

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[¶].

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*,² 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 fate³. 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^Λ.

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^Λ

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 in-

frastructures 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 mouvement* (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 ¹.

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.



THE INFRASTRUCTURAL TERRARIUM AS A TEST BED FOR THE FUTURE

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 $\uparrow \downarrow$ and the new consequences of plant pests and diseases $\uparrow \downarrow$. 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-Agua, 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. Bebbler, *Climate change and plant pathogens*, in "Current Opinion in Microbiology", 70, 2022.