of the original marshy forest - which became the Circeo National Park in 1934 - is preserved, it is done so without its ecological functionality; an "invented nature" (Armiero et al. 2022, p. 77) that becomes a term of comparison with the reclaimed landscape. But also, a human and no human biology laboratory (Cavallo 2010; Dogliani 1999), where to experiment with power and control relationships between species and define new ecologies coherent with the political ecology of the regime (Armiero et al. 2022) and also a showcase (Pergher 2020, p. 107) for displaying a Fascist and modern reclaimed productive landscape. The marshes' regeneration thus presupposed a total and constant struggle against Nature, in which technology, scientific knowledge, the work of peasants and even the control and management of the animal and plant kingdom were intertwined, generating a landscape that was an expression of the regime's creative power and its political ecology. A fragile, artificial, and conflictual enclosed environment designed to maintain a specific socio-ecological state, whose existence is linked to an engineering system that mechanically removes water from the ground. But its productive landscape, increasingly industrialized, and settlement dynamics evolved beyond its logic and today it is challenged by anthropogenic pressures, with ecological, economic, and social impacts.

THE AGRO PONTINO AS A LABORATORY FOR A NEW ALLIANCE. DESIGN EXPLORATIONS

Modern wetland reclaimed landscapes are critical spaces for "eco-imaginative" (Corner 1997) design exploration, in which identifying research by design possibilities and outlining design methodologies and actions. In the last decades, the Pontine reclaimed landscape has been recognized as a place for research

by design explorations concerning the nexus between ecology, landscape, and architecture, ri-defining the complex entanglements between water and land beyond modern oppositions, envisioning alternative scenarios.

Between 2007 and 2008, Alan Berger, by applying his *Systemic Design* (Berger 2009) approach and mainly focusing on water pollution of Agro Pontino, design a *Wetland Machine*, "for filtering, habitat and biological exchange." (Berger 2008) "[…] a 2 sq. km constructed wetland park […] that would both provide a recreational landscape […] and remove pollutants" (Berger 2008). Berger ecological/landscape design- developed closely with the local planning agency and Pontine Plain consortium, though the project has not been constructed, introduces a new way of thinking through an integrated and holistic process of *Systemic Reclamation* (Berger 2008), to improve water quality and groundwater recharge potential, enhance biodiversity and provide recreational space. (Berger et. al 2010, p. 95) The design of a new topography and amphibious ecologies, and the implementation of Nature-based solutions (NbSs), are not led by the intention to restore the pristine wetland ecosystem locally, but to re-design it according to current patterns of environmental, economic, and social fragility, recognizing the highly infrastructured identity of Pontine Marshes and "set this place on a new path." (Berger in Rosenthal 2008).

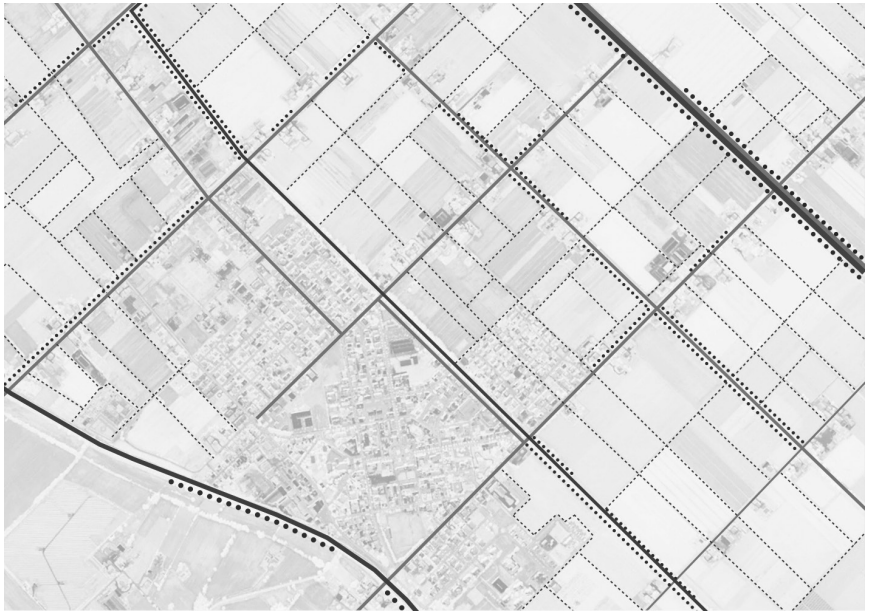
Water quality has been at the core of the project Rewetland (2010-2014), co-founded by the EU LIFE+ Environmental Policy and Governance 2008. The project (Cataldo et al. 2014) aimed to explore the potential of implementing constructed wetlands and phytoremediation solutions for wastewater treatment of Agro Pontino. Through four pilot projects–a protected natural area, an abandoned field, canal buffer strips and a farm – were experimented different NbSs to enhance water quality and management and biodiversity, offering, at the same time, recreational spaces for the community. Whether, from a technical-engineering perspective, the conducted experimentations offer valuable solutions and open toward possible scenarios for improving water resource management, from a design perspective, they highlight a contradictory approach towards re-naturation project.

Water ponds morphologies ape a supposed natural condition, without any engineering-ecological reason related to water management or with respect to foreseen ecological dynamics.

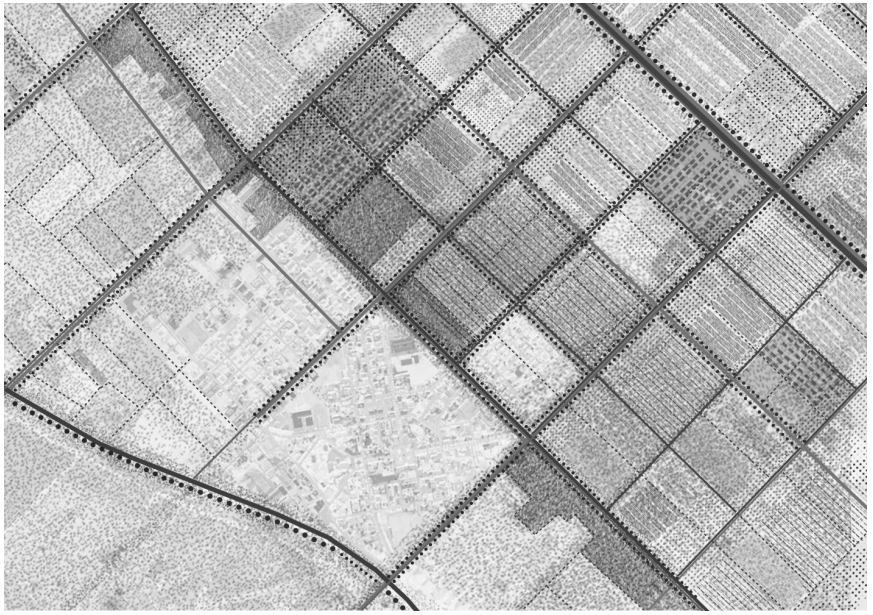
To overcome divisive oppositions and develop a holistic and integrated design methodology, Metta and Onorati (2019) stress the need to

> "[…] recognize the Plain as a platform of change, move-

Flooding risk with different time scenarios in the area of Borgo Pasubio rural village. Post-reclaimed landscape today is affected by sprawl and monoculture and is still based on engineering solutions to ward off water. Map elaborated by Alessandro Raffa, 2023.



