THE ROLE OF DISTINCTION IN DIALECTICAL ANALYSES OF SOCIOECOLOGY

Metabolic Rift, World Ecology, and Urban Political Ecology

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Abstract: The concept of metabolism, as applied to the interrelations between human society and the rest of nature, has been one of the most fruitful iterations of socioecological thought over the last few decades. Here we will examine specific orientations of metabolic thought commonly employed in the social sciences, and their depiction of metabolism as it relates to the "society–nature" problematic and elaborate on the role of the dialectical method when analyzing socioecological processes and distinctions between society and the rest of nature. We will review two overarching uses of metabolism: the theory of metabolic rift and a hybridist metabolic approach to socio-nature. While the former regards society as an emergent property of nature, the latter regards distinctions between the two as undialectical and dualist. First, we review each of these approaches and how they differ in their application of the dialectical method. Then we explore some of the analytic implications of these differing approaches. We contend that a dialectical method that allows for, and encourages, analytical distinction is essential, and that the metabolic rift theory provides an important potential for advancing socioecological analysis in an era of anthropogenic environmental change through its use of analytical distinction between social and environmental phenomena.

Key words: social metabolism; ecology; environmental change; dialectics; materialism

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Introduction

The concept of metabolism, as applied to the interrelations between human society and the rest of nature, has been one of the most fruitful iterations of socioecological thought over the last few decades. In what follows, we will examine specific orientations of metabolic thought commonly employed in the social sciences, and their depiction of metabolism as it relates to the "society–nature" problematic. In doing so, we will elaborate on the role of the dialectical method when analyzing socioecological processes and distinctions between society and the rest of nature.

We will review two overarching uses of metabolism: one as mediator of the social within its larger ecological context, and one that removes the demarcations between the two. In particular, we will analyze the theory of metabolic rift, as representative of the former approach, and the use of metabolism in urban political ecology (UPE) and world ecology, as representative of the latter. We combine the last two frameworks—UPE and world ecology—into what we call hybridist approaches to metabolism. While each of these approaches ultimately stem from and maintain a foundation in Karl Marx's analytical framework of historical and dialectical materialism, as well as his conceptualization of social metabolism, they diverge in their understanding of how such a framework is operationalized, and in their orientation toward the metabolism of society and nature. Hybridist approaches treat the analytical distinction between society, on the one hand, and the larger worldly environment within which it is embedded, on the other, as undialectical and dualist. The theory of metabolic rift instead posits that society is an emergent property of nature, in which it is rooted.

Our analysis highlights the importance of dialectics, and particularly a materialist dialectics, in understanding the different theoretical implications and analytical approaches that each of these frameworks represents. After introducing Marx's conceptualization of social metabolism, we discuss how each of the two approaches, in turn, applies and theorizes Marx's social metabolism. Then, we will focus on how each approach differs with respect to their application of dialectics to the relationship between society and nature, particularly focusing on the role of distinction and its relation to unity in the dialectical method. Finally, we discuss some of the implications of these differing approaches regarding an understanding of the social determinants of ecological harm.

Frameworks

Marx's Social Metabolism

As Fischer-Kowalski puts it, "It was Marx and Engels who first applied the term 'metabolism' to society" (2002, 18). The context within which Marx developed

his conception of social metabolism was the second agricultural revolution of 1830–1870, during which the nutritional depletion of the soil was one of the most serious environmental concerns of the time in Europe. Two factors of the second agricultural revolution are key here. First is the rise of intensive capitalist agriculture, with its increased mechanization, the reduction of the rural population, and a less localized agricultural economy, leading to an increased number of agricultural products being exported, and to widespread soil depletion ultimately leading to input dependency. Second is the advances in the science of soil chemistry. An understanding of the soil's necessary chemical nutrients, such as nitrogen and phosphorus, and the process of nutrient cycling, whereby plant growth contributes to nutrient depletion and the need for the continued recycling of nutrients back to the soil for the maintenance of the soil's fertility, generated an understanding of the causes of soil depletion and how to prevent it.

Marx was greatly attentive to both factors and was deeply informed by the work of German agricultural scientist Justus von Liebig, whose breakthroughs in the study of soil chemistry helped spur nineteenth-century advances in soil science. Liebig's understanding of soil chemistry and in particular the law of compensation—in which nutrients drawn from soil needed to be restored—led him to be highly critical of capitalist agricultural methods, which he argued systematically violated the law of compensation. Following Liebig, Marx maintained that the injection of the capitalist law of value into the process of agricultural production, combined with the separation of the population from the land (part of the town–country rift that is intrinsic to capitalism), were major factors that led to the disruption of the law of compensation (Foster 1999; Moore 2000).

Agricultural production became driven by the cycles of capital, which demanded low-cost, rapidly produced raw materials in the form of food for workers as well as materials required to produce goods. This tended to overburden the soil (along with the workers of the soil), drawing more from it than was returned to it, a process Marx (1976) referred to as the robbery of the soil. The town–country divide, while it predates capitalism, becomes under capitalism the key form of socio-spatial organization. This, among other effects, can disrupt the requisite return to the soil of processed agricultural goods in the form of human waste, which is instead squandered as pollution and sewage in the towns, far removed from where the food and fiber was grown. In later writings, recently examined by Saito (2017), Marx (borrowing from later agronomists like Fraas) extended upon Liebig's conceptions of chemical properties to stress the importance of physical conditions like climate, erosion or weathering, and manuring methods. Thus, the notion of metabolism has deep and substantial roots in the history of Marxian analysis.

The Theory of Metabolic Rift

While Marx's use of the term was referenced by later Marxist scholars, it was primarily John Bellamy Foster and Paul Burkett who excavated it and developed it in modern social science into a theory of metabolic rift. Centrally important in the development of this work was that it demonstrated that Marx had, in fact, taken ecological factors into serious consideration in his analysis of capitalism. Both Foster (1999, 2000) and Burkett (2006, 2014) challenged one-dimensional and doctrinaire readings of Marx, which characterized Marx and Marxism as Promethean, teleological, technocratic, and generally unconcerned with what would later be called ecology. Rather, as these authors demonstrated, Marx was highly attentive to biophysical and chemical concerns, and in particular emphasizing capital's tendencies to disrupt ecologies. This was clearly in line with Marx and Engels's materialist conceptions of both history and nature, where biophysical realities are at the heart of human social development, providing the foundations for varying social forms. The theory of metabolic rift that emerged from this project can be summarized by explicating three interrelated concepts: social metabolism, metabolic rift, and the universal metabolism of nature (Foster and Clark 2020). Below we discuss each in turn.

Social Metabolism

Social metabolism constitutes the interaction between humans and the rest of nature, and the exchange of energy and matter between society and the Earth system—with the former being an emergent property of the latter (Foster 2000; Malm 2018). Every social system forms a particular social metabolism—that is, specific energetic and material relationships, mediated via human labor, with the rest of nature. Therefore, the social metabolic order of capital is but one form of social metabolism. Capitalism as a process of "social metabolic control" is unique compared to all previous forms of social metabolic reproduction in three key ways (Mészáros 1995). First, the social metabolism of capitalism is ultimately uncontainable in its outward, global expansionist aims—the system is driven by its internal contradictions toward consolidation on a global scale. Second, it is an internally antagonistic, alienated form of social metabolic control separating production from consumption and the process of production from the control of production, ultimately tending toward the irrational, inequitable distribution of use values and crises of overaccumulation.[1] And third, it systematically suppresses production based on use value, as "the dominance of use-value characteristic of self-sufficient reproductive systems is historically left behind" (Mészáros 1995, 51), establishing production for exchange value, or abstract value, in its place. Thus, rather than production organized around meeting human needs, the primary purpose of

production under capitalism is to procure profit via exchange and accumulate capital. As Burkett puts it, drawing from both Marx's early writings on the subject as well as the *Grundrisse*:

> In a pre-capitalist economy, the scope for regulation of production by exchange values is limited by the social ties between the producers and the natural conditions of production—ties that tend to create a situation in which "production is *determined* by need." Specifically, the pre-capitalist sphere of exchange value is limited by "the content outside the act of exchange" . . . This content "can only be: (1) The natural particularity of the commodity being exchanged; (2) The particular natural need of the exchangers, or, both together, the different use values of the commodities being exchanged." (Burkett 2014, 63; emphasis original)

This last feature of the capitalist social metabolism, the contradiction between use value and exchange value, is an expression of the primary contradiction of capitalism—between socialized production and privatized ownership—and is a fundamental source of both its social and ecological ills. This contradiction has had numerous ecological implications, and later social metabolic analysts have referred to this as manifesting in a tragedy of the commodity (Longo, Clausen, and Clark 2015).

