"Has It Really Come to This?": An Assessment of Virtue Ethical Approaches to Climate Engineering

Gabriel Leopold Levine
Advisor: Thomas Pogge
Department of Political Science
Yale University

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I. Introduction

"Could you raise your hands if you think the risks of climate change pose a deep, serious problem to civilization? Now keep them up if you also think that abandoning fossil fuels is an extremely difficult task."[1] Most in the audience raised their hands. Only a few put them down. It was August 7, 2013, and E25-111 was filled to capacity. About 150 curious students, professors, and community members had filed in to a lecture hall for a panel discussion on the future of climate engineering, hosted jointly by Harvard University and the Massachusetts Institute of Technology, and moderated by Oliver Morton of *The Economist*. It shouldn't have been a surprise that most in attendance would have raised their hands for both of Morton's opening questions. Only pessimists—those who thought climate change was a serious problem, and that the usual strategies were likely to fail—would have shown much interest in the panel's topic. But pessimists though they might have been, the audience members were ready to consider an experimental way of fighting climate change, one that promises to delay the worst effects of climate change, buying time for civilization to figure out how to abandon fossil fuels.

When Morton asked about "abandoning fossil fuels," he was referring to what is known as climate change "mitigation." That means reducing emissions of the greenhouse gasses that cause climate change. It means initiatives such as carbon taxes, public transportation, and power plant emissions standards. Climate engineering, the subject of the panel discussion, means something else entirely: "reduc[ing] radiative forcing—the amount of energy absorbed by the atmosphere" from the sun.[2] Scientists have proposed several means of accomplishing this, ranging from the seemingly sensible (seeding clouds) to the apparently outlandish (dispersing an

[1] "Debating the Future of Solar Geoengineering," in *Harvard-MIT Geoengineering Seminars* (2013). (I have paraphrased Morton's questions for the sake of clarity.)
[2] Clare Heyward, "Situating and Abandoning Geoengineering: A Typology of Five Responses to Dangerous Climate Change," *PS: Political Science & Politics* 46, no. 1 (2013): 23.

array of billions of mirrors into orbit around the Earth). But perhaps the most prominent proposal has been what chemist Paul Crutzen dubbed "albedo enhancement by stratospheric sulfur injections."[3] (It is this to which I will refer by the term "climate engineering.") Crutzen's phrase refers to the dispersal of tiny droplets of sulfuric acid into the stratosphere, 20 kilometers above the Earth's surface, where they would remain for approximately one year.[4] Like the orbiting mirrors, the sulfuric acid would scatter sunlight back into space, cooling the planet, and offsetting some of the greenhouse effect. Climate engineering would do nothing to reduce atmospheric greenhouse gas concentrations: carbon dioxide would continue to raise temperatures, and to acidify the oceans. But according to David Keith, who spoke on the MIT panel in his capacity as a leading climate engineering researcher, dispersing sulfuric acid for this purpose would be "technically easy," and could cost little more than "a Hollywood blockbuster."[5]

Climate engineering would mimic a natural, though extraordinary, process: when Mount Pinatubo, in the Philippines, erupted in 1991, it released eight million tons of sulfur into the stratosphere, reducing global average temperatures.[6] Moreover, humans already are engineering the climate with sulfur, albeit unintentionally: Global sulfur pollution in the lower atmosphere (below the stratosphere), from the combustion of coal, currently amounts to about 50 million tons annually,[7] and has been found to cause global cooling.[8] Relative to Pinatubo, and to current pollution levels, climate engineering could be modest in scale. Keith, for example, suggests starting to engineer the climate with 250 thousand tons of sulfur annually, and increasing over

[3] P.J. Crutzen, "Albedo Enhancement by Stratospheric Sulfur Injections: A Contribution to Resolve a Policy Dilemma?," *Climatic Change* 77, no. 3-4 (2006).
[4] David Keith, *A Case for Climate Engineering* (Cambridge, Mass.: Boston Review, 2013), 4-5.
[5] Ibid., ix.
[6] Ibid., 11.
[7] Ibid., 70.
[8] Robert K. Kaufmann et al., "Reconciling Anthropogenic Climate Change with Observed Temperature 1998-2008," *Proceedings of the National Academy of Sciences of the United States of America* 108, no. 29 (2011).

about 50 years to 1.3 million.[9] As Keith puts it, "sulfates in the stratosphere are certainly not the best possible technology."[10] They would slow the recovery of the ozone. Moreover, they would contribute to acid rain, and would cause respiratory ailments.[11] But these effects are predictable, and in the latter cases, are likely much less significant than those of sulfur pollution from coal plants today. Sulfates are, in Keith's phrase, "the devil we know."[12] And as far as climate engineering goes, there is today nothing cheaper than sulfates that would be more effective, and nothing more effective that would be cheaper. If "the risks of climate change pose a deep, serious problem to civilization," then we have reason to seriously consider engineering the climate.

