Cosmotechnical Difference in Architecture and Urbanism

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Abstract
This issue of Footprint explores the intersection between architecture, technology and cosmology. It does so by examining the concept of 'cosmotechnics', as proposed by the philosopher Yuk Hui. Cosmotechnics – defined as 'the unification of the cosmic and moral order through technical activities' – proposes that technology is not a universal category but always exists in a co-productive relationship with a specific cosmology. While cosmotechnics has fomented new scholarship in philosophy, STS and cultural theory, its implications for architecture remain underexplored. Here, we introduce the concept of cosmotechnics, distinguish it from previous approaches to technology and cosmology, and outline its unique relevance to architectural discourse. In doing so, we present a core theme of the issue: technologies, cosmologies and architectures do not only influence one another, but are indeed inseparable, mutually constitutive, and conjoined in continual coevolution. Finally, we introduce the contributions that comprise the issue – a diverse set of explorations of the theoretical and practical intersections between cosmotechnics and architecture.

Keywords
Cosmotechnics, technology, cosmology, ontology, worlding

In 1938, the French anthropologist Claude Leví-Strauss journeyed from the city of Cuiabá, Mato Grosso, into the depths of the Brazilian interior. His destination was the village of Kejara, one of the last strongholds of indigenous Bororo culture. After a week's travel upstream on the Rio Vermelho, he found a society that few outsiders had encountered before, one which had sustained its beliefs, rituals and traditions in the face of the cultural devastation of South America's colonisation. Of all the things he observed at Kejara – from ceremonial festivals, dances, crafts and art forms – what especially struck him was the radial plan of the village. As he discovered, this organisational logic was anything but arbitrary. The axes of this circular plan divided Bororo society into a complex system of moieties, clans and classes, and demarcated 'an intricate network of privileges, traditions, hierarchical grades, rights and obligations', such as rules of inheritance and intermarriage. In this way, the village form helped to enact, reaffirm and remind the Bororo of an immensely complex system of social organisation and religious belief, organising their daily lives in accordance with a cosmic order. But Kejara's form was not merely a *reflection* of Bororo cosmology. Rather, this spatialisation was a crucial act, indispensable to integrating cosmic and social space into a unified and enduring whole. As Leví-Strauss observed, this organisation was so integral to their way of life, that Salesian missionaries quickly learned that the fastest way

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to convert the Bororo was to remove them from this radial arrangement and relocate them to new, linearly-planned settlements. Leví-Strauss's study of the Bororo offers just one example of a ubiquitous pattern – namely, a deep imbrication of cosmologies, technologies and architectures in the making and unmaking of worlds.[1]

This issue of *Footprint* explores the intersection between architecture, technology and cosmology. It does so by examining the concept of 'cosmotechnics', a term proposed by the philosopher Yuk Hui, which suggests an irreducible and dynamic union between cosmology and technology. Cosmotechnics proposes that technology is not a universal category but always exists in a co-productive relationship with a specific cosmology (that is, a particular model of cosmic order). Hui developed the framework of cosmotechnics in a series of essays and books, most notably his 2016 monograph *The Question Concerning Technology in China*.[2] The book responds to what Hui identifies as a cultural and philosophical crisis that emerged in the wake of modernity, resulting from the expansive imposition of Western technology, along with its cultural and metaphysical assumptions, upon diverse cultures as an assumed universal. Industrial modernity induced powerful material, economic, and environmental transformations. But more than this, it homogenised diverse cosmological relations into one that conforms to modern technology.[3] As Western technology was spread and taken up uncritically, it imported a number of profound but unspoken cosmological presuppositions about the nature of the universe, knowledge, time, and the place of humanity in the cosmos. The assumption and tacit acceptance of a universal notion of technics surreptitiously transposed Western metaphysics onto cultures with entirely different cosmological relationships to technology.

The ascent of Western cosmotechnics to the status of a global norm has produced a flattening of technological differences, erasing what Hui calls technodiversity. Technodiversity refers to the spectrum of technological relations that would emerge from a plurality of cosmologies – and which transcend the categories and relations inherent to Western concepts of nature, culture and technics. Not only does this erasure pose sovereignty and justice questions by reproducing forms of colonial domination, but it has been argued to be at the metaphysical root of planetary crises, including climate change and ecological destruction. As this issue will explore, architecture is deeply implicated in these processes. Cosmotechnics helps draw attention to how the epistemological and ontological assumptions embedded in technological practices are internalised, reproduced and legitimated through imposed processes of architectural modernisation and globalisation. This issue brings the discourses on architecture and cosmotechnics together in order to uncover possibilities for mutual enrichment. How can the notion of cosmotechnics help a dominantly Eurocentric architectural discourse confront and address questions of technological and cosmological diversity? And how might the field of architecture, through all of its political, economic, social and environmental entanglements, help to develop the abstract framework of cosmotechnics in practical and concrete ways?[4]

