

The Anthropocene as Fetishism

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"A society that is always sicker, but always stronger, has everywhere concretely re-created the world as the environment and decor of its illness, a sick planet."¹

The "Anthropocene" has become a fashionable concept in the natural and social sciences.² It is defined as the "human-dominated geologic epoch," because in this period of natural history it is Man who is in control of the biogeochemical cycles of the planet.³ The result, though, is catastrophic: the disruption of the carbon cycle, for example, leads to a global warming that approaches tipping points that might be irreversible.⁴ The exponential growth of our freedom and power, that is, of our ability to transform nature, is now translated into a limitation to our freedom, including the destabilization of the very framework of life. It reaches its highest degree with the problem of global warming.⁵ In this context, it becomes clear that the Anthropocene is a contradictory concept. If the "human-dominated geologic epoch" is leading to a situation in which the existence of humans might be at stake, there is something very problematic with this sort of domination of Nature that reduces it to a "substrate of domination" that should be investigated.⁶ Its very basic premise, that it is human-dominated, should be challenged — after all there should be something inhuman or objectified in a sort of domination whose outcome might be human extinction.

What is claimed here is that, exactly as for freedom, the Anthropocene is an unfulfilled promise. The same way that freedom in capitalism is constrained by fetishism and class relations — capitalist dynamics are law-bound and beyond the control of individuals; the workers are "free" in the sense that they are not "owned" as slaves, but also in the sense that they are "free" from the means of production, they are deprived of their conditions of existence; the capitalists are "free" insofar as they follow the objectified rules of capital accumulation, otherwise they go bankrupt — so is the social metabolism with Nature. Therefore, I claim that the Anthropocene is the fetishized form of interchange between Man and Nature historically specific to capitalism, the same way as the "invisible hand" is the fetishized form of "freedom" of interchange between men.

Since primitive accumulation, capital caused a metabolic rift between Man and Nature. It was empirically observable at least since the impoverishment of soils caused by the separation between city and countryside in nineteenth-century Great Britain.⁷ In the twenty-first century, though, this rift is globalized, including critical disruptions of the carbon cycle (global warming), the nitrogen cycle, and the rate of biodiversity loss that implies that humanity is already outside of a "safe operating space" of global environmental conditions.⁸ The Anthropocene, appears, then, as the globalized disruption of global natural cycles — and, most importantly, not as a (for whatever reason) planned, intentional, and controlled disruption, but as an unintended side effect of social metabolism with Nature that seems to be progressively out of control. It can easily be illustrated with examples. In the case of the carbon cycle, the burning of fossil fuels is carried out as an energy source for industrial and transport systems. Massive coal extraction began in England during the Industrial Revolution so that, with this new mobile energy source, industries could move from near dams to the cities where cheap labor was.⁹

There was no intention to manipulate the carbon cycle or to cause global warming, or any consciousness of it. The result, though, is that, in the twenty-first century, atmospheric carbon dioxide concentration is already beyond the safe boundary of 350 ppm for long-term human development. As for the nitrogen cycle, it was disrupted by the industrialization of agriculture and fertilizer production, including the fixation of atmospheric nitrogen with the Haber-Bosch process. Again, there was no intention or plan to control the nitrogen cycle, to cause eutrophication of lakes, or to induce the collapse of ecosystems. Once again, the boundary of sixty-two million tons of nitrogen removed from the atmosphere per year is by far already surpassed, with 150 million tons in 2014.¹⁰ A similar story could be told about the rate of biodiversity loss, and the phosphorus cycle and ocean acidification are following the same pattern. The "human-dominated" geologic epoch, in this regard, seems much more a product of chance and unconsciousness than of a proper control of the global material cycles, in spite of Crutzen's reference to Vernadsky's and Chardin's "increasing consciousness and thought" and "world of thought" (noosphere). "They do not know it, but they do it" — this is what Marx said about the fetishized social activity mediated by commodities, and this is the key to a critical understanding of the Anthropocene.¹¹