Post-reclaimed climate-resilient ecological grid and rural patterns. Its ecological performativity is rethought through the implementation of windbreaks and channels as green-blue corridors; rural pattern is redefined through water farming and bio-retantion areas, also for phytoremediation purposes. Map elaborated by Alessandro Raffa, 2023.



ment, and activities, where a myriad of signs, by human as well non-human beings, are inextricably and vividly entangled." (Metta and Onorati 2019, pp. 5-6)

Inside the research by design process "negotiation", '"co-existence", "indeterminacy", "inclusiveness", "overlap", "simultaneity", "eventuality", "instability", "association and collision" (Metta and Onorati 2019, p. 6) are words of an operational vocabulary that could open to the design of a "[…] a multifunctional landscape platform, able to give back food, beauty, ecology, health and leisure." (Metta and Onorati 2019, p. 8).

The described experimental projects let emerge critical issues and questions. How to transition through design process the Agro Pontino ecosystem, imagined as stable and defined, to contemporary changes and challenges? How to bring together the ecological potential of re-naturation and Agro Pontino's palimpsest condition? How to manage the complex entanglements between ecological, social, economic and cultural patterns through design? With these questions in mind, the Agro Pontino is interpreted as a place of design experimentation, in order to identify issues, an operational methodology and tools to deal with modern reclaimed landscapes in a changing climate.

THE AGRO PONTINO AS A PROTOTYPE FOR A NEW ALLIANCE IN A CHANGING CLIMATE

As mentioned above, Agro Pontino's landscape is challenged by endogenous and exogenous anthropogenic pressure, with ecological, economic and social impacts, which will be even stronger in the future. Concerning climate change impacts, heavy and concentrated rainfall, together with dry periods, are already producing increasingly frequent flooding phenomena. Pontine Plain is among the thirty-three Italian areas more at risk of flooding in the next eighty years. (Antonioli 2016) Climatological projections foresee that sea level rise by 2100, together with local hydro-geological dynamics, will have economic, social, and ecological impacts on coastal and inner plain of the Agro Pontino. Flooding risk asks to reconsider the modern separation between water and land as well its "stability." As much as these are projections, the outlined scenario calls for a general reconfiguration of the techno-natural, settlement and agricultural production system. The intention is to design climate adaption through an integrated, holistic and multidisciplinary approach capable of dialoguing with present complexity and future uncertainties, by investigating the dynamic entanglements that have shaped and continue to shape the Agro Pontino reclaimed landscape.

SEARCHING FOR A DESIGN METHODOLOGY. THE AGRO PONTINO OPERATIONAL ATLAS

Starting from researches and design experiments referable to *Landscape Urbanism* and *Ecological Urbanism* (Waldheim 2016; Mostafavi and Doherty 2016) and multi-scalar climate design experiences (Babtist et al. 2019), the objective is to identify a design-oriented operational methodology ⅄, strategies and actions through which climate adaptation process can accompany towards sustainable development scenarios, testing performative ecologies and envisioning new aesthetics.

With this objective, it has been conceived the Agro Pontino Operational Atlas ⅄Ⅱ⅄: an open mapping process/project that, trying to deal with contemporary complexity and uncertainty, defines a structure of possibilities within which, according to multiple time horizons, local community, groups and stakeholders will take actions according to their evolving needs and urgencies and enhance climate resilience through space.

In a first phase, Agro Pontino blue-green techno-natural infrastructure has been investigated with a multi-scalar, multi-temporal process of de-composition and re-composition in order to describe its ecological figures (natural and re-naturized spaces, dry and wet spaces, rural patterns, green-blue corridors, tree lines, species mobilities, etc.), their fragilities and regenerative potentials. Nature is interpreted as a "field of our imagination" (Corboz 1998, p. 191) and as a space of possibility and particular attention has been paid to Nature's symbiotic dimension, i.e., its ability to adapt to different changes, also climatic, and to be adapted by local community in different time frames and scales. The recognized figures and their diagrams together generate an "operational topography" (Di Franco et al. 2018) understood as a structure of possibilities that will allow for the implementation of design actions at the local scale. By considering present and the foreseen long-term climate impacts, the Atlas tries to cope with uncertainties, envisioning different stages between today and 2100. The operational topography diagrams overwrite a palimpsest (Corboz 1998), in continuous evolution, by reshaping the relationships between the infrastructural modern reclamation grid with new wet spaces and related ecological processes; it introduces new meanings and shows spaces of possibilities for design actions that other authors will define in the future.

Moving from the territorial to the urban scale, the design strategy focuses on certain critical areas with respect to present and potential forms of fragility and vulnerability that the effects of climate change could exacerbate. Concerning the selected

specific areas, their fragilities and vulnerabilities, an abacus of possible adaptation actions was developed and matched to hybrid, symbiotic techno-natural spatial devices[11]. The logic behind the proposed solutions aims to overcome present conceptual and physical divisive boundaries, opening to new forms of co-existence. The selected devices, from weak to structural, will be implemented over time by other authors and will contribute to envisioning locally more performative and complex relationships between land and water, human and non-human, nature and culture.

The modern reclamation network of nodes, rods and fields is redefined through new hybrid relationship between dry and wet soils, enhancing biodiversity and multiplying public space.

In coastal areas: dune restoration and re-naturation, with sub-emerged and emerged vegetation, artificial reefs and sub-emerged structures will built up a multiple line of defense; salt marshes re-creation will allow restoring tidal influence and foster ecological connectivity. Concerning inner rural areas: water farming (raised beds, amphibious and floating farming), bioretention areas (bioswales and rain gardens, detention and retention ponds, permeable pavements), naturation of canal's beds and banks and bypasses. Attention has been paid also to modern reclaimed landscape, existing techno-natural devices, and their adaptation potential enhanced: the continuity of wind break rows will be restored, implemented and scaled to protect from wind gusts and canal's naturation will built up a territorial ecological grid. The envisioned multi-scalar, multi-temporal design solutions will improve climate resilience, enhance biodiversity, ecological and spatial quality, and offering diverse recreational possibilities. Through an integrated, inclusive e multidisciplinary approach to design new forms of co-existence for wetland reclaimed landscapes will emerge, overcoming cultural and physical divides and opening towards multiple entanglements for a new alliance.

The paper is the result of the collaboration between the authors. It had been nurtured by A.R.'s previous research on the contemporary design of wetlands reclamation landscapes and on the ongoing research activity inside "Urban Green Shape" project funded on PON R&I and FSE-REACT EU. Paragraphs' attribution: "Modern wetlands…introduction" is att. to A.R. and I.M.; "The Agro..,control" is att. to A.R.; The "Agro…exploration": from "Modern wetlands…" to "…on a new path"; from "The described…" to "…for the future" to A.R.; from "Water quality…" to "…health and leisure" to I.M.; "The Agro… climate" to I.M.; "Searching for…Atlas" to A.R.

Excerpt from the title of the PRIN «SYLVA. Rethink the sylvan. Towards a new alliance between biology and artificiality, nature and society, wilderness and humanity».

The paragraph is a summary and re-elaboration of the contents from: A. Raffa, *Ecologie della 'lotta alla palude' e paesaggio della bonifica integrale dell'Agro Pontino*, in A. Raffa, *Paesaggio ed ecologie della bonifica integrale in Libia*, Accademia Adrianea Edizioni, Roma 2023, pp. 18-30.

