GROUNDING METABOLISM

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edited by DANIEL IBAÑEZ & NIKOS KATSIKIS

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Toward a Singular Metabolism

Epistemic Rifts and Environment-Making in the Capitalist World-Ecology

Critical exploration of the capacity of the concept of metabolism to transcend Nature/Society dualism within a world-ecological framework.

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Metabolism is a seductive metaphor. As critical environmental studies across the humanities and social sciences boomed over the past decade, metabolism and its cognates—above all, the "metabolic rift"[01]—has enjoyed a special place in environmentalist and Marxist thought. We can say two things about this special place. One the one hand, Marx's conception of social metabolism has been reinterpreted as the "metabolism of nature *and* society."[02] On the other hand, there has been virtually no critical interrogation of social metabolism as the metabolic exchange between two entities: "nature" and "society."[03] The "separation" of nature and society has been taken for granted.

Why Should This Be a Problem?

In a nutshell, the problem is that the reality is much more messy, and the relations of humans and the rest of nature more intimate, than the dualistic model suggests. Both mainstream and radical metabolism approaches have highlighted the importance of a historical perspective on the linkage of global capitalism (or industrial society) and global environmental change.[04] This is an important contribution. In the second decade of the twenty-first century, however, the metabolism of nature/society no longer serves to advance our understanding of modernity's unfolding contradictions: of financialization, war, climate change, and much more. It has become increasingly clear, for instance, that financialization not only causes socio-ecological problems, but that financial markets are, in themselves, "ways of organizing nature."[05]

Metabolism-centered studies, like much of critical environmental studies, face an unresolved contradiction: between a philosophical-discursive embrace of a relational ontology (humanity-*in*-nature) and a practical-analytical acceptance of the Nature/Society dualism (humanity *and* nature). This dualism—which I shorthand as the Cartesian binary—is of course manifold.[06] One of Cartesian dualism's essential features is the tendency to circumscribe truth-claims by drawing hard-and-fast lines between what is human and what is "natural." We might call this an *epistemic rift*.[07] At the core of this epistemic rift is a series of violent abstractions implicated in the creation and reproduction of two separate epistemic domains: "Nature" and "Society." The abstractions are "violent" because they remove essential relations from each node in the interests of narrative or theoretical coherence.[08] Not for nothing was this symbolic divorce of Nature and Society consolidated in early capitalism. The epistemic rift was an expression—and also, through new forms of symbolic praxis, an agent—of the world-shaking material divorce of the direct producers from the means of production.[09]

This epistemic rift is premised on the creation of two idealized and independent objects of investigation: Nature/Society. The binary is so resilient because its underlying ontology is mechanical: environmental "factors" can easily be tacked onto the analysis of social processes. Although some version of the phrase "nature-society dialectic" is now commonplace, for the most part such deployments affirm dualism rather than dialectics. How do we see this? Above all, the life and times of metabolism as a "conceptual star" of Marxist thought has resisted the tendency of dialectical praxis to dissolve its analytical objects (nature/society), and to create new categories suitable to comprehending the irreducible messiness and interpenetration of humans with the rest of nature.[10]

Just how one goes about moving from the dualism of humanity *and* nature to the dialectics of humanity-*in*-nature has been a vexing problem for environmentalist thought since the 1970s. My hope, in what follows, is to suggest a different view of this conceptual star. If metabolism is not an exchange between quasi-independent objects—nature/society—but rather a process of life-making

within the biosphere, new possibilities emerge. A singular metabolism of humanity-in-nature might allow us to chart a course beyond dualism.

To say humanity-in-nature is to highlight the specific configurations of human and extra-human natures. In this, capitalism may be comprehended as both producer and product of the web of life, as a "rich totality of many determinations" that transcends the Nature/Society divide.[11] This is a view of capitalism as world-ecology, joining the accumulation of capital, the pursuit of power, and the co-production of nature as an organic whole.[12] In contrast to dualist approaches, a world-ecological reading of metabolism could offer a conceptual way forward, one that might unify humans and the rest of nature through "the unbroken coincidence of our being, our doing, and our knowing."[13]

To recast our narrative frames on the basis of this "unbroken coincidence" implies a movement from "the" environment as object to environment-making as action. All life makes environments; all environments make life. Geographical change is inscribed in the ontology of life itself.[14] For humanity in the era of historical capitalism, environment-making has reached a stage of development capable of facilitating a new geological era. This is usually called the Anthropocene; but it is more accurately called the Capitalocene.[15] It is certain that the twenty-first century is a moment of dramatic global change.