Universal Metabolism of Nature

Based on these unique characteristics, the capitalist social metabolism is one that tends to generate rifts in the universal metabolism of nature. This latter concept—of which the social metabolism is an emergent property—refers to the biogeophysical laws governing the cycling of energy and matter within the earthly biosphere. As Foster explains,

> To account for the wider natural realm within which human society had emerged, and within which it necessarily existed, Marx employed the concept of "the universal metabolism of nature." Production mediated between human existence and this "universal metabolism." At the same time, human society and production remained *internal to* and *dependent on* this larger earthly metabolism, which preceded the appearance of human life itself. (Foster 2013a, 8; emphasis original)

Marx argued that human society was both embedded within, dependent upon, yet also transformed (or "breathed new life into") this universal metabolism of nature, and that what humanity collectively created—society—was a kind of "second nature" (Foster 2013a, 8). This second nature, under the social metabolic order of capital, is, however, an alienated form of social metabolism. Thus, capitalism as a

form of social metabolic production and reproduction is, in many crucial respects, at odds with the material conditions and dynamics that specify the universal metabolism of nature (Foster 2013a).

Metabolic Rift

When the form of social metabolism tends to violate the requirements of the universal metabolism of nature a metabolic rift can emerge (Foster 1999). For example, global commodification of seafood production and consumption can lead to fisheries depletion or collapse on a scale and frequency not previously thought possible (Longo, Clausen, and Clark 2015). As Foster (2000, 163) explains, "Marx employed the concept of a 'rift' in the metabolic relation between human beings and the earth to capture the material estrangement of human beings within capitalist society from the natural conditions which formed the basis for their existence." For Marx, a key manifestation of this rift in the metabolic interaction between society and its natural conditions of existence is the further development of the town–country divide. He argues:

> Capitalist production collects the population together in great centres and causes the urban population to achieve an ever-growing preponderance. This has two results. On the one hand, it concentrates the historical motive power of society; on the other hand, it disturbs the metabolic interaction between man and the earth, i.e., it prevents the return to the soil of its constituent elements consumed by man in the form of food and clothing; hence it hinders the operation of the eternal natural condition for the lasting fertility of the soil. (Marx 1976, 637)

The rift results from the violation of the energetic-material exchange of equivalents (Foster and Clark 2020). This is first expressed specifically in what Liebig called the "robbery of the soil" inherent to capitalist agricultural production. It also manifests more generally in capitalism as a mode of production that abstracts from the qualities of the use values via the flattening, homogenizing, quantifying process of production based on exchange value, where the particular characteristics of differing components of nature are represented as interchangeable quanta of value (Clausen and Clark 2005; Clark and York 2005; Foster, Clark, and York 2010; Austin and Clark 2012; Longo and Clark 2016; Holleman 2018).

A metabolic rift emerges when the mode of social metabolic reproduction, which is humanity's relationship with extra-human nature, shifts from one of *appropriation*, which is inherent in all forms of social metabolism, to one of *expropriation*, or appropriation without exchange (Foster and Clark 2020). Marx argued that "appropriation of nature was a universal phenomenon of social life, of the social metabolism of humanity and nature" (Foster and Clark 2020, 38). Due

to the social propensity for commodification, profit, and capital accumulation, the social metabolism of capitalism, however, goes beyond the mere appropriation of nature, and toward the *expropriation* of nature. In addition to formulating a highly reductive conception of ecologies, whereby dynamic ecosystem qualities are downgraded "to the status of mere conditions of money-making," capitalist value relations contain no internal mechanisms to economically or materially restoring ecological processes (Burkett 2014, 62; see also Foster and Clark 2016). It is this devaluing of extra-human nature, its treatment as a "free gift" or tribute to capital, that embodies and encapsulates capitalism's rift within its social metabolic mode of reproduction.

While the theory of metabolic rift was originally employed by Marx in terms of the town–country divide, capitalist agriculture, and the rupture in the circulation of matter and energy from agricultural production to consumption and its requisite return in the form of fertilizing nutrients, the concept of metabolic rift has broader applications.[2] In fact, just as Marx's ecological critique, embodied in the metabolic rift concept, was fundamental to his overall analysis of capitalism (Burkett and Foster 2006; Clark and Foster 2010), this conceptualization spoke to the more fundamental chasm between the social system of capitalism and the life-sustaining requirements of the Earth's natural systems, beyond the soil rift generated by industrial agricultural production (Foster 1999). Clark and Foster (2010, 143–144) point out that there is a larger "ecological context" of Marx's historical materialist and dialectical method, demonstrating that "Marx . . . established a materialist conception of both nature and history, in which each was dialectically bound to each other." Beyond his focus on agriculture and soil nutrition, Marx applied the concept of metabolism broadly. For example, he recognized that all "natural systems . . . had [their own] particular metabolism," and that every social configuration had its own "social metabolism" that interacted with a variety of earthly metabolic systems (Clark and Foster 2010, 144). In this way, the concept of metabolic rift is extended to a general ecological critique of the capitalist mode of production, and in Marx's materialist conception of history, a recognition of society's fundamental dependence upon the ecosystems and the biogeochemical conditions that we call the natural world.

Hybridist Approaches to Metabolism

Urban Political Ecology and Urban Metabolism

Urban metabolism as a distinct iteration of Marx's concept of socioecological metabolism can be traced to Erik Swyngedouw's efforts to urbanize the field of political ecology. In his seminal 1996 article "The City as a Hybrid," Swyngedouw (1996, 67), in aiming to help bridge the gap "between ecological thinking, political

economy, urban studies and critical social and cultural theory," starts from Marx's materialist approach to analyzing the dialectic between society and the rest of nature. He notes, "Marx insisted on the 'natural' foundations of social development," and that "[s]ocial relations operate in and through metabolizing the 'natural' environment through which both society and nature are transformed, changed, or altered and new socio-natural forms are produced" (68). However, the approach developed then goes on to critique Marx's bifurcation of society and nature in a dualist fashion, thus banishing nature to a separate realm from society, particularly because of his primary focus on the human labor process.

This work argues that scholars such as Henri Lefebvre, Neil Smith, Bruno Latour, and Donna Haraway, among others, provide a necessary corrective to Marx's dualism and exclusion of nature from its central role in social practice. Proceeding from a position of fidelity to a materialist dialectics, the conceptual tools provided by postmodernist and poststructuralist thinkers are incorporated as a means "to transcend the binary formations of 'nature' and 'society' and to develop a new 'language' which maintains the dialectical unity of the process of change as embodied in the thing itself" (Swyngedouw 1996, 70). Thus, from this view, while Marx was correct in positing that humanity and the social realm rest on a natural foundation, he erred in differentiating too absolutely between the two, ironically mirroring the bourgeois philosophy and political economy that he criticized.

