Original research article

Urban Political Ecology
1–16

DOI: 10.1177/30497515251410818
journals.sagepub.com/home/upe

Environments *of* urbanization*

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Abstract

This essay draws on the dialectical philosophy of science developed by ecologist Richard Levins and evolutionary geneticist Richard C. Lewontin—perhaps best known outside their fields of specialization for the essays collected in *The Dialectical Biologist* (1986)—to provide methodological orientation for research on planetary urbanization. Levins and Lewontin's approach to dialectics emphasizes reciprocal co-determination and co-evolution: parts exist only through their relations to wholes; wholes are continually reshaped by the activity of their parts; and every process must be analyzed historically and across scales rather than reduced to a single, privileged unit of analysis or level of explanation. Building upon these methodological principles, we theorize planetary urbanization as an emergent, uneven, multidimensional, and contradictory process through which cities and the non-city environments that sustain them recursively transform one another and co-evolve, generating wide-ranging and often destructive biospheric reverberations. This anti-essentialist conceptualization requires the analytical decomposition and relational investigation of five key terrains of research on planetary urbanization: cities and agglomeration economies; hinterlands and operational landscapes; the human/non-human divide; periodization and geohistorical development; and the category of the planetary itself. This mode of analysis delineates a rigorously dialectical, non-reductionist research program for investigating the environments *of* planetary urbanization, elucidating

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* This essay is derived from the "Afterword" to Neil Brenner, Swarnabh Ghosh and Nikos Katsikis, *Environments of Planetary Urbanization* (Berlin: Jovis, 2025), which presents a collection of studies produced by the authors (individually and in various collaborative combinations) during the last decade. For an initial presentation of our research agenda on planetary urbanization, which was developed in collaboration with Christian Schmid (ETH Zurich), see Neil Brenner ed., *Implosions/Explosions: Towards a Study of Planetary Urbanization* (Berlin: Jovis, 2014). For subsequent, book-length elaborations, see Neil Brenner, *New Urban Spaces*: *Urban Theory and the Scale Question* (New York: Oxford University Press, 2019), esp. Chs. 9 and 10; and Christian Schmid and Milica Topalovic eds., *Extended Urbanisation: Tracing Planetary Struggles* (Basel: Birkhäuser, 2023). Our current work on such issues seeks to theorize the internal relations between capitalist urbanization, the post-1870s fossil-based metabolic regime of capital, and intensifying biospheric crises. See, for example, Neil Brenner and Swarnabh Ghosh, "Between the Colossal and the Catastrophic: Planetary Urbanization and the Political Ecologies of Emergent Infectious Disease," *Environment and Planning A*, 54, no. 5 (2022): 867–910; and Neil Brenner and Swarnabh Ghosh, "The Monster 'Within': Capitalist Urbanization as Geometabolic Escalation," *Development and Change* (2025): https://doi.org/10.1111/dech.70015. We are further elaborating this work in Neil Brenner and Swarnabh Ghosh, *Into the Shatter Zone: Capitalist Urbanization and the Hinterland Question* (Chicago: Urban Theory Lab, University of Chicago, unpublished book manuscript).

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how socio-ecological crises are generated through the very processes that produce and sustain urban life. It also opens a horizon through which to imagine, plan, and build alternative societal metabolisms—and the far-reaching political-economic, institutional, infrastructural, and sociospatial transformations they would require.

Keywords
dialectics, planetary urbanization, operational landscapes, Richard Levins, Richard C. Lewontin

> My world, my Earth, is a ruin.
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> — Ursula K. Le Guin, *The Dispossessed*
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> 'Part' and 'whole' have a special relationship to each other, in that one cannot exist without the other, any more than 'up' can exist without 'down.'
>
> — Richard Levins and Richard C. Lewontin[1]

The ecologist Richard Levins and the evolutionary geneticist Richard C. Lewontin were prominent members of the radical science movement associated with the activist organization *Science for the People*, which coalesced in the United States in the late 1960s.[2] Over the course of their decades-long collaboration at Harvard University, Levins and Lewontin developed a distinctive dialectical method for the analysis of biological, ecological, and social processes, making signal contributions to such varied fields as the philosophy of science, evolutionary biology, public health, agroecology, and political ecology.[3] Not only did their writings help recuperate and extend the long, vibrant tradition of socialist critique in the natural sciences, but they also played an important role in the (re)emergence of Marxian ecological theory in the later twentieth century.[4] Their meta-theoretical and methodological interventions—elaborated most famously in their 1985 essay collection, *The Dialectical Biologist*—advanced a rigorous philosophical alternative to the reductionist onto-epistemology of modern science and offered a radical critique of the ideology, political economy, and institutional apparatuses of scientific knowledge production under late capitalism.[5]

Building on the dialectics of Hegel, Marx, and, notably, Engels, Levins and Lewontin developed their dialectical principles through a critique of what they termed "Cartesian reductionism"—"the dominant mode of analysis of the physical and biological world and by extension the social world."[6] According to Levins and Lewontin, Cartesian reductionism gives ontological primacy to the elementary units or "natural" parts whose aggregations appear to form larger systems (such as ecological niches, ecosystems, economies, or societies). According to this reductionist approach, elementary parts designate internally homogeneous, elementary units that, when sutured together, produce a whole. "The object of reductionist science," Levins and Lewontin explain, "is to find those smallest units that are internally homogeneous, the natural units of which the world is made."[7] This model of splitting "higher dimensional objects" into their constitutive, "lower dimensional" parts is the essential feature of reductionism as a mode of analysis, whether in genetics, biology, ecology, economics, or sociology. It represents, they argue, an "alienated world view [that] captures a particularly impoverished shadow of the actual relations among phenomena in the world, concerning itself only with the projections of multidimensional objects on fixed planes of low dimensionality."[8]

A dialectical approach, by contrast, seeks to illuminate the "full dimensionality" of the objects, processes, and relations that constitute the fabric of life.[9] It starts with the assumption that the world is "internally heterogeneous at every level."[10] Accordingly, "parts" are not naturally pregiven units, but exist only as *relational* elements whose properties must be demarcated reflexively—and always provisionally—with reference to the specific "whole" (object, process, or totality) that is under investigation. Typically, this provisional demarcation occurs through a series of determinate abstractions that, in effect, (a) individuate the "internal relations" that co-articulate parts and wholes; and (b) permit the investigation of their emergence, reciprocal determination, and co-evolution. Thus, in the first instance, what is being demarcated are *relations*, not units. The latter only exist by virtue of the former, and their existence as apparently discrete entities is necessarily provisional, embedded within determinate spatio-temporal conditions, and subject to constant transformation through the vicissitudes of part/whole dynamics. These contextually determined, recursively co-produced part/whole articulations are understood, therefore, as materializations of *emergent*, mutually transformative processes.[11]