Translated by A. Raffa.

Translated by A. Raffa.

For more on the transformations carried out in the Agro Pontino and the ecologies of its 'second nature' see: Opera Nazionale Combattenti, *L'Agro Pontino*, ONC, Rome 1940.

Translated by A. Raffa.

Translated by A. Raffa.

The proposed approach refers to the epistemology of complexity (Morin 2001) and transdisciplinary (Nicolescu 2002) and adopt a mixed method for design research (Creswell 2009).

The Agro Pontino Operational Atlas has been developed by A. Raffa in 2021, inside the research project "Flooding heritages in the Agro Pontino" by Accademia Adrianea di Archiettura e Archeologia.

NbS categories identified refer back to: World Bank, A Catalogue of Nature-based Solutions for Urban Resilience, World Bank Group Washington, D.C. 2021.

GREEN-COVERED: THE SINT-PIETERSBERG AS A TERRARIUM OF CULTURES

KEVIN AMENDT, CHIARA CARAVELLO, RITA OCCHIUTO

The Sint-Pietersberg is a hill stretching in continuity between Belgium and the Netherlands and is here adopted as an experimental *terrarium*. In the center of a perennial conflict of interests between nature conservation and industrial exploitation for the extraction of limestone blocks and powder, the recent history of the Sint-Pietersberg is an intense succession of actions and reactions between humans and nature. Here, after gradual withdrawal of limestone quarrying operations, a process of re-naturalization began, either from nature itself or through the artificialization of greenery. Progressively, exceptional natural beauty and biodiversity regained their place both in the surface and underground spaces, forming a unique lush landscape (Occhiuto 2021).

The text aims to compare different ways for nature to regain its place in man-made landscapes resulting from invasive underground resource exploitation. The focus is on the interactions in re-naturalization processes between phenomena of 'spontaneous nature,' freely formed and limitedly controlled, and phenomena of 'induced nature,' imposed and highly controlled. Focusing on aesthetic and cultural values, the text questions the significance of re-naturalization actions: is it enough to compose 'green landscapes' as desirable objects to be exploited to make the Earth more profitable? Or can considering 'natural systemic conditions' suggest other ways of intervening and caring for places, taking inspiration from what nature is already rebuilding and reconfiguring?

THE VERLOREN VALLEI AND THE ENCI-QUARRY IN THE SINT-PIETERSBERG

The limestone extraction processes can take place underground or on the surface, altering the landscape irreversibly albeit leading to different environmental and aesthetical impacts. In both cases presented in this text, open-cut quarrying began in the interbellum (SAHV 1985; Amendt 2010), during which the original above-ground landscape is literally removed and underground galleries from previous extraction phases disappear.

The first case is the *Verloren Vallei*, which can be defined as a small-scale open-cut quarry where the extraction processes came to an end within a few years (SAHV 1985, p. 63). The re-naturalization process has been taking place since the industrial use was ceased about eighty-five years ago, defining a spontaneous natural environment. The second case is the ENCI-quarry, which unmistakably manifests its 'operational landscape character' (Rosier 2022, p. 18) with the violent impact of its size, given by extraction operations protracted over almost a century.

Although the extractive process has only recently stopped, it was already from around 1939 (Nieste 1996, p. 125) that the re-development of the surrounding affected by quarring began, according to man-imposed and highly controlled natural development.

The processes of the quarry's re-appropriation by nature brought to life precious landscapes, thicker and lusher throughout the seasons, and visibly enriched from year to year. The presence of different species of flora and fauna, each with its own specific sound, rhythm, and frequency, lends an intense and unique flavor to every step in these landscapes. The character and materiality of the soil, the lightness and porosity of the vegetal mantle, the play of light and shadow, filters and determines the development of the space all around. In this impactful overall picture, only the attentive observer can grasp the complex combination of particular units characterizing the post-extractive landscape. Indeed, if in the case of the ENCI-quarry the re-naturalization processes are apparently spontaneous, on a closer look the landscape is to a large extent the result of management operations that have forced nature into overbearing development guides.

If, on the one hand, spontaneous re-naturalization is dominated by a continuum of ongoing evolutionary processes (Fromonot & Desvigne 2020), on the other hand, greening is subject to man-driven functional and aesthetic artifice (Lassus 1981), where man-desired natural values are imposed and "nature cannot remain itself" (Morton 2007, p. 81). In this regard, a distinction shall be made between 'system' and 'standard' possibilities for cultivating these soil and subsoil samples, setting the ground at the center of man-nature relationship (EC 2000).

POST-EXTRACTIVE LANDSCAPES

In 1938, in his extensive book on the Sint-Pietersberg, van Schaïk talks about several entrances of underground quarries in the midst of the forest, still visible "despite [open-cut] limestone exploitation has been eating through the most beautiful part of the forest for a few years". The text refers to the Verloren Vallei, *where* the open-cut exploitation revealed to the surface the full height and depth of the underground galleries, creating "a particularly beautiful effect amid the green frame" (van Schaïk 1983, p. 102). This area with exposed underground passages is characterized by a specific kind of landscape defined in French as *erablaies-tillaies à scolopendre*, outlined by van Schaïk as "a particularly beautiful piece of (cultural) landscape" (van Schaïk 1983, p. 412).

Les grandes fenêtres in the Verloren Vallei.
The open-cut exploitation revealed to the surface the full height and depth of the underground galleries. Photo by Kevin Amendt, 2021.

Artificial lake and beach created during the first phase of re-naturalization of the ENCI-quarry. The affluence was so high that the project turned out to be unsustainable. Today, the site is no longer accessible. Photo by Kevin Amendt, 2017.

In this regard, cultural value is often attributed to the new vegetation covering the land, also referring to the land remodeled by English landscape gardeners in the 17th century (Repton 1800). Here, the cultural values are the experiences that people can still gain by walking through the site, without doing anything more: just to connect with the different states of the land, which is always changing.

While in the *Verloren Vallei* we can observe nature reclaiming its space wildly, partly precluding access to man, the decommissioning of the ENCI-quarry is accompanied by a man-driven transformation process, where exploitation of the territory has been 'green-covered.'

Indeed, if in the ENCI quarry, a vegetal colonization phenomenon known as 'primary succession' can be observed, we know that the results of this process are not entirely natural. In fact, the transformation of the slope into a chalk grassland was encouraged by its covering with limestone and an overlay of loss. Furthermore, "grass clippings from other chalk grasslands were laid out shortly after placement" (Majoor et al. 2020, p. 320). In addition to this, given the artificial ground level where a part of the area, a permanent mechanical water pumping system must be operated (Majoor et al. 2020, p. 321). Thus, the development process of this natural environment is entirely driven by man.

In this sense, the *Plan of transformatie* written in 2009 by the *Stichting Ontwikkelingsmaatschappij ENCI*, can be seen as the design concept for the composition of a *terrarium* defined within the former quarry area.

CONCLUSION

For both the underground and the surface landscape generated by centuries-old limestone quarrying in the Sint-Pietersberg, we may conclude that "a cultural product with a peculiar, almost perfect, aesthetic balance has been created unconsciously, unintentionally answering to the same laws that exist in nature." (Diederen 1982, p. 7).