But the task of interpreting these dramatic, and accelerating, global changes is daunting, and it is complicated by more than the facts on the ground. For the epistemic rift between the "economic" and the "environmental" limits our capacity to understand the character of the present conjuncture; it constrains our understanding of how the capitalist world-ecology has created and resolved crises over the *longue durée*. Is this a developmental crisis, one amenable to resolution through renewed redistribution and commodification? Or have we entered a period of protracted transition from one mode of production to another, an epochal crisis? In my view, any effective reply to these questions must ground capitalism in the earth itself, and show how modernity does not act upon nature, so much as develop through the web of life. Capitalism produces,but is also produced by, the web of life.

Capitalism as a Way of Organizing Nature: From Environmentalist Arithmetic to Dialectical Reason

The analytical challenge of explaining how capitalism develops through, rather than upon, nature is posed by the turbulence of the twenty-first-century world-system. Financialization, global warming, the rise of China—and much beyond—are neither social nor environmental processes, as conventionally understood. They are, rather, bundles of human and extra-human nature in which the really decisive connections turn on the configuration of power and re/production in the web of life. Not the separation from, but the terms of humanity's place within, nature is crucial to understanding the conditions of capitalist renewal (if any) and crisis. For I think many of us understand well enough intuitively—even if our analytical frames still lag behind—that capitalism is far more than an "economic system," and indeed far more than a social system. Capitalism is a way of organizing nature.[16]

Such a perspective immediately draws our attention toward two great organizing moments. First, capitalism internalizes—however partially—the relations of the biosphere. In the process, the agencies of capital and empire (but not only these) seek to turn the work of the biosphere into capital (abstract social labor). Second, capital's internalization of biospheric process—something that all human organizations do—simultaneously shape the biosphere's internalization of capitalism's process. These are asymmetrical relations, of course, whose valences and vectors change over time. In this, the philosophical point shapes the historical observation: capitalism, like all civilizations, is constituted through a double internalization: capitalism-in-nature/nature-in-capitalism. To say human activity of any sort "organizes" nature is to say that human activity is ontologically coincident with, and constituted through, specifically bundled relations with the rest of nature. The production of nature is therefore always the co-production of nature—not of two ontologically independent units (humanity plus nature) but of an evolving mosaic of interdependent flows, forces, conditions, and relations. This means that the accumulation of capital and the pursuit of power in the modern world-system do not have an ecological dimension, but rather are ways of human organization moving, representing, channeling, and reworking a singular metabolism: the web of life. And in the very act of moving, representing, channeling, and reworking—always unevenly, and in the modern world, systemically

combined—human organization acquires new properties, undergoes cumulative and sometimes fundamental change, and brings new contradictions to the fore.

In this, all human activity is environment-making, which extends far beyond the earth-moving of urbanization, agricultural expansion, mining, and so forth. I underscore the point because the global environmental change literature leaves little room for ideas and culture as "material forces."[17] Environment-making is therefore not limited to earth-moving; it encompasses those epoch-making revolutions in cartography, agronomy, economic botany, quantification, and much beyond—the relations of what I have called *abstract social nature*.[18] In this perspective, capitalism names those long-run and large-scale patterns of environment-making that encompass "planetary urbanization"; earth-moving always works through the extra-economic procedures of mapping and quantifying reality.[19]

In contrast, environmentalists have long espoused an exogenous breakdown model, in which overpopulation, resource scarcity, earth-system breakdown, and increasingly today, global warming will cause either planetary disaster or the end of civilization as we know it. The metabolic rift perspective at once converges and diverges from this breakdown model. Its central diagnostic metaphor is "planetary catastrophe."[20] Humanity's ongoing and impending transgression of "planetary thresholds" signals an immediate threat to the planet's capacity to sustain life.[21] In this, metabolic rift arguments find common cause with the Anthropocene argument.[22] Meanwhile, rift analysts represent capitalism as essentially independent of planetary catastrophe: "[T]he system will recognize that money cannot be eaten only when the last tree has been cut—and not before."[23] Here the rift perspective diverges from other environmentalist currents—"peak oil" and its predecessors[24]—that view resource scarcity as the prime mover of civilizational crisis. For the peak-everything approach, industrial civilization winds down long before the last barrel of oil is extracted. Notwithstanding this divergence from environmentalist thought, metabolic rift arguments share with the latter an ontological consensus: the relations of Nature (environments without humans) and Society (humans without nature) are quasi-independent. The two systems interact, but are not mutually constituting. Marx's "interdependent process of social metabolism" has been reduced to the "metabolism of nature *and* society."[25]

