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To Live in Compromised Worlds: Holly Jean Buck's *After Geoengineering*

I often have the feeling, while walking through Manhattan, sitting in a nice restaurant, or lounging on my couch, that what I am experiencing is some kind of ghost reality already vanishing before my eyes. Perhaps this is the fate of everyone who has been fervently reading the increasingly catastrophic reports coming from the IPCC. Or anyone whose attention is tuned to the patterns of wind and rain and sun and the movements of animals and plants. The reality that we live in, driven by fossil fuel dependency, seems to be hanging by a thread.

[1] This may be a tenacious thread, but as we witness increasingly catastrophic weather events around the globe, it seems obvious that our current way of life cannot be maintained. Something is going to give, one way or another. These alternate realities are how Holly Jean Buck starts her new book, *After Geoengineering: Climate Tragedy, Repair, and Restoration*. The first chapter ends with a choose-your-own-adventure narrating varying degrees of climate catastrophe and various iterations of geoengineering projects, depending on the reader's faith in both political processes and technological solutions. These fictionalized futures are a depiction of the futures that we are actually facing. If we wish to avoid 1.5C warming, we need to drop emissions and even go negative by the end of the century. In order to accomplish this, there needs to not only be drastic decarbonization, but many types of geoengineering are also being considered. This is what Buck calls the "desperation point." On the left, we often discredit geoengineering outright. But Buck argues that some of these technologies could be useful for a just transition, and that simply wishing them away, or relying only on decarbonization, will not help us remain below a critical warming threshold. Her book is a critical examination of geoengineering as a means to avert climate catastrophe.

In order to give a clear picture of the various geoengineering technologies, and their widely different implications, Buck divides the book into sections that deal with the two primary methods of carbon sequestration: cultivation and burial. Cultivation includes all of the various biological techniques, from algae farming to afforestation (the planting of new forests), while burial involves mechanical methods of carbon capture and storage—

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[1] For a thorough understanding of the ways in which fossil fuels have permeated all aspects of our culture and political systems, see Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (New York: Verso, 2011); Stephanie LeMenager, *Living Oil: Petroleum Culture in the American Century* (Oxford, UK: Oxford University Press, 2014); Imre Szeman, "How to Know about Oil: Energy Epistemologies and Political Futures," *Journal of Canadian Studies/Revue d'études canadiennes*, vol. 47, no. 3 (2013): 145–168; Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018); and Andreas Malm, *Fossil Capital* (New York: Verso, 2016).

including pulling CO₂ out of the air, concentrating it as a gas or liquid, and then burying it, or “weathering,” a process that speeds up carbon mineralization by injecting concentrated CO₂ with water into rocks, effectively turning the CO₂ into a rock. Buck makes clear that “carbon removal is likely to be analogous to waste control: a massive industry, but not a transformative one,” and encourages the reader to think about carbon removal through the frameworks of “development interventions, humanitarian interventions, and infrastructure” (41–42). She illustrates the many-forked crossroads at which we stand through both traditional academic or journalistic prose and short speculative fiction narratives that illustrate possible outcomes.

These futures, radically different from the past we have known, are already here.[2] They appear in the forms of fires and floods and unseasonable temperatures, or with the vanishing of any clear and distinct season in the first place. For so many people, these futures have been the present for centuries—a kind of double vision that sees that this reality is a dystopia, life after an apocalypse. Kyle Whyte argues that, for Indigenous peoples on Turtle Island (otherwise known as North America), climate breakdown is merely one event in a much longer series of catastrophic climate events that have been imposed on these lands since the beginning of settler colonialism.[3] Eyal Weizman has argued that changing the climate was *the aim* of settler colonialism, as colonists sought to re-institute a vision of a displaced Europe.[4] For those of us shielded from this knowledge because we were on the receiving end of the spoils, we are just catching up, and far too late, to our own devastating mess.