This observation strongly connects our brief study to the principles of the European Landscape Convention (EC 2000), which calls for attention to the perception that is set between people and places. Hence, new relationships can slowly emerge from the care given to perception (not sight, not function). For this reason, the vegetation cover cannot be reduced to a technical layer cladding the surfaces exposed by previous operations. And it is not to be considered as a strategy of embellishment either, taking care of the visual aspect of the place, nor their economic values.

The *terrarium* thus acquires the meaning of giving time to accompany natural phenomena in their development, but also allowing the population to re-tame the places to give them a cultural meaning, a sense of belonging associated with man-made landscapes' evolution in time.

“Pyramids” in the ENCI-quarry.
The decommissioning of the ENCI-quarry is accompanied by a man-driven transformation process, where a specific and symbolic landscape is pre-defined. Photo by Chiara Caravello, 2023.

‘Sint-Pietersberg’ in Dutch or ‘Montagne Saint-Pierre’ in French.

Exploitation of the Sint-Pietersberg for the underground extraction of limestone began from the 13th century until the beginning of the 20th century, when open-cut quarries took hold and continued to the present day. Cfr. K. Amendt, *De afgraving van de Sint Pietersberg en een ingangspartij zuidelijk van Lichtenberg*, in “SOK Mededelingen”, 53, July 2010, pp. 22–47; J. Silvertant, *Caestert: een mijnbouwarcheologische erfgoedsite*, Scientific report of the Institute Europa Subterranea 3, Institute Europa Subterranea, Valkenburg aan de Geul 2010; D.C. van Schaik, *DE SINT PIETERSBERG. Met een aanvullend gedeelte van 1938-1983*, EF & EF b.v., Thorn 1983.

The Sint-Pietersberg is an area that lends itself to experimentation with different approaches, from conservative (respecting long-term natural processes) to interventionist (altering the natural rhythm to reach short-term goals). Facing these two positions, a living *terrarium* emerges as an experimenting field for landscape research, based on iterative in-situ actions.

While the shape of the underground galleries is directly determined by the mining technique employed and it remains stable over time due to the constant environmental conditions in the underground (excluding exceptional phenomena such as collapse or flooding of portions of the galleries), the spatial configuration of the landscape on the surface is determinedW both by the drastic marks left by open-cut extraction and by variable environmental conditions. In addition, the increased visibility of these landscapes draws higher public attention and a consequent greater need for redevelopment to ‘heal the open-cut wound’ and ‘return Earth to the people’.

The Dutch name ‘Verloren Vallei’ can literally be translated in English as ‘Lost Valley’.

Approx. 200 x 40 meter. Data according to measurements taken by the author on the Geoportal of Vlaanderen - Digitaal Hoogtemodel Vlaanderen II, multidirectionale hillshade 0,25 m. Available online at: https://www.geopunt.be/ [accessed 7 August 2023].

Approx. 1800 x 1300 meter. Data according to measurements taken by the author on the Geoportal of Vlaanderen - Digitaal Hoogtemodel Vlaanderen II, multidirectionale hillshade 0,25 m. Available online at: https://www.geopunt.be/ [accessed 7 August 2023].

The open-cut extraction stopped in 2018 (Majoor et al. 2020, p. 303).

Van Schaïk mentions in particular the entrance of Caestert, one of the most ancient underground quarries in the area along the border between Belgium and the Netherlands.

Author’s translation.

Author’s translation.

Among others, the largest and most majestic entrances to be seen today in the Verloren Vallei are known in French as *les grandes fenêtres* (literally: the big windows), probably because of both the fact that originally they were not entrances and due to their position halfway up the limestone outcrop.

We would like to thank Raphaël Magermans of the *Département de la Nature et des Forêts - Service public de Wallonie* for the information. Cfr. *G1.A41a - Erablaies-tillaies à scolopendre*, Portail Wallonie. http://biodiversite.wallonie.be/fr/g1-a41a-erablaies-tillaies-a-scolopendre.html?IDC=951 [accessed 7 August 2023].

Author’s translation.

According to the *Encyclopaedia Britannica*, primary succession is “the evolution of a biological community’s ecological structure) in which plants and animals first colonize a barren, lifeless habitat. Species that arrive first in the newly created environment are called pioneer species, and through their interactions they build a simple initial biological community.” Cfr. “Primary Succession | Definition, Stages, & Facts | Britannica.” https://www.britannica.com/science/primary-succession [accessed 19 July 2023].

This is a rare process that can only exist where fertile soil is lacking on the surface, for example due to a volcanic eruption or after the retreat of a glacier (Majoor et al. 2020, p. 306). Author’s translation.

Author’s translation.

Author’s translation.

Document without author reference available online at: https://www.enci.nl/nl/plan-van-transformatie [accessed 7 August 2023].

Note that the plan was defined nine years before the final closure of the ENCI open-cut quarry in 2018.

Author’s translation.

ABOVE THE ROOF. DESIGNING SECOND CHANCES

FRANCESCA ZANOTTO

Over the past few years, one of the means employed by architecture to demonstrate its concern for climate change and endangered nature has been the creation of indoor replicas of at-risk biotopes and habitats, often set up within white pavilions, vacant art museum spaces, and geodetic greenhouses[1].

These reproductions not only aim to raise awareness on the environmental crisis, but also suggest architecture may act as a protective ark, safeguarding these environments from the threats of destruction and loss caused by the impacts of the Anthropocene. However, as soon as nature is transformed into an object placed within the confines of a white box, its ecological value in terms of its ecosystemic relationships and its profound connection to our physical and psychological well-being and survival is lost, alongside with the awareness of the threats we face. As the traditional monument, according to Mumford, is the antithesis of renewal and evolution (Mumford 1938, pp. 433-440), and as Young argues, if we rely on monuments "to do our memory-work for us, we become that much more forgetful" (Young 1993, p. 5), in a similar vein, when nature is placed on a pedestal, enclosed behind glass, or accompanied by a tombstone-like caption, it becomes impossible to fully experience and embody with all the meaning we associate with and seek in the natural world.

"Homo urbanus," indeed, primarily relies on nature for leisure and as an escape from the pressures of urban lifestyle. While they find sustenance and their working environment in busy cities, they seek out nature for immersive experiences of relaxation, spiritual contemplation, learning, and physical excitement. From this perspective, climate change not only poses a threat to nature and ecosystems but also, along with the changes to the Earth's crust and extreme temperature variations, jeopardizes the feasibility of these experiences. Activities such as trips to the countryside, hiking, skiing, and swimming may become unviable or undergo radical transformations, as may do our current forms of interaction with natural environments where we currently perform these activities. We still lack a clear vision of how these experiences might adapt or change. Future scenarios of nature depicted in contemporary narratives portray the environment as devastated by climate change, our original sin; in such a world, there is no space for leisure and enjoyment.

For different reasons, our era is already familiar with the evolution of leisure activities in natural settings: humans have spread capsules worldwide, enclosing artificial environments with the aim of recreating specific natural scenarios, even in locations far from their natural occurrence.

2124: sea levels have risen, snow has melted.
CopenHill is the only mountain available for skiing.
Drawing by Francesca Zanotto, 2023.