According to UPE scholars, the contribution of poststructuralist thought serves as an essential supplement to our understanding of socioecological metabolism, with its emphasis on hybrids, and the dissolution of boundaries and binaries. Wachsmuth, in his overview of the history of social metabolic thought, argues that urban metabolism

> borrows heavily from Marx's original formulation of social metabolism . . . But to avoid the traps of the society-nature and material-discursive binaries . . . insist[s] upon the ubiquity of nature in social realms . . . while denying that nature can ever be independent of the social. (Wachsmuth 2012, 516)

The result is a conception of "socio-nature," a result of modernity's absolute entanglement of the two (Wachsmuth 2012).

Urban political ecologists employ "metabolism" differently than metabolic rift scholars. In addition to "the material production of socio-nature," in which metabolism is the mediation of biogeochemical phenomena and social practices, there is an equally real and important "representational production of socio-nature," in which metabolism mediates "the discursive production of socio-nature," resulting in hybrid constructions which cannot be analyzed or distilled into their respective parts (Swyngedouw 1996, 71–72). Borrowing from cultural theorist Donna

Haraway, cities are formulated as "a cyborg world, part natural/part social, part technical/part cultural, but with no clear boundaries, centres, or margins" (Heynen, Kaika, and Swyngedouw 2006, 12). The "material substratum," especially in an era of global capital accumulation and extensive commodification, "was more and more a product of social production" (Smith 1984, 32). In other words, phenomena that we consider social or human, such as urban landscapes, are in fact entangled socio-natural phenomena, in ways that make the demarcating of the two aspects counterproductive.

This concept of hybrids is, thus, central to UPE: drawn from Latour, hybrids consist of the products of socio-natural admixtures such as cities which both no longer have identifiably "social" or "natural" components and are equally the result of material and discursive/cultural practices. Here metabolism represents this process of hybridization, the act of blurring binaries like nature and society, city and country, human and non-human. As Swyngedouw (2006a, 113) puts it: "When mobilizing the twin vehicles of 'metabolism' and 'circulation' from a historical materialist epistemological perspective, the binary construction of 'nature' and 'society' that characterized much of the modern scientific and cultural tradition radically disappear." Thus, metabolism is the process of combining and intermingling what are often seen as mutually exclusive opposites. It is the obscuring of distinctions and their recasting as irreversibly blended conglomerates. This hybridized conception, or blurring of distinction, contrasts with the metabolic rift school's tendency to situate capitalist production as alienated from, and antagonistic to, ecologies.

The UPE approach also incorporates the notion of the agency of non-human forces into its concept of metabolism, as a particular manifestation of socio-natural hybrids. Also derived from Latour—in this case, his notion of actor–network theory (ANT) and of diffused agency—non-human agency functions as part of an ensemble of agency, dispersed within socio-natural hybrids, or assemblages (Zimmer 2010). Take, as an example, a hydroelectric power plant: here would be an assemblage of human and extra-human actors, which would include the engineers who designed the plant, the capitalists of the corporation who owned and directed the construction of the plant, the geological conditions within which it was constructed, the water itself, and the wildlife within it. Each is entangled within one another, each imbued with agency, à la an organic machine, to borrow White's (1996) framework for understanding the hybrid metabolism of the Columbia River.

Like metabolic rift scholars, urban political ecologists politicize these socio-natural arrangements, and argue against their naturalization (Zimmer 2010). Significantly, this politicization is posited by some UPE scholars as distinguishing it from a Marxian approach. As Zimmer (2010, 348; emphasis added) notes, "Based on Marx, metabolism in Urban Political Ecology is taken as a material or

energetic exchange, *but* this exchange is seen as a historical product," allowing greater room for human intention and agency in this process of metabolism. Thus, there are clear distinctions between the UPE approach to social metabolism and that of the metabolic rift school, including how to operationalize the relationship of society to extra-social nature, the role of hybrids as key units of analysis and reflections of reality, as well as the question of agency.

World Ecology and the Singular Metabolism

In an approach that often parallels and expands upon UPE's iteration of urban metabolism, a school of thought led by Jason W. Moore has criticized the metabolic rift approach, proposing an alternative rendering of social metabolism. This approach characterizes the theory of metabolic rift as a dualistic theorization of the relation between the social metabolism and a universal metabolism of nature. Moore (2017) proposes instead the framework of a single metabolism, or a "world ecology," as the means to unify the conceptually disparate but internally, intrinsically linked phenomena of class, nature, political economy, and history. Like UPE and the critique of Marxist ecological thought, the world ecology approach argues that the philosophical underpinnings of the theory of metabolic rift are ideologically rooted in the very processes it claims to critique. "The notion that social relations (humans without nature) can be analyzed separately from ecological relations (nature without humans) is the ontological counterpoint to the real and concrete separation of the direct producers from the means of production" (Moore 2015, 19). Despite the metabolic rift scholars' claims to the contrary, the world ecology analysis posits that the theory's method of abstracting the social from the ecological, and the human from "extra-human natures," are not *mere* abstractions, for analytical purposes, or mere social constructions. Instead,

> They are, rather, abstractions at once violent and real. They are *violent*, in the sense that they abstract too much reality in the interests of conceptual clarity. And they are *real*, in the sense that Society and Nature are in fact operative forces. (Moore 2015, 27; emphasis original)

The attempts of social scientists who study the environment to ontologically abstract humanity from nature and then subsequently analyze relations between the two are regarded as engaging in a sort of "Green Arithmetic," which mechanically adds together the two "violent abstractions" of nature and society. This approach, while purporting to be a dialectical one that focuses on the internal relations among and struggle between unified opposites, is rebuked as ultimately a metaphysical orientation, one of isolated "things," rather than internal relations (Moore 2011, 2015).

There is, in this view, a disconnect between the ontological recognition that nature and society are dialectically linked in "an internal relation within a single totality" (Foster, Clark, and York 2010, 229), and a theoretical orientation that, when employed, treats them as separate properties, with one acting upon the other. Thus, while metabolic rift theorists recognize in principle, as famously stated by Hegel, that "the truth is the whole" regarding the relations between social and non-social systems, there is a theoretical disconnect in terms of how these scholars approach theory and historical analysis. It is an example of the fallacy of a "double yes": answering in the affirmative to both the question "Are humans a part of nature?" and "Can we analyze human organizations as if they are independent of nature?" (Moore 2017, 292).

In opposition to the alleged dualism of social metabolism, the world ecology approach presents an ontological orientation of the "*oikeios*" (Moore 2011). This conceptualization is developed with the intention of transforming "objects" into "relations." Interaction, it is argued, implies separate objects that encounter one another. Dialectics, instead, implies undetachable, non-abstractable relations. "From the perspective of the *oikeios*, civilizations (another shorthand) do not 'interact' with nature as resource (or garbage can); they develop *through* nature-as-matrix" (Moore 2015, 36; emphasis original). The *oikeios* originates from Greek philosopher Theophrastus, who used it to describe the relationship between a plant and its environment and is thus indicative of the integral whole this relationship represents. The *oikeios* conveys the "messy bundle of relations" that have been improperly, violently abstracted and divided into the dichotomized objects of nature and society (Moore 2011, 5).

Relatedly, the *oikeios* conceptualization challenges the causal flow of humans as actors and nature as acted-upon. Like UPE, borrowing from both the new materialism and actor–network theory scholars like Bruno Latour and Donna Haraway, world ecology emphasizes the agency of inanimate nature. The *oikeios* thus allows "the relations of specific civilizations, food, water, and oil [to] become real historical actors" (Moore 2015, 36). However, "The issue is emphatically not one of the agency of Nature *and* the agency of Humans" (Moore 2015, 37; emphasis original). Rather, from a world ecology perspective there is no such thing as *distinctly human* agency, but only agency as expressed through historically specific human and extra-human bundles of social aggregates, non-human species, and inanimate features such as geological formations, weather patterns, or bodies of water.