This has led to a curious state of affairs in relation both to thinking capitalism's historical limits and to considering Marx's "ecological" thought in the study of historical change. For much of the environmentalist left, the question of limits has been pursued through an arithmetic rather than dialectical procedure: "Marxist ecology = society + nature." There are social limits, and there are natural limits. The problem is that the boundaries between the metabolism of the two units—nature and society—are nowhere specified; and the ways in which social limits make natural limits, and vice-versa, are unspecified. By and large, the metabolic rift approach tends to paint a picture of capitalism rushing headlong into the abyss—perhaps true enough in a broad sense—but there is little sense of how history is co-produced by humans and the rest of nature. This gives rise to a static and ahistorical theory of Natural Limits, in which humans (not-Nature) ultimately push nature (not-Humans) too far, whereupon nature exacts its "revenge."[26] Too often, however, the revenge of nature appears as impending cataclysm, and too rarely as a "normal" cyclical phenomenon of capitalism.

This one-size-fits-all model of ecological crisis is a problem if we acknowledge nature, even in a dualist sense, as a constitutive field and force in modern world history. This history is replete with instances of capitalism overcoming seemingly insuperable "natural limits."[27] Any account of capitalist development unable to come to grips with capitalism's cyclical socio-ecological crises—developmental crises—will be unable to frame a theory of capitalism's cumulative limits today. Ignoring the "normal" operation of capitalism's world-ecological reorganizations, such a dual systems approach to metabolism gives us only one flavor of crisis: the apocalypse. In the absence of a rigorous historical approach to the bundling of human and extra-human natures in the accumulation process, arguments for an epochal crisis today will tend to fall back on arithmetic rather than dialectical reason.[28]

This fetishization of natural limits is problematic analytically, because it blinds us to the ways that capitalism unfolds historically through the web of life. Positing two metabolisms, one social and one natural, the Marxist metabolism school forgets to answer the really revolutionary question: How are distinctive metabolisms of capital, power, and production unified, however unevenly, across the long arc of capitalist history? The problem with the rift perspective's argument is not its identification of distinctive metabolisms

but its hardening of these into the modernist containers of Nature/Society. This would not be such a problem were it not for the considerable influence of Foster's reading of Marx and ecology. Marx's ecological insights have been taken up by a significant layer of critical scholarship in a manner largely defined by Foster's dualistic interpretation of "social metabolism" as "nature *and* society" rather than society-*in*-nature. This hardening into a dualist position has discouraged (until now) a debate over the possibilities for a unified theory of capitalism as the accumulation of capital, the pursuit of power, and the co-production of nature.

The formulation of social metabolism as the "metabolism of nature and society" has won such great popularity among social scientists because it leaves untouched the sacred category of Society. This dualism is the metabolic rift perspective's greatest strength and greatest weakness. For in channeling research into the metabolism of nature and society, metabolism has been reduced to a question of flows and stocks between pre-formed units. This has, in turn, encouraged a divorce between Marx's historical materialism and Marx's theory of value. It is often difficult to discern the analytical difference between the use-/exchange-value binary of metabolic rift analysts and the utility/exchange binary of neoclassical reasoning. The politics between the two are clearly different; but it is difficult to see Marx's central theoretical contribution—on the shaping of capitalist civilization through socially necessary labor-time—at work in Marxist ecology today.

And why should this matter? One of the key sources of understanding how capitalism creates and transcends limits—Marx's theory of value and the analysis of capitalism's crises—is rarely encountered in Marxist analysis, and even less rarely is Marx's political economy revised and renewed as if the relations of capital unfold through nature. In brief, through the law of value, Marx identified the ways in which the worlds of humanity-in-nature became valued *and* not-valued over the past five centuries, converting the globe into a vast storehouse of unpaid work—delivered by "women, nature, and colonies."[29] This cheap nature strategy was the basis for advancing labor productivity within the commodity system.[30] Marx's conception of value-relations, in other words, provides a way of seeing the exploitation of labor-power and the appropriation of unpaid work performed by human and extra-human natures as a singular metabolism of many determinations.

From Dualism to Dialectics: Metabolic Rift to Metabolic Shift

The problem of Nature/Society dualism has been confronted on philosophical terrain since the 1970s.[31] It is on this philosophical terrain that relational critiques of dualism have advanced furthest.[32] And yet, the philosophical victory of humanity-in-nature has rarely penetrated the theory and history of capitalist development. Critical political economy unfolds from the premise that the relations of capital are ontologically prior to the environmental consequences they effect. This ontological premise explains the popularity of a "converging" or "triple" crisis discourse since 2008.[33] Happily, environmental crisis tendencies are now invoked alongside economic contradictions. But this carries us only so far. However welcome the inclusion of environmental factors, the converging crisis discourse rests on an environmentalist arithmetic that is fundamentally dualist.