From cosmology to cosmotechnics

The word 'cosmology' derives from the ancient Greek *kosmos*, meaning 'the world or universe as an ordered and harmonious system'.[5] Cosmology, then, is the study and explanation of that system of universal order. Broadly speaking, cosmology refers to understandings of the universe, including ideas about its structure, its constituent elements, and the relations between its parts.[6] In any given culture, these ideas permeate the language, symbols and practices of everyday life, and are not necessarily explicated in theoretical terms. Cosmologies provide the taken-for-granted assumptions that underlie shared understandings of reality. They delineate the boundaries of what is conceivable and thinkable and provide the framework for how humans make sense of and act in the world.[7] According to the historian N.D. Jewson, 'cosmologies prescribe the visible and the invisible, the imaginable and the inconceivable.'[8] More than mere descriptions of reality, cosmologies are inherently political forces.[9] Cosmological ideas are woven into powerful narratives about the natural order, which are drawn upon to legitimate certain actions as righteous and just, while casting others as unthinkable or repugnant.[10]

Cosmotechnics, on the other hand, is defined by Hui as 'the unification of the cosmic and moral order through technical activities'.[11] The implications of this formulation are significant: not only do cosmological ideas enable and constrain technological practices, but techniques and practices are the necessary means by which cosmologies are manifested and sustained (or negated). This leads to Hui's radical proposition that there is no technology, nor cosmology as such, 'only multiple cosmotechnics'.[12] The cosmos, in this sense, is less the outer space of astral physics, but rather the space of different lifeworlds constituted locally through shared places, myths and practices.[13]

By connecting cosmotechnics to the field of architecture, this issue aims to expand the ways in which technology is understood in architectural discourse. This understanding has evolved under the influence of the major twentieth-century thinkers in the philosophy of technology and in science and technology studies (STS). Architectural theorists of the early twentieth century such as Lewis Mumford and Siegfried Giedion developed a view of technology as an

ostensibly autonomous and deterministic force in society. Over the course of that century, a tradition of technological critique, beginning with the work of Martin Heidegger and developed by thinkers such as Herbert Marcuse, Jacques Ellul, Ursula Franklin, Albert Borgmann, Ivan Illich and Jürgen Habermas, would give rise to a sense that technology was acquiring a power and logic of its own, and was a force that threatened and oppressed human culture.[14] By the late twentieth century, a more nuanced view had emerged, which highlighted how technology was shaped by a complex set of cultural and social forces.[15] These ideas continue to exert a lasting influence over architectural and urban critique. Cosmotechnics builds on these approaches further still, by emphasising the need to understand this complex interaction in terms of the local cosmological contexts in which they emerge and evolve.

By identifying the co-productive relationship between cosmology and technology, Hui builds on a specific tradition in the philosophy of technology, one which has had comparatively little influence in architectural theory.[16] This tradition, associated with Gilbert Simondon and Bernard Stiegler, emphasises the integral role of technics in the process of hominisation. Simondon, one of Hui's primary influences, posited a complex, recursive, coevolutionary relation between tools, users and environments – a relation he called 'technicity'.[17] Bernard Stiegler extended this inquiry by showing how technical objects serve as mediums of collective memory, and are thus fundamental to the constitution of human psychology and subjectivity. In this view, technics is not merely something that humans *do*.[18] Instead, humans and technologies come to be what they are through a contingent and indeterminate process of reciprocal transformation.[19] That is to say, humans do not only evolve *with* tools, but *through* them.[20] As Hui argues in this issue, cosmotechnics is a framework for articulating multiple accounts of the *genesis* of technicities, by giving attention to the various religious, aesthetic, philosophical spheres in which tool-user relations originate.

Uniting cosmotechnics and architectural discourse presents a theoretical challenge, one that stems largely from architecture's ambiguous relation to 'technical practices' as invoked in Hui's definition of cosmotechnics. On the one hand, we cannot simply reduce architecture to a type of technology – as Roi Salgueiro Barrio and Sasha McKinlay argue in their essay 'The Sea Wall and the *Kampung'*, the layers of cultural, aesthetic, philosophical motivation that inform architecture exceed mere technological rationality. At the same time, architecture is inseparable from the technical objects and practices through which it is expressed. Whether in artefacts (such as buildings) or processes (such as design, construction, or knowledge production), architecture's ubiquitous and unavoidable interconnection with technics offers fruitful ground for analysis, as well as renewed practices and methods.[21] What is clear is that the complex, relational view suggested by cosmotechnics presents a timely and necessary evolution of the conceptual grammar by which architecture has hitherto understood technology. By foregrounding the irreducible relationship between the cosmological, the architectural, and the technological, cosmotechnics opens up a richer framework to explore this coevolutionary triad.[22]

Architecture, technology and naturalism: beyond the ontological and postcolonial turns

While an implicit recognition of the link between architectures, cosmologies and technologies has occasionally surfaced in architectural discourse, their interconnection has never been robustly theorised.[23] For example, theorists of the modern movement such as Siegfried Giedion and Walter Benjamin registered cosmological implications in the technologies of the new architecture.[24] Giedion clearly recognised the role of worldview, or what he called the 'orientation of the period'. In *Mechanization Takes Command*, he claims that:

> tools and objects are outgrowths of fundamental attitudes to the world. These attitudes set the course followed by thought and action. Every problem, every picture, every invention, is founded on a specific attitude, without which it would never have come into being.[25]

However, as one of the most active proponents of the modern movement, Giedion was less curious about the reverse process – what is the role of tools in transforming those very attitudes? More recently, Alberto Pérez-Gómez has argued that the Copernican Revolution produced a crisis of meaning which continues to define modern architecture.[26] His work shows how, through a cosmological transformation in the status of number and geometry, architecture turned away from experience, symbolism and poetry as its primary sources of meaning, and was increasingly subordinated to the imperatives of technology and mathematical certainty. For Pérez-Gómez, it was a cosmological shift that transformed architecture in the image of technology – a fate from which architecture must be rescued by reasserting the primacy of human subjectivity over technological rationality. Lewis Mumford – perhaps the most prolific writer to unite the discourses of technology and architecture – maintained a persistent connection to cosmology in his work, appearing most vividly in his invocation of mechanical and organic metaphors.[27] Culture, as well as its connection to nature, was a central preoccupation for Mumford. And while he extended his analyses to other civilisations and epochs, the basic ontological categories

by which he did so went largely unquestioned.

While these thinkers intuited a link between cosmology, technology and architecture, they shared some common shortcomings. In particular, they never confronted the prospect of cosmological plurality, nor did they question the assumed universality of Western cosmological ideas. The most significant of these ideas is the ontology of naturalism, one of the central pillars of Western cosmology since the Renaissance, which rests on an opposition between culture (the dominant) and nature (the subordinated).[28] By limiting their analyses to the Western experience, and taking for granted the naturalistic distinction between nature and culture (with technology seen as a cultural product), these thinkers failed to capture the full complexity of this triadic relationship. In some cases, technology was treated simply as subordinate to culture and ideas. In others, technology was seen as an overwhelming and inevitable force of social and cultural transformation. In either case, with technology neatly enfolded within the category of culture, a broader view of how cosmology and technology interact within architecture was never fully recognised.

Outside the Western architectural tradition, cosmotechnics also challenges and extends discourses in philosophy and the humanities that have given cosmological plurality more serious attention. Two of the most significant among these are the related discourses of the so-called ontological turn, and postcolonial theory.[29] The ontological turn is a movement that emerged within cultural anthropology in the 1990s, and takes as its starting point a rejection of the pretensions to universality of the aforementioned dualism of Western naturalism.[30] The turn toward ontology marks a move away from social constructivism or crude forms of relativism, which, in their superficial assimilation of diversity and multiculturalism, nonetheless proceed from unquestioned cosmological premises, such as a shared, unitary and stable 'nature'.[31] The ontological turn thus goes beyond epistemological pluralism by relativising the very entities and processes that are held to constitute 'reality'.[32] This ethos is captured in Andrew Pickering's proposal to 'take different worlds seriously', rather than explain away differences between diverse lifeworlds as the expressions of malleable cultures toward a singular and enduring nature.[33] While Hui affirms and extends the ontological turn's critique of the idea of a unitary nature, he also warns against the possible interpretation that this justifies a return to pre- or non-modern ways of life, or what Clive Hamilton terms 'going native ontologically'.[34] For Hui, the purpose of technodiversity is not to advance certain cosmologies at the expense of others, but to draw numerous cosmotechnics into a creative synthesis capable of addressing planetary crises.[35]

The second discourse that broaches the notion of cosmological plurality, which cosmotechnics extends, is postcolonial theory. Unlike the ontological turn, postcolonial theory has produced distinct and well-articulated bodies of research in spatial discourses. One such body of work exists in architectural history, where theorists have articulated the multifaceted and nuanced role that architecture plays in colonial and postcolonial domination. This literature places architecture within an extended conceptualisation of the modes of colonial power that include knowledge, culture and aesthetics.[36] The histories mapped by Jiat-Hwee Chang, Arindam Dutta and others have shown how architecture – not only as a technical artefact, but as a set of procedures, norms and institutions – acts as a vehicle of ideological and epistemic power, and has helped to assert Western worldviews, values and interests over those of the Global South.[37] Within the field of urban studies, postcolonial approaches have emphasised how the underlying epistemology of urban theory has been derived from the Euro-American experience.[38] The assumed universality of this epistemology, and its uncritical transferral to other contexts, it is argued, has not only led to a misinterpretation of the urban realities of the Global South, but underwrites a continuation of colonial era domination and capital accumulation through 'mainstream global urbanism'.[39] In response, postcolonial urban studies have sought to denaturalise the Eurocentric assumptions embedded in urban theory, draw attention to the unique specificity of cities and urbanisation processes beyond the West, and call for 'new geographies of theory' to emerge from the Global South.[40]

