

Heaving Concrete: Conversations Between Urban Trees and Sidewalks

Aaron Bradshaw

In Naples, Italy, a trunk penetrates the ground, its claw-like base levering the heavyset sidewalk curbstone out of alignment. In London, a tree rises from the paved earth, heaving concrete slabs upwards in a prolonged inhalation. Urban trees push, pull and tug against their concretized confinement, rendering the solid membrane of the city porous and permeable. The tree in the first image below appears to act almost purposefully, using rationally planned urban form as a fulcrum to leverage its own unruly strength. Through the profusion of their root networks, trees probe the vulnerabilities of their physical landscapes – and the social, political and technical indices of the latter’s construction – and emerge as persistent coauthors of the urban topography. Paying attention to street trees and their encounters with anthropogenic surfaces raises questions about how best to live with other-than-human agents in urban environments that have classically been thought of as human spaces. The laborious passage of roots through solid surfaces acts aesthetically to draw out easily overlooked registers of the city, such as subsurface materials, flows and different scales of urban ecology. Tree–infrastructure encounters also unfold in the context of shifting imaginaries

and discourses surrounding urban nature, and foreground a series of tensions in conceptualizations of urban nature's independent agency and its role in changing climates. Bringing these aspects together might be generative for reframing how we think about concrete and its ecological registers.



In London, street trees were not systematically planted by the municipality until the mid- to late 1800s; before this, they had been confined to formal parks and gardens. Such tree planting was part of a programme of urban beautification and a response to growing issues of industrialization, pollution and health concerns (Roman and Eisenman 2022). During the early phases of street tree planting in London, sidewalks and roads were commonly assembled from wooden blocks. Later, and particularly following the rebuilding of London following the two world wars, tarmacadam, asphalt and concrete were favoured (Winter 1993: 38; Renier 2012). Concrete enclosure represents a relatively recent phase in the life-history of urban trees, opening up a series of new ecological interactions. Due to their low surface permeability, materials like concrete and asphalt force tree roots to radiate farther from the trunk in order to access water from more readily infiltrated areas. Roots may also gravitate towards subterranean infrastructures such as leaking pipes, sewers and hidden rivers. The ever-extending roots exert forces on the surface above them, leading to heaving and cracking. The localized uptake of water also produces imbalances in the moisture distribution of the soil, causing it to shrink and swell, further stressing the surface above it (British Geological Survey n.d.). The formation of cracks subsequently increases local rates of infiltration, causing more swelling and structural disturbance and setting up a process typical of positive feedback: as one crack forms, it becomes easier for newer ones to do so.

← *A tree leverages a curbstone out of alignment, Naples, Italy.*
Photo: Aaron Bradshaw, 2023.

→ *Concrete slabs swell upwards at the base of a growing tree, London.*
Photo: Aaron Bradshaw, 2023.



The roots of a London plane tree crack an adjacent wall (left) after meandering below the paved sidewalk (right).

Photos: Aaron Bradshaw, 2023.



A curb is removed to make space for an expanding tree, London.

Photo: Aaron Bradshaw, 2023.

As I walked through the residential streets of Hackney in East London, I observed many trees, some up to eighty years old,¹ breaking through paved surfaces, cracking walls and lifting curbstones. This heaving, cracking and splitting is the result of a complex interplay between biological tropisms, pedological properties and sociotechnical interventions. The action of roots growing in confined spaces and dense environments brings the surface layers of asphalt, tarmac and concrete into conversation with the deeper layers of ground below – clay, silt, sand and a variety of urban technosols. Through attention to these fissures, uneven surfaces and crevices, we can follow not

¹ See the London Street Tree map at <https://apps.london.gov.uk/street-trees/>

only the pathways of root growth beneath the surface of a road, but also attune to the properties of subsurface materials, subterranean gradients of water and nutrients, and a compressed history of freezing, thawing, shrinking and swelling. When sidewalk upheavals are repaired, often through improvised sealing with asphalt or pebbledash resin, this erasure leaves its own scar. Interventions into various subsurface utility infrastructures – such as (waste)water, gas, electricity – leave other distinctive marks on the paved surface that articulate with root-induced fissures to produce a material patchwork. Through the intermingling of dendrological, concrete and human agency, these surfaces become a *medium* upon which the machinations of the subsurface are registered, and where we can witness a translated map of the world below.²

² See Schuppli 2020.