The problem is that adding "the environment" to a laundry list is precisely that: additive, and not synthetic. This kind of "soft" dualism tends to justify social-reductionist analyses of neoliberalism's crisis tendencies, which cannot be abstracted from capitalism's quest for cheap natures.[34] Nature, in this dominant critical approach, does not call for any fundamental rethinking of capital, value, and the patterns of recurrence, evolution, and crisis in historical capitalism. For world-historical scholars too, environmental factors are now widely recognized, but again in additive fashion: "the" environment can now be added to a long list of consequential factors in modern world history. It is this arithmetic of "nature plus society" that insulates critical political economy and world-historical studies from a view of modernity as producer and product of the web of life. And it is this arithmetic that leads Foster to the conclusion—shaping a decade of metabolic rift analysis—that there is no "feedback mechanism that… turns environmental destruction into increasing costs for capital itself."[35]

But if nature matters as more than consequence, and as more than additive factor, how do we go about reshaping our methodological premises, conceptual vocabulary, and analytical frames to show capitalism-*in*-nature rather than capitalism *and* nature? Any effective response must pursue a translation of the philosophical

claim (humanity-in-nature) into workable analytics for the history of capitalism—including, of course, the history of the present.

For the world-ecology synthesis, the historical task is not one of explaining the separation of humanity and nature, but rather of specifying the historical forms of humanity-in-nature, and therefore nature-in-humanity. Humanity's species-being is located at once in and inside our bodies, and at the same time outside of us.[36] The "system of nature" is immediately internalized through our life-activity, which through embodied thought simultaneously externalizes our experiences *and mental* constructs in a never-ending yet asymmetrical and contingent circle of life.[37]

A world-ecological method unfolds from the premise of a fundamental unity between human activity with the rest of nature. The historical specificity of "mode[s] of humanity" derives from their co-produced relation within nature as a whole.[38] There is no ontological divide between the web of life and civilizations, only distinctive variations and configurations within nature as a whole. Even when environments are in some abstract sense pre-formed (the distribution of the continents, for example), historical change works through the encounters of humans with those environments, a relation that is fundamentally co-productive. A mountain range or an ocean is therefore an environmental, not historical, fact; historical change begins when we move from such environmental facts to environment-making, through which humans make environments and vice-versa.[39] Here we recognize that humanity's environment-making proceeds through the nexus of production and reproduction, a process in which humanity "can only proceed as nature does herself," by "chang[ing] the form of the materials."[40] Such a mode of analysis gives analytical—not just moral—teeth to the now-ritualized denunciations of capitalism's destruction, degradation, and disruption of nature.[41] For the focus now shifts to the "reordering of matter" through the *oikeios*—the creative, generative, and manifold relation of species and environments—in its successive historical-geographical forms.[42] The notion that humans relate to nature, in our "physical *and mental* life," as an internal actor "simply means that nature is linked to itself."[43] From this perspective, the problem is not metabolic rift, but metabolic shift.

Toward a Singular Metabolism: Geography, Nature, and the Limits to Capital

Any pursuit of such a holistic and relational perspective not only implies but necessitates a transition from dualism to dialectics. The virtue of the metabolic rift as a heuristic intervention was to highlight the irreducibly geographical character of human activity, no moment of which is independent of the web of life. Marx and Engels's point about the urbanization of the countryside—a process that unfolded in successive historical determinations—was to underscore how the relations of production, class, and accumulation enter into specific historical-geographical forms in the rise of capitalism, from its sixteenth-century origins to the era of large-scale industry.[44] These specific historical-geographical crystallizations do not produce a social metabolism that subsequently confronts a natural metabolism; they are co-produced through a singular metabolism in which humans participate. Metabolisms are always geographical. Capitalist relations move through, not upon, space, which is to say through, and not upon, nature as a whole.

Foster's contribution was to suggest how we might read Marx to understand capital, class, and metabolism as an organic whole. From this perspective, all social relations are spatial relations are relations within the web of life. Metabolism, in this perspective, is about shifts (provisional and specific unifications), not rifts (cumulative separation).

Put in these terms, the apparent solidity of town and country, bourgeois and proletarian, and above all Society and Nature, begins to melt. Metabolism, liberated from dualisms, acts as a solvent. For if metabolism is comprehended as a totality of totalities in which life and matter enter into specific historical-geographical arrangements, we are called to construct a much more supple and historically sensitive family of concepts, unified by a dialectical method that transcends all manner of dualisms—not least, but not only, Nature/Society.