Just to say that we should consider climate engineering seriously is not to say that we, as humanity, should actually engineer the climate. Nor is it to say even we should invest in climate engineering research. As climate engineering has begun to enter the mainstream of climate policy discussion, commentators have raised myriad ethical concerns about it. These have often fallen into two categories that are not mutually exclusive: concerns about *consequences* and concerns about *governance*, both broadly construed. Toby Svoboda, for example, has discussed the risk of "unintentional discontinuation" of a climate engineering scheme, threatening "very rapid global warming as global temperatures 'catch up' to the radiative forcing of CO_2 and other greenhouse gasses."[13] Martin Bunzl has written about the complexities entailed in providing compensation for the potential harms of climate engineering.[14] Dale Jamieson has warned of the difficulty of devising appropriate norms of procedural justice for governing climate

[9] Keith, *A Case for Climate Engineering* 87.
[10] Ibid., 7.
[11] Ibid., 71.
[12] "Technology to Cool the Planet: An Interview with David Keith," *Boston Review*, October 29 2013.
[13] Toby Svoboda, "The Ethics of Geoengineering: Moral Considerability and the Convergence Hypothesis," *Journal of Applied Philosophy* 29, no. 3 (2012): 247.
[14] Martin Bunzl, "Geoengineering Harms and Compensation," *Stanford Journal of Law, Science, & Policy* (2011).

engineering.[15] Stephen M. Gardiner has argued that climate engineering is unlikely to fulfill "norms of justice and community" unless the "roots of [the] political inertia" underlying inaction on climate change more generally can be addressed.[16] Patrick Taylor Smith has analyzed climate engineering as a possible form of "domination" by present generations over future ones.[17] This list, of course, is incomplete. It indicates only some of the difficulties we might face in attempting to justify a given climate engineering policy.

There are ethical worries about climate engineering, however, that do not relate to its consequences, or to its governance. Some philosophers have raised concerns about the "very idea" of attempting to engineer the climate. These challenges will be the focus of my essay. Consequences and governance are, arguably, the categories by which we evaluate almost *every* public policy. In a stable polity, there will usually be consensus that the policies subject to debate are, in principle, morally permissible. Those writers who question the "very idea" of climate engineering seek to remove it from this consensus. They seek to show that it would be misguided to assess climate engineering only within our usual political categories, because engineering the climate would be *intrinsically bad*. Often, these philosophers consider climate engineering bad because of the *attitudes* that it would express. In Section II of this essay, I will describe these kinds of criticisms as "virtue ethical." As I will show, that climate engineering might be intrinsically bad does not mean that it could *never* be justifiable. Rather, it means that we approach our attempts at justification with some presumption against engineering the climate.

I have chosen to focus on intrinsic arguments against climate engineering for three reasons. First, we generally think that assessing the intrinsic moral character of actions is the

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[15] Dale Jamieson, "Some Whats, Whys, and Worries of Geoengineering," *Climatic Change*, no. 121 (2013): 533.
[16] Stephen M. Gardiner, *A Perfect Moral Storm: The Ethical Tragedy of Climate Change* (Oxford: Oxford University Press, 2011), 361-3.
[17] Patrick Taylor Smith, "Domination and the Ethics of Solar Radiation Management," in *Engineering the Climate: The Ethics of Solar Radiation Management*, ed. Christopher J. Preston(Plymouth, UK: Lexington Books, 2012).