This means, in turn, that parts are not discrete units or fixed singularities from which wholes coalesce; rather, they may be defined as parts "only when there is a whole for them to be a part of."[12] In other words, the internal relations that underpin and animate part/whole articulations are not arbitrary or contingent linkages, but crystallize through patterned, durable regularities that shape and are in turn shaped by those very relations. The demarcation of (interconnected) parts is, therefore, never distinct from the demarcation of an (emergent, evolving) whole; these are recursively co-dependent moments of dialectical analysis insofar as "part implies whole, and whole implies part."[13] Thus, in stark contradistinction to reductionist approaches that typically proceed by isolating parts as "preexisting units of which wholes are then composed," a dialectical methodology is reflexive in its delineation of parts and wholes, recognizing that "part *makes* whole, and whole *makes* part."[14] And furthermore, "parts and wholes evolve in consequence of their relationship, and the relationship itself evolves."[15]

In the history of modern science, Levins and Lewontin argue, this dialectical method has generated impressive insights and opened up entirely new terrains of investigation. Across diverse fields, from genetics, biology, and physics to ecology, putatively undecomposable "basic units" have repeatedly proven to be further decomposable in at least two key senses. First, due to advances in techniques of observation, measurement, and analysis, and concomitant advances in modes of conceptualization, apparently elemental units have been further disaggregated into still more elemental sub-components, still lower-order sub-components of the latter, and so forth. Second, and just as crucially, these putatively elemental units (and their constituent sub-units) have in turn been revealed to have been formed through myriad, superordinate relations to more encompassing wholes, and thus to be embedded within still broader, higher-order ensembles of part/whole relations. In this sense, the coherence and unity of any apparently discrete entity may be subjected to dialectical analysis through an endlessly repeated double-movement. In this spiraling, reflexive procedure, myriad lower- and higher-order webs of relations are excavated, first, from "within" the apparently discrete entity under investigation to reveal its constituent sub-elements; and second, with reference to those superordinate wholes in which that entity appears to be embedded and through which it is co-constituted. For Levins and Lewontin, the rigorously relational analysis of these dynamics of emergence, reciprocal co-determination, and recursive co-evolution is among the core tasks of dialectical investigation.

Levins and Lewontin further elaborate their dialectical methodology through the proposition that, in epistemological terms, "there is no basement."[16] This architectural metaphor is intended to signal the radical irreducibility and internal heterogeneity of all elements of socionatural relations, and the corresponding need to develop analyses that illuminate the patterned multidimensionality of the latter in diverse fields of inquiry. For Levins and Lewontin, the assumption of analytical decomposability is not an ontological maxim about the supposedly intrinsic complexity or heterogeneity of the socionatural world. Rather, it is a radically anti-essentialist injunction to explore "each level of organization without having to search for

fundamental units."[17] In this sense, the process of analytical decomposition is never complete. Levins and Lewontin's epistemological wager is that scientific research may be advanced most productively when it is released from the reductionist obsession with excavating some "fundamental" unit as the underlying essence of the processes, relations, and dynamics under investigation. The anti-essentialist claim that "there is no basement" thus translates into a pragmatic epistemological orientation that facilitates the continuous exploration of "new domains for investigation and practice."[18]

The assumption of analytical decomposability produces two interconnected methodological imperatives —first, reflexivity and agility about the choice of analytical units in any investigation; and second, the prioritization of processual dynamics in the analysis of objects and phenomena. "What characterizes the dialectical world, in all its aspects," Levins and Lewontin write, "it is that it is constantly in motion."[19] From this point of view, the analyst's mission is not to reveal the underlying diversity of the phenomena under investigation as a kind of ontological essence lurking beneath the appearance of unity, stability, and coherence. The two-fold goal, rather, is (a) to find evidence of further analytical decomposability, understood as the expression and product of evolving part/whole relations across myriad terrains and scales of life; and on this basis, (b) to develop strategies to investigate and theorize the latter in their richly patterned emergence, reciprocal co-determination, and co-evolution.

Notably, in analyzing these relational webs, patterning processes, and their meta-patterning crystallizations, Levins and Lewontin reject simplistic hierarchical models that presuppose the symmetrical nesting of lower-order relational domains within higher-order wholes. This also involves a decisive break with Hegelian frameworks (including traditional Marxist variants thereof) that embrace a dyadic, linear, and teleological conception of historical change. Against such isomorphic, additive, or expressive visions of totality, they emphasize disarticulation, disjunction, and disequilibrium, and the role of opposing forces in generating conflict, contradiction, and crisis, within and among the relational webs being analyzed across myriad sites and scales of analysis. This approach, they argue, is likely to reveal the crystallization of multiple, jaggedly intermeshed matrices of part/whole articulation whose internal configuration is continuously transformed through the interpenetration, superimposition, and multiplication of their constituent relations. Totality, then, is not pregiven or encompassing, but emerges and is transformed through the part/part and part/whole relations that constitute (and continually reconstitute) its concrete expressions, systemic parameters, and modalities of evolution.

It is upon these philosophical foundations that Levins and Lewontin build their classic analysis of the relation between organism and environment, published in their jointly-authored column *Eppur' Si Muove* in the journal *Capitalism Nature Socialism*.[20] Here, they offer a critique of hegemonic ideas in evolutionary biology—in particular, the Darwinian conception of the organism as a stable unit equipped with an "internal autonomous program" enabling it to adapt to "externally generated environmental demands." Within that framework, "the internal forces" of organisms are rigidly separated from the environment, conceived as a "preexistent element of nature formed by autonomous forces." The environment of organisms was thus understood as a fixed background condition, "a kind of hole in ecological space that may be filled, but […] may also be empty, waiting for an occupant." While Levins and Lewontin acknowledge this conceptualization as Darwin's "most powerful contribution to the development of modern biology," they argue that its rigid differentiation of internal and external forces, and its static, reductionist understanding of the environment, has also impeded further scientific understanding. A drastic epistemological reorientation is needed, they propose, not just for developing an approach to evolutionary biology adequate to evolutionary science, but for orienting "a rational environmental politics" and "a rational political ecology."[21]

In contrast to the Darwinian conception of the organism/environment relation, Levins and Lewontin insist upon their reciprocal co-determination and co-evolution, declaring: "There is no organism without environment, but there is no environment without an organism […] environments are as much the product of organisms as organisms are of environments." Far from a lapse into idealism, vitalism, or

social constructionism, they offer here a profoundly dialectical insight into a major intellectual puzzle that includes but also transcends the epochal debates provoked by Darwinism in evolutionary biology. Echoing Marx's classic account in the *Grundrisse*, Levins and Lewontin emphasize the dialectical interplay between production and consumption, with each moment of this metabolic dyad incessantly transforming the conditions in which the other unfolds: "Every act of consumption is an act of production and every act of production is an act of consumption."[22] In other words, the spatial arenas in which the production and consumption occur are themselves continually transformed through those very processes.