In fact, Crutzen locates the beginning of the Anthropocene in the design of the steam engine during the Industrial Revolution.¹² However, instead of seeing it as a mere empirical observation, the determinants of the "human-dominated" geologic epoch should be conceptually investigated in the capitalist form of social relations. With his analysis of fetishism, Marx showed that capitalism is a social formation in which there is a prevalence of "material relations between persons and social relations between things," in which "the circulation of money as capital is an end in itself."¹³ Capital is the inversion where exchange value directs use, abstract labor directs concrete labor: "a social formation in which the process of production has mastery over man, instead of the opposite," and its circulation as money and commodities for the sake of accumulation constitutes the "automatic subject," "self-valorizing value."¹⁴ Locating the Anthropocene in capitalism, therefore, implies an investigation into the relation between the Anthropocene and alienation, or, as further developed by the late Marx, fetishism.¹⁵ This is the core of the contradictions of the "human-dominated" geologic epoch. According to Marx, the labor-mediated form of social relations of capitalism acquires a life of its own, independent of the individuals that participate in its constitution, developing into a sort of objective system over and against individuals, and increasingly determines the goals and means of human activity. Alienated labor constitutes a social structure of abstract domination that alienates social ties, in which "starting out as the condottiere of use value, exchange value ended up waging a war that was entirely its own."¹⁶ This structure, though, does not appear to be socially constituted, but natural.¹⁷ Value, whose phenomonic form of appearance is money, becomes in itself a form of social organization, a perverted community. This is the opposite of what could be called "social control."¹⁸ A system that becomes quasi-automatic, beyond the conscious control of those involved, and is driven by the compulsion of limitless accumulation as an end-in-itself, necessarily has as a consequence the disruption of the material cycles of the Earth. Calling this "Anthropocene," though, is clearly imprecise, on one hand, because it is the outcome of a historically specific form of metabolism with Nature, and not of a generic ontological being (antropo), and, on the other hand, because capitalism constitutes a "domination without subject," that is, in which the subject is not Man (not even a ruling class), but capital.¹⁹

It is important to note that fetishism is not a mere illusion that should be deciphered, so that the "real" class and environmental exploitation could be grasped. As Marx himself pointed out, "to the producers...the social relations between their private labors appear as what they are, i.e., as material relations between persons and social relations between things"; "commodity fetishism...is not located in our minds, in the way we (mis)perceive reality, but in our social reality itself."²⁰ That is why not even all scientific evidence of the ecological disruption, always collected post festum, is able to stop the destructive dynamic of capital, showing to a caricatural degree the uselessness of knowledge without use.²¹ The fact that now "they know very well what they are doing, yet they are doing it" does not refute, but rather confirms that the form of social relations is beyond social control, and merely changing the name of the "Anthropocene" (to "Capitolocene" or whatever) would not solve the underlying social and material contradictions.²² Value-directed social production, that is, production determined by the minimization of socially necessary labor time, results in an objectified mode of material production and social life that can be described by "objective" laws. Time, space, and technology are objectified by the law of value. Of course the agents of the "valorization of value" are human beings, but they perform their social activity as "character [masks]," "personifications of economic relations": the capitalist is personified capital and the worker is personified labor.²³ The fetishistic, self-referential valorization of value through the exploitation of labor (M-C-M') with its characteristics of limitless expansion and abstraction of material content implies the ecologically disruptive character of capitalism, that is, that in capitalism "the development of productive forces is simultaneously the development of destructive forces."²⁴ Self-expanding value creates an "industrial snowball system" that is not consciously controlled, "a force independent of any human volition."²⁵ In this context, it is not a surprise that the disruption of global ecological cycles is presented as the "Anthropocene," that is, as a concept allusive to a natural process. That Man is presented as a blind geologic force, such as volcanic eruptions or variations in solar radiation, is an expression of the naturalized or fetishized form of social relations that is prevalent in capitalism.

Therefore, the technical structures with which Man carries out its metabolism with Nature is logically marked by fetishism. As Marx noted, “technology reveals the active relation of man to nature, the direct process of the production of his life, and thereby it also lays bare the process of the production of the social relations of his life, and of the mental conceptions that flow from those relations.”²⁹ In capitalism, production processes are not designed according to the desires and needs of the producers, ecological or social considerations, but according to the law of value. Taking as an example the world energy systems, it has been demonstrated that there is no technical constraint to a complete solar transition in two or three decades if we consider the use-value of fossil and renewable energies (their energy return and material requirements), that is, it is technically feasible to use fossil energy to build a solar infrastructure to provide world energy in a quantity and quality sufficient for human development.²⁷ This transition, which from the point of view of use-value or material wealth is desirable, necessary, and urgent (due to global warming) is not being carried out, though, because fossil energy is still more prone to capital accumulation, to the valorization of value: capital went to China to exploit cheap labor and cheap coal, causing a strong spike in carbon emissions on the eve of a climate emergency, in a clear display of fetishistic irrationality.²⁸ More generally, the American ecologist Barry Commoner showed that in the twentieth century many synthetic products were developed (such as plastics and fertilizers) that took the place of natural and biodegradable products. However, the new products were not better than the old ones; the transition was only carried out because it was more lucrative to produce them, although they were much more polluting and environmentally harmful — in fact it is shown that these new technologies were the main factor for the increase of pollution in the United States, more than the increase in population or consumption.²⁶