Central to the world-ecological approach is the dissolution of the boundaries between what traditionally constitute "social" and "natural" historical developments. For example, the "social" phenomenon of "financialization," is reconceptualized as "a *bundle* of human and extra-human natures," as "[i]ts claims on future wealth involve claims on future capacities of human *and extra-human*

work, and its transmutation into capital" (Moore 2017, 289; emphasis original). An example of this is demonstrated by how a supposedly purely "natural" phenomenon—the biospheric limits that determine how much crude oil objectively exists underground, or the amount of greenhouse gasses released into the atmosphere that would trigger certain environmental tipping points—is in fact co-determined by these bundles of human and extra-human nature. Thus, the notion of "peak oil" is a co-produced phenomenon, determined not only by objective biospheric limits of oil reserves and atmospheric carbon sinks, but by the dialectical interplay between these limits, broadly speaking, and how "social" institutions like markets react upon (and within) them.

> Financialization not only exerts upward pressure on oil prices and encourages market volatility. To the extent that financial activities are more profitable than investing in exploration and extraction, it renders the latter insufficiently profitable, an effect homologous to (and reinforcing) the rising costs of production stemming from depletion. (Moore 2015, 148–149)

In other words, social–environmental scholars need not fetishize the notion of "natural limits" to capital's excursions—the formula is not as simple as "nature" providing a quantitatively determined number of resources that humanity has to extract, or a finite area of space within which societies can deposit their waste. This example is an expression of what is essential to the world-ecological framework: the recasting of environmental and social phenomena as intrinsically intertwined, so that any attempt to untangle these bundles is an act of excision that does irreparable damage to the whole, despoiling any subsequent analysis of its parts.

Dialectics and Society–Nature Problematic

We posit that a central point of discord between metabolic rift and hybridist approaches lies in their conceptualization and application of dialectics. Here, we provide a brief overview of dialectical analysis, and then we detail how each approach utilizes dialectics in unpacking the society–nature question. Dialectics, which has its origins in Greek philosophy, was most famously advanced within an idealist framework by Georg W. F. Hegel, before being transformed and synthesized on a materialist foundation by Marx and Engels. Dialectics deals with "[t]he identity of opposites . . . the recognition (discovery) of the contradictory, *mutually exclusive*, opposite tendencies in *all* phenomena and processes of nature" (Lenin 1975, 648; emphasis original). It is a methodological approach to understanding reality as matter in motion, in which all phenomena consist of internal struggle between opposing (and uneven) aspects, privileging change over stability, and

emergence and transformation over stasis. Dialectics was integral to Marx's entire theoretical and methodological framework (Ollman 1993), and has been further developed by subsequent Marxist theorists, among others.

Each approach to social metabolism discussed makes use of, or references, the dialectical method. Important in this analysis, each of the two frameworks of socioecological metabolism—metabolic rift and hybrid approaches—develops a distinct set of arguments on the correct orientation toward social and extra-social (or "natural") phenomena. Metabolic rift theorists argue that a key point of delineation between the theory of metabolic rift, and that of its critics, is the former's comprehension and assimilation of the dialectical method. Urban political ecologists contend that the society–nature binary is undialectical, and that, to maintain a dialectical approach of internal contradiction and unity of opposites we must forge a new way of speaking about and understanding socio-nature. Similarly, world ecologists argue that the concept of *oikeios*, or singular metabolism, is "a concept that moves from the *interaction* of independent units—Nature and Society—to the dialectics of humans in the web of life" (Moore 2015, 35; emphasis original). So how does dialectics, and a dialectical method, help us comprehend the relationship between qualitatively distinct, yet unified, phenomena? How can the method deal with both aspects of this: distinction and unity? Next, we will briefly outline key aspects of a dialectical method and characterize how each of these approaches makes use of it in relation to the question of nature and society, or socio-nature.

Metabolic Rift

Metabolic rift scholars, drawing on Marx as well as other Marxist theorists, view society as an emergent property of nature, one that is both united with (and ultimately a subordinated part of) the "whole" of universal nature, yet also consisting of specific properties and characteristics that are irreducible to the totality (Foster 2013b, 2016b; Foster and Burkett 2000; Foster and Clark 2016, 2020; Malm 2018, 2019). In relation to this, it is important to clarify this concept of emergence: What does it mean to say that society is an emergent property of nature? First, it means that society and the natural world from which it emerges are both composed of the same substance—matter in motion. This is called substance monism (Malm 2018, 2019). Thus, on the most fundamental of levels, society and the rest of nature constitute a whole, *and* societies constitute *parts* within the whole of the planetary ecosystem, or the *whole* of nature.

Carolan, drawing on the critical realist philosophical approach of Roy Bhaskar (2008), explains the concepts of both emergence and rootedness as follows:

> "higher" level phenomena are rooted in, and emergent from, more "basic" phenomena . . . Thus, the need for the "higher" level social sciences; for ultimately,

> the "higher" level phenomena that they study cannot be explained away with references to particle physics or genetic sequencing alone. (Carolan 2005, 2–3)

Metabolic rift scholars are strongly influenced by Bhaskar's critical realist (often dubbed critical materialist) ontology (Foster, Clark, and York 2010; Foster and Clark 2016; York and Clark 2010; York and Mancus 2009). Here, the notion of "higher" phenomena refers to phenomena that have "emerged" from more "basic" phenomena, the former being social forms of reality, and the latter being the forms of reality from which these social forms emerge and are still rooted. This includes everything from the basic particles that constitute all matter, to the specific biochemical processes from which all living things are constituted, to the Earth system as a whole. This dialectic—of the social metabolic order being both rooted in yet also distinct from, and thus composed of properties not found anywhere else in, the universal metabolism of nature—is at the essence of the metabolic rift theory, and a form of what is called substance monism, property dualism (Malm 2018, 2019).

Further, because societies emerge from and are rooted in the natural world, societies at their core *are* natural, and not only are of the same substance—matter in motion, elementary particles—but at times share the same properties—for example, materials and resources drawn from and embedded within social configurations. This is because the boundaries between societies and the planetary ecosystems from which they emerge and within which they are rooted are *relative*—like all boundaries and borders. That is, they are relative, but real. Drawing from Engels, Foster argues that "Such a conception meant that nature and humanity had to be conceived in historical terms, that is, in their making, with humanity to be viewed in large part in terms of its self-making." As integrated levels of reality, nature and history are understood in an "ontological emergent" manner (Foster 2020, 222).

Hybridist Metabolic Approaches

Urban political ecologists and world ecologists also emphasize dialectics as essential to their analytical orientation. Urban political ecologists argue that metabolism, along with circulation, are "the central metaphors" of a historical materialist approach, "With its emphasis on movement, change, and process . . ." Metabolism and circulation "embody what modernity has been, and will always be about: change, transformation, flux, movement, creative destruction" (Swyngedouw 2006b, 22). Yet it is also posited that Marx's method of distinguishing between society and nature was undialectical, as it externalized and reified a relationship that is, in fact, internal and porous.

If we, however, maintain a view of dialectics as internal relations, we must insist on the need to transcend the binary formations of "nature" and "society" and to develop a new "language" which maintains the dialectical unity of the process of change as embodied in the thing itself. The things are hybrids or quasi-objects (subjects and objects, material and discursive, natural and social) from the very beginning (Swyngedouw 1996, 69–70). Here, drawing distinctions between things is inherently undialectical. The solution is to treat all phenomena as hybrids, which converge subject and object, material and discursive, natural and social, and so on.

This understanding of dialectics coincides with that of world ecology. However, instead of critiquing Marx, world ecology focuses on the metabolic rift theory for its Cartesian dualism, in opposition to a dialectical approach, and in contrast to Marx. In place of what is seen as a process of bifurcating society on the one hand and nature on the other, the *oikeios*, or singular metabolism, is presented as "a radical elaboration of the dialectical logic immanent in Marx's concept of metabolism," as it "moves from the *interaction* of independent units—Nature and Society," found in metabolic rift scholarship, "to the dialectics of humans in the web of life" (Moore 2015, 45, 35; emphasis original).