Environments, in this understanding, are not an exterior realm of pre-existing materiality, but crystallize as such precisely through the metabolic operations of organisms in continuously shaping and reshaping their own conditions of existence. Through their sensuous life-activities—such as nutrient consumption and storage, symbiotic relations to other organisms, and waste discharge—organisms produce distinctive formations of environment beyond their boundaries, molded in relation to their own life-processes, in a kind of biological terraforming process. In this sense, Levins and Lewontin maintain, organisms not only adapt to environments, but actively construct and reconfigure them. Specific kinds of environments are shaped and reshaped through their continual exchanges with organisms. The historically layered accretions of such metabolic exchanges transform the organism in question while reciprocally co-producing environments *of* organisms. Thus, "changing organisms lead to changing environments […] [E]very species […] is at every moment constructing and destroying the world it inhabits."[23]

Levins and Lewontin's dialectical conceptualization of part/whole relations, and their elegant application of that framework to the relation between organism and environment, offer generative methodological resources for our efforts to transcend city-centric epistemologies of urbanization and, on this basis, to explore what we conceptualize as the environments *of* planetary urbanization. The italics around "of" in this formulation denote the reflexively dialectical conceptualization of city/non-city relations—and their planetary reverberations—that grounds our approach to the urban process under capitalism. In this sense, as we elaborate below, the "of" signifies a restlessly dynamic, relational web whose constitutive elements are continuously and recursively being reworked—urbanization *and* the myriad environments this process produces, feeds upon, and transforms. The churning of this web of city/non-city relations is not simply enclosed "within" a planetary environmental carapace, but has reshaped the biosphere itself, from the microbiological to the planetary scale. We thus draw upon Levins and Lewontin's anti-Cartesian dialectics to investigate and theorize the environments *of* planetary urbanization—the distinctive, ever-mutating socio-ecological and biospheric transformations that are generated *through* the geo-metabolic dynamics of capitalist urbanization.

There is, of course, a longstanding tradition of dialectical thought in radical urban studies, constituted by the post-1968 waves of creative work in urban Marxism and cognate streams of critical urban studies, which have productively destabilized the various forms of reductionism, positivism, and spatial determinism that remain deeply entrenched in mainstream approaches to the urban question.[24] While our work is very much embedded within these heterodox traditions of urban theory, we take particular inspiration from Levins and Lewontin's framework due to its radically anti-essentialist, non-reductionist approach to the vexing question of demarcating the sites, scales, and contexts of scientific inquiry. Indeed, given our concern to critically interrogate, reconstruct, and drastically expand the naturalized units of analysis—and their concomitant sites of observation—around which the field of urban studies has long been configured, we find particularly generative synergies between our agendas and those elaborated by Levins and Lewontin.

Much like Levins and Lewontin in their critique of the Darwinian demarcation of the organism/environment dyad, we emphasize that the planetary geographies of urban life cannot be neatly disentangled from what is often cast as an "exterior" realm: the rural, the agrarian, the pastoral, the wild, or the non-human. Agglomeration processes neither produce nor result from coherently bounded, self-sustaining, undecomposable territorial units—whether described as cities, metropolitan regions, or otherwise—but hinge *constitutively* upon

determinate webs of metabolic relations to non-agglomerative spaces (in our terms, "operational landscapes").[25] Indeed, over the course of the past 150 years, the intensive territorial enclosure, operationalization, infrastructuralization, and terraforming of non-city spaces of extraction, primary commodity production (including agriculture), energy distribution, logistics, and waste absorption have figured crucially in facilitating and indeed intensifying the continued concentration of population, infrastructure, and investment into dense zones of urban agglomeration. Across the world economy, through contextually specific pathways, these (increasingly fossil-fueled) dynamics have in turn contributed to still further waves of enclosure, infrastructuralization, territorial rationalization, metabolic intensification, and socioenvironmental destruction within and among such operational landscapes. The Earth's biosphere is, in effect, being parcelized, appropriated, colonized, and intensively operationalized to support the metabolic demands of endlessly escalating concentrated urbanization on a planetary scale—the "hypertrophic city," in Max Ajl's apt formulation.[26]

With these infrastructural, territorial, and energo-metabolic dynamics in view, we can begin to grasp the sense in which operational landscapes are not merely *impacted* by city growth but serve as environments *of* urbanization. They are not articulated to zones of agglomeration simply through contingent relays of supply or waste (that is, as exterior "taps" and "sinks"), or as one categorical unit within a static, ahistorical binary (urban/rural, city/countryside). Rather, in the dialectical sense of this expression, they serve as *internally related* parts of an emergent, ever-evolving whole—the capitalist urban fabric—which now encompasses, transforms, and increasingly degrades the planetary biosphere. These are, then, the "hidden abodes" of the contemporary "urban age" that, in our analytical framework, constitute the sociometabolic foundations of planetary urbanization.[27] Especially since the consolidation of a fossil-based metabolic regime of capital in the late nineteenth century, this matrix of city/non-city relations has come to serve as a precondition, medium, and outcome of capital's drive towards geo-metabolic intensification. This relational matrix—unevenly materialized in the capitalist urban fabric—also undergirds many of the climate and nature emergencies that are profoundly reshaping the biophysical conditions for urban life—and social existence more generally—in the early twenty-first century.[28]

The investigation of these internal relations of parts and wholes—cities and operational landscapes; their ever-evolving spatial materializations; and their geo-metabolic pulsations and entropic dissipations across the planetary biosphere—requires, as a first-order priority, the analytical decomposition of all naturalized cartographies of settlement space that arbitrarily parcelize the sociometabolic relations of capital into separate domains of inquiry or territorial containers. The city-centric territorializations of settlement space that continue to prevail in the field of urban studies embody the form of "alienated science" so forcefully criticized by Levins and Lewontin; such frameworks reduce emergent, evolving, multidimensional, and contradictory processes to "fixed planes of low dimensionality."[29]

In order to excavate the "full dimensionality" of capitalist urbanization, its materializations in the capitalist urban fabric, and its wide-ranging, increasingly destructive imprints across the planetary biosphere, five closely interconnected tasks acquire particular urgency.[30]

Decomposing agglomeration

First, processes of agglomeration require systematic analytical decomposition; they are not neatly contained within pregiven spatial units, but are composed of heterogeneous elements, most of which are not endogenously produced.[31] This exercise reveals the historical specificity and geographic variegation of agglomeration processes under modern capitalism and brings into view the constitution and ongoing remaking of cities through their evolving relations to variegated, non-city territories and environments. The analytical decomposition of agglomeration processes thus helps illuminate the multiple determinations, within and beyond metropolitan centers, that shape the patterns and pathways of urban life. This includes shifts in the forms, terrains, and scales of urban politics in response to the escalating, overlapping political-economic

and ecological crises of capitalism over the *longue durée* and in the present conjuncture. In the Global North and South alike, the sociopolitical relations of urban agglomeration—including the decomposition/recomposition of social classes, the mobilization of new forms and scales of state repression, and the emergence of new multi-regional, multi-racial, and multi-ethnic political alliances—are inextricably linked to socio-economic and socio-environmental transformations beyond the territorial boundaries of cities; the latter are in turn articulated to broader, crisis-induced spatial and scalar shifts in the geopolitical economy of global-neoliberal capitalism.[32] To the degree that we connect the oil well to the office tower, the land grab to the *favela*, the distribution warehouse to the apartment block, the solar farm to the supermarket, or the industrial feedlot to the financial hub, we are likely to gain a deeper, more holistic understanding of the urban *problematique*.