Of course the law of value does not determine only the final products, but also the production processes, which must be constantly intensified both in terms of rhythms and material efficiency, if not in terms of the extension of the working day. Already, in his day, Marx highlighted the “fanaticism that the capitalist shows for economizing on means of production” as they seek the “refuse of production” for reuse and recycling.³⁰ However, under the capitalist form of social production, productivity gains result in a smaller amount of value created per material unit, so that it fosters enlarged material consumption.³¹ This general tendency is empirically observable in the so-called Jevons Paradox, when efficiency gains eventually result in a rebound effect, increased material production.³² It was first shown by William Stanley Jevons, who presented data that demonstrate that the economy of coal in steam engines during the Industrial Revolution resulted in increased coal consumption.³³ What in a conscious social production would be ecologically beneficial (increased efficiency in resource use), in capitalism increases relative surplus-value, and therefore reinforces the destructive limitless accumulation of capital and a technological system that is inappropriate in the first place. It is astonishing that many environmentalists still preach efficiency as an ecological fix, without noticing that the capitalist social form of wealth (value) turns productivity into a destructive force.

Even the way capitalism deals with the problem of pollution is configured by alienation: everything can be discussed, but the mode of production based on commodification and maximization of profits. As production is carried out in competing isolated private production units, socio-technical control is limited to external control, through state regulations that enforce end-of-pipe technologies and market mechanisms. The Kyoto Protocol is the best example of market mechanism. It represents the commodification of the carbon cycle, establishing the equivalence principle, the very form of commodity fetishism, in a sort of stock exchange of carbon. Therefore, it implies a whole process of abstraction of ecological, social, and material qualities to make possible the equivalence of carbon emissions, offsets, and carbon sinks located in very different ecological and social contexts. The abstraction process includes the equalization of emission reductions in different social and ecological contexts, of emissions reductions carried out with different technologies, of carbon of fossil origin and biotic origin, the equalization of different molecules through the concept of “carbon equivalent” and a definition of “forest” that does not include any requirement of biodiversity.³⁴

However, as with any commodity in capitalism, use-value (carbon emissions reductions) is governed by exchange-value. The fetishistic inversion of use-value and exchange-value that characterizes capitalism implies that the effective goal of the whole process of emissions trading comes to be money, not emissions reduction. Empirical examples abound. The trading scheme does not present any incentive for long-term technology transition, but only for short-term financial earnings (time is money). Offsets in practice allow polluters to postpone a technological transition, while the corresponding Clean Development Mechanism (CDM) project probably generates a rebound effect that will foster fossil fuel deployment in developing countries.³⁵ Easy technological reductions, such as burning methane in landfills, allow the continuation of carbon emissions by big corporations. Some industries earned more profits mitigating emissions of HFC-23 than with the commodities they produced, while generating huge amounts of offsets that again allow polluters to keep up with their emissions.³⁶ And the comparison of projects with baseline “would be” scenarios even tragically allows the direct increase of emissions, for example, by financing coal mines that mitigate methane emissions. And more examples could be cited. The fact that global warming is determined by cumulative emissions in any meaningful human time-scale reveals the perverse effects of this exchange-value-driven scheme: delays in emissions reductions today constrain the possibilities of the future.³⁷ Again, as could be grasped beforehand with a simple theoretical Marxian critique, exchange-value becomes dominant over use-value, as the allocation of carbon emissions is determined not by socio-ecological criteria, but according to the valorization requirements or by “the optimized allocation of resources” — when the global carbon market hit the record market value of 176 billion dollars in 2011, the World Bank said that “a considerable portion of the trades is primarily motivated by hedging, portfolio adjustments, profit taking, and arbitrage,” typical jargon of financial speculators.³⁸ Kyoto, with its quantitative approach, does not address, and hampers, the qualitative transition that is necessary to avoid a catastrophic climate change, that is, the solar transition. Even though substantial amounts of capital are mobilized with the trading schemes, global carbon emissions continue to increase.

