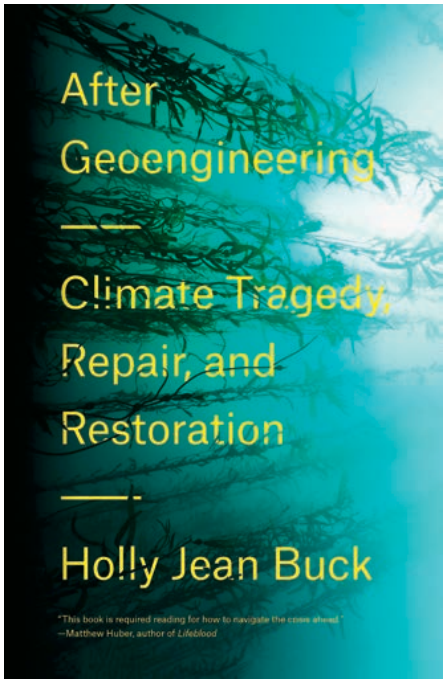
Whatever Human Makes

ELIZABETH GARBEE



After Geoengineering: Climate Tragedy, Repair, and Restoration
by Holly Jean Buck. London, UK: Verso, 2019, 288 pp.

The view out my porthole this morning is slate gray sea against a backdrop of glacial ice and heavy white clouds. Here in the Antarctic, one could be forgiven for thinking nothing ever changes. After all, the air bubbles trapped in these glaciers are hundreds or thousands of years old. The seals and penguins wake up every day and do what they have always done. And a ship full of human passengers, such as the one I'm on, will always seem like a visitor from a different world. Yet in this foreboding, alien landscape, we see some of the most dramatic evidence of human-caused climate change, with whole ecosystems and weather patterns shifting to become ever warmer, ever more turbulent. We can sense the clock ticking here, marching toward drastic and irreversible change, and wonder if there's anything humans can do to stop it.

Among the many real and imagined solutions for climate change, Holly Jean Buck contends that geoengineering is the future nobody wants. In her new book, *After Geoengineering: Climate Tragedy, Repair, and Restoration*, she considers the term "geoengineering" itself—which implies that it's possible for humans to control or engineer the climate system at a global scale—to be a "weird artifact of the 21st century way of seeing the human relationship with the rest of nature."

Defining geoengineering is nearly as difficult as describing the uncertain outcomes of its implementation. Broadly speaking, the term is reserved for deliberate large-scale manipulation of the processes that affect Earth's climate in an attempt to counteract the effects of global warming. One of the most common proposals, for example, is solar geoengineering, a hypothetical program inspired by the decrease in global temperatures following large volcanic eruptions. The technology most often imagined for this project involves injecting aerosolized particles into the stratosphere to increase reflectivity and reduce the amount of solar radiation absorbed by the planet.

Buck begins her conversation about what comes after geoengineering by posing three questions: When is the right time to start? How much will be enough? When is it time to stop? She gives various perspectives due consideration as she deftly avoids the acrimony that can shape scientific discourse as surely as it does climate politics. To critics of geoengineering, altering the amount of incoming solar radiation by spraying the stratosphere with aerosols is crazy; on the other hand, the more the climate warms, the more a drastic solution seems appealing, and garners the kind of attention that turns into research funding. (And research funding, as geoengineering skeptics will often argue, is at the top of the slippery slope that ultimately—if not

quite inevitably—leads to deployment of the technology.)

Woven through Buck's (too lengthy) introduction are warnings against using geoengineering to hedge climate risks. She notes that the research needed on geoengineering will itself take decades, which could be too late to prevent significant damage. Scientists are highly unlikely to recognize climate tipping points until humans have already crossed them, making attempts to avoid them through geoengineering implausible. And any successful geoengineering program must be paired with the much more difficult goal of global decarbonization.

At this point, geoengineering takes a back seat as Buck devotes the rest of her book to the more pressing challenge of systemically reducing the world's dependence on carbon-emitting fossil fuels. She maps the landscape ahead and holds space for a negotiation of costs and benefits, risks and rewards for a menu of decarbonization options.

Besides her exemplary and comprehensive survey of current and near-future decarbonization technologies, one of the strengths of Buck's approach to her topic is the narrative nonfiction treatment of an issue often too complex for individual human imaginations. At times reminiscent of a travelogue or choose-your-own-adventure novel, the book describes how Buck developed her perspectives on the issue through both professional and deeply personal experiences, including a formative romantic relationship that transpired within the context of her work.

Buck highlights "how elite commitment to fossil fuels has a history of thwarting alternatives, even when the alternatives come from within established industrial interests." One of those alternatives is bioenergy with carbon capture and sequestration (BECCS), a so-called negative-emissions geoengineering technology that stores more carbon dioxide than it produces. BECCS produces energy by burning biomass, such as agricultural or forestry wastes or specially grown crops, and captures and stores the subsequent carbon.