Decomposing operational landscapes

Second, this approach also holds that there is "no basement" with regard to the investigation of operational landscapes of extended urbanization. The apparent discreteness, stability, and coherence of such non-city territories and environments must likewise be analytically decomposed, revealing myriad interconnections to diverse "elsewheres," including metropolitan centers and the global metropolitan network, as well as to other operational landscapes and their own yet-more-hidden abodes of plunder and pollution, from which matter, energy, and labor-power are appropriated, capitalized, and dissipated across the gravitational field of capital's value relations. This methodological imperative thus requires us to subject non-city spaces to careful investigative scrutiny in search of their relational interconnections to agglomeration processes, whether (a) through their direct role in extraction, industrial agriculture, or other forms of primary commodity production, (b) as the socioecological supports for (and "hidden abodes" of) such operations, or (c) as "sacrifice zones" into which the dissipated, often toxified, metabolic byproducts of urban industrial development are expunged.[33]

Here too, the exercise of analytical decomposition is intended to open up "new domains for investigation and practice."[34] How might our understanding of the "power of agglomeration" change if we simultaneously consider the evolving role of urban centers in animating processes of unequal ecological exchange, in the dispossession and displacement of relative surplus populations (and its attendant forms of militancy and struggle), in the worldwide consolidation of carbon-intensive forms of infrastructure, and in concomitant forms of ecological plunder?[35] How can we decipher the sociometabolic imprint of global metropolitan centers on, for example, monocrop agribusiness landscapes, zones of fossil fuel extraction, industrial livestock processing plants, copper and lithium mines, intercontinental logistics grids, and toxic waste dumps? How can we discern the imprint of such highly capitalized, high-throughput operational landscapes—and the imperial relations through which they are often forged and reproduced—on the patterns and pathways of agglomeration they support?

Destabilizing the human/non-human binary

Third, the methodological imperative of analytical decomposition requires us to destabilize the reified binary of human/non-human that is widely presupposed in anthropocentric and city-centric approaches to the urban question.[36] From this point of view, as several generations of scholarship in urban political ecology have underscored, urbanization processes are inextricably intermeshed with the metabolic dynamics of biogeophysical transformation on a planetary scale. Urbanization not only produces cyborg cities, metropolitan natures, and more-than-human geographies, but also continually reshapes the non-human world, from microbial life, regional ecosystems, and terrestrial biomes to planetary-scale ecologies. The point here is not merely that urban space is produced through the appropriation and commodification of matter,

energy, landscapes, and non-human life, but that capitalist urbanization has reworked the very biogeophysical conditions that undergird the metabolic reproduction of cities. Because these relations generate historically distinctive constellations of reciprocal co-determination, recursive co-evolution, and socio-ecological crisis across the planetary biosphere, urbanization must be recognized as one of the core macrogeographical processes underlying the Capitalocene: its metabolic imprints now pervade the planetary biosphere as a whole, from the microplastics permeating the world's oceans to the gigatons of carbon circulating in the atmosphere.

The analytical decomposition of biogeophysical processes in relation to the *problematique* of urbanization thus opens up new lines of inquiry for an "urban political ecology beyond methodological cityism."[37] How, for instance, are cities, metropolitan regions, and global intercity networks entangled with the industrial livestock production regime, the territorial reorganization of agrarian landscapes for monocrop agribusiness, the rising concentration of nitrogen dioxide in the atmosphere, and the accelerating destruction of planetary biodiversity? Through what mechanisms and pathways do the socio-ecological dislocations arising from these reconfigurations of the non-human world unsettle and reshape urban life, within and beyond cities and their contiguous hinterlands? How is the rapid expansion and multiplication of metropolitan regions articulated to the ongoing enclosure and degradation of forests, rangelands, and wildlands worldwide? To what extent, and through what mechanisms, have the major infectious diseases of the twenty-first century emerged from the intersecting webs of city/non-city relations—materialized in degraded or fragmented ecosystems, terraformed landscapes, circulatory infrastructures, and agro-industrial supply chains—that at once transgress and transform inherited typologies (urban/rural/wildland) of geographical space?[38]

Rethinking the periodization of capitalist urbanization

Fourth, this dialectical approach requires a radical reconceptualization of the geohistorical patterns and pathways through which the capitalist form of urbanization unfolds. Here, we confront the vexing question of how to apprehend and periodize the diachronic dimensions of urban development without naturalizing the existence of fixed, stable spatial units such as cities, metropolitan regions, or territories. If spatial organization is itself always in the process of being reconfigured, how can we track the sociohistorical trajectories and geographical imprints of the processes under investigation?

This intellectual terrain has, of course, been richly explored by dialectical theorists who refuse to separate space and time—Henri Lefebvre, Milton Santos, David Harvey, Doreen Massey, and Gillian Hart, to name just a few. It is also familiar to theorists of uneven and combined development who analyze geoeconomic restructuring with reference to the multiplicity of overlapping, multiscalar spatio-temporal processes through which accumulation strategies, state strategies, and social forces interact to produce specific conjunctures and their attendant geopolitical orders, institutional architectures, macrospatial rule-regimes, and political cultures.[39] In the context of urban studies, such ideas and methods also articulate directly to approaches to the urban question as a scale question, which explicitly reject the analytical imaginary of the urban as a fixed unit of sociospatial organization and seek, by contrast, to investigate its ongoing production and contestation within a shifting web of interscalar relations.[40] Levins and Lewontin's dialectical approach to part/whole relations converges productively with such analyses; it permits their articulation to a reconceptualization of capitalist urbanization as a spatialized process of *geo-metabolic escalation*, one that acquires planetary dimensions under the fossil-based metabolic regime of capital.[41] The animating puzzle, then, is how to investigate the multiscalar, and ultimately planetary, historical-geographical dynamics of capitalist urbanization—combined, uneven, and variegated—without reducing this process to its forms of appearance in the changing morphologies of urban agglomeration.[42]

If we revisit these questions in light of Levins and Lewontin's dialectical method, we can avoid the pitfalls of conceiving the geohistory of urbanization as a process involving the change of any pregiven entity or

unit—"the city" or otherwise—and instead seek to investigate the webs of part/whole relations that cumulatively produce and continuously restructure the capitalist urban fabric and its constitutive geo-metabolic dynamics. In methodological terms, this entails a radical expansion of the range of geographies, sites, and objects typically associated with urbanization. From this perspective, urbanization processes cannot be reduced to the demographic or areal growth of cities. Instead, building on Levins and Lewontin's method, concentrated and extended urbanization are conceived as moments of a dialectical process. The components of this process are relational; they are reciprocally co-determined yet fundamentally heterogeneous parts of an evolving, self-forming whole. Research on planetary urbanization is therefore focused on illuminating—in Marx's famous formulation from the *Grundrisse*—the "multiple determinations" through which those heterogeneous parts, together with the internally differentiated wholes they constitute, are interwoven and thus co-evolve.[43] It does not rest on the universalizing claim that "the city" has spilled beyond its former boundaries to engulf the entirety of the planet as a homogenous, indivisible substance.[44]