What does this mean for the question of limits? Too much of the discussion around limits has been framed narrowly, focusing too much on resource constraints and too little on how capitalism's drive for limitless expansion presumes an endless frontier of cheap nature. Foster's insight was to see capitalism as an open-system metabolism, one that requires more and

more cheap nature just to stay in place: not just nature as input (e.g., cheap fertilizer) but also nature as waste frontier (e.g., greenhouse gas emissions). Many of the most powerful implications of metabolic rift thinking, however, remain fettered by the very dualisms that Foster initially challenged, not least an unduly narrow view of the "economy" and of accumulation as an economic process (it is surely much more than this) and an undue emphasis on the rarely specified "destruction" of nature.[45] Entropy is all fine and good to embrace, but the web of life is also a place full of life-creating and environment-making activities. A one-way theory seldom gets you where you want to go.

If we take seriously the post-Cartesian implications of an open-flow conception of capitalism's metabolisms in historical perspective, the first thing that comes into focus in the centrality of the "Great Frontier." The Great Frontier was a term coined by the historian Walter Prescott Webb to describe the great shift in the labor-land ratio that inaugurated the rise of capitalism in the sixteenth century.[46] The Great Frontier was, in Webb's apt turn of phrase, the source of unprecedented "windfall profits" (not least American silver). Its opening marked the rise of a civilization that had begun to pivot on the cash nexus. Webb thought the modern world was the product of a great "boom" of economic prosperity that lasted for four centuries; on closer inspection, thanks to the great vertical frontiers of coal and then oil, this Great Boom appears to have last until the dawn of the twenty-first century, with signs of exhaustion apparent by the 1970s. Although the specifics of Webb's analysis have often been superseded in the half-century since he wrote, the basic argument is as sound as ever: modernity's epoch-making reorganizations of human and extra-human natures (labor and land) were in fact a colossally "abnormal" process premised on ruthless conquest and the appropriation of wealth on the frontier. The frontier of what? Of commodification and global value relations. For central to the great arc of modern world history, from the sixteenth century to the present, has been the voracious consumption of, and relentless quest for, cheap natures—"cheap" in relation to the accumulation of capital and its curious privileging of wage-work as the only thing worth valuing. A civilizational conceit of this sort could only emerge on the basis of devaluing both human work outside the commodity system—much of it so-called women's work—and the "work" of extra-human natures.[47]

What this line of thought suggests is that the investigation of capitalism and the "end of cheap nature" has been hobbled by its Cartesian sorting out of the problem; "nature" remains the stuff of metals and oil and corn, to the exclusion of human natures. So I would recommend that our analyses of capitalism's metabolism and its limits begin by unifying the processes of "surplus humanity" and the end of cheap energy, food, and raw materials.[48] We must dispense with the notion that something like climate change as a whole can be analyzed in its quasi-independent social and natural dimensions. And we must embrace the understanding that, with climate change, financialization, or warfare, we are dealing with bundles of human and extra-human natures, that these are varied and bundled "determinations of one essence."[49] Such an embrace would take "limits talk" as a methodological proposition rather than empirical claim, setting aside the millenarian language of catastrophe and privileging a more hopeful and historical view of limits and crises. Crises are full of danger, to be sure, but, as the Chinese would remind us, they are also full of opportunity.

Far from denying geological and biospheric realities, the limits suggested by a monist and relational view of metabolism—the pulse of capitalism as world-ecology—bring into focus the historical agency of extra-human natures as internal to the unfolding crisis of capitalist civilization. I have highlighted capitalism as a world-ecology because this perspective frames the long-run patterns of capital, power, and production in the web of life. Such a perspective defies the convenient and Cartesian notion that capital, power, and production can be placed into their bloodless and disembodied boxes, next to another, bigger but still quite tidy box called Nature. And if we still recognize that the capitalist project creates something called nature in discrete forms (resources, genes, etc.), a world-ecological view of metabolism reveals this view of compartmentalized natures as a "God-trick"[50]: please do pay attention to the Man behind the curtain.

The promise of a singular metabolism perspective is this. It recognizes that the realities signified by capital, power, and nature cannot be encaged within dualist categories. Capital and power (and more than this, of course) unfold within the web of life, a totality that is shaped by manifold civilizational projects. But these projects are not infinitely contingent. Foster and his colleagues are right about the "what" of capitalism's

coherence. And yet, their dualism—an ontological and epistemic rift—keeps them from understanding that value-relations, themselves co-produced, make that coherence. These global value-relations create a set of quasi-lawlike rules of reproduction that necessarily admit contingency, for the very sound reason that capitalism's greatest strength has been its flexibility in mobilizing and recombining parts of nature in the interests of endless accumulation. And because value was premised on valuing some nature (e.g., wage-labor) and not-valuing most nature ("women, nature, colonies"), it necessitated a powerfully alienating conception of nature as external.