special work of philosophy. While philosophical reasoning can inform our considerations about more typical policy questions, engaging with them seriously would require robust empirical analysis, of a sort that is beyond the realm of my experience. (This is not to say that empirical analysis excludes philosophical analysis.) Second, we might want to know if there are any intrinsic reasons not to engineer the climate *before* we reason about what climate engineering would cost, or how we should govern it. By focusing my paper as I do, I hope to show whether or not we should proceed with our other arguments. Third, moral concerns of the sort I have described are common in contemporary public discourse regarding climate engineering. James Fleming, a historian of human attempts at weather control, has described climate engineering as "driven by hubris." [18] According to journalist Eli Kintisch, some climate scientists "say manipulating our mysterious skies is too arrogant and distasteful even to consider." [19] Environmental ethicist Dane Scott has written that for some environmental critics, "geoengineering is more than a bad idea—it is an expression of a mistaken philosophy and dysfunctional culture." [20] Among professional philosophers, at least Scott, Jamieson, [21] and Gardiner, [22] along with Clive Hamilton, [23] David R. Morrow, [24] Chrisopher J. Preston, [25] and

[18] David Biello, "Can Geoengineering Save the World from Global Warming?," *Scientific American*, February 25 2011.
[19] Eli Kintisch, *Hack the Planet: Science's Best Hope—or Worst Nightmare—for Averting Climate Catastrophe* (Hoboken, NJ: John Wiley & Sons, 2010), 58.
[20] Dane Scott, "Geoengineering and Environmental Ethics," *Nature Education* 3, no. 10 (2012).
[21] Jamieson, "Some Whats, Whys, and Worries of Geoengineering," 534-5.
[22] Stephen M. Gardiner, "Are We the Scum of the Earth? Climate Change, Geoengineering, and Humanity's Challenge," in *Ethical Adaptation to Climate Change: Human Virtues of the Future*, ed. Allen Thompson and Jeremy Bendik-Keymer(Cambridge, MA: The MIT Press, 2012).
[23] Clive Hamilton, *Earthmasters: The Dawn of the Age of Climate Engineering* (New Haven, CT: Yale University Press, 2013), 178.
[24] David R. Morrow, "Starting a Flood to Stop a Fire? Some Moral Constraints on Solar Radiation Management," *Ethics, Policy, & Environment* 17, no. 2 (2014).
[25] Christopher J. Preston, "Re-Thinking the Unthinkable: Environmental Ethics and the Presumptive Argument against Geoengineering," *Environmental Values* 20(2011).

Albert Borgmann,[26] have all advanced "intrinsic" arguments against climate engineering. I believe that this represents a significant proportion of the relatively few philosophers working in this field.

In this essay, I will analyze virtue ethical arguments against climate engineering, meaning those that relate to the attitudes it would express. These are, to be sure, not the only intrinsic arguments against climate engineering. But in general, they have been among the most fully developed. They also come closest to capturing the rhetorical force of popular descriptions of climate engineering as "hubristic," "distasteful," and "dysfunctional." In Section II, I will look closely at Gardiner's argument that climate engineering might entail the "tarnishing" of the human species. Gardiner is a significant figure in public climate engineering discourse—he was the only philosopher on the MIT panel—and his argument is perhaps the most fully developed of the "intrinsic" arguments against climate engineering. Nonetheless, I will argue that his argument fails to provide good reason for skepticism. In Section III, I will explore three alternative approaches, all of which take as their starting point descriptions of climate engineering as a "technological fix," or "technofix." As Scott describes, this framing is common in discussion of the ethics of climate engineering.[27] Moreover, unlike Gardiner's analysis, the technofix arguments emerge more directly out of the physical characteristics of climate engineering, and so they appear more plausible candidates for identifying its intrinsic moral traits. I argue, however, that of the three I consider, only Holly Jean Buck, Andrea R. Gammon, and Christopher J. Preston's (co-written) argument can contribute significantly to our moral discourse, and even this argument faces significant limitations. Finally, in Section IV, I will return to Gardiner's concept

[26] Albert Borgmann, "The Setting of the Scene: Technological Fixes and the Design of the Good Life," ed. Christopher J. Preston, *Engineering the Climate: The Ethics of Solar Radiation Management* (Lanham: Lexington Books, 2013). 199.
[27] Scott, "Geoengineering and Environmental Ethics."

of "tarnishing evils." I will argue that, even if we were to accept that climate engineering might be tarnishing, our theoretical analysis would likely not provide practically useful reasons for action. As I will explain, this is because of the global diffusion of responsibility for climate engineering.