Indoor ski slopes in the desert, indoor beaches, and tropical habitats in inland China or outside Berlin: these capsules are not designed to faithfully reproduce natural scenarios with the ambition of being realistic, but to make accessible the leisure activities that are performed in such scenarios.

Some contemporary architects are going beyond both of these mentioned approaches. In recent architectural projects, they transcend the intention of merely depicting and conserving nature "as it is," and they also avoid recreating natural scenarios for traditional forms of enjoyment of nature. Instead, they propose a deliberate distortion of nature, presenting an intentionally altered version of natural settings that expressly blend both natural and artificial elements. This gives rise to entirely new, fabricated natural landscapes where new leisure activities occur within augmented ecosystems, resilient or adapted to the radical transformations caused by climate change, finding their spark of innovation in what Michael Jakob recognizes as a "surplus" (Jakob 2022, p. 12), evident in the imitation of nature by large-scale artifacts that convey diverse messages.

Since its establishment in the early 1990s, the Dutch firm MVRDV has been investigating the relationship between architecture and landscape in an innovative and pragmatic manner. In a country literally reclaiming land from the sea to create its own territory, MVRDV's work has particularly focused on envisioning future scenarios enabled by "carrying density to extremes" (MVRDV, *FARMAX*, 2006). The building-manifesto for this research is the Netherlands Pavilion designed by the firm for Expo 2000 in Hanover. This pavilion stacked six artificial Dutch "typical" or "stereotypical" landscapes, offering a model to reduce land usage and demonstrating the feasibility of expanding existing surfaces: a dunescape, an oak forest, a tulip field, agricultural land, and a polder landscape, with wind turbines on the roof reaching toward the sky. The building's concept aimed to propose the possibility of manufacturing landscapes and replicating them endlessly, essentially presenting "a practical model for the reinvention of the world" (Liebs 2000). However, when reconsidered from the perspective of climate change, the pavilion represents an abstract solution to address future land requirements due to issues such as soil depletion and rising sea levels, proposing "adapted forms" of cultural fruition at the same time. In a 2006 statement, the firm prophetically described the pavilion as a "survival kit," attempting to find a solution for "a lack of light and land" (MVRDV 2006).

The approach of fabricating nature and landscapes, along with expanding the usable surface of the world through archi-

tecture, all while exploring new ways to use space, enjoy nature, and express in the spatial dimension, is a recurring theme in much of MVRDV's work. The Depot Boijmans Van Beuningen in Rotterdam, unveiled in 2021 and featuring a 'flying' forest on its rooftop, is no exception. The Depot returns a larger surface area to the Museumpark compared to the building's footprint, while offering an inflated experience of an urban park. Within this "surplus" of floor area created by design, the enjoyment of the park takes on new qualities, perspectives, and dimensions, potentially enabling new uses and rituals.

This concept reached an extreme with BIG's Amager Bakke waste-to-energy plant in Copenhagen. Here, trees grow on the sides of a synthetic ski slope, enduring Baltic winds and vapors emitted from the chimneys. This 85-meter-high structure forms Denmark's only "mountain," where design makes hiking, skiing, and climbing possible. The project introduces mountain culture to a flat country through innovative rituals and amenities such as ski rentals, ski lifts, and an Alpine-inspired wooden lodge. The man-made panorama for skiers and hikers offers views of Copenhagen's industrial landscape; beneath the ski slope a mountain of waste is incinerated to produce energy, underlining the connection between our consumption patterns and the transformation of our environment and the potential to craft nature through technological means. Known as CopenHill in English, the site provides a distorted mountain experience. While it may be less captivating than experiencing a "real" mountain, it "interpret(s) citizens' dreams" (Covatta 2018) and remains accessible in a context where such an experience was previously unavailable. Furthermore, given the ongoing impacts of global warming and the gradual decline of natural snow, CopenHill could serve as a preview of the potential future of winter sports and recreational activities.

Snøhetta stands out among architectural firms as actively envisioning future scenarios and reimagining public spaces, visual aesthetics, and spatial poetry within the context of climate change. They designed an expansion and visitor center for the Svalbard Global Seed Vault, recognizing the necessity of envisioning a potential future that embraces beauty, learning, and enjoyment for our imperiled natural world. They also designed Under, an underwater restaurant located near the town of Båly, which appears to have washed up on the Norwegian coast as a deliberate wreck, or "the latest architectural victim of coastal erosion" (Lloyd-Smith 2022).

The restaurant serves as a futuristic capsule, offering a glimpse of the potential dinner-with-a-view experience in an

era marked by rising sea levels. One of Snøhetta's prominent achievements is the Oslo Opera House, unveiled in 2010, which aimed to transform the perception of the Oslo waterfront. Often referred to as an iceberg, the defining feature of the structure is its distinctive "roof-façade," creating a "full public space" (Mikolajska, Haupt 2019, p. 6) that enables individuals to reconnect with the water, evoking the sensation of being on a beach. However, this space offers many activities beyond what a typical beach might provide:

> Parents push baby carriages to the top; tourists pull suitcases from the train station; swimmers, sunbathers, kayakers, and swans treat the western edge as a beach. Dog walking, Tai Chi, and sunset watching are popular. For a performance of 'Carmen' in 2009, the opera company showed a free simulcast on a large screen in front of the building, and some five thousand people spread picnic blankets on the roof to watch it (Owen 2013).

At the bottom, the roof of the Opera slides into the water and disappears, proposing a seashore adaptable to sea level rise, perceived as an urban park despite the lack of greenery, according to an approach frequently seen in contemporary urban design where "blue is green" (Dubinina, Wawrzyńska, Krośnicka 2022, p. 9).

The illustrated architectures establish hybrid environments, revealing the altered state of natural ecosystems⇓. Their purpose is not to freeze an idea of pristine nature at risk due to the effects of climate change but, otherwise, they activate and bear witness to a playful, non-alarmist relationship between humans and nature. These projects will preserve leisure rituals, even though the climate crisis may irreversibly alter them; furthermore, they serve as manifestos, envisioning future forms of leisure and open-air experiences. In a certain sense, they function as counter-monuments:⩚ rather than perpetuating the mourning of nature, they provocatively suggest fun as a strategy to celebrate it. In the present day, these architectures provide recreational spaces for the public to enjoy, where "new kinds of public engagement with energy and sustainability have the potential to emerge" (Kall, Ford, Schick 2021, p. 50).

Throughout their research on density, MVRDV has envisioned new spatial paradigms and experiences in dozens of their projects, endorsing the "compact city," where maximum density also means achieving maximum functions, and typological innovation fosters new uses and urban experiences. This paradigm extends to the integration of nature and biodiversity into the dense urban environment where, despite their love for their urban house,

"homo urbanus seeks the excitement of the unknown and needs a certain degree of anarchy to stimulate him" (Pozo Gil 2013, p. 54). In alignment with this conviction, architect Marta Pozo Gil, formerly the Sustainability leader at MVRDV, raises the question: "Can the combination of city and wilderness bring together the rational and the unpredictable for the stimulation of people? "(Pozo Gil 2013, p. 54).

Nature can, therefore, become an integral element in the project, bringing innovation to design and urban experiences while challenging traditional approaches to outdoor activities:

> The old idea of splitting rural and urban ecologies is not attractive in either environmental or social terms. The challenge of providing lodging for people, animals, and plants can lead to innovative and enriching spaces and experiences. However, this requires shifting the points of reference where current urban and architectural patterns would be neither applicable nor desirable. Overturning concepts are not easily acceptable, but smartly brought into practice can renew urban reality and go beyond its current repletion (Pozo Gil 2013, pp. 54-55).