In this scenario, it is increasingly likely that the application of an end-of-pipe technology might be necessary. With the rise of the Welfare State and ecological regulation, a myriad of such technologies were used to mitigate industrial emissions to water, air, and soil — air filters, wastewater treatment plants, etc. The problem is that these technologies can only be applied in particular corporate units if it is feasible in the context of value-driven production, that is, only if it does not jeopardize the profitability of corporations. It happens, though, that carbon capture and storage (CCS) is still too expensive to be used in production units or transport systems. Therefore, what comes to the fore is *geoengineering*, the ultimate end-of-pipe technology, the technological mitigation of the effects of carbon emissions on a planetary scale, the direct manipulation of world climate itself — with the use of processes such as the emission of aerosols to the stratosphere to reflect solar radiation, or the fertilization of oceans with iron to induce the growth of carbon-sequestering algae.³⁹ Its origins can be traced back to the Vietnam War and Stalinist projects, and one of its first proponents was Edward Teller, the father of the atomic bomb.⁴⁰ There are huge risks involved in this approach, as the climate system and its subsystems are not fully understood and are subject to non-linearities, tipping points, sudden transitions, and chaos. Besides, climate system inertia implies that global warming is irreversible in the time scale of a millennium, so that such *geoengineering* techniques would have to be applied for an equal amount of time, what would be a burden for dozens of future generations.⁴¹ In case of technological failure of the application of *geoengineering*, the outcome could be catastrophic, with a sudden climate change.⁴²

Considering its relatively low cost, though, it is likely that capitalism assumes the risk of business as usual in order to preserve its fetishistic quest for profits, keeping *geoengineering* as a sort of silver bullet of global warming.⁴³ Of course there is the frightening possibility of combining *geoengineering* and trading schemes, so that *geoengineering* projects could generate carbon credits in a competitive market. That was the idea of Planktos Inc. in a controversial experiment of ocean fertilization, that alludes to a dystopian future in which world climate is manipulated according to the interests of corporate profits.⁴⁴ It is clear that capitalist control of pollution, either through market mechanisms or state regulations, resembles the Hegelian Minerva’s Owl: it only (re)acts after the alienated process of production and the general process of social alienation. However, if the core of destructiveness is the fetishistic process itself that is reproduced by trading schemes, and end-of-pipe technologies are subject to failure and complex dynamics that are not rationally accessible to the time scales of human institutions (at least in their current forms), both market and state mechanisms might fail in avoiding a catastrophic climate change.

Future projections of global warming by neoclassical economists reveal the alienated core of the Anthropocene in its very essence. In integrated climate-economic models such as the ones developed by William Nordhaus and Nicholas Stern, the interest rate ultimately determines what is acceptable in terms of atmospheric concentration of greenhouse gases and its related impacts (coastal inundations, biodiversity loss, agricultural disruption, epidemic outbreaks, etc.), as “cost-benefit analyses” discount future impacts and compound present earnings.⁴⁵ But as shown by Marx, the interest is the part of the profit that the industrial capitalist pays to the financial capitalist that lent him money-capital in the first place, after the successful valorization process.⁴⁶ Interest-bearing capital is value that possesses the use-value of creating surplus-value or profit. Therefore, “in interest-bearing capital the capital relationship reaches its most superficial and fetishized form,” “money that produces money,” “self-valorizing value.”⁴⁷ Interest-bearing capital is the perfect fetishistic representation of

capital, as the automatic geometric progression of surplus-value production, a “pure automaton.”⁴⁸ Correspondingly, the determination of future social metabolism with Nature by the interest rate is the ultimate expression of the fetishistic character of this historical form of social metabolism with Nature, that is, of the fetishistic core of the so-called Anthropocene, no matter the magnitude of the interest rate. In capitalism the interest rate is determinant of investments and allocation of resources, and overcoming this is not a matter of moralistically (and unrealistically) using a lower magnitude for the interest rate as Stern does, but of overcoming the capitalist mode of production itself.⁴⁹