The aim of our work, rather, is to investigate the hypothesis that, since the planetarization of primarily fossil-fueled circuits of industrial and commercial capital after the 1870s, agglomeration processes (concentrated urbanization) have been more directly articulated to major transformations of non-city spaces (extended urbanization)—and vice versa. It is precisely these articulations—materialized in sociospatial upheavals, colossal infrastructural configurations, terraformed landscapes, and eviscerated ecosystems—that require further investigation, theorization, and periodization. The *problematique* of planetary urbanization is thus conceived as a research program on (a) the sociospatial *and* sociometabolic relations of agglomeration processes under the fossil-fueled formation of global capitalism; (b) the multiple determinations that produce such relations, within and beyond the agglomeration; (c) the restructuring of such metabolic relations through the contradictions and crisis-tendencies of capital (elsewhere theorized as "differential" urbanization); and (d) the wide-ranging, increasingly destructive reverberations of such processes across the planetary biosphere—which in turn drastically reshape the biogeophysical *and* political-economic conditions in which subsequent rounds of capitalist urbanization unfold.[45]

Contending with the historicity of capitalist urbanization in this radically relational sense requires, inter alia, a fundamental reconceptualization of the historical geographies *and* political ecologies of the urban process. This involves developing synthetic, macrohistorical frameworks that can adequately account for shifts in the nature, degree, and form of reciprocal co-evolution between cities and non-city spaces during specific historical conjunctures, their political mediations, and their socioenvironmental contradictions. How, for instance, might we trace the impacts of the late-nineteenth-century steam shipping revolution on the regional geographies of urbanization in the Indian Ocean World? Conversely, how did the emergence of vertically integrated production in the urbanizing heartlands of Euro-American industrial capitalism scramble the configuration of circulatory and productive infrastructures in West Africa and Central America? Can we better understand the contradictions of the so-called "golden age" of postwar Fordist-Keynesian urbanization by connecting it to transformations in the global political geography of fossil energy in the 1950s and 1960s? How are the planet-girding infrastructures associated with contemporary "supply-chain capitalism" articulated to new forms of political mobilization and class struggle in the megacities of the global South and in the deindustrialized urban regions of the older industrialized world?

This dialectical framing stands in sharp contrast to the simplistic notion that all aspects of city life are produced exogenously, or conversely, that city-building should be the exclusive or primary lens for interpreting and investigating all aspects of social, territorial, and environmental transformation beyond the city.[46] To pronounce the nature of such interconnections through *a priori* abstractions, independently of specific operations of analytical decomposition, would be profoundly undialectical and ahistorical, neither intellectually illuminating nor politically productive. As conceived here, analytical decomposition is a means to *investigate* the multiple determinations that intermesh city spaces and non-city territories under the

Capitalocene, such that their developmental trajectories not only contingently articulate, but co-evolve in determinate ways.

Decomposing the planetary

These considerations lead to a fifth and final point of articulation between Levins and Lewontin's dialectics and our approach to planetary urbanization: the planetary must itself be analytically decomposed as a reference point, scale, and horizon for our investigations. As the preceding discussion has underscored, one of the most glaring limitations of the alienated worldview that underpins mainstream analyses of urbanization is that their reductionist, low-dimensional conceptualizations render invisible the myriad, opposing forces that shape it, and the contradictions that animate its patterns and pathways. The dialectical counterpoint to this alienated worldview must be applied to illuminate not only the part/whole relations and contradictory processes that shape and reshape cities, their operational landscapes, and the hidden abodes that support the latter, but also the planetary urban fabric that crystallizes through the intermeshing, reciprocal co-determination, and co-evolution of such relational webs. Levins and Lewontin caution us to avoid reifying *any* unit, scale, object, or site of analysis; "there is no basement" *ever*.

We must, in short, avoid replacing methodological cityism (or methodological territorialisms at other scales) with similarly low-dimensional variants of methodological planetarism—modes of analysis that treat the planetary as pregiven and immutable, somehow autonomous from the profoundly contradictory processes that constitute, animate, and mediate even its most systemic materializations.[47] The challenge for dialectical approaches to planetary urbanization is thus to illuminate its emergent properties and contextually specific materializations; *and* the determinate macrospatial processes that at once shape and constrain its evolutionary pathways as a dynamic "context of context."[48]

What, then, is being planetarized through the process of capitalist urbanization? How do the webs of part/whole relations that form the capitalist urban fabric—and the conflicts, crises, and contradictions that animate them—acquire a planetary scope and impact? Our approach seeks to investigate the churning, contradictory dynamics of implosion/explosion that constitute and continuously rework the capitalist urban fabric, from the microbiological to the planetary scales, in significant measure through the spatial metabolism of capital, its extensive infrastructural materializations, and its transformative *and* destructive reverberations across the web of life. Our inquiry is focused on this churning process itself, and its socioecological contradictions, rather than on the apparently stabilized sociospatial configurations it may temporarily produce.[49]

Planetary urbanization can thus be thought of as a world-ecological *maelstrom* that is materialized, on one level, in the vast infrastructures and terraformed landscapes through which capital sustains its drive toward geo-metabolic escalation. The most obvious expressions of these are the built environments of metropolitan regions and megacities; the intercontinental grids of transportation and communication that link airports, highways, railway lines, ports, canals, and submarine cables into an integrated logistical field; the myriad resource frontiers where the energetic-material basis of capitalist operations is secured, extracted, and produced; sprawling zones of agro-industrial production, including high-throughput livestock slaughter and processing; and the industrial infrastructures of fossil capital, including gas and oil wells, offshore rigs, pipelines, and refineries.

Just as crucially, the implosions/explosions of planetary urbanization are constituted through the systemic violence of neo-imperialist domination, militarized displacement and mass murder, and ecological plunder that undergird these infrastructures and operational landscapes of capital. In this relational-dialectical sense, the (geo)political ecologies of planetary urbanization crystallize across a wide spectrum of territories and environments, many far removed from cities and metropolitan regions. These include, for example, land enclosures and depeasantization in the majority world that drive large-scale displacements from "rural" regions into megacity slums; the degradation and destruction of forests, wildlands, rivers, and aquifers through the intensifying operations of transnational agribusiness and extractive capital; the cascade

of extinctions unfolding across the Earth's biomes; and, ultimately, the degradation of the biosphere itself into a planetary sacrifice zone.