II. Gardiner's Argument from Moral Responsibility

a. Virtue Ethics & Climate Engineering

Gardiner argues that when one treats climate engineering as a possible "lesser evil" than allowing possibly catastrophic harms due to climate change, one "runs the risk of being glib, cavalier, and even perhaps morally irresponsible."[28] For him, "[e]thics is not only about our relationships with other morally important entities, it is also about *who we are*."[29] This perspective, Gardiner explains, belongs distinctively to *virtue ethics*, and can reveal conclusions greatly different from those of consequentialist or deontological theories. One of these, he argues, is that conceding that climate engineering is "some kind of 'evil'"[30] carries with it "considerable moral baggage."[31] A utilitarian, by contrast, might not admit "the existence of genuine moral dilemmas."[32] Faced with only bad options, she would be able to accept the "lesser evil" without worrying that she was acting wrongly. Gardiner further argues that the moral challenges that virtue ethics can reveal about climate engineering are "highly relevant to climate change policy in general and geoengineering more specifically."[33] Indeed, he believes virtue ethical concerns are powerful enough to "make a difference to [the] moral motivation"[34] of those

[28] Gardiner, *A Perfect Moral Storm*, 395.
[29] "Are We the Scum of the Earth?," 242.
[30] *A Perfect Moral Storm*, 341.
[31] Ibid., 388-9.
[32] Ibid., 388.
[33] "Are We the Scum of the Earth?," 252.
[34] Ibid.

determining climate policy. If we accept climate engineering as an evil, Gardiner argues, then, "contrary to initial appearances," arguments supporting either climate engineering or even only pre-emptive climate engineering *research* become "neither simple nor irresistible."[35]

Gardiner raises several important worries about climate engineering in his several essays on the subject. Only one of these, however, is distinctively virtue ethical, in the sense that I described above. This is his argument that, by engineering the climate, humanity may fail to adapt to the Earth, and that this is cause for significant moral concern, even if climate engineering is, in some cases, the "lesser evil." Gardiner sketches this argument in his book, *A Perfect Moral Storm*, and develops it more fully in his article, "Are We the Scum of the Earth? Climate Change, Geoengineering, and Humanity's Challenge" I will begin by describing Gardiner's position, which he develops through two hermeneutics that he terms *the Challenge* and "rocking the boat." Though *the Challenge* is descriptive and literal, and "rocking the boat" is normative and analogical, I will explain how, together, they form a coherent argument against climate engineering. I will then critique these hermeneutics: I will argue that *the Challenge* is both *vague* and *implausible*, while "rocking the boat" is *disanalogous* to most plausible instances of climate engineering. From this discussion, I will conclude that Gardiner's argument fails to provide persuasive reasons to think that climate engineering would constitute a new moral failure that would tarnish the moral character of humanity.

Before I begin my reconstruction of Gardiner's arguments, I provide two preliminary notes. First, Gardiner targets what he terms, following Gregor Betz,[36] the "Arm the Future Argument" for climate engineering research. I will not discuss the "Arm the Future Argument" in specific terms in this essay. But the important point is that it proposes research into climate

[35] *A Perfect Moral Storm*, 394.
[36] Gregor Betz, "The Case for Climate Engineering Research: An Analysis of the 'Arm the Future' Argument," *Climatic Change* 111, no. 2 (2012).

engineering, in preparation for its possible deployment in a "nightmare scenario," in which climate engineering would be the only way to avoid catastrophic global warming. (We can imagine that a "nightmare scenario" might arise, for example, through the triggering of acute positive climate change feedback mechanisms, such as the melting of the Arctic permafrost). Second, Gardiner follows Bernard Williams in describing certain evils as "tarnishing" or "marring." (These terms are identical in meaning). A "tarnishing evil" is one that begets "a negative moral evaluation of an agent's action (or actions), that is licensed when the agent (justifiably) chooses the lesser evil in a morally tragic situation, and which results in a serious negative moral assessment of that agent's life considered as a whole." A "blighting evil" is a more serious instance of a tarnishing evil: it is one that tarnishes irredeemably.[37] Not all evils, according to this classification, are tarnishing. I will discuss the concept of tarnishing, and the role that it might play in our thinking about climate engineering, in Section IV of this essay.

b. The Argument Presented

For Gardiner, climate engineering is likely to be a tarnishing, and perhaps even a blighting evil. Gardiner explains that, insofar as it would substitute for the reduction of greenhouse emissions (typically called the "mitigation" of climate change), climate engineering might enable carbon polluters to shirk their moral responsibilities. We might hold these responsibilities, to be sure, long before humanity any "nightmare scenario." But a "nightmare scenario" would reveal our failure particularly starkly. Gardiner writes that if we were ever to so find ourselves on the verge of calamity:

> One way in which our lives might be tarnished would be if the commitment to geoengineering becomes a vehicle through which we (e.g., our nation and/or our

[37] Gardiner, *A Perfect Moral Storm*, 387.