Future scenarios determined by the interest rate ultimately negate history, since only in capitalism the interest rate is socially determining, as it is capital in its purest form. While in capitalism interest-bearing capital becomes totally adapted to the conditions of capitalist production, and fosters it with the development of the credit system, in pre-capitalist social formations, “usury impoverishes the mode of production, cripples the productive forces.”⁵⁰ This is so because in capitalism credit is given in the expectation that it will function as capital, that the borrowed capital will be used to valorize value, to appropriate unpaid “free” labor, while in the Middle Ages the usurer exploited petty producers and peasants working for themselves.⁵¹ The determination of future social metabolic relation with Nature by the interest rate is thus an extrapolation of the capitalist mode of production and all of its categories (value, surplus-value, abstract labor, etc.) into the future, the fetishization of history — again, this is in line with the term Anthropocene, that makes reference to an ahistorical Man.

Besides, the sort of cost-benefit analysis that Nordhaus and Stern carry out tends to negate not only history, but matter itself, as the trade-off of the degradation of material resources with the abstract growth implies the absolute exchangeability between different material resources, and hence between abstract wealth (capital) and material wealth, which in practice is a false assumption. For example, the most basic natural synthetic process necessary for life as we know on Earth, photosynthesis, is not technologically substitutable, that is, no amount of exchange-value could replace it.⁵² Besides, synthesizing the complex interactions and material and energy fluxes that constitute ecosystems of different characteristics and scales, with their own path-dependent natural histories, is not at all a trivial task — material interactions and specificity are exactly what exchange-value abstracts from. What this sort of analysis takes for granted is commodity-form itself, with its common substance (value) that allows the exchange between different material resources in definite amounts, detached from their material and ecological contexts. But it is this very detachment or abstraction that leads to destructiveness. “The dream implied by the capital form is one of utter boundlessness, a fantasy of freedom as the complete liberation from matter, from nature. This ‘dream of capital’ is becoming the nightmare of that from which it strives to free itself — the planet and its inhabitants.”⁵³

Last but not least, capital is also trying to increase its profits exploiting the very anxiety caused by the prospect of the ecological catastrophe, as an extension of the production of subjectivity by the culture industry.⁵⁴ For example, Starbucks cafés offer their customers a coffee that is a bit more expensive, but claim that part of the money goes to the forest of Congo, poor children in Guatemala, etc. This way, political consciousness is depoliticized in what is called the “Starbucks effect.”⁵⁵ It can also be seen in commercial advertisements. In one of them, after scenes depicting some kind of undefined natural catastrophe intercalated with scenes of a carpenter building an undefined wooden structure and women in what seems to be a fashion show, the real context is revealed: the models are going to a sort of Noah’s Arc built by the carpenter, so that they can survive the ecological catastrophe. The purpose of the advertisement is finally disclosed: to sell deodorant — “the final fragrance.” The slogan — “Happy end of the world!” — explicitly exploits the ecological collapse to sell commodities.⁵⁶ Opposition and political will themselves are being seduced to fit into the commodity form, even pervading climate science itself. Some scientists seem to notice this pervasive pressure of economic fetishism over science when they state: “liberate the science from the economics, finance, and astrology, stand by the conclusions however uncomfortable” or “geoengineering is like a heroin addict finding a new way of cheating his children out of money.”⁵⁷ Decarbonization is always challenged to be “economically feasible.” What is necessary, though, is that a more radical critique come to the fore in the public debate, an explicitly anticapitalist stance that refuses the requirements of capital accumulation in the definition of socio-environmental policies — not the least because it seems it is already impossible to reconcile the limitation of global warming to two degrees Celsius and simultaneously keep “economic growth.”⁵⁸

It must be highlighted that the fetishization here described and its ecological destructiveness are a historical development, specific to capitalism, and that is why it can be overcome: the social metabolism with nature is not necessarily destructive. Commodity fetishism and labor as the social-mediating category (abstract labor) are historically specific to capitalism, and began with primitive accumulation.⁵⁹ The Anthropocene as the globalized disruption of Nature is the externalization of alienated labor, its logical material conclusion.⁶⁰ Overcoming it requires the reappropriation of what has been constituted in alienated form, that is, the decommodification of human social activity or the overcoming of capitalism.⁶¹ Technology so reconfigured and socialized would no longer be determined by profitability, but would be the technical translation of new values, and would tend to become art.⁶² Instead of being determined by the unidimensional valorization of value, social production would be the outcome of a multiplicity of commonly discussed criteria, ranging from social, ecological, aesthetic, and ethical considerations, and beyond — in other words, material wealth should be freed from the value-form. Technologies such as solar energy, microelectronics, and agroecology, for example, could be used to shape a world of abundant material wealth and a conscious social metabolism with Nature — a world with abundant clean renewable energy, abundant free social time due to the highly automated productive forces, and abundant food ecologically produced, under social control.⁶³