Both the ontological turn and postcolonial theory are united in their emphasis on the condition of *locality* in planetary politics, something that constitutes both a strength and a weakness. The challenge that these discourses made to Euro-American hegemony was a necessary correction to the long-presumed universality of Western ideals, and the forms of violence it enabled. More than simply calling for tolerance or recognition of the local against the global, these discourses stressed the active role that diverse, non-Western cosmologies must play in generating new knowledge, practices and politics. At the same time, a number of critiques have been made against these discourses. Hui has argued that postcolonial theory has tended to overemphasise historical narrative at the expense of technology's material agency. For him, even if the dominant narrative of Western naturalism is challenged and 'provincialised', the processes of modernity continue apace through the effects of material technologies that continue to influence design over time.[41] The invocation of a local-global dichotomy has also drawn criticism. For example, Hui has argued that the transformative potential of the local is foreclosed by its framing as an aesthetic counterpoint

to the global, as non-modern and non-Western culture is commodified in the service of global capital.[42] Moreover, as he claims in our interview with him, cosmological locality has often been conflated with ethnic or national identity. This overlooks the much more profound role of cosmology in orienting human action, and instead encourages social fragmentation – a retreat into identity that precludes possibilities for coalition and collective action.

An analogous critique has been made of postcolonial urban studies: that it may too quickly relinquish useful and necessary conceptual tools to describe the planetary dynamics that inevitably condition local contexts.[43] The broader financial, environmental and political conditions of the capitalist world system (what Neil Brenner, Jamie Peck and Nik Theodore call 'the context of contexts') are not a mere neutral container, but a productive force from which localities can never be wholly disentangled.[44] Cosmotechnics offers a way through this impasse by calling for renewed attention to locality, while acknowledging its insufficiency as an end goal and emphasising the dialectical, coproductive relationship between the local and global.

Cosmotechnics suggests both a historical and futural orientation. What Hui terms a 'new world history', in which the various technological cultures are no longer held to originate in Western *technē*, also forms the basis upon which alternative technological futures can be articulated. These futures exceed commonplace notions of technological innovation, referring to a more fundamental reinvention of tools and methods in ways that transcend the categories and relations inherent to Western cosmology. More work is needed, however, to define, operationalise and understand the ways that architecture and cosmotechnics interconnect. To that end, the contributions to this issue present a diverse series of explorations of the theoretical and practical intersections between cosmotechnics and architecture. They do so by foregrounding a productive tension between the local and universal dimensions of technology, within the situated contexts of various cultures. In so doing the contributions in this issue highlight the problems and possibilities of cosmotechnics as a project of reinvention.

Cosmotechnics as reinvention: problems and possibilities within and beyond architecture

The contributions begin with Maryia Rusak's essay titled 'Celestial Resistance', which explores the cosmotechnical conflict that emerged in the implementation of an ambitious building scheme for dozens of schools in Zambia, funded by the World Bank and assisted by a network of Norwegian agencies and consultancies. During the 1960s and '70s, this project sought to deploy a number of Western technologies, such as prefabricated construction and digital management systems, which clashed with local norms, processes and values. The essay illustrates how conflicts in cosmological visions often produce more than mere disagreement: two divergent cosmologies, each freighting their own assumptions about reality and truth, may be entirely illegible, incoherent, or even invisible to one another.[45] While cosmotechnical conflict ultimately undermined this modernist vision, it simultaneously reveals sites for reinvention.

Roi Barrio and Sasha McKinlay highlight similar geopolitical dynamics, but bring the discussion to the urgent environmental crises of the present day. Their essay examines two contrasting responses to the threat of rising sea levels in Indonesia, namely an enormous protective sea-wall, planned by Dutch firms, and the reflexive, adaptive modes of dwelling contained in the architectural, cultural and religious traditions of the *kampung*. As the authors explain, these divergent cosmotechnics should not be understood as zero-sum, but rather represent an opportunity to generate new approaches that integrate the global with the local. By foregrounding architecture's place within (and its power to reshape) the 'techno-geographic milieu', the authors suggest how cosmotechnics might aid architecture in overcoming the impasse facing 'cosmopolitical design'.

Experimental studio Diseño Detonante and Aura Cruz Aburto continue the theme of environmental disaster with a visual essay that explores the possibility of reasserting indigenous cosmotechnics in the face of the twin destructions of natural disaster and colonial dispossession. Based on the authors' time spent with the Binnizá and Ikoots people in the Isthmus of Tehuantepec in Oaxaca, Mexico, the essay chronicles their experiences following a devastating earthquake in September 2017, which destroyed the homes of the local people. While the rebuilding that followed was driven by necessity, it also presented an opportunity to re-establish ancestral ways of living and knowing, thereby reaffirming the connections between places, community and territory, which are continually threatened by modernist ideologies of progress and development.