The Netherlands Pavilion in Hanover managed to extend this new urban reality even after its decommissioning: "Thousands of birds started to inhabit the vacant structure. [...] Partyseekers started to use the forest. It became a real park so to say" (MVRDV, *Expo 2000*, 2006). CopenHill waste-to-energy plant/ski slope, perfectly embodies BIG's "yes-ideology" (Bjarke Ingels Group 2009, pp. 391-395), a disruptive concept capable of fundamentally transforming our expectations for urban spaces and the potential uses and experiences we can envision in nature: architecture should say 'yes!' to all the demands of a project, all the desires and needs of the client, politicians, the public, and thus should accommodate any unforeseen function that the consumerist generation may imagine, such as skiing on a waste treatment plant. With a lower profile, the roof of the Oslo Opera House facilitates a broader range of activities than a natural beach, ready to adapt and evolve in response to rising sea levels. In the words of Kjetil Thorsen, co-founder of Snøhetta, it enables people to "experience certain things they hadn't experienced before. I think that's interesting in architecture—to generate new situations" (Owen 2013). Clearly, these desires, needs, new urban realities, and new situations find a prominent stage: the roof. In the examples examined, roofs have few or no programmatic connections with what occurs below, as they were in the middle of two overlapped yet distinct worlds, as climbing onto them means crossing a threshold into a new realm.

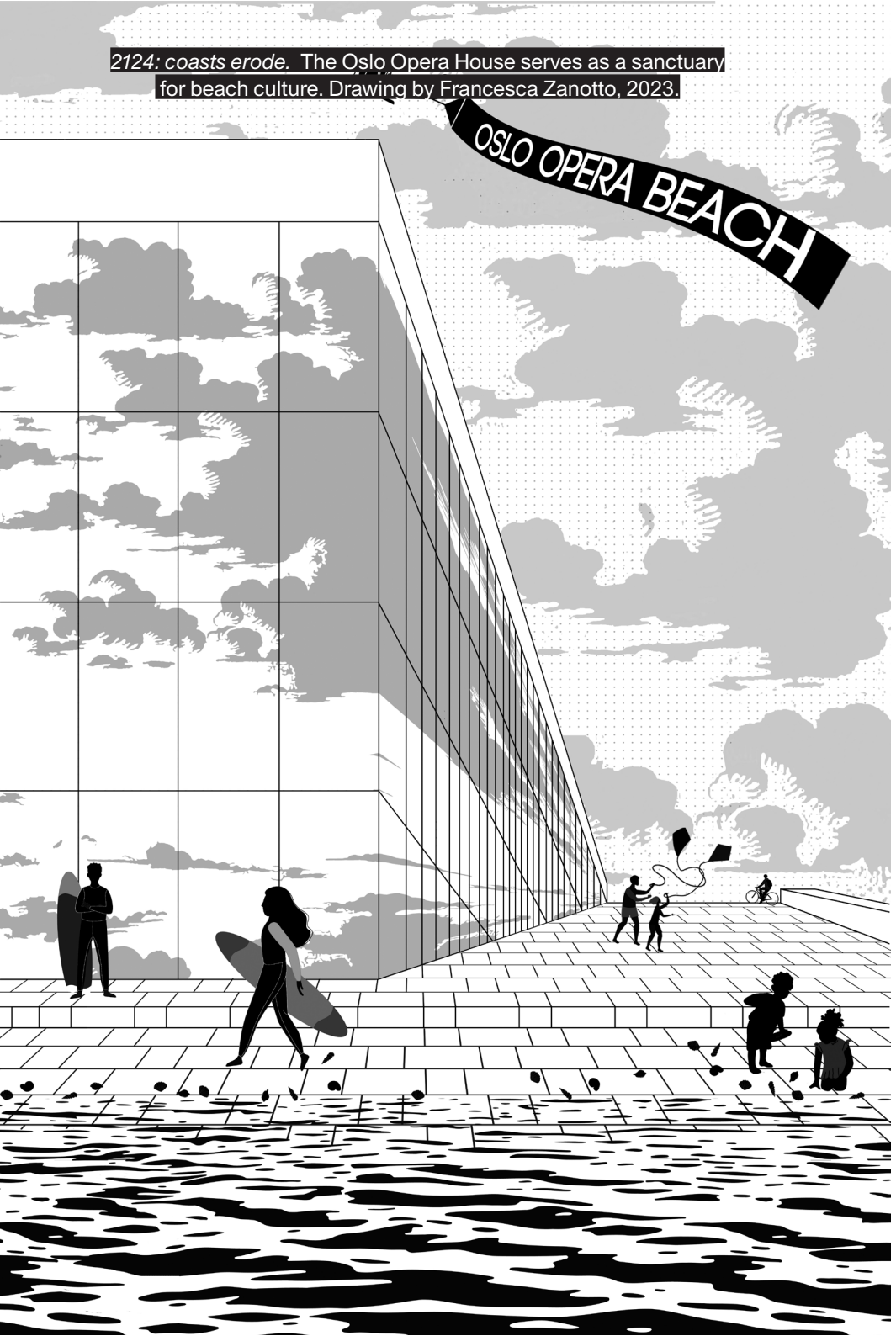
2124: the Earth is a continuous, dense city. A stack of lost Dutch landscapes can be enjoyed at the Expo 2000 Pavilion in Hanover. Drawing by Francesca Zanotto, 2023.

MVRDV has spent over three decades expanding the vertical dimension of architecture, populating roofs, crowns, and attics with structures like parasites, stairs, and lifts, and elevating people as high in the city as possible [1].

Much like green roofs, which have, for years, provided a space to compensate for the ground space occupied, roofs in contemporary architectural designs provide a second chance, an alternative terrain to enjoy nature and create a new world, a new soil overlapping with the one compromised at ground level. The 1909 theorem in form of a cartoon published by Life magazine and referenced in Koolhaas' *Delirious New York* portrayed the skyscraper as a "utopian device for the production of unlimited numbers of virgin sites on a single metropolitan location" (Koolhaas 1978, p. 69), a range of social aspirations and lifestyles, multiplying the surface area of the original plot potentially infinitely, creating inhabitable space where there once was none. Contemporary architecture has already demonstrated that we can generate space seemingly out of thin air; it now strives to elevate the ground level several meters higher, essentially starting anew from clean slate. The base, the ground floor, the relationship with the ground is no longer the central focus; level 0 will be submerged as temperatures rise, becoming an unhealthy, invisible, and undesirable realm in the dense urban landscape. All attention and the opportunities offered by architecture now extend above the roof, marking the dawn of an age of "sky consumption."

The portrayal of new activities and realities above the roofs appears to be approached, both in the design process and its narrative, through a language that is already well-established in contemporary architectural discourse but takes on new significance in the context of climate change: humor and irony. Both BIG and MVRDV are part of a wave of firms adopting a "populist" (Zaera-Polo 2016, p. 263) approach in their architectural storytelling. This approach exhibits a "comic-book-like directness, [...] a sort of caricature of the design process" (Zaera-Polo 2016, p. 263) conveyed through diagrams, the distortion of generic forms, comical exaggerations, and a return to a recognizable architectural vocabulary, facilitating strong and easily communicated associations. This language is accessible and playfully challenges Modernist architectural conventions, evolving from post-modernist irony as the emphasis shifts towards responding to daunting scenarios of climate change and the "modest" lifestyle required to conserve resources and reverse consumption patterns, all approached with a lighthearted and hopeful attitude.

