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Concrete:
An Introduction

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As a journal dedicated to the critical study of infrastructure, *Roadsides* consistently interrogates the mediums by which humans attempt to shape their environments and manage the connections between and among human and nonhuman systems. Understanding infrastructure in this broad sense, we are compelled to reckon with concrete, the second-most widely used substance in the world by volume, surpassed only by water. On a molecular level, concrete is created through a chemical reaction triggered by water, which binds its constituent components – cement and aggregate – into a solid material of varied, but generally extremely high levels of compressive strength and durability. While it can be adapted to diverse specifications and needs, the making of any concrete structure necessitates the contribution of labor, capital, processed and raw materials, energy and planning (Harkness, Simonetti and Winter 2015; Choplin 2023). Implicit in this understanding is that the chemical genesis of concrete represents merely one moment within the extensive geographies and temporalities associated with this material. Looking backward and forward from concrete's chemical transformation, we can discern a vast network of connections and implications.

Though it has been used for millennia, concrete gained prominence as a modern material thanks to its extensive application in the construction industry over the twentieth century (Forty 2012; Oleson et. al. 2014). As a substance that offers ideational promises of modernity, development and nation-building, concrete has long been deployed by state authorities and industrialists, who highlight its potential to improve quality of life and to transform societies. At the same time, its widespread informal use by self-builders in poor regions around the world adds another facet to its association with the 'modern'. The geographical scope of concrete usage has also grown immensely over time, replacing other local building materials as it becomes favored in new places. In a most basic sense, then, the widespread adoption of concrete is tied to the creation of a more flexible (read: cheaper) labor force than the specialized craftsman-led trades that dominated construction in earlier times. As a result, the growing use of concrete is inextricable from the expansion of cities, industry and what more broadly gets referred to as 'modern development' in its various guises (Gandy 2003; Campanella 2008). We can scarcely imagine the contemporary built environment without concrete.

Recent scholarship has challenged longstanding explanations that attribute the emergence of new building materials to the march of progress. Adrian Forty's (2012) examination of the cultural histories of concrete, for example, sheds light on the diverse usages and interpretations of the material in different spaces and times. While concrete has been a symbol of modernization under capitalist and socialist regimes and has featured prominently in the construction of iconic modern architecture and infrastructures, it is also intertwined with the failures of certain political projects and the consequences that emerge therefrom (Pétursdóttir 2013; Arboleda 2017; González-Ruibal 2017; Bennett 2021; Littlejohn 2021).

Ethnographic studies of concrete in different settings capture how such a mundane material in infrastructural construction achieves a significance that stretches from the everyday to the geopolitical (Abourahme 2014; Elinoff 2017, 2019; Zeeve 2019; Choplin 2020; Schwenkel 2020; Menon 2022). Some of these works are informed by a burgeoning subfield known as 'new materialism', which argues that matter has a life force of its own and hence its performance does not always correspond with human intentions (Bennett 2010). The material agency of concrete and its inherently temporal nature are exemplified in Penny Harvey and Hannah Knox's (2010) study of concrete road construction and state-building in Peru. Despite its presumed association with stability, durability and strength, the concrete used there in paving roads – which naturally aimed to bolster connectivity – tended often to break up; this led not only to physical hazards but also caused significant damage to the legitimacy and public image of the governments sponsoring these projects. The decay of poorly maintained concrete structures has, in fact, been linked symbolically to various kinds of social and political erosion in contexts as diverse as Sikkim (McDuie-Ra and Chettri 2020) and Italy (Arboleda 2017). Finally, concrete figures centrally in the problem of climate change due to the enormous, embodied carbon content tied to the production of cement, its key ingredient. Attempts to deploy alternatives, such as "aircrete" (Degani 2020), may bear fruit in the coming decades; but for now, concrete remains the dominant source material of the built environment.

Ultimately, the burgeoning critical literature addressing concrete alerts us to its vitality as a complex symbolic referent and as a material medium connected to a spectrum of social and environmental processes. All of these aspects are dense with contradictions and possibilities, and all of them are tied to vast geographies, intertwined infrastructures and varied histories. Building on insights derived from the scholarship outlined above, contributions to this edited collection consider the potency of concrete and its social, technical, ecological and political entanglements in a variety of contexts. These dynamics are explored in Matthew Gandy's essay, which looks at four ways of understanding concrete through the analytical lens of urban political ecology to extend insights gleaned through concrete to a variety of scientific and cultural developments. Moving on to the discussion of concrete's ecologies, the next two contributions – by Susanne Trumpf and Aaron Bradshaw, respectively – describe the unseen encounters between concrete and other nonhuman agents, including soil and trees, to make the case that cementitious surfaces must be seen as part and parcel of the living environment and urban biosphere. The liveliness of concrete is further delineated in Lukas Ley's article, which features recent experiments with 'ecological concrete' that enhances marine habitats, allowing the construction of port infrastructures to align with discourses of sustainable development.

Concrete sub-dam, Plover Cove Reservoir, Hong Kong.
Photo: Natalia Echeverri, 2020.

Although concrete is a prominent feature in numerous state-led modernization and infrastructural development programs, its usage has been adapted by local communities on their own terms. In his study of the soil-cement brick technology used in workers' housing in Taiwan and supported by overseas development assistance from the United States, Yu-Han Huang illustrates how the program's eventual failure was inseparable from the materiality and normative assumptions of what is modern amongst targeted beneficiaries. Turning to the context of northern Vietnam, Jean Michaud and Sarah

Turner detail how concrete has been selectively adopted by Hmong households in order to maintain cultural conventions amidst ongoing state efforts to modernize rural areas. The conflicts between different agencies in shaping concrete infrastructure are explored in Natalia Echeverri's photo-essay, which documents the remaking of the lush valleys of Hong Kong's Lantau Island through a set of stunning images, revealing the formal and informal interventions in the landscape that continue to transform their concrete constructions at different scales.

The next three contributions reflect on the political and social roles of concrete in shaping the production of urban space and economies. In his study of the Lafarge cement plant in Casablanca, Daniel Williford traces how concrete in Morocco followed a trajectory from an instrument of colonial rule to a central node within postcolonial imaginaries of autonomy. In a different context, Pierre Wenzel considers how vernacular concrete construction in contemporary Senegal is heavily mediated by new social-media technologies. The malleability of concrete in such instances is harnessed by non-professional designers who collectively inscribe urban landscapes with expansive spaces of poured concrete that inter-reference images of concrete cityscapes around the world. Focusing on the Abidjan and Lagos corridor in West Africa, Armelle Choplin uncovers how concrete is seized upon locally as the material of choice across a spectrum of construction projects – to the point that a regional concrete-scape is taking form. Referring to recent building experiments that promote local knowhow and the use of alternative materials, the essay ends by contemplating the potential role of African cities in enacting more sustainable urban futures.

The final photo-essay by Eli Elinoff seeks to unsettle the boundaries between the city and the countryside and to dissolve the distance between sites of extraction, production and consumption of concrete. By deploying the conventions of pastoral landscape photography to document quarries, mines and manufacturing sites, the images serve as reminders that such places should be understood as part of distributed urban ecologies deeply connected to the urban centers they help to construct.

In examining the processes through which concrete has been used to construct different assemblages of built forms and its uneven impacts on ecologies, communities and economies, the essays here significantly expand our understanding of the sociocultural significance of concrete and its material agency in the ongoing remaking of the living environment. Perhaps most fundamentally, we have invited this collection's authors to drill down into concrete at the material level and attend to its temporality and precarity. In so doing, they reveal new, overlooked layers of connection between the gritty nature of concrete and social-ecological life.

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