Simon Sadler picks up the topic of indigenous ontologies in his review of Alison Page and Paul Memmot's book *Design: Building on Country*. The book aims to connect Australia's indigenous past to the current challenges of postcolonial modernity, through an exploration of the objects, spirituality, camps, shelters and materials of indigenous 'design' (a largely untranslatable term in indigenous Australian languages). For Sadler, the book presents 'an Aboriginal cosmotechnics' that, after 65 000 years of evolution, has been effaced by colonial domination. Taking Aboriginal ontologies seriously – including the socio-spatial relations, obligations to land, and forms of

kinship embedded within the indigenous notion of 'Country' – offers an opportunity to reframe future-oriented questions about design in a postcolonial Australia.

In a review of a collection of essays by the Japanese architect and theorist Hiroshi Hara, titled 'Space: from function to modality', Masamichi Tamura provides a glimpse into an early precursor to cosmotechnical criticism developed during the 1970s and 1980s. The essay reveals how Hara's thinking on space, modernity, tradition, technics and architecture prefigured the cosmotechnical line of inquiry. For example, Hara's concept of modality (which bears certain parallels to Simondon's technicity) refers to the 'material and locational contingencies' of architecture as technology, which cohere into integrated, complex environments, linking humans, tools and space.

Alan Díaz Alva reviews Anselm Jappe's 2020 book *Béton: Arme de construction massive du capitalisme*, which chronicles the rise of reinforced concrete as the construction material of choice of global capitalism. The essay shifts the focus from sites and populations towards materials, as well as the political, economic and social systems in which they're embedded. In particular, Alva argues that the pursuit of technodiversity requires that we grasp the specific local mechanisms through which such a monoculture was established in the first place. To that end, Alva highlights the unique value of the tradition of Marxist theory to which Jappe belongs, known as *Wertkritik*, which emphasises questions of matter and abstraction, rather than class or ideology.

Supplementing these essays, each of which grapples with a specific case and history, are a set of contributions confronting the methodological value that architecture might gain from the framework of cosmotechnics. Joel Letkemann considers methodological cues that a project of architectural cosmotechnics might take from the literary genre of speculative fiction (SF) and the concept of 'co-futures'. The argument centres on the work of physicist and science fiction author Vanadana Singh, whose work foregrounds alternative technological imaginaries that resist the universal, while maintaining a planetary-scale awareness through speculative infrastructures and technologies of social coordination. Beyond the ideas and imaginaries embodied in the final product of Singh's stories, the essay also considers the value that architecture might draw from the participatory strategies of their production – what Letkemann terms 'technologies of collaboration' – by which Singh draws diverse perspectives into her writing and worlding process. Casting architecture as its own narrative and story-building tradition, the essay points to ways in which the discipline's notions of futurity, time and progress might be reconfigured through other modalities of practice.

Robert Gorny's review essay grapples with the complex relation between cartographic practices (mapping) and the project of architectural worlding by inviting readers to rethink how worlding practices are implicated within the various technical processes of architecture. His review builds on work that connects worlding theories to the field of cartography, and attempts to map material transformations in parallel with the worlding practices that have emerged from post-humanist critical theory. Gorny considers the possibilities that such an approach offers for placing architecture within a general history of *technē*. This, in turn, could enable cartographic practices to perform their role as critical devices within contemporary technological decision-making.

The role of technological imagination in planetary crises is taken up further by Simon Weir as he explores the notion of tragedy, both as an artistic and philosophical category, and as a description of our civilisational predicament. Drawing on the traditions of surrealism and object-oriented ontology, the essay prompts a new consideration of the epistemological value of the non-rational. Striking AI-generated visuals draw on Magritte's 'tragic pairs', using the text prompts 'shipwreck' and 'theatre' to produce a creative scrambling of relations and non-relations, posing questions about the ontological stability of architecture. These scenes project into an alien future in which the aims of today's technology are ancient history, lying in preserved ruins. As the essay tours these otherworldly landscapes of 'cosmotechnical tragedy', readers are prompted to irrational interpretation, and to speculate upon radically redrawn architecture-ecology relationships.

Finally, we turn to the interview with Yuk Hui that closes the issue, in which he offers his own foray into a cosmotechnical view of architectural and urban questions. In a wide-ranging discussion, Hui expands on topics touched only briefly in his work to date, but which are immensely important for spatial and design disciplines. The first of these is the now ubiquitous notion of the smart city and the role of digital technologies in urbanism. Hui connects the smart city's promise of an automated, organic part-whole relation in urban space to the rising role of infrastructure and the geopolitical imperatives of competition. As smart city critiques appear to have run aground, having had little impact in slowing that particular urban ideology, Hui's suggestion to rethink analytical and critical methods is well overdue. The second pertains to geography and notions of space, particularly the role of regions and landscapes as vessels of transcendent and symbolic meaning. Hui traces Simondon's thoughts on this subject to Mircea Eliade's work in the history of religion, which describes an original union between humans and sacred spaces.[46] These places - constellated by

points and fields charged with cosmological meaning - represent counterpoints to the abstract, inert and homogeneous space of modernity. It is within this richer figurative and physical 'ground', Hui argues, that we must place cybernetic technologies.