Then and only then Man could be in conscious control of planetary material cycles and could use this control for human ends (even if deciding to keep them in their “natural” state). In fact, this means taking the promise of the Anthropocene very seriously, that is, Man should take conscious control of planetary material cycles, extend the terrain of the political hitherto left to the blind mechanics of nature and, in capitalism, to commodity fetishism.⁶⁴ And this not only because the productive forces developed by capitalism allow it — although up to now we do it without conscious social control — but also because it might be necessary. Civilization is adapted to the Holocene conditions that prevailed in the last ten thousand years, and we should be prepared to act to preserve these conditions that allow human development, or mitigate sudden changes, because they could be challenged not only by human (fetishized) activity, but also by natural causes, what already occurred many times in natural history (such as in the case of glacial-interglacial cycles triggered by perturbations in Earth’s orbit, or the catastrophic extinction of dinosaurs due to a meteor impact).⁶⁵ The (fetishized) “invisible hand” and the (fetishized) “Anthropocene” are two faces of the same coin, of the same unconscious socialization, and should both be overcome with the communalization of social activity, that is, the real control of planetary material cycles depends on conscious social control of world production.

It should be emphasized that what is here criticized as “fetishism” is not merely the imprecise naming of the “Anthropocene,” but the form of material interchange itself. And yet what emerges here is a truly utopian perspective, the promise of the realization of the Anthropocene, not as an anthropological constant or a “natural” force, but as a fully historical species-being that consciously controls and gives form to the material conditions of the planet. If, as put by the young Marx, alienated labor alienates Man’s species-being, the liberatory reorganization of social-material interchange would unleash the species potential that is embedded, though socially negated, in the “Anthropocene.”⁶⁶ Geoengineering and advanced technology in general freed from value-form and instrumental reason could be used not only to solve the climate problem, but also, as Adorno wrote, to “help nature to open its eyes,” to help it “on the poor earth to become what perhaps it would like to be.”⁶⁷ Advanced forces of production imply that Fourier’s poetic utopian vision recalled by Walter Benjamin could be materialized:

cooperative labor would increase efficiency to such an extent that four moons would illuminate the sky at night, the polar ice caps would recede, seawater would no longer taste salty, and beasts of prey would do man’s bidding. All this illustrates a kind of labor which, far from exploiting nature, would help her give birth to the creations that lie dormant in her womb.⁶⁸

Even the elimination of brutality in nature (predation) and the abolition of slaughterhouses through the production of synthetic meat nowadays seem within theoretical reach with “genetic reprogramming” and stem-cell technology. That goes beyond the wildest Marcusean utopian dreams.⁶⁹ Of course, this requires a social struggle that subverts the production determined by the valorization of value and frees, first of all, human potential. On the other hand, with business as usual, we are likely to see our material future on Earth being determined by the interest rate, emergency geoengineering, and chance.