As world-ecological surpluses diminish and crises of overaccumulation proliferate, inherited relays of appropriation are subjected to mounting pressures and constraints. To offset declines in profitability, dominant factions of capital in primary energy/commodity production ratchet up the pace and intensity of capitalized extraction, thereby escalating the drive to subsume previously uncommodified or partially commodified realms of life within the forcefield of value relations. In seeking to increase metabolic throughput, capital's resource- and energy-intensive accumulation strategies generate systemic crises of underproduction as inherited relays for appropriating "cheap" natures are progressively exhausted. This also accelerates the wasting of human and non-human bodies and the expulsion of toxic materials and dissipated entropy into the Earth's oceans, rivers, lakes, soils, and atmosphere.[50] As Henri Lefebvre observed, the resultant "space of catastrophe"—an immanent horizon of worldwide social and ecological disaster—is not merely coincidental to but constitutive of the dynamics of planetary urbanization; it is inseparable from the colossal techno-infrastructures that weave together agglomerations with their myriad operational landscapes.[51]

The metaphor of implosion/explosion is intended, then, to illuminate the profoundly contradictory metabolic churn animated by the dynamics of planetary urbanization—what we have theorized elsewhere as its throughput ecologies *and* its exhaustion ecologies.[52] Its constitutive elements are formed and transformed through the intermeshing of agglomeration processes with (a) the production and remaking of non-city territories and environments to sustain urban metabolism; and (b) the wide-ranging political-ecological reverberations of these relations across the planet, which are now assuming highly destructive, often catastrophic forms. In this sense, implosion/explosion should not be understood as a stable morphological relay or linear two-step sequence ("first implosion, then explosion"), but as the incessant pulsation of sociospatial relations and political ecologies, together with their toxic dissipations, coursing through the gravitational field of value relations and, by implication, the entire web of life. The planet-girding matrix of infrastructure, built environments, and terraformed landscapes—which is, in significant measure, a materialization of city/non-city relations (or, we might say, *urbanization*'s metabolism)—cannot be adequately grasped through inherited settlement typologies or land-cover classification systems, because the spaces indexed by the latter are being drastically, often concurrently, transformed through the profit-driven dynamics of with: capital. The geographies of implosion/explosion extend far beyond those sites most dramatically reshaped by capital's strategies of territorial enclosure, landscape simplification, infrastructuralization, and bio-engineering—whether in metropolitan cores, monocrop plantations, automated extractive complexes, or extended logistics corridors. These vast spatial configurations sustain capital's relentless, profit-driven metabolism by appropriating unpaid or underpaid labor and extracting energy and matter from myriad hidden abodes, proximate and remote, that are neither replenished nor regenerated in the wake of this systematic social and biospheric plunder. The political ecologies of such processes of appropriation, exhaustion, and wasting are continuous with myriad pathways of biospheric destruction; they must therefore be explored as constitutive dimensions of the urban *problematique*.

Coda

Might the dialectical approach to capitalist urbanization outlined above provide orientation for ongoing struggles to destabilize or even supersede the monstrous dynamics of enclosure, plunder, pollution, and ruination that have been unleashed through the metabolic operations of capital and their spatialization in the planetary urban fabric? Clearly, one of the preconditions of such struggles is the denaturalization of hegemonic ideologies that represent extant forms of institutionalized expropriation, savage inequality, and environmental destruction as if they were necessary "forces of nature" rather than the contested expressions of

alienated social relations. Such ideologies are not merely intellectual constructs, but actively shape the material configuration of the world. They naturalize and often animate the abstract violence of capital and the banalities of its political-regulatory management, even amidst deepening social suffering, escalating militarized destruction, and intensifying ecological devastation. In this sense, our efforts to transcend the "alienated science" of mainstream urban studies are inextricably linked to the collective project of developing "*alter*-urbanizations"—and "*alter*-metabolisms"—that might counteract the "devil's brew" of "industrial colonial capitalism" and the myriad threats it poses to collective social existence and planetary ecological survival.[53] Like all dialectical approaches, those advanced here flow from and seek to advance what Roy Bhaskar evocatively described as the "pulse of freedom," understood not only as a struggle against systems of injustice, alienation, and ruination, but also as an efflorescence of radical imagination and political creativity to forge a multiplicity of pathways toward emancipation.[54]

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Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Notes

1. Richard Levins and Richard Lewontin. *The Dialectical Biologist* (Cambridge, Mass.: Harvard University Press, 1985), 3.
2. Others included scholars such as Rita Arditti, Jonathan Beckwith, Anne Fausto-Sterling, Stephen Jay Gould, and Ruth Hubbard. See Sigrid Schmalzer, Daniel S. Chard, and Alyssa Botelho, eds., *Science for the People: Documents from America's Movement of Radical Scientists* (Amherst: University of Massachusetts Press, 2018). In recent years, *Science for the People* has been revived and rebuilt, see Helen Zhao, "What is a Radical Analysis of Science? New Directions for Science for the People," *Science for the People*, 22, no. 1 (2019), available at: https://magazine.scienceforthepeople.org/vol22-1/what-is-a-radical-analysis-of-science/
3. Levins and Lewontin were also leading figures in their primary scholarly fields. Levins made important contributions to mathematical ecology, biological theory and modelling, population genetics, and the study of the relationship between evolutionary adaptation and environmental variation. Lewontin helped found the field of molecular population genetics and made major contributions to evolutionary theory.
4. See, among other works, John Bellamy Foster, *The Return of Nature: Socialism and Ecology* (New York: Monthly Review Press, 2021). For a comprehensive overview of the development of Marxist approaches to the philosophy of science in the twentieth century, see Helena Sheehan, *Marxism and the Philosophy of Science: A Critical History* (London: Verso, 2017).
5. See Levins and Lewontin, *The Dialectical Biologist*.
6. Levins and Lewontin, *The Dialectical Biologist*, 269.
7. Ibid, 271.
8. Ibid, 271.
9. Ibid, 271.
10. Ibid, 272.