The field of architecture is one of the primary arenas in which the global stakes of technodiversity will play out. Whether we see further technical convergence and homogenisation, or new proliferation of alternative modes of technological thought, spatial disciplines will figure centrally in this future. Despite the recent interest in cosmotechnics, further work is needed which seeks to define, operationalise and understand the link between cosmological ideas, technology and architecture. While the contributions to this issue have initiated this discussion, they also reveal new directions for further research. For example, how can modern societies overcome the political barriers to translating diverse cosmotechnics into new paradigms of spatial practice and urban theory? How does the massive acceleration in AI complicate the pursuit of technodiversity in architecture? How are global scale infrastructure projects implicated in cosmotechnical transformation? Which unwritten architectural histories might extend or challenge the theory of cosmotechnics? As this issue makes clear, a continued exploration of cosmotechnics and architecture is both timely and necessary.

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Notes

1. A rich body of historical and anthropological literature attests to the link between spatial practices and cosmological ideas. See Claude Lévi-Strauss, *Tristes Tropiques*, trans. John Weightman and Doreen Weightman (London: Penguin Books, 2011); Stanley Jeyaraja Tambiah, 'The Galactic Polity in Southeast Asia', *HAU: Journal of Ethnographic Theory* 3, no. 3 (December 2013): 503–34; Michael Herzfeld, 'Shaping Cultural Space: Reflections on the Politics and Cosmology of Urbanism', in *Life Among Urban Planners: Practice, Professionalism, and Expertise in the Making of the City*, ed. Jennifer Mack and Michael Herzfeld (Philadelphia: University of Pennsylvania Press, 2020); Émile Durkheim and Marcel Mauss, *Primitive Classification*, trans. Rodney Needham (Chicago: University of Chicago Press, 1967); for a close study of cosmological ideas in early Western spatial practices, as well as a brief account of parallels in African and Eastern traditions, see Joseph Rykwert, *The Idea of a Town: The Anthropology of Urban Form in Rome, Italy and the Ancient World* (London: Faber and Faber, 2010). See also the work of John Tresch on 'cosmograms' (images and symbols of the cosmos, such as in buildings, images and narratives), which surveys numerous architectural expressions of cosmological ideas; John Tresch, 'Cosmogram', in *Cosmograms*, ed. Mélik Ohanian and Jean-Christophe Royoux (New York: Lukas & Sternberg, 2005); John Tresch, 'Technological World-Pictures: Cosmic Things and Cosmograms', *Isis* 98, no. 1 (March 2007): 84–99.
2. Yuk Hui, *The Question Concerning Technology in China: An Essay in Cosmotechnics* (Falmouth: Urbanomic, 2016); Yuk Hui, 'On Cosmotechnics: For a Renewed Relation between Technology and Nature in the Anthropocene', *Techné: Research in Philosophy and Technology* 21, no. 2 (2017): 319–41; Yuk Hui, 'For a Planetary Thinking', *e-flux* 114 (December 2020), https://www.e-flux.com/journal/114/366703/for-a-planetary-thinking/.
3. Hui, 'On Cosmotechnics', 8.
4. Vinícius Portella, 'Cosmotechnics and the Multicultural Trap', *Triple Ampersand Journal (&&&),* 21 November 2022, https://tripleampersand.org/cosmotechnics-and-the-multicultural-trap/.
5. Anna Maria Destro, 'Cosmology and Mythology', in *21st Century Anthropology: A Reference Handbook*, ed. H. James Birx (London: Sage, 2010), 227; for a history of the term and its meaning in theological and scientific contexts, see Helge Kragh, *Conceptions of Cosmos: From Myths to the Accelerating Universe: A History of Cosmology* (Oxford: Oxford University Press, 2013).
6. Signe Howell, 'Cosmology', in *The Routledge Encyclopedia of Social and Cultural Anthropology*, ed. Alan Barnard and Jonathan Spencer (London: Routledge, 2010), 196–99.