As root networks interact with the various hard materials out of which cities are constructed, the results also index social divisions in urban mobility: roads are often made from tarmac, which is relatively plastic and therefore accommodating to extending roots. The concrete slabs out of which sidewalks are assembled, on the other hand, are brittle and have many joining edges, resulting in large displacements and upheavals that impact both bipedal and wheeled locomotion. The differing effects of tree roots on these substances echo the privileging of certain mobilities over others in cities and mark divisions between different infrastructural publics. For instance, as tree growth may impact sidewalks more destructively than it does roads, the former also gathers less investment for repair (Gibson and Marshall 2022). These tensions are further complicated by the growing awareness that, in North American cities at least, tree-canopy coverage (or lack thereof) strongly correlates with socioeconomic inequalities and systemic oppression; urban forests tend to be concentrated in more affluent

← Concrete paving stones are replaced with pebbledash in a neat repair, London.

Photo: Aaron Bradshaw, 2023.

→ A pavement scarred by many repairs and root cracks. The original pavement is visible at the top of the image, London.

Photo: Aaron Bradshaw, 2023.



neighbourhoods and less so in poorer and racialized areas (Schwarz et al. 2015). As they pass through and uproot urban architecture, root networks mark out a series of sociopolitical, material and ecological strata across multiscale geographies.

In this respect, urban forests are increasingly framed as critical infrastructures, offering ecosystem services and nature-based solutions. This framing is typical of resilience discourse that marks a shift in the scientific and political apprehension of urban trees; an aestheticized and ornamental view of urban nature is replaced by a utilitarian framework in which trees are enrolled for their beneficial effects on human lives. Through their ability to counter the urban heat island effect, filter pollution, retain water and provide habitats for other organisms, street trees are further coopted as dampeners of erratic environmental change. On the one hand, this can be seen as productive for getting more nature into our cities and (possibly) for protecting that which is already there. On the other, by focusing on specific quantifiable parameters (such as carbon capture), resilience discourses enact an operationalization and depoliticization of arboreal agency. This risks devaluing certain forms of other-than-human life in urban contexts and disregarding the unquantifiable meanings of different trees to certain people. Resilience discourse further embodies contradictions whereby the self-organizing properties of (urban) nature are seen to both secure *and* undermine life (Meriläinen 2020). The radiation of root networks is an emergent property of trees' own resilience, yet their encounters with the urban infrastructures have the potential to disrupt certain mobilities and are often framed as a conflict.

Miniature ecosystems form in the cracked surfaces around trees, London.

Photos: Aaron Bradshaw, 2023.



As resilience discourses fail to grapple with the entangled and indeterminate trajectories of urban nature, the lives of trees are gaining a new appreciation in the cultural imaginary. One particularly provocative image is that of underground mycorrhizal networks that link trees together and facilitate the exchange of nutrients and chemical signals (Karst et al. 2023). In the context of city trees encased in concrete, mycelial imaginaries might be seen as an allegorical solution to the image of urban ecosystems as cut off, separated and fragmentary (Watson 2016). Yet, as Matthew Gandy (in Sholis 2023) comments, responding to the technocratic and sterile modernism that concrete often evokes, “the surfaces of concrete support complex constellations of algae, bacteria, and other microorganisms.” Microbial agency may enact its own erosion of concrete, creating crevices and proto-soils in which seeds colonize and germinate (May 2003; Gaylarde and Baptista-Neto 2021). These reciprocal effects foster above-ground connectivity between various organisms in the city, thereby linking different scales of ecology together as they draw on concrete as a generative substrate.

Trees inhabit urban space in their own manner and their slow, meandering mobilities mark out specific ways of urban knowing and becoming. By teasing out the literal permeability of the city, urban trees challenge modernist ontologies that split culture from nature and which view the city as a space controlled primarily by human agency. Recognizing the agency of trees faced with concrete points to the limits to human agency in separating out the entangled and indeterminate facets of dendrological lives. In a wider context, this also means recognizing our own entanglement with, and reliance upon, the other-than-human world.

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