11. For further elaborations on the notion of internal relations, see Bertell Ollman, *Dance of the Dialectic: Steps in Marx's Method* (Urbana, IL.: University of Illinois Press, 2003).
12. Levins and Lewontin, *The Dialectical Biologist*, 272.
13. Ibid, 272.
14. Ibid, 272; italics in original.
15. Ibid, 3.
16. Ibid, 278.
17. Ibid, 278.
18. Ibid, 278.
19. Ibid, 279.
20. Richard Levins and Richard Lewontin, "Organism and Environment." *Capitalism, Nature, Socialism* 8 (2009): 95–98; reprinted in Richard Levins and Richard Lewontin, *Biology under the Influence: Dialectical Essays on Ecology, Agriculture, and Health* (New York: Monthly Review Press, 2007), 31–34. The following page references correspond to the latter version.
21. All quotations in the preceding paragraph are from Levins and Lewontin, "Organism and Environment," in *Biology under the Influence*, 32, 34.
22. Ibid, 32, 34.
23. Ibid, 34.
24. See, for example, Henri Lefebvre, *The Urban Revolution*, trans. Robert Bononno (Minneapolis: University of Minnesota Press, 2003 [1970]); David, Harvey, "Cities or Urbanization?" *CITY* 1, no. 1–2 (1996): 38–61; and Andy Merrifield, *Metromarxism: A Marxist Tale of the City* (New York: Routledge, 2007). For more general reflections on the application of dialectical methods to the investigation of sociospatial and socionatural relations, see Sirmu Altun, Christian Caiconte, Madelaine Moore, Adam David Morton, Matthew Ryan, Riki Scanlan, and Austin Hayden Smidt, "The Life-Nerve of the Dialectic: György Lukács and the Metabolism of Space and Nature," *Review of International Political Economy*, 30, no. 2 (2022): 584–607; Eric Sheppard, "Geographic Dialectics?," *Environment and Planning A* 40 (2008): 2603–2612; David Harvey, *Justice, Nature and the Geography of Difference* (Oxford: Basil Blackwell, 1996); and Gillian Hart. "Relational Comparison Revisited: Marxist Postcolonial Geographies in Practice," *Progress in Human Geography* 42, no. 3 (2018): 371–394.
25. See Brenner, Ghosh, and Katsikis, *Environments of Planetary Urbanization*.
26. Max Ajl, "The Hypertrophic City versus the Planet of Fields," in *Implosions/Explosions: Towards a Study of Planetary Urbanization*, ed. Neil Brenner (Berlin: Jovis, 2014), 533–550.
27. Our approach to the "hidden abodes" of capitalist urbanization is strongly influenced by the work of Nancy Fraser, Jason W. Moore, and William Conroy. See, especially, Nancy Fraser, "Behind Marx's Hidden Abode: For an Expanded Conception of Capitalism," *New Left Review* 86 (2014): 55–72; Jason W. Moore, *Capitalism in the Web of Life* (New York: Verso, 2015); William Conroy. "Background Check: Spatiality and Relationality in Nancy Fraser's Expanded Conception of Capitalism," *Environment and Planning. A* 55, no. 5 (2022): 1091–113; and William Conroy, "Constitutive Outsides or Hidden Abodes? Totality and Ideology in Critical Urban Theory," *Urban Studies* 61, no. 10 (2024): 1827–48. For further elaborations of our approach to such issues, see Brenner, Ghosh, and Katsikis, *Environments of Planetary Urbanization*.
28. This argument is elaborated at length in Brenner and Ghosh, "The Monster 'Within': Capitalist Urbanization as Geometabolic Escalation"; and Brenner and Ghosh, *Into the Shatter Zone.*
29. Levins and Lewontin, *The Dialectical Biologist*, 271.
30. The term "full dimensionality" is from Levins and Lewontin, *The Dialectical Biologist*, 271.
31. For various elaborations of this point, see N.A. Phelps and T. Ozawa, "Contrasts in Agglomeration: Proto-industrial, Industrial and Post-industrial Forms Compared," *Progress in Human Geography* 27, no. 5 (2003): 583–604; Erica Schoenberger and Richard Walker, "Beyond Exchange and Agglomeration: Resource Flows and City Environments as Wellsprings of Urban Growth," *Journal of Economic Geography* 17, no. 5

(2017): 935–258; Christof Parnreiter, "The Janus-Faced Genius of Cities," *Urban Studies* 59, no. 7 (2022): 1315–1333; and Christian Schmid and Monika Streuele eds., *Vocabularies for an Urbanising Planet: Theory Building Through Comparison* (Basel: Birkhäuser, 2023).

32. See for instance, Phil Neel, *Hinterland: America's New Landscape of Class and Conflict* (London: Reaktion Books, 2018); Ricardo Jacobs, "An Urban Proletariat with Peasant Characteristics: Land Occupations and Livestock Raising in South Africa," *The Journal of Peasant Studies* 45, nos. 5–6 (2018): 884–903; Kasia Paprocki, "The Climate Change of Your Desires: Climate Migration and Imaginaries of Urban and Rural Climate Futures," *Environment and Planning D: Society and Space* 38, no. 2 (2020): 248–66; Ilias Alami, Jack Copley, and Alexis Moraitis, "The 'Wicked Trinity' of Late Capitalism: Governing in an Era of Stagnation, Surplus Humanity, and Environmental Breakdown," *Geoforum* 153 (2024): 103691, https://doi.org/10.1016/j.geoforum.2023.103691.
33. Brenner and Ghosh, "The Monster 'Within'"; Brenner and Ghosh, "Between the Colossal and the Catastrophic."
34. Levins and Lewontin, *The Dialectical Biologist*, 278.
35. On the "power of agglomeration," see Edward W. Soja, *Postmetropolis: Critical Studies of Cities and Regions* (Oxford: Blackwell, 2000). For elaborations on this point, see also Parnreiter, "The Janus-faced Genius of Cities"; and Schoenberger and Walker, "Beyond Exchange and Agglomeration."
36. See, classically, Matthew Gandy, "Cyborg Urbanization: Complexity and Monstrosity in the Contemporary City," *International Journal of Urban and Regional Research* 29, no. 1 (2005): 26–49; Erik Swyngedouw, "The City as a Hybrid: On Nature, Society and Cyborg Urbanization," *Capitalism Nature Socialism* 7 (1996): 65–80; and Nik Heynen, Maria Kaika, and Erik Swyngedouw eds., *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism* (London: Routledge, 2006). For more recent elaborations see, for example, Bram Büscher, "The Nonhuman Turn: Critical Reflections on Alienation, Entanglement and Nature under Capitalism," *Dialogues in Human Geography* 12, no. 1 (2021) 54–73; Maan Barua, "Infrastructure and Non-Human Life: A Wider Ontology," *Progress in Human Geography* 45, no. 6 (2021): 1467–1489; Nigel Clark, "Urban Granaries, Planetary Thresholds," in *The Botanical City*, eds. Matthew Gandy and Sandra Jasper (Berlin: Jovis, 2020), 30–37; and Kregg Hetherington, "Agribiopolitics: The Health of Plants and Humans in the Age of Monocrops," *Environment and Planning D: Society and Space* 38, no. 4 (2020): 682–698.
37. See Creighton Connolly, "Urban Political Ecology beyond Methodological Cityism," *International Journal of Urban and Regional Research* 43, no. 1 (2019): 63–75; Hillary Angelo and David Wachsmuth. "Urbanizing Urban Political Ecology: a Critique of Methodological Cityism," *International Journal of Urban and Regional Research* 39, no. 1 (2015): 16–27. For an analysis along these methodological lines, see Swarnabh Ghosh, Neil Brenner, and Nikos Katsikis,"The Global Industrial Feedlot Matrix: A Metabolic Monstrosity" in *Technical Lands: A Critical Primer*, eds. Jeffrey S. Nesbit and Charles Waldheim (Berlin: Jovis, 2022), 132–155.
38. Brenner and Ghosh, "Between the Colossal and the Catastrophic."
39. See, for example, Ilias Alami and Adam D. Dixon, *The Spectre of State Capitalism* (New York: Oxford University Press, 2024); and Adam Tooze, "Against Synecdoche! A Plural Taxonomy of Capitalist Globalization," *Chartbook 340* (2024): December 19.
40. See Brenner, *New Urban Spaces*.
41. For a theorization of capitalist urbanization along these lines, see Brenner and Ghosh, "The Monster 'Within'"; Brenner and Ghosh, *Into the Shatter Zone.*
42. For a comprehensive overview of such morphological approaches, see Soja, *Postmetropolis.* Some of their limitations are explored in Brenner, *New Urban Spaces*. In fact, even the most sophisticated approaches to the historical geographies of capitalist urbanization—such as those informed by David Harvey's notion of "structured coherence"—have yet to escape this reductionist trap, which ultimately tethers its periodization to the changing spatial form of cities, typically those associated with the emergence and consolidation of industrial capitalism in the North Atlantic. See, classically, David Harvey, *The Urbanization of Capital: Studies in the History and Theory of Capitalist Urbanization* (Baltimore: The Johns Hopkins University Press, 1985), as well as Soja, *Postmetropolis*. For an approach to developing