> generation) try to disguise our exploitation of other nations, generations, and species…[our commitment] might show that we have failed to take on the challenge facing us, and instead have succumbed to moral corruption. Indeed, the decision to geoengineer might reveal *just how far we are prepared to go* to avoid confronting climate change directly, and this may constitute a tarnishing, even blighting, evil. Think about what people mean, when, in tragic circumstances, they say "*Has it really come to this?*"[38]

Climate change, in Gardiner's view, requires us to reckon with our own immorality, because it forces us to acknowledge that activities as banal as turning on the lights in our home cause harm to individuals whom we will never meet. But arguments in favor of researching climate engineering make this reckoning more difficult. They tend, Gardiner writes, "to obscure a vital moral feature of the situation: the potential crisis is to be brought about by *our* (the current generation's) *failure* to pursue better climate policies...there is usually an important moral difference between (on the one hand) preparing for an emergency, and (on the other hand) preparing for an emergency that is *to be brought about by one's own moral failure*."[39]

How might this moral difference be relevant to our judgment? We might argue that, when preparing for an emergency that is to be brought about by our own moral failure, we don't merely have an obligation to prevent the emergency. We might also have an obligation to cease the activity that *caused* the failure in the first place. If we did not do this, despite having all reasonably necessary means, we might think that, collectively, we have not really assumed moral responsibility for our own actions. In this case, Gardiner's argument indicates that we should prevent the "nightmare scenario" by significantly reducing our greenhouse emissions. But climate engineering would (almost literally) mask the deleterious effects of greenhouse emissions. It would do nothing, on its own, to reduce greenhouse emissions. We may therefore worry that climate engineering would allow us evade to moral responsibility for climate change.

[38] Ibid., 392.
[39] Ibid., 360.

This concern is not exclusively virtue ethical. For example, it might describe a consequentialist moral hazard argument against climate engineering. Such an argument would indicate that climate engineering could become a dangerous excuse for our not reducing greenhouse emissions, because it would provide an "insurance policy" against their worst effects. Such consequentialist concerns are pervasive in discussions of climate engineering, as Ben Hale has discussed.[40] But Gardiner's worry is also perfectly coherent in the language of virtue: it indicates that we would not want to be the *sort of person*, or belong to the *sort of species*, that evades moral responsibility for an emergency that would be "brought about by our own moral failure."

What I have just presented is the essential statement of Gardiner's position. But even if we find his account of moral responsibility intuitively appealing, and even if we think that it might raise concerns for climate engineering, it remains to be argued precisely *what* moral responsibilities we have, *why* we have them, and what would be the normative *implications* of our abdicating them. Gardiner begins to answer these questions by appealing to *the Challenge*, which, as I will discuss, indicates that we might have a teleological reason for not engineering the climate. Gardiner then supplements *the Challenge* with the analogy of "rocking the boat." Using this, he argues that if humanity were to engineer the climate, it would not only fail *the Challenge*, it might also act so badly as to suffer tarnishing.

I will begin by analysis of Gardiner's argument by quoting at length his descriptions of *the Challenge* and "rocking the boat." In "Are We the Scum of the Earth?," Gardiner introduces *the Challenge* as an "initially plausible framing" of the moral environment of climate engineering "grounded in…fairly weak and widely shared ethical intuitions."[41] He does not intend *the Challenge* to provide a final determination regarding the moral status of climate engineering.

[40] Betz, "The Case for Climate Engineering Research."
[41] Gardiner, "Are We the Scum of the Earth?," 246.

Indeed, it does not refer directly to climate engineering at all. Rather, Gardiner uses *the Challenge* to indicate which features of climate engineering might be salient to our moral judgment. Introducing *the Challenge*, Gardiner writes:

> Let us begin with two claims. The first concerns our basic situation. It states that humanity is, in geological and evolutionary terms, a recent arrival on the planet, and is currently undergoing an amazingly rapid expansion, in terms of sheer population size, technological capabilities, and environmental impact. The second claim concerns the implications for our agency. It asserts that, as a result of the first claim, a basic question facing us as humans is whether we can meet the challenge of adapting to the planet on which we live…The science…suggests that humanity is currently failing to meet *the Challenge*.[42]