At the core of the capitalist project, therefore, from its sixteenth-century origins, was the scientific and symbolic creation of nature in its modern form, as something that could be mapped, abstracted, quantified, and otherwise subjected to linear control.[51] This was external nature; it is what we have come to call Nature, even if many of us no longer believe in a Nature that is independent of the Anthropos. It is easy to talk about the "limits to growth" as if they were imposed by this (external) Nature, but the reality is thornier, more complex, and, I would say, more hopeful. For the limits of capitalist civilization include biophysical realities, but are not reducible to them. Politics still matters.[52] And if the limits of capitalism today are limits of a particular way of organizing nature—this is hardly to deny the acceleration of biospheric change through global warming, the Sixth Great Extinction, and more—then we are confronted with the possibility of changing humanity's relation to nature, which is to say also humanity's relation to itself. Is the "collapse" of a civilization that plunges nearly half its population into malnutrition really something to be feared? The Fall of Rome after the fifth century and the collapse of feudal power in Western Europe ushered in golden ages in living standards for the vast majority.[53] We should be wary of making too much of such parallels. But we make too little of them at our peril.

I have long thought that the most pessimistic view is one that holds for the survival of modernity in something like its present form. But this is impossible, for the good reason that capitalism's metabolism is inherently an open-flow system that continually exhausts its sources of nourishment. There are limits to how much new work capitalism can squeeze out of new working classes, forests, aquifers, oilfields, coal seams, and everything else. Nature is finite. Capital is premised on the infinite. Thus the centrality of the Great Frontier in the history of capitalism, and the centrality of the end of the last frontiers—cheap oil in the Middle East, cheap labor-power in China, cheap food everywhere—in the present conjuncture.[54] It was this Great Frontier that inaugurated a civilizational metabolism in which most nature, including most humans, was sacrificed in service to the productivity of wage-labor. These frontiers of appropriation were the decisive way of making others outside the circuit of capital, but within reach of capitalist power, foot the bill for the endless accumulation of capital. The great secret and the great accomplishment of the capitalist mode of production has been to not pay its bills, which is what frontiers made possible. The end of the frontier today is the end of Cheap Nature, and with it, the end of capitalism's free ride.

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Notes

01. John Bellamy Foster, "Marx's Theory of Metabolic Rift," American Journal of Sociology 105, no. 2 (1999): 366–405.

02. Karl Marx, Capital, vol. 3 (New York: Penguin, 1991), 949; John Bellamy Foster, "The Metabolism of Nature and Society," chap. 5 in Marx's Ecology (New York: Monthly Review Press, 2000).

03. But see Jason W. Moore, "Transcending the Metabolic Rift," Journal of Peasant Studies 38, no. 1 (2011): 1–46

04. Respectively, the global metabolism school of Fischer-Kowalski and her colleagues and the metabolic rift perspective of Foster, Richard York, and their students. See Marina Fischer-Kowalski, Fridolin Krausmann, and Irene Pallua, "A Sociometabolic Reading of the Anthropocene," Anthropocene Review, (forthcoming, 2014): 1–26; and John Bellamy Foster, Brett Clark, and Richard York, The Ecological Rift (New York: Monthly Review Press, 2010).

05. Jason W. Moore, "Wall Street Is a Way of Organizing Nature," Upping the Anti 12 (2011): 47–61; Larry Lohmann, "Financialization, Commodification, and Carbon," in Socialist Register 2012: The Crisis and the Left, ed. Leo Panitch, Gregory Albo, and Vivek Chibber (London: Merlin, 2012), 85–107.

06. Val Plumwood, Feminism and the Mastery of Nature (New York: Routledge, 1993).

07. The term is indebted to Jeremy Vetter, "Expertise, 'Epistemic Rift,' and Environmental Knowledge in Mining and Agriculture in the U.S. Great Plains and Rocky Mountains" (paper presented to the annual meeting of the American Society for Environmental History, 29 Mar 2012); and Mindi Schneider

and Philip McMichael, "Deepening, and Repairing, the Metabolic Rift," Journal of Peasant Studies 37, no. 3 (2010): 461–484. Their independent formulations are, however, distinct from epistemic rift as epistemological dualism.

08. Derek Sayer, The Violence of Abstraction (Oxford: Blackwell, 1987).

09. Jason W. Moore, "The Capitalocene, Part II: Abstract Social Nature and the Limits to Capital (unpublished paper, Fernand Braudel Center, Binghamton University), http://www.jasonwmoore.com.