Regardless of where we sit, a threshold has been crossed, quantified, and positivized by the parts per million of carbon in the atmosphere. Carbon dioxide levels are higher now than they have been for the last eight hundred thousand years—long before humans existed. But even if these numbers and statistics have passed us by, or are incomprehensible, there are so many other indications: species lost, polluted waterways, unbreathable air. Yet, we still hold out some kind of hope that another limit will not be reached, the perilous one of 1.5C global warming, which will amplify these terrifying realities to new heights. *After Geoengineering* begins by acknowledging that we are on a path to far exceed this threshold. In many circles, including the recent IPCC reports, staying below 1.5C or 2C warming will necessarily involve some kind of geoengineering. As Buck makes clear, geoengineering comes in many forms: regenerative agriculture, bioenergy (BECCS), carbon capture and storage (CCS), and solar geoengineering, which involves “stratospheric aerosol injection,” or spraying aerosols into the atmosphere above the levels that planes fly in order to change both the quality and amount of sunlight that reaches the surface of the Earth (3). Geoengineering is not a particularly well-understood set of techniques. It needs to be seen, as philosopher Pak-Hang Wong states, “not as a *one-off event* but as a *temporally extended process*” (27). In other words, geoengineering is not a singular intervention but a series of ongoing interventions. And what comes after these interventions is just as important as the interventions themselves (27).

Many of these technologies have so far only been taken up by the oil industry, but they feature heavily in both IPCC and International Energy Agency reports as key elements in avoiding climate catastrophe, although they have not been widely implemented. Whether we like it or not, it seems

[2] By “we,” here, I am referring only to those of us who understood ourselves to have a future, a progressively good future. In other words, those of us with the accordant class and race and ability status that would allow us to believe in such an orientation to the future. On the case of futurelessness, see Terike Haapoja, “Three Modalities of Futurelessness,” *This Is Not a Blog* (May 8, 2019).

[3] Kyle Whyte, “Our Ancestors’ Dystopia Now: Indigenous Conservation and the Anthropocene,” in *Routledge Companion to the Environmental Humanities*, ed. Ursula Heise, Jon Christense, and Michelle Niemann (London: Routledge, 2016).

[4] Eyal Weizman, *The Conflict Shoreline* (Göttingen: Steidl, 2015).

that geoengineering might very well be in our future, and Buck advocates for “resistance that is more than reactive” (206). She writes, “I’m gravely concerned about what the scientific evidence indicates for the future of life on earth. I’m worried that climate change will become so severe that even more people will suffer, and that in the midst of that suffering, people will grasp for solar geoengineering without adequate caution. I am worried that geoengineering will be used to protect material assets at the request of those who own those assets, without regard to vulnerable communities who lack any assets” (242). Buck argues forcefully that if these technologies are on the horizon, then it is in our own best interest, especially for those of us on the left, to think through models of worker-owned, collective forms of geoengineering. She also argues that early implementation of some of the more benign forms of geoengineering, such as carbon capture and storage (meaning mass deployment now), might avert the much more troubling versions of these technologies in the future, such as solar geoengineering. But regardless, technologically remediating climate change is no small task. One year’s worth of CO₂ emissions captured and bound to rocks, in the scenario of “weathering,” for example, would amount to “a couple of big mountains’ worth of material, not piles, mountains,” as one of Buck’s interlocutors warns (147). Put in clearer terms, Buck writes that, “Basically, capture of climate-significant amounts of carbon dioxide entails an infrastructure on the same scale of today’s oil industry—but to put the carbon back underground” (122).

While Buck is cognizant of the critiques from the left that geoengineering offers an extension and amplification of the same logics that have caused this crisis, she asks instead: What if we didn’t dismiss geoengineering so quickly? [5] What if we recognized geoengineering as something that could be used to further the ends of environmental justice—not only to avert the impending genocides of climate change but to put forward a kind of social democratic platform that included reparations, basic minimum income, etc.? In many ways, the book feels like a Green New Deal Plus, where the plus includes technologies such as CCS and regenerative agriculture. She advocates for a future that combines industrial technologies with de-growth, a platform that seems akin to the infrastructural investments that were necessary during the first New Deal. In line with this process is a path to either force or encourage fossil fuel companies to become carbon-capture and storage companies. Additionally, the tech for carbon removal could be open source rather than proprietary if we are to adopt these technologies soon.