We may see from this account that *the Challenge* is *descriptive*, rather than normative. Though the term "failure" might carry distinctively ethical connotations in our everyday parlance, here, it means only the failure to achieve a specified end. In this respect, *the Challenge* is *teleological*. Because *the Challenge* is not normative, we can imagine humanity failing it in *non-moral* ways. For example, if some unpredictable natural disaster were to devastate human civilization, we probably could be said not to have adapted to the planet, as a species. But this failure would be basically amoral, since no agent would have been responsible for the destruction. Also important to Gardiner's analysis is that *the Challenge* is *global* in its scope. Thinking in terms of *the Challenge* would, in the first instance, mean thinking of the ethical implications of climate engineering for humanity as a whole, rather than, for example, only for certain political leaders. Finally, and relatedly, *the Challenge* partially shifts our moral focus away from the physical act of climate engineering, and towards the *moral environment* in which we might choose to engineer the climate.

For *the Challenge* to ground a critique of climate engineering, Gardiner would need additional normative content. To provide this, Gardiner introduces the image of climate

[42] Ibid., 246-7.

engineering as "rocking the boat." Gardiner uses "rocking the boat" to argue by analogy that climate engineering would constitute a *moral* failure of *the Challenge*. (Gardiner also suggests another analogy for the same purpose, which he calls "fouling the nest." However, I take "rocking the boat" to be the more intuitively powerful of the two, and so I discuss it exclusively.) The idea of climate engineering as "rocking the boat" is not original to Gardiner: he borrows it from climatologist Gavin Schmidt. Schmidt has suggested that "that there is something absurd" about the pursuit of climate engineering. According to Gardiner, he asks us to imagine:

> …a small boat being deliberately and dangerously rocked by one of its passengers. Another traveler offers to use his knowledge of chaotic dynamics to try to counterbalance the first, but admits that he needs huge informational resources to do so, cannot guarantee success, and may make things worse. Schmidt asks: 'So is the answer to a known and increasing human influence on climate an ever more elaborate system to control the climate? *Or should the person rocking the boat just sit down?*'…The rhetorical nature of Schmidt's question presumably underlies the emotional force of the example. What kind of person rocks the boat and then refuses to sit down? Isn't this a reckless, callous, and shallow individual?[43]

Argument by analogy is dangerous, because analogies may be susceptible to competing interpretations, many of which are often only subtly different. In my reading, the boat rocker here represents (at least some) greenhouse polluters. The prospect of trying to counterbalance the rocking represents climate engineering under conditions of scientific uncertainty. The boat itself represents the climatic system. And the fellow passengers represents those threatened by climate change or, perhaps, only those threatened by climate change who are also not contributing greatly to the problem.

"Rocking the boat" is clearly a *normative* account of climate engineering: it calls for the boat rocker to "just sit down." Moreover, the norms to which it appeals are specifically *virtue ethical*. Gardiner here describes climate engineers as "reckless, callous, and shallow." These

[43] Ibid., 249.

words can, perhaps, describe agents' motives (which are most relevant to deontological theories) or their predispositions to effect certain outcomes (which are most relevant to consequentialist theories), but they most typically describe agents' *characters*. These words answer Gardiner's question, "who are the boat rockers?" "Rocking the boat" therefore indicates that we should not merely be concerned with why the intention to rock the boat might be wrong, or with what rocking the boat would *do* to ourselves and others, but with what *kind of person* would act in this way. Our virtue ethical assessment is independent of any deontological or consequentialist ones: we would properly condemn the boat rocker, according to Gardiner, *even if* his fellow traveler were ultimately able to stabilize the boat before anyone had suffered greatly because of the disturbance. Because "rocking the boat" is virtue ethical, we could not easily assimilate the concerns it raises into a cost-benefit analysis: it would be difficult to specify the "cost" of being a callous person.

As I indicated above, "rocking the boat" explains why climate engineering might constitute a moral failure of *the Challenge*. *The Challenge* asserts that humanity must adapt to the planet. This is a basic end, the fulfillment of which is essential to the success of the human species as a whole. Anthropogenic climate change is antithetical to that end: it entails altering the climate beyond the limits of what the Earth can sustain, insofar as it renders the Earth less inhabitable to the human and non-human life that depend on particular, predictable climatic conditions. Climate engineering, however, would entail *intervention* into natural processes. By engineering the climate, we might be reducing some of the effects of climate change, but we would not be advancing our adaptation to our planet. "Rocking the boat" purports to demonstrate that climate engineering would be wrong for three reasons. First, it would be *unnecessary* (there is no reason to rock the boat); second, it would be *easy to prevent* (the boat rocker could "*just sit down*"); and

third, it would put others at risk (rocking the boat might cause it to capsize). Failing *the Challenge* by engineering the climate would, as a result, be "reckless, callous, and shallow." Moreover, *the Challenge* indicates why climate engineering might be a *tarnishing* evil: by engineering the climate, we risk being "reckless, callous, and shallow" with respect not to an ordinary moral dilemma, but rather to one of the most fundamental components of human flourishing, namely, our successful adaptation to the planet.