While MVRDV adopts a subtle approach, engaging in "comical" (Wainwright 2021) design processes that involve replicating objects, rotating buildings vertically by 90 degrees, and designing "spaces that make you smile" (MVRDV 2023) to make the public realm "no longer boring" (MVRDV 2023), BIG developed the concept of "hedonistic sustainability" (Bjarke Ingels Group 2009, p. 50). According to BIG, sustainability, or an environmentally aware lifestyle, "isn't pain – but pleasure!" (Bjarke Ingels Group 2009, p. 34). Embracing climate change awareness does not mean enduring sacrifices or downgrading life quality, but making life even more enjoyable than the alternative, without adhering to the notion of a "modest and humble lifestyle" (Kall, Ford, Schick 2021, p. 52) that may be perceived as necessary to slow down – or expiate? – climate change. This joyful and optimistic approach appears to align with Pier Vittorio Aureli's viewpoint: in the face of the "design rhetoric on sustainability [...] based on the dilemma between survival or extinction" the architectural culture "is forcefully invited to do something, to be responsible, to find a solution. In other words, the rhetoric of sustainability eliminates any possibility of a negative response a priori. Within such rhetoric we are condemned to optimism" (Aureli 2013, p. 125). This necessary optimism thus finds expression on the clean slate of architecture's roofs, akin to a *tabula rasa*: "we are no longer expected to do something; rather, we should make room, we should create the space for something else to happen" (Aureli 2013, p. 126). Following these lines of thought, Snøhetta does not rely on an explicitly fun or ironic narrative, at least not always. Their visionary depictions of the future, whether near or distant, contrast with the dramatic scenarios we are used to confront in contemporary narrations of climate change. With a "quiet optimism," they dare to design the space for imagining a transformed world, a changed nature where joy, beauty and poetry remain possible.



2124: coasts erode. The Oslo Opera House serves as a sanctuary for beach culture. Drawing by Francesca Zanotto, 2023.

ᚼ See, for example, the recreation of the indigenous grassland inside Australia's Venice Architecture Biennale pavilion in 2018 by Baracco+Wright Architects; the rooms of Louisiana Museum of Modern Art in Copenhagen filled by an ancestral rocky landscape by Olafur Eliasson in 2014; the indoor forest at Singapore's Changi Airport enclosed in a steel and glass 'donut" structure designed by Safdie Architects in 2014.

ᛟ See, for example, the work by Austrian photographer Reiner Riedler: R. Riedler, *Fake Holidays*, Moser, Munich 2009.

ᛇ See, for example, the studies on microplastics and their pervasive presence in different ecosystems: X. Lim, X., *Microplastics are everywhere — But are they harmful?*, in "Nature", 593, 2021, pp. 22-25.

ᚾ Counter-monumentaslim has been firstly defined by Californian English and Judaic & Near Eastern Studies scholar James E. Young. See, among others: J.E. Young, *The Counter-monument: Memory against Itself in Germany Today*, in "Critical Inquiry", 18, 1992, pp. 267-296; and, already referred in the text, J.E. Young, *The Texture of Memory: Holocaust Memorials and Meaning*, Yale University Press, New Haven 1993.

ᛚ See, among the others: Didden Village, Rotterdam, 2006; Anyang Peak, Anyang, 2006; Galije Resort, Budva, 2009; Maquinnext, Barcelona, 2012; The Couch, Amsterdam, 2013; The Stairs to Kriterion, Rotterdam 2016; The Podium, Rotterdam, 2022; Rotterdam City Walk, Rotterdam, 2022; Tainan Market, Taiwan, 2022. (Joor et al. 2020, p. 303).

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ABOVE THE ROOF. DESIGNING SECOND CHANCES
FRANCESCA ZANOTTO

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BIOGRAPHIES

HASSAN AHMED

Hassan (Beybe) Ahmed is a Maldivian environmentalist and coral scientist. In 2007, he founded the NGO “Save the Beach Maldives”. Since then, he is fighting for an ecologically sustainable development of the country, involving local communities and schools. In 2014 he started his first coral restoration project. He led projects on different islands and organised the very first coral relocation in the Maldives (2016). He believes that only through information and knowledge the community will be able to protect and preserve its natural heritage. His aim is to grow back entire reefs and restore their ecological role lost due to climate change and coastal development.

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Kevin Amendt is an independent researcher engaged in the study of underground quarries, their role in today’s landscape and their preservation. Member of the “Studiegroep Onderaardse Kalksteengroeven”, “vzw Hulpdienst Groeven” and founder of “Onderzoeksbureau MGL”, he advises public and other organisations in the border region Liège (BE) - Limburg (NL/BE).

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Born in Rome in 1997, curious explorer and patient creative, third of four children. After classical high school, she enriched her university course with two years abroad, practicing drawing at FAUP in Porto and ecology at ENSP in Versailles-Marseille, and on-site internships with Wagon-Landscaping and the Botanical Garden of Rome. In 2023, she graduated with honors in Architecture - Urban Design at Roma Tre, guided by A. Metta, presenting with C. Condemi Maglia Boscata, a landscape architecture thesis on the material and immaterial, microscopic and cosmic geographies of the Magliana Stream.

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Annalisa Azzola is a marine ecologist and research fellow at University of Genoa. She finished her PhD in Marine Science and Technologies in 2023. Her research topics include characterization, monitoring, and assessment of the ecological status and change over time of coastal ecosystems. Part of her research also focuses on assessing local and global anthropogenic impacts. Her studies are based on scientific diving techniques, including visual field surveys and photographic sampling.

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Beatrice Azzola is an architect and academic researcher. She worked in several architecture firms in Italy, Portugal and Switzerland. In 2021 she started her PhD on Italian highway architecture and landscape. She also works on the disciplinary interferences between architecture and ecology.

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Thomas Cabai is an Italian architect and Ph.D. candidate at the Department of Architecture and Urban Studies (DAStU) at Politecnico di Milano, where he is also a teaching assistant in the Landscape and Infrastructure Design Studio. His main research interest lies within the relationship between ecology and built environment in anthropic territories. He is part of the National Biodiversity Future Center and is currently working on several projects of Restoration Ecology and Phytoremediation in the Metropolitan City of Milan, Tuscany and Friuli Venezia Giulia.

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Chiara Caravello is a PhD candidate in architecture in a double programme between the University of Liège (BE) and Politecnico di Milano (IT). Awarded with a FNRS fellowship, she is carrying out her research on underground quarries in the cross-border area of the ‘Three Countries Park’ in the Euregio Meuse-Rhine (BE-NL-DE).

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Architect and researcher, Giulia Cazzaniga holds a PhD in Landscape and Environment from Sapienza Università di Roma. Her research focuses on the impact of representation on the perception of landscape and its influence on the design of future transformations. Recently, she has applied this reflection to the River Po basin. She is part of the research team financed by Enel Green Power focusing on the decommissioning of solar power plants and she is currently a research fellow at the Politecnico di Milano where she teaches Landscape Architecture design.