10. Marina Fischer-Kowalski, "Society's Metabolism," in The International Handbook of Environmental Sociology, ed. Michael R. Redclift and Graham Woodgate (Cheltenham, UK: Edward Elgar, 1997), 119–137.

11. Karl Marx, Grundrisse (New York: Vintage, 1973), 100.

12. In addition to Moore, the world-ecology synthesis is pursued by Gennaro Avallone, "Tra finanziarizzazione e processi ecologici: la salute urbana come bene comune," Sociologia Urbana E Rurale 101 (2013): 85–99; Sharae Deckard, "Mapping the World-Ecology," (unpublished paper, School of English, Drama, and Film, University College Dublin, 2012); Benjamin Marley and Samantha Fox, "Exhausting Socio-Ecological Relations," Journal of World-Systems Research (forthcoming); Michael Niblett, "The 'Impossible Quest for Wholeness'," Journal of Postcolonial Writing 49, no. 2 (2013): 148–160; Roberto José Ortiz, "Latin American Agro-Industrialization, Petrodollar Recycling, and the Transformation of World Capitalism in the Long 1970s," Critical Sociology (forthcoming); Christian Parenti, "The *Inherently* Environmental State: Nature, Territory, and Value," (unpublished paper, School for International Training, 2014); Tony Weis, The Ecological Hoofprint (London: Zed, 2013).

13. Humberto Maturana and Francisco Varela, The Tree of Knowledge (Berkeley: Shambhala, 1987), 25.

14. Richard Lewontin and Richard Levins, "Organism and Environment," Capitalism Nature Socialism 8, no. 2 (1997): 95–98.

15. Jason W. Moore, "The Capitalocene, Part I: On the Nature and Limits of Our Ecological Crisis" (unpublished paper, Fernand Braudel Center, Binghamton University, 2014), http://http://www.jasonwmoore.com; Moore, "The Capitalocene, Part II."

16. This argument is elaborated in Jason W. Moore, "Transcending the Metabolic Rift," Journal of Peasant Studies 38, no. 1 (2011): 1–46; "Ecology, Capital, and the Nature of Our Times," Journal of World-Systems Analysis 17, no. 1, (2011): 108–147; "Wall Street Is a Way of Organizing Nature"; "From Object to Oikeios" (unpublished paper, Department of Sociology, Binghamton University, 2013), http://www.jasonwmoore.com.

17. Marx reminds us that "theory itself becomes a material force when it has seized the masses." Does this not apply also to the bourgeoisie? Karl Marx, "Contribution to the Critique of Hegel's Philosophy of Right," in The Marx-Engels Reader, ed. R.W. Tucker (New York: Norton, 1978), 60.

18. See Moore, "The Capitalocene, Part II."

19. Neil Brenner, ed., Implosions/Explosions (Berlin: Jovis, 2013).

20. John Bellamy Foster, "The Epochal Crisis," Monthly Review 65, no. 5 (2013), 1.

21. Johan Rockström et al., "Planetary Boundaries," Ecology and Society 14, no. 2 (2009), http://www.ecologyandsociety.org/vol14/iss2/art32/main.html.

22. Will Steffen, Paul J. Crutzen and John R. McNeill, "The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?" Ambio 36, no. 8 (2007): 614–621.

23. John Bellamy Foster, The Ecological Revolution (New York: Monthly Review Press, 2009), 206.

24. Richard Heinberg, The Party's Over (Gabriola Island, BC: New Society, 2003); Donnella H. Meadows et al., The Limits to Growth (New York: Signet, 1972).

25. Marx, Capital, vol. 3, 949; Foster, Marx's Ecology, chapter 6.

26. Frederick Engels, "The Part Played by Labor in the Transition from Ape to Man," in The Origin of the Family, Private Property, and the State (New York: International Publishers, 1970), 260.

27. See especially Jason W. Moore, "The End of the Road? Agricultural Revolutions in the Capitalist World-Ecology, 1450–2010," Journal of Agrarian Change 10, no. 3 (2010): 389–413.

28. A good example is Foster's Cartesian reformulation of my framing of world-ecological crises, in which long-run cyclical moments of crisis and restructuring shape, and are shaped by, a long-cumulative moment (see Moore, "Transcending the Metabolic Rift"; and "Ecology, Capital, and the Nature of Our Times"). Crucially, Foster characterizes epochal crises as the "*convergence* of economic and ecological contradictions." Such a formulation makes sense only if we presume the ontological and historical independence of "economy" and "ecology." See Foster, "The Epochal Crisis," 1.