Before I critique Gardiner's argument, I will briefly discuss its intended *scope* and *force*. With respect to scope, Gardiner does not indicate that *all* attempts to engineer the climate would constitute a moral failure of *the Challenge*. And presumably, climate engineering could constitute such a failure even if it were not precisely analogous to "rocking the boat." But as I wrote above, Gardiner does suggests that we today run "the risk of being glib, cavalier, and even perhaps morally irresponsible."[44] Gardiner therefore intends his argument to apply a wider range of scenarios than we, his readers, might initially think. However, we could only precisely determine the scope by testing whether "rocking the boat" is an adequate analogy for the particular situations we imagine. With respect to force, Gardiner establishes a hierarchy of wrongs, with tarnishing (or rather blighting, the permanent form of tarnishing) as the worst. I will discuss this point more extensively in Section IV of this essay. For now, it will suffice to say that, insofar as climate engineering would be tarnishing for us, we ought to attempt to prevent the engineering of the climate. Avoiding tarnishing should be our highest moral priority, barring any extraordinary countervailing claims.

c. The Argument Criticized

[44] *A Perfect Moral Storm*, 395.

Below, I will present two broad criticisms of *the Challenge*. First, I will argue that *the Challenge* is *vague*, because it is not clear what it would mean to "adapt to the planet on which we live." Second, I will argue that *the Challenge* is *implausible*, because it is not clear why we as a species should have to adapt to the planet, rather than taking other kinds of measures to mitigate the consequences of our behavior. On the basis of these arguments, I conclude that *the Challenge* is a potentially misleading frame in which to understand the morality of climate engineering, and is therefore of very limited use to our moral judgment.

The Challenge is *vague* because the concept of "adaptation to the planet" is underspecified. It is certainly true that, as Gardiner describes, "humanity is…a recent arrival on the planet, and is currently undergoing an amazingly rapid expansion."[45] And this does indeed create a test for our species as to whether we can long endure under the stress of those conditions. But it is not clear, at least from Gardiner's brief account, what it would mean to adapt to the planet. Is humanity tasked, for example, with surviving without the use of artificial tools? Is there some threshold for scale, riskiness, or novelty of manipulation, beyond which human artifice becomes indicative of the failure of *the Challenge*? Or can we ultimately reduce "adapting to the planet on which we live" to something like, "not interfering with natural systems so as to make humanity worse off"? If we do not know what would count as a failure of *the Challenge*, then we certainly cannot know what would count as a *moral* failure of *the Challenge*. If we cannot describe climate engineering as a moral failure of *the Challenge*, then Gardiner provides us no reason for believing that climate engineering might entail tarnishing.

Moreover, without further specification, there would likely exist apparent moral failures of *the Challenge* that reflect badly only upon "what we do" and not "who we are." Though Gardiner would admit that his virtue ethical approach does not exhaust moral concerns about

[45] "Are We the Scum of the Earth?," 246.

climate engineering, he intends *the Challenge* to relate climate engineering to fundamental aspects of human identity. To do this effectively, *the Challenge* must primarily describe "who we are." As an example, consider David R. Morrow's analysis of climate engineering. Morrow explains that "some environmental ethicists," including Thomas Heyd and Tom Regan, "argue for general (though defeasible) norms of 'nonmeddling' or nonintervention in nature."[46] Even without engaging Heyd's and Regan's arguments in detail, Morrow indicates how such norms might function in our moral determinations. After discussing the "Doctrine of Double Effect" (which "invokes the difference between doing something intentionally and bringing it about as an unintended but foreseen side effect"[47]), Morrow argues that "if it is wrong to intervene significantly in the natural world, then [his formulation of that doctrine] will count [solar radiation management] as worse than emitting [greenhouse gasses]."[48] Morrow concludes that, in determining the costs and benefits of climate engineering, we should weigh the "downside risks created by [solar radiation management]…much more heavily than anything else."[49]