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Amina Chouairi is a PhD student in Urbanism at Università Iuav di Venezia and holds a Master of Science in Landscape Architecture from Delft University of Technology. Since 2019, she has been researching and working on the Venetian Lagoon complex transitional territory, exploring the debated relations among its cultures and natures. Crucial for her is the understanding of the agency of the barene landscape - the brackish marshes, i.e. the ignition point from which to rethink the Venice-in-a-lagoon system.

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Felice Cimatti teaches “Semiotica e teoria dei linguaggi” at the ‘Università della Calabria.

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Pietro Consolandi is a researcher and artist based in Venice, where he co-founded the Barena Bianca collective in 2018. He is a research fellow at THE NEW INSTITUTE Centre for Environmental Humanities (NICHE), Ca’ Foscari University, inquiring about the possibility to implement the Rights of Nature in the Venetian Lagoon from a cultural point of view. He also collaborates with art and ecology foundation TBA21–Academy since 2020, where he develops various collaborative didactic initiatives as OCEAN / UNI Research Lead.

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Saskia de Wit is landscape architect and assistant professor at the Section of Landscape Architecture, Delft University of Technology. She designs gardens and landscapes at her office Saskia de Wit tuin en landschap. Her research focuses on the garden as a core concept of the field of landscape architecture: the concept of the garden is used as a lens for further research into site-specificity, the sensory perception of place, urban landscapes, leftover spaces and urban forestry.

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Damiano Di Mele, architect, PhD candidate at the Sapienza University of Rome in international co-tutorship with the Universidad Politécnica de Madrid (UPM). Graduated cum laude from the Iuav University of Venice after a period of training in Spain. His current research is focused on the analysis of themes related to the history and criticism of contemporary Spanish architecture in the relationship between figurativeness and structure. He participates in research activities in the GIPC group (Grupo de Investigación en Paisaje Cultural) at the Proyectos Arquitectónicos department of the Escuela Técnica Superior de Arquitectura de Madrid (ETSAM), where he has been a visiting doctoral researcher since 2022.

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Sara Favargiotti is Associate Professor at the University of Trento, DICAM. Her research investigates the multiple identities of landscapes through applied research at different scales, focusing on fragile territories, emerging infrastructure, adaptive dynamics and regenerative design. Local coordinator of project B4R. Branding for Resilience (PRIN, 2020-2024), member of the Directive Board of IASLA (since 2018), she is co-founder and scientific advisor of the innovative startup RUMA S.r.l. SB.

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Marco Ferrari is a researcher at the University of Trento, DICAM and adjunct Professor of Architectural Design Theory at the University of Ferrara. He is project leader of PaesaggiForti project and partner and co-founder of the artistic duo AIDEL. He is particularly interested in contemporary architectural and landscape theory and in revealing the relationship between bodies, ecologies and space, questioning concepts of domesticity and intimacy in both living environments and landscape.

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Andrea Foppiani is a PhD candidate in Architectural, Urban, and Interior Design from the DAStU department at Politecnico di Milano, where he graduated with honors in Sustainable Architecture and Landscape Design. His research focuses on post-logistics landscapes in the Po Valley, working through more-than-human ecologies to explore future hybrid scenarios. He is an academic tutor in design studios and is part of the Landscape Of[f] Limits International Workshop’s organization team.

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Hermano Luz is a designer from Brazil and a PhD researcher in Creative Technologies at the University of Galway. He received a Master's in Design Studies degree from the Harvard Graduate School of Design, where he was a curator of the GSD Kirkland Gallery. He has exhibited and published internationally as an artist and contributed to several technological art projects. In his practice, he mixes iconic cultural heritage with contemporary digital media to inspire participatory creative practices.

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Silvia Mundula is a PhD candidate at the Politecnico di Milano and a garden designer. After completing her Master's degree in Architecture in Milan, she gained a Master's degree in History and Critical Thinking at the Architectural Association in London, where she developed her interest in the theory of gardens. Her research investigates the cultural principles and the design outcomes of contemporary wild oriented planting design in Europe.

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Valentina Noce is an architect and researcher based in Milan (Italy). She is the founder of architectural office Sabotage Practice. She is completing a PhD in Architecture Interior and Urban Design at Politecnico di Milano, where she's also collaborating in teaching activities. Bridging the realms of architectural practice and academic research, her work delves into the intersections between space and technology.

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Irene Pancrazi is a marine biologist specialising in tropical environments and their restoration. In 2016 she started to work for the NGO "Save the Beach Maldives", after witnessing a bleaching event in the Maldives and feeing the urge to take action. Since then, she was in charge of the set-up and the research protocol of various coral restoration projects. She collaborates with various Italian universities, tutoring students and supporting scientific research. Today she is one of the project managers at the NGO and shares the same dream as its founder: to grow back the whole reef and see it thrive.

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Mariana Pereira Guimarães is an architect-engineer from Brazil and PhD Candidate in Politécnico di Milano's Architecture, Urban and Interior Design program. Mariana was a Marie-Curie EID-ITN research fellow within the SOLOCLIM programme (ID 861119) studying innovative outdoor water-cooling solutions such as fountains and water mists that can respond to extreme urban heat. She received a Master's in Urban Planning and Public Health from Harvard University focused on Human Health and Sustainability.

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Besides he is a Research Consultant at the Brookfield Sustainability Institute in Toronto and contributor in DOMUSweb.

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Sara Anna Sapone is an Architect, Ph.D. candidate and Research Fellow at Politecnico di Milano. Here she was involved in teaching and research activities, such as the program G124 promoted by Renzo Piano on italian peripheries. Meanwhile, she worked in Milan-based architecture firms, addressing urban renewal and architectural design. Since 2020, she's developing her doctoral research " Precision Wildland" within the AUID program at PoliMi and a research stay at the Landscape architecture section of TU Delft, funded by the Idea League Grant.

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Gerardo Semprebon, PhD architect, is Assistant Professor in architectural and urban design at the Department of Architecture and Urban Studies (DAStU) of the Politecnico di Milano. Holder of two Ph.D. titles, SJTU + PoliMi, in 2019, he has been a visiting scholar at the BUCEA. The core topic of his research covers architectural strategies of revitalization in complex settlement systems, with specific focuses on Chinese and Italian cities and territories.

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Chiara Toscani is an architect, educator and researcher based in London. She is currently a PhD candidate at the AA School in London in History and Critical Thinking in Architecture. She got her first PhD in Architectural and Urban Design at the Politecnico di Milano and was awarded a postdoctoral research fellow in 2010. She taught urban and architectural design at the Politecnico di Milano, tutored at AA Summer School and Ravensbourne University. Author of essays and books. For a decade, she worked as a senior architect at Cino Zucchi Architetti.

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In the same serie

Sara Marini (a cura di), *Nella selva. XII tesi*, 2021.

Sara Marini, Vincenzo Moschetti (a cura di), *Sylva. Città, nature, avamposti*, 2021.

Alberto Bertagna, Massimiliano Giberti (a cura di), *Selve in città*, 2022.

Sara Marini, Vincenzo Moschetti (a cura di), *Isolario Venezia Sylva*, 2022.

Jacopo Leveratto, Alessandro Rocca (a cura di), *Erbario. Una guida del selvatico a Milano*, 2022.

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