periodizations of capitalist urbanization in relation to the consolidation and restructuring of the global agrifood system, see Swarnabh Ghosh and Ayan Meer, "Extended Urbanization and the Agrarian Question: Convergences, Divergences, and Openings," *Urban Studies* 58, no. 6 (2021): 1097–1119.

43. Karl Marx, *Grundrisse: Foundations of the Critique of Political Economy*, trans. Martin Nicolaus (New York: Penguin Classics, 1973 [1857]), 101. For discussion and elaboration, see Jean-Paul Addie, "Stuck Inside the Urban with the Dialectical Blues Again: Abstraction and Generality in Urban Theory," *Cambridge Journal of Regions, Economy, and Society* 13, no. 3 (2020): 575–592; and Hillary Angelo and Kian Goh, "Out in Space: Difference and Abstraction in Planetary Urbanization," *International Journal of Urban and Regional Research* 45, no. 4 (2021): 732–744.
44. Nor does research on planetary urbanization propose that contemporary urban transformations are boundless or spatially amorphous—a new version of the "spillover" imaginary that has long underpinned major traditions of urban geography. This misreading is advanced for example, in Allen J. Scott, "The Constitution of the City and the Critique of Critical Urban Theory," *Urban Studies* 59, no. 6 (2022):1105–1129; and Michael Storper and Allen J. Scott, "Current Debates in Urban Theory: A Critical Assessment." *Urban Studies* 53, no. 6 (2016): 1114–1136.
45. On the dialectical interplay between concentrated, extended, and differential urbanization, see Neil Brenner and Christian Schmid, "Towards a New Epistemology of the Urban?" *CITY* 19, no. 2-3 (2015): 151–182.
46. See, for example, Tariq Jazeel, "Urban Theory with an Outside," *Environment and Planning D: Society and Space* 36, no. 3 (2018): 405–19. For a counterpoint, see Addie, "Stuck Inside the Urban with the Dialectical Blues Again."
47. Such reifications of global space have a long genealogy in traditions of social science as divergent as modernization theory, world-systems analysis, and theories of global networks (on the latter, see Neil Brenner, "Beyond State-Centrism: Space, Territoriality and Geographical Scale in Globalization Studies," *Theory and Society* 28, no. 1 (1999): 39-78). Closely parallel hypostatizations have emerged in new forms in the context of ongoing debates on the Anthropocene, planetary computation, the technosphere, and planetary boundaries. These various streams of research open up many urgent questions about planetary socioenvironmental, infrastructural, and metabolic transformations, but often using low-dimensional conceptual frameworks that obfuscate the variegated, conflictual, and often deeply contradictory processes that underpin the production and transformation of planetary dynamics. This is not the place to discuss such frameworks in any detail, or the quite divergent critical counterpoints that have been developed to replace them. The latter include, among others, Jason W. Moore's approach to the Capitalocene and world ecology; debates on the Plantationocene and the Wasteocene; Donna Haraway's theorization of the Chthulucene; Anna Tsing's notion of the "patchy" Anthropocene; various streams of work on climate coloniality (including notable contributions by Farhana Sultana and Olúfémi O. Táíwò); as well as Phil Neel's extraordinary new work on the planetary factory. For critical overviews of and engagement with several such perspectives, useful starting points are Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History, and Us*, trans. David Fernbach (New York: Verso, 2016); and Nigel Clark and Bronislaw Szerszynsky, *Planetary Social Thought: The Anthropocene Challenge to the Social Sciences* (Cambridge: Polity, 2021).
48. For earlier analyses of the "context of contexts" in relation to urban studies debates, see Neil Brenner, David J. Madden, and David Wachsmuth, "Assemblage Urbanism and the Challenges of Critical Urban Theory," *CITY* 15, no. 2 (2011): 225–240; and Neil Brenner, Jamie Peck, and Nik Theodore, "Variegated Neoliberalism: Geographies, Modalities, Pathways," *Global Networks* 10, no. 2 (2010): 182–222.
49. This is one of the core arguments developed in the concluding chapters of Brenner, *New Urban Spaces*; as well as in Brenner and Ghosh, "Between the Colossal and the Catastrophic."
50. The analysis of capital's world-ecological crisis tendencies summarized in this paragraph draws extensively upon Jason W. Moore's conceptual and historical framework—see Moore, *Capitalism in the Web of Life.* See also Martín Arboleda, "On the Alienated Violence of Money: Finance Capital, Value, and the Making of

Monstrous Territories," in *New Geographies 09: Posthuman*, eds. Mariano Gomez Luque and Ghazal Jafari (Cambridge, Mass.: Graduate School of Design, Harvard University, 2018), 201; Mazen Labban, "Rhythms of Wasting/Unbuilding the Built Environment," *New Geographies 10: Fallow*, eds. Michael Chieffalo and Julia Smachylo (Cambridge, Mass.: Graduate School of Design, Harvard University, 2019), 33–41; and Saskia Sassen, *Expulsions: Brutality and Complexity in the Global Economy* (Cambridge, Mass.: Harvard University Press, 2014).

51. Henri Lefebvre, *State, Space, World: Selected Essays,* eds. Neil Brenner and Stuart Elden (Minneapolis, MN.: University of Minnesota Press, 2009).
52. See Brenner and Ghosh, "The Monster 'Within': Urbanization as Geometabolic Escalation."
53. Max Ajl, *A People's Green New Deal* (London: Pluto, 2022), 99. On "*alter*-urbanizations," see Neil Brenner, "The *Problematique* of Critique," in *Critique of Urbanization: Selected Essays* (Basel/Berlin: Bauwelt Fundamente + Birkhäuser Verlag, 2016), 16-24. On "*alter*-metabolisms," see Brenner and Ghosh, "The Monster 'Within'."
54. Roy Bhaskar, *Dialectic: The Pulse of Freedom* (London: Verso, 1993).