29. Maria Mies, "National Liberation and Women's Liberation," chap. 6 in Patriarchy and Accumulation on a World-Scale (London: Zed, 1986). On value relations as a way of organizing nature, see Moore, "Transcending the Metabolic Rift"; "The Capitalocene, Part I" and "The Capitalocene, Part II.")

30. Jason W. Moore, "The End of Cheap Nature, or, How I Learned to Stop Worrying about 'the' Environment and Love the Crisis of Capitalism," in Structures of the World Political Economy and the Future of Global Conflict and Cooperation, ed. Christian Suter and Christopher Chase-Dunn (Berlin: LIT, 2014), 1–31.

31. Charles Birch and John B. Cobb, The Liberation of Life (Cambridge: Cambridge University Press, 1981); David Harvey, "Population, Resources, and the Ideology of Science," Economic Geography 50, no. 3 (1974): 256–277; Neil Smith, Uneven Development (Oxford: Basil Blackwell, 1984); Raymond Williams, "Ideas of Nature," in Ecology: The Shaping Inquiry, ed. Jonathán Benthall (London: Longman, 1972), 146–164; Alfred Schmidt, The Concept of Nature in Marx (London: New Left Books, 1973).

32. Bruce Braun and Noel Castree, eds., Remaking Reality (New York: Routledge, 1998); David Harvey, Justice, Nature, and the Geography of Difference (Oxford: Basil Blackwell, 1996); Bruno Latour, We Have Never Been Modern (Cambridge, MA: Harvard University Press, 1993); Plumwood, Feminism and the Mastery of Nature.

33. Susan George, "Converging Crises," Globalizations 7, no. 1–2 (2010): 17–22; Foster, "Epochal Crisis"; Philip McMichael, "The Land Grab and Corporate Food Regime Restructuring," Journal of Peasant Studies 39, no. 3–4 (2012): 681–701.

34. Jason W. Moore, "Cheap Food & Bad Money: Food, Frontiers, and Financialization in the Rise and Demise of Neoliberalism," Review 33, no. 2–3 (2012): 125–161; "The End of Cheap Nature."

35. Foster, The Ecological Revolution, 206 (2002 original).
36. A being which does not have its nature outside itself is not a natural being, and plays no part in the system of nature." Karl Marx, The Economic and Philosophic Manuscripts of 1844 (Mineola: Dover Publications, 2007), 157.
37. Ibid.; also Karl Marx, Capital, vol. I (New York: Vintage, 1977), 283.
38. Quotation from Gerda Roelvink, "Rethinking Species-Being in the Anthropocene," Rethinking Marxism 25, no. 1, (2013), 52–69; this argument is developed in Moore, "The Capitalocene, Part I."
39. Richard Levins and Richard Lewontin, The Dialectical Biologist (Cambridge, MA: Harvard University Press, 1985); Moore, "From Object to Oikeios."
40. Marx, Capital, vol. I, 133, emphasis added.
41. Foster, Clark, and York, The Ecological Rift.
42. Quotation from Petro Verri, quoted in Marx, Capital, vol. 1; on the *oikeios*, see Moore, "Transcending the Metabolic Rift," and "From Object to Oikeios."
43. Marx, Economic and Philosophic Manuscripts, 74, emphasis added.
44. Karl Marx and Frederick Engels, The German Ideology (New York: International Publishers, 1970); Marx, Capital, vol. 1, part 8.
45. Foster et al., Ecological Rift; Foster, Ecological Revolution.
46. Walter Prescott Webb, The Great Frontier (Austin: University of Texas Press, 1964).
47. Moore, "The End of Cheap Nature."
48. Quotation from Mike Davis, Planet of Slums (London: Verso, 2006); see Moore, "The End of Cheap Nature"; "Cheap Food and Bad Money."
49. Karl Marx, Critique of Hegel's Philosophy of Right (1843), https://www.marxists.org/archive/marx/works/1843/critique-hpr/ch05.htm.
50. Quotation from Donna J. Haraway, "Situated Knowledges," Feminist Studies 14, no. 3 (1988): 575–599.
51. Moore, "The Capitalocene, Part II."
52. Christian Parenti, "Shadow Socialism," New Politics 14, no. 4, (2014): http://newpol.org/content/rethinking-state-0.
53. Chris Wickham, Framing the Middle Ages (Oxford: Oxford University Press, 2005); Immanuel Wallerstein, "The New European Division of Labor: c. 1450–1640," in The Modern World-System I (New York: Academic Press, 1974).
54. Moore, "The End of Cheap Nature."