It is also possible to see some of the techniques that Buck proposes, such as regenerative agriculture, as healing practices. Regenerative agriculture involves the widescale adaptation of earlier, and often Indigenous, forms of farming that do not rely on chemical pesticides or fertilizers and that actively work to build up the vitality of the soils. This involves no or low tilling, using cover crops and leaving crop residues to decay, and using species or varieties with greater root mass to maximize the ability of the soil to sequester carbon (99). These practices ask us to rethink our relations not just to agriculture but to many of the plantation logics that are at the heart of climate chaos. They reverse the dependency on monocrops and also ask us to reckon with the devastating ideologies that led to chattel slavery, and to contemporary capitalism, where so many forms of life were turned into mere commodities,

[5] As Buck explains, “right now, the primary market for CCS is enhanced oil recovery: using CO₂ to force out oil that wouldn’t otherwise be extracted” (Buck 2019, 123).

from people to plants.[6] Implementing practices of regenerative agriculture seems desirable regardless of carbon dioxide levels. However, Buck warns that the use of biological material for carbon sequestration is a one-off method, so regenerative agriculture alone may not be efficacious to avert climate catastrophe. “When the potential is used up, this is called ‘sink saturation.’ It’s also reversible, meaning the new practices must be continued to keep the carbon sequestered” (102). In other words, if there were a change in policy or ideology, the carbon stored in living forms could easily be released back into the atmosphere. Greenhouse gases could also be released by climate change itself, for example, through forest fires. But the real problem lies with scale: “current emissions are on the order of forty gigatons of CO₂ per year, or fifty gigatons of CO₂ equivalent when you count other greenhouse gases. Afforestation, soil carbon, and biochar, at the extremes of their socio-technical potential, could remove perhaps ten to twenty gigatons of CO₂ equivalent per year of that” (114–115). If we had started the project of decarbonization through regenerative agriculture in, say, 1990, when the first IPCC report was issued, that might have been sufficient. At this point, cultivation in all its forms is not predicted to make enough of an impact to avert the 1.5C limit of warming that low-lying island nations say is necessary to save their way of life and homelands. Given this, we have an ethical conundrum ahead of us: do we support technologies that in many ways divert attention from the desperate need to decarbonize, that could shore up wealth for some of those same companies that got us into this mess, that exacerbate and extend the logics of progress that have proved devastating across the world but that might save countless species and human lives? It seems like a deal with the devil, which is the reason so many people on the left have refused to engage with geoengineering. Succinctly summarizing this critique, T. J. Demos writes that “geoengineering appears to be a technological construct mobilized in part precisely so as not to address social injustice and to restrict our understanding of environment to the biogeophysical realm.”[7]

Each of the chapters of *After Geoengineering* represents an attempt to think through the embedded consequences of implementing different kinds of geoengineering and what new social forms may be possible in this future. In other words, Buck understands quite well the critique by people like Demos but is not willing to simply cede geoengineering to the right or to giant corporations. Could geoengineering, especially carbon capture and sequestration, taken by the West, be understood as a form of climate reparation? As Buck writes, “There is an opportunity here to appropriate this group of techniques for redistributive ends. Morally, rich countries have an imperative to develop this technology [CCS], and use it, in order to reduce climate risk for everyone. This comes down to having an appetite for paying for and living with expensive infrastructure” (127). Buck argues that a binary approach of technological utopianism vs. radical refusal is no longer adequate, as geoengineering technologies do not necessarily imply the continuation of our existing way of life but could instead offer us a way to act in ways congruent with environmental justice.