Here the claim is that the very notion of interaction implies separation—for two things to interact, they must be severed from one another, and thus not in dialectical unity. Further, it is argued that a dialectical unity of opposites requires asymmetry—the relations between aspects of a contradiction are uneven. Finally, a dialectical approach requires resolution, or change, rather than reified and static categories. Thus, it is argued that "[Metabolic] Rift analyses have resisted the tendency of dialectical praxis to dissolve its analytical objects, and to create new categories suitable to comprehending the historically successive interpenetrations of humans with the rest of nature" (Moore 2017, 295–296). If the ideological concepts do not transform, interpenetrate, and dissolve into hybrids, in a process of analysis and synthesis, these abstractions become ossified and mechanical, rather than dialectical and fluid.

Discussion

Overview

The application of the dialectical method is one of the central differences between the metabolic rift approach, on the one hand, and hybrid approach, on the other. Specifically, the analytically appropriate way to handle the distinction between society and the rest of nature lies at the heart of the differences. The primary questions here are: Does analytic demarcation between social and extra-social

systems and phenomena contribute to or hinder our understanding of socioecological questions? How do the different approaches alter the application of social metabolism?

As mentioned, hybrid metabolic approaches—both UPE and world ecology scholars—ultimately answer these questions along similar lines: that such distinctions hinder or obscure our understanding of the world. A world ecology approach argues that the nature–society divide is a product of Cartesian dualism, and that this binary is in significant part culpable for many horrors of modernity, within which the logic of capital accumulation is embedded (Moore 2015). UPE scholars contend that "we do not need . . . specific conceptual or methodological tools for investigating the place of nature in the society . . . *All* the features of modern urbanization are socio-natural" (Wachsmuth 2012, 516; emphasis original), and that "[t]he urban world is a cyborg world, part natural/part social, part technical/part cultural, but with no clear boundaries, centres, or margins" (Heynen, Kaika, and Swyngedouw 2006, 12). Metabolic rift theorists attest that recognizing the "metabolic rift in the relation between human society and the larger natural world of which it was an emergent part" is essential to understanding our current ecological crisis, and the underlying dynamics which have given rise to and continuously regenerate such crises (Foster and Burkett 2018, 2). These latter scholars suggest that to do so, we must be able to analytically distinguish between social and non-social phenomena (Foster and Clark 2016, 2020; Malm 2018).

The Importance of Distinction and Contradiction

The centrality of contradiction—of things consisting of a unity of opposites, which simultaneously gives that thing its identity and forms the basis for its transformation—is important, as it presents boundaries and distinctions as both necessary and relative, with the latter being principal in an overall sense (Avakian 2009; Levins and Lewontin 1985; Wolff 1983). The predominance of change, permeability, fluidity, and emphasis on the whole has led some dialecticians to downgrade distinctions between the various parts that constitute such wholes, as well as their relative autonomy. As Ollman puts it, dialectical thinkers, or those who claim the mantle of dialectics, sometimes err by "play[ing] down or even ignore[ing] the parts, the details, in deference to making generalizations about the whole" (1993, 17). In other words, in holistic thinking more generally, including some that draw on dialectics, there can be a tendency toward a one-sidedness that "stresses the connectedness of the world but ignores the relative autonomy of [the] parts" (Lewontin and Levins 2007, 107). Both aspects are essential: 1) the need for distinctions between phenomena in order to analyze the world, but without reifying the parts; and 2) privileging not only the relations between phenomena or between different aspects of a phenomenon, but, more fundamentally, their

interpenetration and interconnection. Bob Avakian (2009) approaches this synthesis as follows:

> [L]et's take the example of a cell within an overall human body. Such a cell itself has a discrete existence and identity as such—with its own relative identity . . . which itself is marked by contradiction (internal contradiction in that context, or at that level), while at the same time that cell exists within, and forms a part of, a certain organ of the body (a lung, heart, liver, etc.), and in turn that organ exists within, and forms a part of, the body as a whole. The discrete existence and relative identity of each of these things (or particular forms, or levels, of matter) once again is real, but is also relative—there is not an absolute separation between them, and they not only "interact" with each other but also are integrated, at different levels, as part of a larger whole (or universal).

Thus, while identity—or matter in its discrete forms or levels—is relative, in terms of their relationship to the whole, without making such analytic distinctions, a human body becomes one undifferentiated mass of undetachable parts, thus challenging cogent understanding and analysis. Or, as Lewontin and Levins (2007, 108) argue, "despite Hegel's dictum that 'the truth is the whole' we cannot study 'the whole.'" It is essential, they also add, that dialectical analyses should emphasize "interpenetration, [the parts'] mutual determination, their entwined evolution, and yet also their distinctness. They are not 'One'" (Lewontin and Levins 2007, 106). Lenin (1975, 648; emphasis original) also posits the question of dialectics and the analysis of the whole into parts as follows: "The splitting of a single whole and the cognition of its contradictory parts . . . is the *essence* . . . of dialectics."

While hybridist scholars emphasize unity and wholeness, what distinguishes dialectical materialism from a variety of holistic, or monist, philosophies is its emphasis on change, stemming from internal conflict, contradiction, and the division of one into two. As Lewontin and Levins put it:

> [T]he powerful impact of the realization that things are connected sometimes leads to claims that "you cannot separate" body from mind, economics from culture, the physical from the biological, or the biological from the social . . . Of course, you *can* separate [them] . . . We have to in order to recognize and investigate them. That analytical step is a necessary moment in understanding the world. But it is not sufficient. After separating, we have to join them again, show their interpenetration, their mutual determination, their entwined evolution, and yet also their distinctness. (Lewontin and Levins 2007, 106; emphasis original)

The splitting of wholes into their component parts; analysis of these parts, their interrelation, and how, through struggle, they further rupture, leading to the emergence of new contradictions, new identities of opposites, is fundamental, Lewontin and Levins (2007) and Levins and Lewontin (1985) argue, to the dialectical method.

Embracing distinction can allow an analysis to unpack the oftentimes contradictory associations that mutually constitute the whole. It is an important point of orientation in materialist dialectics that seemingly dichotomous opposites are in fact connected *through* contradiction. This means that both material and ideological "binaries" which *appear* mutually exclusive—life and death, animate and inanimate, hot and cold—upon deeper examination, form a unity. They are mutually dependent upon, and in fact transform into, one another. They derive their identity—their overall character and specific features—from one another, and thus "the two sides have a single identity" (Mao [1937] 2007, 95). And, while forming a unity of opposites, which consists of struggle between them, one aspect under a given set of conditions and given moment through time is principal and the other is secondary, meaning there is "unevenness of the forces that are in contradiction" (92).

Emphasizing contradiction also enables us to recognize that not every possible pair of things that are different from or appear to be in opposition to one another "actually [constitute] a unity of opposites, nor do things which under certain conditions form a unity of opposites always exist as such" (Wolff 1983, 33). Here we can therefore pose the following question: Does it make sense to think of society and nature as a unity of opposites? And if so, under what conditions?

The Dialectical Utility of the Metabolic Rift

We argue that the most useful way to approach this question is in a materialist, and not an idealist fashion. In other words, rather than treating "society" and "nature" as reified, binary, monolithic, and idealist categories, we must proceed from a concrete, historical analysis of the specific material manifestations of social arrangements and their relation to the rest of the natural world. In accordance with Mao's ([1937] 2007, 79) thesis that "the living soul of Marxism, is the concrete analysis of concrete conditions," this question cannot be answered abstractly, divorced from historical analysis of material reality, in all its multilayered complexity. Proceeding from this orientation, it also becomes clear that it is impossible to analyze specific historical social arrangements—not as separated in some absolute sense from the larger material (natural) reality in which it is rooted, but with definite laws of motion and modes of operation that distinguish it from the whole (emergence)—without some notion of the social, which can and must be analyzed in its own right (Foster and Clark 2016; Malm 2019). The question, therefore, is not *if* analytic distinctions between social phenomena and other forms of nature

should be drawn, but *how* this should be done in ways that maintain the fundamental unity—contradictory and dialectical, not monist and harmonious, unity—and rootedness of the former in the latter.