7. Sociologists such as Douglas, Berger and Luckmann have shown how human action draws its meaning from a shared universe of symbols, assumptions and taken-for-granted beliefs. See Mary Douglas, *How Institutions Think* (Syracuse: Syracuse University Press, 1986); Peter L. Berger and Thomas Luckmann, *The Social Construction of Reality: A Treatise in the Sociology of Knowledge* (New York: Anchor Books, 1990).
8. N. D. Jewson, 'The Disappearance of the Sick-Man from Medical Cosmology, 1770–1870', *Sociology* 10, no. 2 (May 1976): 225–44.
9. Allan has shown that cosmologies have been a powerful force in the history of international politics, by constraining and enabling new ideas about meaningful, just, and valid purposes. Bentley Allan, *Scientific Cosmology and International Orders* (Cambridge: Cambridge University Press, 2017).
10. Cosmologies can be understood as constellations of cosmological elements. Allan proposes five categories of cosmological elements: ontology (the fundamental units of matter, the forces that govern them, and categories of representation), episteme (the modes and procedures likely to produce reliable or true knowledge of the universe), temporality (the nature and direction of time), cosmogony (the origins and history of the universe), and destiny (the role or place of humanity in the cosmos). Ibid., 11.
11. Hui, *The Question Concerning Technology in China*, 19.
12. Yuk Hui, 'Cosmotechnics as Cosmopolitics', *e-flux* 86 (November 2017), https://www.e-flux.com/journal/86/161887/cosmotechnics-as-cosmopolitics/.
13. Yuk Hui, *Art and Cosmotechnics* (Minneapolis: University of Minnesota Press, 2020), 41.
14. William W. Braham, Jonathan A. Hale and John Stanislav Sadar, eds., *Rethinking Technology: A Reader in Architectural Theory* (London: Routledge, 2007), xiv; Alan Jacobs, 'From Tech Critique to Ways of Living', *The New Atlantis,* Winter 2021, https://www.thenewatlantis.com/publications/from-tech-critique-to-ways-of-living.
15. Braham, Hale, and Sadar, *Rethinking Technology*, xiv.
16. Stavros Kousoulas, *Architectural Technicities: A Foray into Larval Space* (London: Routledge, 2023). Recent exceptions include: Robert Gorny, Stavros Kousoulas, Dulmini Perera, Andrej Rodman, ed., *The Space of Technicity: Theorising Social, Technical and Environmental Entanglements* (Delft: TU Delft OPEN, 2024).
17. On the notion of technicity in relation to architecture and technological change, see Dulmini Perera and Stavros Kousoulas, eds., 'All Is in Formation: Architecture, Cybernetics, Ecology', *Footprint* 28 (June 2021).
18. We follow previous issues of *Footprint* which have distinguished 'technics' as the 'general domain of technical practice as a system', as opposed 'technology', implying a fusion of technics with scientific rationality. Robert. A Gorny and Andrej Radman, eds., 'The Epiphylogenetic Turn and Architecture: In (Tertiary) Memory of Stiegler', *Footprint* 30 (July 2022).
19. This adapts the biological concept of 'ontogenesis' to a description of the tool-user relation.
20. Gorny and Radman, 'The Epiphylogenetic Turn'.
21. On the processual and artifactual modalities of technics in architecture, see Zeynep Çelik Alexander and John May, eds., *Design Technics: Archaeologies of Architectural Practice* (Minneapolis: University of Minnesota Press, 2019).
22. Gorny et al., *The Space of Technicity*.
23. A number of studies have examined the cosmological basis of architecture and urbanism without explicitly theorising the technological dimension: A.F. Wright, 'The Cosmology of the Chinese City', in *The City in Late Imperial China*, ed. G. William Skinner and Hugh D. R. Baker (Stanford: Stanford University Press, 1977), 33–75; Tilo Schabert, 'The Cosmology of the Architecture of Cities', *Diogenes* 39, no. 156 (December 1991): 1–31; Samer Akkach, *Cosmology and Architecture in Premodern Islam: An Architectural Reading of Mystical Ideas* (Albany: State University of New York Press, 2005). See also work that has mapped the influence of scientific cosmology upon urban theory: Graeme Davison, 'The City as a Natural System', in *The Pursuit of Urban History*, ed. Derek Fraser and Anthony Sutcliffe (London: Edward Arnold, 1983); Christopher Hamlin, 'The City as a Chemical System? The Chemist as Urban Environmental Professional in France and Britain, 1780–1880', *Journal of Urban History* 33, no. 5 (July 2007): 702–28.
24. Giedion saw in the construction possibilities of glass, iron and reinforced concrete an unfolding transformation of the categorical distinctions such as between the organic and technological, and subject and object. By collapsing boundaries between space, form, and the experiencing subject, technology would blur the traditional boundaries of architecture,and give way to a unified space of 'mind and machine'. See Sigfried Giedion, *Bauen in Frankreich, Bauen in Eisen, Bauen in Eisenbeton* (Berlin: Gebr. Mann, 2000[1928]). On Benjamin and Giedion's intellectual influence, see Detlef Mertins, 'Walter Benjamin and the Tectonic Unconscious: Using Architecture as an Optical Instrument', in *The Optic of Walter Benjamin*, ed. Alex Coles (London: Black Dog Publishing, 1999), 196–221; Sven-Olov Wallenstein, 'Space, Power, Control', *Site*, 26 March 2021, https://www.sitezones.net/articles/spacepowercontrol.
25. Siegfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (Oxford: Oxford University Press, 1948), 3.
26. Alberto Pérez-Gómez, *Architecture and the Crisis of*

Modern Science (Cambridge, MA: MIT Press, 1985).