1. Guy Debord, *The Sick Planet*, trans. Not Bored (2006 [1971]) <http://www.notbored.org/the-sick-planet.html>

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3. Paul Crutzen, "Geology of Mankind," *Nature* 415 (2002) 23.
4. David Archer, *The Global Carbon Cycle* (Princeton: Princeton UP, 2010), and James Hansen, *Storms of My Grandchildren: The Truth about the Coming Climate Catastrophe and Our Last Chance to Save Humanity* (New York: Bloomsbury, 2009).
5. Slavoj Žižek, *Living in the End Times* (New York: Verso, 2010) 333.
6. Max Horkheimer and Theodor Adorno, *Dialectic of Enlightenment: Philosophical Fragments*. Trans. Edmund Jephcott (Stanford: Stanford UP, 2002 [1947]) 6.
7. Karl Marx, *Capital: A Critique of Political Economy*, Volume III, trans. David Fernbach (London: Penguin, 1991 [1894]) 949, and John Bellamy-Foster, *Marx's Ecology: Materialism and Nature* (New York: Monthly Review, 2000).
8. Johan Rockström et al., "A Safe Operating Space for Humanity," *Nature* 461 (2009): 472-75, and Will Steffen et al. (2015), "Planetary Boundaries: Guiding Human Development on a Changing Planet," *Science* 347: 6223 (13 February 2015).
9. Andreas Malm, "The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry," *Historical Materialism* 21:1 (2013): 15-68.
10. Steffen et al., "Planetary Boundaries."
11. Karl Marx, *Capital: A Critique of Political Economy*, as per first German edition, trans. Albert Dragstedt (n. d. [1867]).
12. Crutzen, "Geology."
13. Karl Marx, *Capital: A Critique of Political Economy*, Volume I. Trans. Ben Fowkes. (London: Penguin, 1990 [1867]) 166, 253.
14. Marx, *Capital*, Vol. 1, 175, 255.
15. For a discussion of the continuity between the Marxian concepts of alienation and fetishism, see Lucio Colletti's introduction in Karl Marx, *Marx's Early Writings*, trans. Rodney Livingstone and Gregor Benton (London: Penguin, 1992 [1844]).
16. Guy Debord, *Society of the Spectacle*, trans. D. Nicholson-Smith (New York: Zone, 1994 [1967]) 46. See also Moishe Postone, *Time, Labor, and Social Domination: A Reinterpretation of Marx's Critical Theory* (Cambridge: Cambridge UP, 1993), and Anselm Jappe, *Les aventures de la marchandise: Pour une nouvelle critique de la valeur* (Paris: Denoël, 2003): 25-86.
17. Postone, *Time* 158-60.
18. Jappe, *Les aventures* 25-86.
19. Robert Kurz, *Subjektlose Herrschaft: zur Aufhebung einer verkürzten Gesellschaftskritik, EXIT!* (1993).
20. *Capital*, Volume I 166 (emphasis added), and Žižek, *End Times* 190.
21. Debord, *Sick Planet*.
22. Slavoj Žižek, *Mapping Ideology* (New York: Verso, 1994) 8.
23. *Capital*, Volume I 179, 989.
24. Paul Burkett, *Marx and Nature: A Red and Green Perspective* (New York: St. Martin's, 1999) 79-98, and Robert Kurz, *Schwarzbuch Kapitalismus* (Frankfurt am Main: Eichborn, 2009 [1999]) 10.
25. Kurz, *Schwarzbuch* 218, and John Holloway, *Crack Capitalism* (New York: Pluto, 2010) 146.
26. *Capital*, Volume I 493n4.
27. Peter D. Schwartzman and David W. Schwartzman, *A Solar Transition Is Possible* (London: IPRD, 2011), and Mark Jacobson and Mark Delucchi, "A Path to Sustainable Energy by 2030," *Scientific American* (Nov. 2009): 58-65
28. Andreas Malm, "China as Chimney of the World: The Fossil Capital Hypothesis," *Organization and Environment* 25:2 (2012): 146-77, and Daniel Cunha, "A todo vapor rumo à catástrofe?" *Sinal de Menos* 9 (2013): 109-33.
29. Barry Commoner, "Chapter 8: Population and Affluence" and "Chapter 9: The Technological Flaw," *The Closing Circle: Nature, Man, and Technology* (New York: Knopf, 1971).
30. *Capital*, Volume III 176.
31. Claus Peter Ortlieb, "A Contradiction between Matter and Form," *Marxism and the Critique of Value*, ed. Neil Larsen, Mathias Nilges, Josh Robinson, and Nicholas Brown (Chicago: MCM, 2014 [2008]) 77-121.
32. John Bellamy-Foster, Brett Clark, and Richard York, *The Ecological Rift: Capitalism's War on the Earth* (New York: Monthly Review, 2010): 169-182.
33. William Stanley Jevons, *The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal Mines* (n. d. [1865]) <http://www.econlib.org/library/YPDBooks/Jevons/jvnCQ.html>