In this sense, we contend that the theory of metabolic rift is quite suitable to this dialectical and materialist approach—maintaining the analytic distinction between society and nature not in an absolute sense, but in the particular social forms that emerge historically, and how these forms incorporate, interact with, and come into conflict with the rest of the natural world (Malm 2019). This materialist dialectical approach can be traced back to Engels's efforts to clarify the analytical value of a dialectics of nature that transcended both idealist and mechanical materialist methods of analysis (Foster 2020). Metabolic rift theory starts with the specific characteristics of capital's social metabolism—how its metabolic order's mode of operation is driven by the law of value—which generates historically novel, and quite dire, socio-environmental conditions. The capitalist mode of production is far from stagnant; particular political-economic shifts—most notably the transition from capitalism's competitive to its monopolistic/imperialist phase, but also other, less epochal changes as well—have intensified, recast and reframed capital's ecological contradictions. Yet, the basic antagonistic form of capitalism's social metabolism remains conceptually because the system itself remains materially, in objective reality. Capital continues, and its laws of motion continue to come into direct, antagonistic contradiction with the laws of motion of the planet's manifold and interwoven ecosystems and cycles. Starting from here—the concrete, material conditions, and underlying dynamics of an emergent social economic system and metabolic order, and not the abstract, idealized categories of "nature" and "society"—such an antagonistic unity of opposites can in fact be identified. In short, we stress that allowing for this analytical distinction enables a thoroughgoing concrete analysis of the contradictions and antagonisms that constitute this unified whole.

Among hybridist theorists there is a strong neo-Kantian idealist tendency. A thread that runs through much of world ecology and urban political ecology's critique is a strong emphasis on language and discursive constructions—hence the claim that one must only discuss humanity-in-nature or nature-in-humanity, lest a linguistic dualism be constructed (Moore 2015). There is no doubt that "[c]onsciousness itself is 'a state of matter'" (Moore 2015, 7) and that consciousness transforms into other forms of matter through human praxis (Mao [1937] 2007). Yet a basic premise of materialist dialectics is that consciousness is a second-order phenomenon that, in the final analysis, emerges from sensuous material reality (Marx and Engels 1978, 154–155). There are certainly vulgar materialist interpretations of this premise: the idea that an individual's consciousness is merely a direct outgrowth of their social location, for example. Or, more

generally, a vulgar materialist approach may negate or downplay the powerful material force that ideas can become.

However, we suggest that a *dialectical* materialist understanding of the ecological contradictions that exist under capitalism should not *begin* with, nor principally emphasize, ideas, ideal constructions, or discursive framing. Instead, analysis of these concerns benefits from the emphasis on investigation and analysis of the actual ways that societies, operating under the regime of capital, come into conflict with, attempt (and fail) to transcend, and disrupt ecological processes, systems, and principles. A hybridist orientation tends to lead to an approach in which the discursive "dissolution of dualities" and dialectical resolution of contradiction is called for, which is more likely to result in an analysis that is abstracted from the unfolding of these contradictions in material reality. In short, the metabolic rift cannot be transcended through discursive reframing or the dissolution and resynthesis of analytic objects; its transcendence must occur through overcoming capital.

Embracing a dialectical method that tends to downplay distinction, interaction, and contradiction can also obscure the alienated and ecologically destructive features specific to the capitalist mode of production. In other words, a hybridist approach can result in an analytical obstacle whereby there emerges a reluctance, or reticence, to characterize environmental problems as harmful per se. This becomes clearer when we look at the implications of hybridization, and particularly its hybridization of the social and the natural, so essential to both UPE and world ecology. From a hybridist approach, human interventions, or constructions—development projects, infrastructural systems, modes and means of producing, distributing, and consuming resources—are *ipso facto* natural. For example, dams and irrigation systems may be characterized as "socio-physical constructions," making them neither natural nor "unnatural" (Swyngedouw 2009, 56). This makes it more difficult for such social (or "socioecological") phenomena—the profligate burning of fossil fuels that release carbon dioxide into the environment and cause climate change, for example—to be characterized as environmental problems or environmentally harmful by definition. Instead, we are to look at the disproportionate effects any such change has on different groupings of people and/or ecosystems: "While environmental (both social and physical) qualities may be enhanced in some places and for some people, this often leads to a deterioration of social and physical conditions elsewhere" (Swyngedouw 2009, 57; see also White, Gareau, and Rudy 2017). Such disproportionalities are eminently political—oppressed and marginalized social groups generally bear the brunt of the burden. Thus, for example, the privatization of the water supply of a major city in the Global South may benefit the wealthy and elite classes, while harming those on the margins.

This is an essential insight; analyzing the unequal effects of various social projects on different groups is an indispensable task of socioecological inquiry. Yet, there is an analytical obstacle: the reluctance, or reticence, to characterize environmental problems as harmful as such. The analytical implications of hybridization, and particularly its hybridization of the social and the natural, so essential to both urban political ecology and world ecology, are significant for understanding modern environmental change. However, without demarcation between the social and nature—recognized, under the capitalist mode of production, as a unity of opposites that are mutually constitutive yet consist of unique internal dynamics—the ability to clearly identify the *source* of environmental problems is blunted. This can have quite consequential implications, including, some have argued, "dismantl[ing] any chance of politically challenging the destructive forces ravaging our planet" (Hornborg 2017, 68). Without being able to sift through the specific properties of the social—such as capitalist development; with its profit motive, engine of unending accumulation, competition between different blocs of capital, the impetus for substituting energy- and material-intensive for labor-intensive production, and so on—that cannot be found anywhere else in nature, it becomes much more difficult to distinguish between what we *can* change, and what we *cannot* change. Thus, allowing for distinction analytically encourages one to uncover the malleable, constructed, and reifying tendencies of capitalist development that generate metabolic rifts.

Therefore, removing analytical distinction can result in a vulnerability toward reification and conceptual flattening. Consequently, it risks naturalizing all manner and forms of social activity and structures, diminishing the significance of uniquely human agency; and of our specific (and scientifically determinable) causal responsibilities for the environmental problems we face. Malm's description of an oil spill illustrates the value of analysis that embraces distinction with powerful clarity:

> Think of an oil spill. A company unleashes the liquid into a delta. There is a novel unity in place—oil and water are mixed—but this gives us no reason to treat the two elements of the situation as identical, or (the same thing) declare that one has devoured the other. Rather, we would want to know more about their specific properties. On the one hand, we have the biological diversity of the delta, the birthing seasons of the dolphins, the birds migrating in and out, the food chain, the wave action; on the other, the operating procedures of the corporation, the workings of the profit motive, the level of competition in the oil industry, the function of petroleum in the wider economy . . . [W]e need to know how they interact, what sort of damage the one does to the other and, most importantly, how the destruction can be brought to an end. (Malm 2018, 61)

In the epoch of climate change and widespread ecological collapse and peril, the need to distinguish between the social determinants of these phenomena and their manifold environmental effects has in fact never been greater (Foster 2016a; Malm 2018).

Distinction, Capitalist Value, and Ecological Crisis

Over-emphasis on the realization that apparent dualisms are unities of opposites, is not merely a philosophical problem, and the incorrect handling of the society–nature dialectic is not some abstract theoretical misconception. As Levins and Lewontin (1985, 286) posit, "The principles of materialist dialectics . . . have implications for research strategy and educational policy as well as methodological prescriptions." That is to say, there are real, material implications that can flow from the philosophical and theoretical orientations of metabolic rift or hybridist approaches to socioecological analysis and questions of sustainability.