However, despite her valiant effort, some of the failures of the book come through most clearly in the short fictionalized vignettes that appear at the end of each of the chapters in the cultivation and burial sections of the

[6] For further links between plantation logic, the Anthropocene, and ecocide, see Donna Haraway, “Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin,” *Environmental Humanities* 6 (2015): 159–165; Donna Haraway, Noboru Ishikawa, Gilbert Scott, Kenneth Olwig, Anna L. Tsing, and Nils Bubandt, “Anthropologists Are Talking—about the Anthropocene,” *Ethnos* (2015); Nicholas Mirzoeff, “It’s Not the Anthropocene, It’s the White Supremacy Scene, or, The Geological Color Line,” in *After Extinction*, ed. Richard Grusin (Minneapolis: University of Minnesota Press, 2016); Nicholas Mirzoeff, “Visualizing the Anthropocene,” *Public Culture*, vol. 26, no. 2 (2014): 213–232; Kevon Paynter, “Black Farmers Reviving Their African Roots: ‘We Are Feeding Our Liberation,’” *Yes!* (March 2, 2018); Katherine McKittrick, “Plantation Futures,” *Small Axe*, vol. 17, no. 3 (2013): 1–15.

[7] T. J. Demos, “To Save a World: Geoengineering, Conflictual Futurisms, and the Unthinkable,” *e-flux* 94 (October 2018).

book. In these stories, used to illustrate the potential futures that we could inhabit if we adopted these different technologies, racial difference is not mentioned. This absence strikes me as incredibly telling of the ways in which whiteness is figured as normative and is blindly reproduced by both Buck and the conversation around climate change. Additionally, in these stories, romance operates through heteronormative dating tropes, despite the apocalyptic backdrop. Success is still measured by cocktail dresses and fancy receptions. In other words, these worlds, whether positive or negative versions of the possibilities of what comes after geoengineering, have somehow not grappled at all with questions of social relations, of the intimacies of encounters, and how these may or may not shift with massive decarbonization. Perhaps this was the point, to show that social change is slow. But I also think that this may be indicative of precisely the lack of radical imagination enforced by the fixation on greenhouse gas emissions, a fixation that forecloses the capacity to think beyond social forms that reproduce the logics of extractivism. This is also illustrated at the very end of the book, which closes with a reference to Extinction Rebellion, a movement that has garnered both incredible excitement for its massive direct actions to demand climate “truth” and policy intervention, and a deeply troubling reiteration of the failures of the white environmental movement, or what Van Jones has called “the unbearable whiteness of green.”[8]

[8] Van Jones, “Vanity Fair: The Unbearable Whiteness of Green,” *Huffington Post*, May 17, 2007. For a thoughtful critique launched by the wretched of the earth collective in relation to Extinction Rebellion, see Wretched of the Earth, “An Open Letter to Extinction Rebellion,” *Red Pepper* (May 3, 2019).

The last chapter of the book describes an incredibly sympathetic case study that supports the possible use of solar geoengineering. Daniel Harrison, an Australian oceanographer, is desperately trying to buy time for the Great Barrier Reef. Harrison proposes using solar geoengineering as a temporary measure to slow acidification and warming enough to give the reefs a chance. I understand the scientist’s desire. The thought of living in a world without coral reefs is a grief I can barely imagine. Buck makes clear that the reef is essential for hundreds of thousands of people’s livelihoods and untold aquatic ecosystems. But, despite all this, I cannot get behind any form of solar geoengineering. It seems like an astronomically bad idea, one with hugely unknown consequences, and one that might, as she acknowledges, turn the sky white (3). Never have I heard of a more literal connection between whiteness and climate change. This totalizing white atmosphere cannot be what we concede.

Despite these failings, *After Geoengineering* offers a valuable engagement with geoengineering. Far too often on the left, what we want is the pureness of critique, of distance. What I appreciate most about the book is the risk of proposing, the risk of engaging with realities that are totally compromised. I see Buck’s project as a necessary ethical intervention into engaging with what we don’t want, with realities that we wish were otherwise. It is from this compromised position, from the acknowledgment that the world itself is so deeply damaged, that we might be able to build more livable worlds, to begin to address climate reparations and environmental justice, to think with other-than-humans, and from there to imagine more radical political possibilities and trajectories. What Buck offers is a sustained and thoughtful engagement with what we would rather ignore, or dismiss, because our current reality is so deeply troubling.