34. Larry Lohmann, "The Endless Algebra of Climate Markets," *Capitalism Nature Socialism* 22:4 (2011): 93-116, and Maria Gutiérrez, "Making Markets Out of Thin Air: A Case of Capital Involution," *Antipode* 43:3 (2011): 639-61.
35. Kevin Anderson, "The Inconvenient Truth of Carbon Offsets," *Nature* 484 (2012) 7.
36. Lohmann, "Endless Algebra."
37. Damon Matthews, Nathan Gillet, Peter Stott, and Kirsten Zickfeld, "The Proportionality of Global Warming to Cumulative Carbon Emissions," *Nature* 459 (2009): 829-33.
38. Jeff Coelho, "Global Carbon Market Value Hits Record \$176 Billion," *Reuters* (30 May 2012).
39. ETC Group, *Geopiracy: The Case Against Geoengineering* (Manila: ETC Group, 2010).
40. Eli Kintisch, *Hack the Planet: Science's Best Hope—or Worst Nightmare—for Averting Climate Catastrophe* (Hoboken: John Wiley & Sons, 2010): 77-102.
41. Susan Solomon, Gian-Kasper Plattner, Reto Knutti, and Pierre Friedl, "Irreversible Climate Change Due to Carbon Dioxide Emissions," *PNAS* 106:6 (2009): 1704-9.
42. Victor Brovkin, Vladimir Petoukhov, Martin Claussen, Eva Bauer, David Archer, and Carlo Jaeger, "Geoengineering Climate by Stratospheric Sulfur Injections: Earth System Vulnerability to Technological Failure," *Climatic Change* 92 (2009): 243-59.
43. Scott Barrett, "The Incredible Economics of Geoengineering," *Environmental and Resource Economics* 39:1 (2007): 45-54.
44. Martin Lukacs, "World's Biggest Geoengineering Experiment 'Violates' UN Rules," *The Guardian* (15 October 2012).
45. William Nordhaus, *A Question of Balance: Weighing the Options on Global Warming Policies* (New Haven: Yale UP, 2008), and Nicholas Stern, *The Economics of Climate Change: The Stern Review* (London: HM Treasury, 2007).
46. *Capital*, Volume III 459-524.
47. *Capital*, Volume III 515.
48. *Capital*, Volume III 523.
49. Stern, *Economics*.
50. *Capital*, Volume III 731-32.
51. *Capital*, Volume III 736.
52. Robert Ayres, "On the Practical Limits to Substitution," *Ecological Economics* 61 (2007): 115-28.
53. Postone, *Time* 383.
54. Horkheimer and Adorno, *Dialectic*.
55. Slavoj Žižek, *Catastrophic But Not Serious*. Lecture video (2011).
56. Axe, "Happy End of the World!" Advertisement video (2012).
57. Kevin Anderson and Alice Bows, "A New Paradigm for Climate Change: How Climate Change Science Is Conducted, Communicated and Translated into Policy Must Be Radically Transformed If 'Dangerous' Climate Change Is to Be Averted," *Nature Climate Change* 2 (Sept. 2012): 639-40, and Kintisch, *Hack* 57.
58. Kevin Anderson and Alice Bows, "Beyond 'Dangerous' Climate Change: Emission Scenarios for a New World," *Philosophical Transactions of the Royal Society* 369 (2011): 20-44.
59. Postone, *Time*; Holloway, *Crack Capitalism*; Crisis Group, *Manifesto Against Labour* (1999).
60. *Sick Planet*.
61. *Time*.
62. Commoner, *Closing Circle*; Herbert Marcuse, *One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society* (Boston: Beacon, 1964); Herbert Marcuse, *An Essay on Liberation* (Boston: Beacon, 1969).

63. Robert Kurz, *Antiökonomie und Antipolitik Zur Reformulierung der sozialen Emanzipation nach dem Ende des "Marxismus"* (1997); Schwartzman and Scharzman, *Solar Transition*; Miguel Altieri, *Agroecology: The Science of Sustainable Agriculture* (Boulder: Westview, 1995).
64. Eric Swyngedouw, "Apocalypse now! Fear and Doomsday Pleasures," *Capitalism Nature Socialism* 24:1 (2013): 9-17.
65. Hansen, Storms, and Rockström et al., "Safe Operating Space."
66. Marx, *Marx's Early Writings*.
67. Cited in Herbert Marcuse, *Counterrevolution and Revolt* (Boston: Beacon, 1972) 66.
68. Walter Benjamin, "On the Concept of History" in *Walter Benjamin, Selected Writings, Volume 4, 1938-1940*, ed. Howard Eiland and Michael W. Jennings (Cambridge: Belknap, 2003) 394.
69. See David Pierce, *Reprogramming Predators* (2009), and BBC, *World's First Lab-Grown Burger Is Eaten in London* (5 Aug. 2013). Marcuse's skepticism about the "pacification of nature" is expressed in *Counterrevolution and Revolt* 68.