Failure to distinguish between the social—which, of course, by definition is not a purely anthropic realm—and the extra-social worlds can blur how the law of value emerged in the first place. Value, or the amount of socially necessary labor time embodied in commodities which are exchanged for commodities of equal value, is unique to the capitalist mode of production (Burkett 2014; Marx 1976). Capitalism's treatment of value, as the expression of exchange value, which itself is the crystallization of a distinct quantity of abstract labor, is only understandable from a specifically social-historical perspective—one that, it bears repeating, considers non-social ecological factors and systems as an essential component of any such social analysis.

Marx's concept of value is premised on the labor theory of value, which recognizes human labor power as the source of surplus value under capitalism. The special role of labor under capitalism—which is flattened of its qualitative distinctions and transposed from concrete labor into quanta of abstract labor (Marx 1976)—is essential if we are to understand why human organizations relate to the rest of nature in such uniquely destructive ways under the epoch of capitalism. It explains the relentless drive among competing blocs of capital to lower the cost of labor power and increase their productivity. The environmentally destructive consequences of capitalism ultimately flow from this peculiar form of valuation, as the theory of metabolic rift and other Marxian scholarship reveals. In contrast, hybridist perspectives tend to dissolve this law of value into one that does not demarcate between human labor power and, for example, the energetic potential of a flowing river (see Moore 2016, 89–90).

The issue, again, is one of analytic distinction. The concept of work as defined, say, by physicists, is distinct from the concept of work (labor) used in the social sciences, and for good reason. Ultimately the latter must conform to the former as

a type of expenditure of energy acting as a force upon matter. But it is not reducible to such. And it is precisely the distinctness of human labor *under capitalism* that explains so much about the nature of social–environmental interactions under capitalist development (Foster and Burkett 2018; Nayeri 2016). As Foster and Burkett (2018, 7) argue, "value, as opposed to use value," is not an inherent quality of things but a reflection of inequitable, historically contingent social relations.

There is, in other words, a "specific, social basis of abstract labor and of value under capitalism," which is not reducible to "a mere physical process" of work/energy (Foster and Burkett 2018, 7). This distinction enables one to recognize that the core problem does not lie in capital's failure to recognize the inherent value of ecologies; rather, capital fetishizes and naturalizes a specific value form that is endemic to capitalist social relations. Accordingly, no argument to recognize the value of ecologies, or the universality of value, will influence the capitalist value form, precisely because this form is the crystallization of historically contingent social relations and economic laws to which capitalists are beholden. This insight is possible via a method that allows for the uncovering of distinctions. Further, it better enables us to recognize that the source of our current ecological crises lies in social relations that must be politically challenged and transcended through social struggle.

Conclusion

In this article, we have defined and examined two approaches in Marxist socioecological thought that draw on the metabolism concept: metabolic rift and hybridist. In particular, we have considered these approaches in relation to the society–nature problematic, emphasizing their theoretical elaborations and implications. Hybridist approaches to the society–nature question have posed important challenges and criticisms that reassert the importance of the whole and the unity of opposites. Further, in emphasizing unity, we can better understand how non-human nature possesses a surprising influence on social processes and historic formations. In like manner, hybrid approaches importantly highlight the logical and political fallacies associated with externalizing nature as something beyond human influence, or social phenomena as beyond the influence of extra-social nature.

Yet, we contend that these invaluable insights do not negate or invalidate the premises of the metabolic rift framework. In contrast to the criticisms of its dualist orientation, we argue that the theory of metabolic rift is dialectical, in that it enunciates both *unity*—human configurations of nature as emergent properties, embedded and rooted within the universal natural metabolism—and *conflict*—between the specific properties and laws of the capitalist epoch of social history and the

imperatives of ecological sustainability. It is also dialectically materialist, in that its starting point is not discursive framing or ideal constructions, but the actually existing, historically unfolding material contradictions that arise from the capitalist mode of production. As a result, metabolic rift theory offers useful and necessary analytical insights into ecological crises and sustainable alternatives.

Capitalist social relations possess their own, historically specific tendencies that cannot be found in non-human nature. As such, hybrid approaches can be limited in their capacity to reveal the precise conditions and political-economic processes that drive ecological crises. These conditions can best be found and understood through an analysis of capitalism as a form of social organization that brings it into an antagonistic relationship with that from which it emerges, the universal metabolism of nature. The root of this antagonism can be deciphered via an analysis of capitalist value relations, which reveals two fundamental points of contention. One, capital accumulation depends on the wage–labor relation, and is thus a product of social relations between labor and capital. Two, to maintain this relation, capital expropriates nature as a "free gift," in much the same way that it expropriates the utility of reproductive care work or other forms of non-paid labor that exist beyond or outside the wage relation (Foster and Clark 2020). Ecologies confront capital expropriation with their own metabolic requirements and limits that capital cannot rationally respond to, a tension that produces rifts at sea, in soil, the atmosphere, and multiple other contexts and scales.

We contend that a dialectical method that allows for, and even encourages, analytical distinction makes these kinds of insights possible. Further, we argue that blurring categories and over-emphasizing fluidity and unity risks obfuscating the social forces behind ecological crises. As a materialist dialectical approach, metabolic rift theory provides important potential for advancing socioecological analysis in an era of anthropogenic environmental change.

Notes

1. This contradiction has three primary forms of motion: (1) It severs production from consumption which, among other things, leads to an overaccumulation of use values in certain parts of the world, and an under-accumulation of use values in other parts of the world, irrespective of these regions' contributions of labor power and natural wealth to the system of global production; (2) It severs the process of production from the control of production, or it detaches the producers themselves from the decision-making processes of production, which leads to the phenomenon of alienated labor, while ultimately severing the capitalists themselves from this control as well, as the system of capitalism is a system of "*subjectless control* in which the controller is actually controlled by the fetishistic requirements of the capitalist system" (Mészáros 1995, 66; emphasis original); (3) It separates the production from the circulation of commodities, which is an expression of the contradiction between capitalism as a social metabolic order that is on the one hand a global economic

system, and on the other hand is politically configured into individual competing nation-states (Mészáros 1995).

2. However, this is not to deny that the town–country antagonism is the principal moment in the historical unfolding of capitalism—in other words, the town–country divide is not merely one of several (equally important) rifts, but instead is a spatial expression of capitalism's primary historical development (see Burkett 2014; Foster 2000; Moore 2000).

References

Austin, K., and B. Clark. 2012. "Tearing Down Mountains: Using Spatial and Metabolic Analysis to Investigate the Socio-ecological Contradictions of Coal Extraction in Appalachia." *Critical Sociology* 38 (3): 437–457.

Avakian, B. 2009. "'Crisis in Physics,' Crisis in Philosophy and Politics." *Demarcations* 1. Accessed March 5, 2022. http://demarcations-journal.org/issue01/crisis_in_physics.html#text2.

Bhaskar, R. 2008. *A Realist Theory of Science*. London: Verso.

Burkett, P. 2006. *Marxism and Ecological Economics: Toward a Red and Green Political Economy*. Chicago: Haymarket Books.

Burkett, P. 2014. *Marx's Nature: A Red and Green Perspective*. Chicago: Haymarket Books.

Burkett, P., and J. B. Foster. 2006. "Metabolism, Energy, and Entropy in Marx's Critique of Political Economy: Beyond the Podolinsky Myth." *Theory and Society* 35 (1): 109–156.

Carolan, M. S. 2005. "Realism without Reductionism: Toward an Ecologically Embedded Sociology." *Human Ecology Review* 12 (1): 1–20.

Clark, B., and J. B. Foster. 2010. "Marx's Ecology in the 21st Century." *World Review of Political Economy* 1 (1): 142–156.

Clark, B., and R. York. 2005. "Carbon Metabolism: Global Capitalism, Climate Change, and the Biospheric Rift." *Theory and Society* 34 (4): 391–428.