She argues that new technology *and* new forms of organized production are necessary to realize the potential of BECCS, since the technology's biggest hurdle is cost competition with fossil fuels. (She even asserts that BECCS can't be effective under a capitalist system that prioritizes limitless growth.) Here she channels, as she does several times through the book, the activist Naomi Klein, as well as the ecological Marxists, in seeing the need to change not only the technologies implicated in climate change but also the way people live and interact. Buck's position, however, is less ideological than it is practical: to see the necessary results in carbon removal and emissions reduction, she argues that society needs to rethink incentive structures and social capital.

The rest of this section focuses on what experts already know about BECCS, how they know it, and how various actors are using that knowledge. She covers a number of potential bioenergy sources, including kelp cultivation and regenerative agriculture, as well as larger infrastructural issues involving carbon capture, storage, transportation, and monitoring. Here Buck warns of the huge gulf between positing and researching various strategies and actually having reliable technologies. Furthermore, she notes, "even if we did have perfect knowledge about how much carbon all these practices could sequester, would people act on it?" That's the multibillion-dollar question.

What kind of political and social realignment would it take to get these programs off the ground at the billion-ton scale required to move the needle on human-caused climate change? Buck advocates for "degrowth," an equitable downscaling that strives to simultaneously improve human well-being and ecological conditions, while developing future industrial technology that doesn't exist to "conquer" nature.

These themes persist in later chapters as she imagines alternative futures predicated on climate justice, equity, and carbon removal. These futures depend on innovations that are more than simply replacing one commodity with another. People doing the work of carbon removal should define the field and set the working conditions, she argues, and "good green jobs" will require attention to issues of race, gender, and inclusion.

Buck's chapter on the future of education is the weakest of the book; she acknowledges the topic is beyond the scope of her own expertise, and is one that even experts in the field find to be wickedly difficult. However, in the following chapter, on how to get countries and companies to abandon their fossil fuel assets and income, Buck's incisive commentary and strong prose style return. Readers are hardly ever left to wonder where she stands on an issue. (Buck is not in favor of using coal with carbon capture and storage, for example.) She expertly preserves the nuance and complexity of figuring out what to do with the remains of an industry on which the entire global economy currently depends. After all, societies will likely need these companies' technology and expertise for large-scale carbon removal, and some oil money even funds mitigation and adaptation work. She acknowledges that taxpayers will likely bear the brunt of any government fossil fuel bailout, but argues that the fossil fuel industry cannot continue to dictate the terms of its own involvement in responding to the climate crisis.

Yesterday, on our visit to the coast of Antarctica, we explored the icy skeleton of a whaling ship that caught fire and ran aground, topped with bird nests and draped in algae. Our Russian guide, Vadim, commented in his accented English, "Whatever human makes, nature takes back. It just takes long time." Could geoengineering buy humans more time? To what ends? Will geoengineering help reduce climate-related risks for the least privileged in global society? Or will it buy fossil fuel companies more time to turn a profit while despoiling the atmosphere?

In the book's final section, Buck en-

courages readers to consider *who* gets to write the algorithm for a geoengineering project. How do scientists and funders and policy-makers build something equitable and effective? Here's her best-case scenario for implementing a geoengineering project: it would involve international cooperation and collaboration, be limited in scope and time, carefully consider the necessary workers and infrastructure, and be paired with the formidable challenge of global-scale decarbonization.

What Buck *doesn't* do is back a specific geoengineering technology, and quite deliberately. The technology itself is almost the least important part of her discussion. It's clear she believes humanity's best chance of addressing climate change will require the kind of generational thinking that went out of fashion with Egyptian pyramids and Gothic cathedrals, and a reconceptualization of the relationship between technological innovation and rural society. Humans could also continue to "wait and see," she reminds us, or do nothing. After a couple hundred pages of *After Geoengineering*, no option seems obvious or optimal, so in a sense readers are back where they started—although assuredly more informed.

Whatever human makes, nature takes back. I'm left wondering how much longer that whaling shipwreck will stand. Will more knowledge about the effects of various mitigation and removal techniques actually realign global priorities? Would humans regret more the actions not taken or those made in haste and desperation? The clock will keep ticking no matter what. I can't help but think whatever future humans engineer—or simply fall into—will be the one we deserve.

Elizabeth Garbee *is a science policy analyst with the Consortium for Science, Policy & Outcomes at Arizona State University. She also teaches middle school math and is the director of an integrated arts/humanities/STEM program at a prekindergarten through eighth grade school in Silver Spring, Maryland.*