27. Lewis Mumford, *The Myth of the Machine: Technics and Human Development* (New York: Harcourt, Brace, Jovanovich, 1970); Lewis Mumford, *Technics and Civilization* (New York: Harcourt, Brace and Company, 1934).
28. Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley: University of California Press, 1976).
29. These discourses are part of a much larger set of theoretical discussions that have begun to take ontological and cosmological questions as their prime focus. These include, but are not limited to, object-oriented ontology, actor-network theory, cosmopolitics, new materialism, speculative realism, as well as trans- and post-humanism. Each of these has its own tradition in architecture, summaries of which exceed the scope of this introduction.
30. Martin Holbraad and Morten Axel Pedersen, *The Ontological Turn: An Anthropological Exposition* (Cambridge: Cambridge University Press, 2017).
31. For example, De Castro has shown that the experience and concept of nature in Amerindian animist cosmology is based on a shared culture between humans and non-humans (that is, monoculturalism), counterposed by multiple natures (multinaturalism); Eduardo Viveiros De Castro, 'Cosmological Deixis and Amerindian Perspectivism', *The Journal of the Royal Anthropological Institute* 4, no. 3 (September 1998): 469–88. Phillipe Descola, by proposing a set of 'modes of identification' and 'modes of relation', attempts to account for the vast historical and geocultural diversity in cosmologies; Philippe Descola, *Beyond Nature and Culture*, trans. Janet Lloyd (Chicago: University of Chicago Press, 2014).
32. Holbraad and Pedersen, *The Ontological Turn*, 3.
33. Andrew Pickering, 'The Ontological Turn: Taking Different Worlds Seriously', *Social Analysis* 61, no. 2 (2017): 134–150.
34. Clive Hamilton, *Defiant Earth: The Fate of Humans in the Anthropocene* (Cambridge: Polity, 2017), 106.
35. Eduardo Viveiros De Castro and Yuk Hui, 'For a Strategic Primitivism: A Dialogue between Eduardo Viveiros de Castro and Yuk Hui', *Philosophy Today* 65, no. 2 (2021): 391–400.
36. Edward W. Said, *Orientalism* (New York: Pantheon Books, 1978); Walter Mignolo and Catherine E. Walsh, *On Decoloniality: Concepts, Analytics, Praxis* (Durham, NC: Duke University Press, 2018). See also the work of Rudolfo Kusch, whom Mignolo credits with expanding postcolonial thought beyond economic domination, to recognise what Mignolo called 'the coloniality of knowledge and being'; Rodolfo Kusch, *Indigenous and Popular Thinking in América*, trans. Maria Lugones and Joshua M. Price (Durham, NC: Duke University Press, 2010).
37. Jiat-Hwee Chang, *A Genealogy of Tropical Architecture: Colonial Networks, Nature and Technoscience* (London: Routledge, 2016); Arindam Dutta, *The Bureaucracy of Beauty: Design in the Age of Its Global Reproducibility* (New York: Routledge, 2007). See also the work of Kenny Cupers: Kenny Cupers, Federica Zambeletti and Laura Nkula-Wenz, 'South Designs for Planetary Futures', *KoozArch,* 2 September 2022, https://www.koozarch.com/interviews/south-designs-for-planetary-futures; Nick Axel, Kenny Cupers, and Nikolaus Hirsch, eds., 'Coloniality of Infrastructure' issue of *e-flux Architecture*, (September 2021), https://www.e-flux.com/architecture/coloniality-infrastructure/.
38. Ananya Roy, 'Worlding the South: Towards a Post-Colonial Urban Theory', in *The Routledge Handbook on Cities of the Global South*, ed. Susan Parnell and Sophie Oldfield (London: Routledge, 2014), 9–20; Jennifer Robinson, *Ordinary Cities: Between Modernity and Development* (London: Routledge, 2006).
39. Eric Sheppard, Helga Leitner and Anant Maringanti, 'Provincializing Global Urbanism: A Manifesto', *Urban Geography* 34, no. 7 (November 2013): 893–900.
40. Ananya Roy, 'The 21st-Century Metropolis: New Geographies of Theory', *Regional Studies* 43, no. 6 (July 2009): 819–30; Jennifer Robinson, 'New Geographies of Theorizing the Urban: Putting Comparison to Work for Global Urban Studies', in *Routledge Handbook on Cities of the Global South*, ed. Parnell and Oldfield (London: Routledge, 2014), 57–70; Susan Parnell and Jennifer Robinson, '(Re)Theorizing Cities from the Global South: Looking Beyond Neoliberalism', *Urban Geography* 33, no. 4 (May 2012): 593–617; Sheppard, Leitner and Maringanti, 'Provincializing Global Urbanism'.
41. Hui, *The Question Concerning Technology in China*, 305.
42. Hui, 307.
43. Neil Brenner and Christian Schmid, 'Towards a New Epistemology of the Urban?', *City* 19, no. 2–3 (2015): 151–182, 161.
44. Neil Brenner, Jamie Peck and Nik Theodore, 'Variegated Neoliberalization: Geographies, Modalities, Pathways', *Global Networks* 10, no. 2 (April 2010): 182–222, 202.
45. On trans-cosmological 'visibility', see Denis R. Byrne, 'Archaeology and the Fortress of Rationality', in *Cosmopolitan Archaeologies*, ed. Lynn Meskell (Durham, NC: Duke University Press, 2009), 68–88.
46. Mircea Eliade, *Myths, Rites, Symbols: A Mircea Eliade Reader* (New York: Harper & Row, 1976).

Biography

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