Clausen, R., and B. Clark. 2005. "The Metabolic Rift and Marine Ecology: An Analysis of the Ocean Crisis within Capitalist Production." *Organization and Environment* 18 (4): 422–444.

Fischer-Kowalski, M. 2002. "Exploring the History of Industrial Metabolism." In *A Handbook of Industrial Ecology*, edited by R. U. Ayres and L. W. Ayres, 16–26. Cheltenham, UK: Edward Elgar.

Foster, J. B. 1999. "Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology." *American Journal of Sociology* 105 (2): 366–405.

Foster, J. B. 2000. *Marx's Ecology: Materialism and Nature*. New York: Monthly Review Press.

Foster, J. B. 2013a. "Marx and the Rift in the Universal Metabolism of Nature." *Monthly Review* 65 (7): 1–19.

Foster, J. B. 2013b. "The Epochal Crisis." *Monthly Review* 65 (5): 1–12.

Foster, J. B. 2016a. "In Defense of Ecological Marxism: John Bellamy Foster Responds to a Critic." *Climate and Capitalism*. Accessed March 5, 2022. https://climateandcapitalism.com/2016/06/06/in-defense-of-ecological-marxism-john-bellamy-foster-responds-to-a-critic/.

Foster, J. B. 2016b. "Marxism in the Anthropocene: Dialectical Rifts on the Left." *International Critical Thought* 6 (3): 393–421.

Foster, J. B. 2020. *The Return of Nature: Socialism and Ecology*. New York: Monthly Review Press.

Foster, J. B., and P. Burkett. 2000. "The Dialectic of Organic/Inorganic Relations: Marx and the Hegelian Philosophy of Nature." *Organization and Environment* 13 (4): 403–425.

Foster, J. B., and P. Burkett. 2018. "Value Isn't Everything." *Monthly Review* 70 (6): 1–17.

Foster, J. B., and B. Clark. 2016. "Marxism and the Dialectics of Ecology." *Monthly Review* 68 (5): 1–17.

Foster, J. B., and B. Clark. 2020. *The Robbery of Nature: Capitalism and the Ecological Rift*. New York: Monthly Review Press.

Foster, J. B., B. Clark, and R. York. 2010. *The Ecological Rift: Capitalism's War on the Earth*. New York: Monthly Review Press.

Heynen, N., H. Kaika, and E. Swyngedouw. 2006. "Urban Political Ecology: Politicizing the Production of Urban Natures." In *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, edited by N. Heynen, H. Kaika, and E. Swyngedouw, 1–20. London: Routledge.

Holleman, H. 2018. *Dust Bowls of Empire: Imperialism, Environmental Politics, and the Injustice of "Green" Capitalism*. New Haven, CT: Yale University Press.

Hornborg, A. 2017. "Dithering While the Planet Burns: Anthropologists' Approaches to the Anthropocene." *Reviews in Anthropology* 46 (2–3): 61–77.

Lenin, V. 1975. "On the Question of Dialectics." In *The Lenin Anthology*, edited by R. C. Tucker, 648–651. New York: W. W. Norton and Company.

Levins, R., and R. Lewontin. 1985. *The Dialectical Biologist*. Cambridge, MA: Harvard University Press.

Lewontin, R., and R. Levins. 2007. *Biology under the Influence: Dialectical Essays on Ecology, Agriculture, and Health*. New York: Monthly Review Press.

Longo, S. B., and B. Clark. 2016. "An Ocean of Troubles." *Social Problems* 63 (4): 463–479.

Longo, S. B., R. Clausen, and B. Clark. 2015. *The Tragedy of the Commodity: Oceans, Fisheries, and Aquaculture*. New Brunswick, NJ: Rutgers University Press.

Malm, A. 2018. *The Progress of This Storm: Nature and Society in a Warming World*. London: Verso.

Malm, A. 2019. "Against Hybridism: Why We Need to Distinguish between Nature and Society, Now More Than Ever." *Historical Materialism* 27 (2): 156–187.

Mao, T. (1937) 2007. "On Contradiction." In *Revolutions: Slavoj Žižek Presents Mao on Practice and Contradiction*, edited by S. Žižek, 67–102. London: Verso.

Marx, K. 1976. *Capital: A Critique of Political Economy*, vol. 1. London: Penguin Books.

Marx, K., and F. Engels. 1978. "The German Ideology." In *The Marx Engels Reader*, 2nd ed, edited by R. C. Tucker, 146–200. New York: W. W. Norton and Company.

Mészáros, I. 1995. *Beyond Capital: Toward a Theory of Transition*. New York: Monthly Review Press.

Moore, J. W. 2000. "Environmental Crises and the Metabolic Rift in World-Historical Perspective." *Organization and Environment* 13 (2): 123–157.

Moore, J. W. 2011. "Transcending the Metabolic Rift: A Theory of Crises in the Capitalist World-Ecology." *Journal of Peasant Studies* 38 (1): 1–46.

Moore, J. W. 2015. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. London: Verso.

Moore, J. W. 2016. "The Rise of Cheap Nature." In *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism*, edited by J. W. Moore, 78–115. Oakland, CA: PM Press.

Moore, J. W. 2017. "Metabolic Rift or Metabolic Shift? Dialectics, Nature, and the World-Historical Method." *Theory and Society* 46 (4): 285–318.

Nayeri, K. 2016. "On Jason W. Moore's 'Capitalism in the Web of Life.'" *Our Place in the World: A Journal of Ecosocialism*. Accessed March 5, 2022. http://forhumanliberation.blogspot.com/2016/07/2379-on-jason-w-moores-capitalism-in_18.html.

Ollman, B. 1993. *Dialectical Investigations*. New York: Routledge.

Saito, K. 2017. *Karl Marx's Ecosocialism: Capital, Nature, and the Unfinished Critique of Political Economy*. New York: Monthly Review Press.

Smith, N. 1984. *Uneven Development: Nature, Capital and the Production of Space*. Oxford: Blackwell.

Swyngedouw, E. 1996. "The City as a Hybrid: On Nature, Society and Cyborg Urbanization." *Capitalism Nature Socialism* 7 (2): 65–80.

Swyngedouw, E. 2006a. "Circulations and Metabolisms: (Hybrid) Natures and (Cyborg) Cities." *Science as Culture* 15 (2): 105–121.

Swyngedouw, E. 2006b. "Metabolic Urbanization: The Making of Cyborg Cities." In *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, edited by N. Heynen, H. Kaika, and E. Swyngedouw, 21–40. London: Routledge.

Swyngedouw, E. 2009. "The Political Economy and Political Ecology of the Hydro-Social Cycle." *Journal of Contemporary Water Research and Education* 142 (1): 56–60.

Wachsmuth, D. 2012. "Three Ecologies: Urban Metabolism and the Society-Nature Opposition." *Sociological Quarterly* 53: 506–523.

White, D. F., B. J. Gareau, and A. P. Rudy. 2017. "Ecosocialisms, Past, Present and Future: From the Metabolic Rift to a Reconstructive, Dynamic and Hybrid Ecosocialism." *Capitalism Nature Socialism* 28 (2): 22–40.

White, R. 1996. *The Organic Machine: The Remaking of the Columbia River*. New York: Hill and Wang.

Wolff, L. 1983. *The Science of Revolution: An Introduction*. Chicago: RCP Publications.

York, R., and B. Clark. 2010. "Critical Materialism: Science, Technology, and Environmental Sustainability." *Sociological Inquiry* 80 (3): 475–499.

York, R., and P. Mancus. 2009. "Critical Human Ecology: Historical Materialism and Natural Laws." *Sociological Theory* 27 (2): 122–149.

Zimmer, A. 2010. "Urban Political Ecology: Theoretical Concepts, Challenges, and Suggested Future Directions." *Erdkunde* 64 (4): 343–354.