If we accept Morrow's argument, we might certainly construe climate engineering as a moral failure of *the Challenge*, for at least two reasons. First, by "meddling" so extensively in the natural world, we humans would not have "adapted" to the planet, in the sense that we would not have found our proper place in it; our activity, we might suppose, would no longer be aimed at changing ourselves, but non-human life as well. Second, by putting ourselves in danger, such that we would have *needed* to meddle, we would have shown ourselves unable to live within the constraints of what the natural world would allow. This would clearly be a *moral* failure, since Heyd's and Regan's construe "nonmeddling" as a normative principle, with independent ethical

[46] Morrow, "Starting a Flood to Stop a Fire?," 29.
[47] Ibid., 24-5.
[48] Ibid., 30-1.
[49] Ibid., 34.

force. However, violating this norm would not principally implicate "who we are," in any sense independent of "what we do." Though nonmeddling is an intrinsic weakness in climate engineering—climate engineering simply *is* a form of intervention into nature—, Morrow argues that we can meaningfully account for it in a (modified) cost-benefit calculation. This indicates that, even if we accept Morrow's arguments, we would be morally free to engineer the climate, so long as we have given appropriate weight to the norm of nonmeddling. There would be no "genuine moral dilemma." We must therefore further specify what it would mean to fail to adapt to the planet for *the Challenge* to best clarify the virtue ethics of climate engineering.

To arrive at a clear notion of failure of *the Challenge* we must specify the *purpose* for which we must adapt to the planet. I argue that by specifying this purpose, however, we reveal adaptation to the planet be purely instrumental. This renders *the Challenge* implausible, because it indicates that adaptation probably does not relate to the fundamental aspects of human character. Recall that Gardiner intends *the Challenge* to be descriptive, rather than normative. In this sense, to say that humanity must adapt to the planet does not mean that humanity must conform to some norm, like "nonmeddling." Rather, it is to say that humanity must adapt to the planet *to achieve some end*. What might this end be? Must humanity adapt merely to survive? Or to flourish? Or to live in some kind of harmony with nature? To answer these questions, we must implicitly adopt additional descriptive premises, specifying humanity's basic goals, beyond those that Gardiner provides. Indeed, we would have to begin simply by specifying "humanity" itself. It is insufficient, then, to say that *the Challenge* is "a result of" the biological status of human life.[50] But this discussion indicates that adapting to the planet is merely *instrumental*. The *ends* for which we adapt might constitute part of "our basic situation"[51] as humans, but adaptation

[50] Gardiner, "Are We the Scum of the Earth?," 247.
[51] Ibid.

probably does not. This will hold unless we think that adaptation is *overwhelmingly* our preferred strategy for achieving our basic ends, such that we can hardly escape the need to adapt. But Gardiner does not argue for this point, and given humanity's history of *manipulating* the planet, he cannot simply assert it. In practice, adapting to the planet is certainly a matter of "attitudes and dispositions," as Dale Jamieson writes, drawing upon the work of Ehrlich & Ehrlich.[52] But if those attitudes are of only derivative moral concern, then *the Challenge* may mislead our moral judgments, because failing to adapt would not fundamentally implicate "who we are."

I will next consider "rocking the boat." We might think that, even if we believe *the Challenge* not to be a useful moral frame, we might still think that "rocking the boat" could help us identify salient moral features of climate engineering. Gardiner uses "rocking the boat" to demonstrate that we would negatively evaluate the moral character of those who, by emitting carbon dioxide and other greenhouse gasses without restraint, compel the engineering of the climate as a "last ditch" effort to avert the most serious harms of climate change. He suggests further that "there us something absurd"[53] about the pursuit of climate engineering, because, as it would be easy for the boat-rocker to sit down, so too, would it be easy for carbon polluters to reduce their emissions, so as to substantially mitigate global warming. I argue, however, that despite Gardiner's claims, "rocking the boat" is actually disanalogous with the conditions under which one might attempt to engineer the climate in several important respects. Because of this, "rocking the boat" fails to provide a plausible account of the morality of climate engineering.

First, while "rocking the boat" portrays "sitting down" as easy, reducing greenhouse emissions sufficiently to avert the worst effects of climate change would impose significant costs on the world economy. When we speak of someone as "callous," as Gardiner does of the boat-

[52] Dale Jamieson, "Ethics and Intentional Climate Change," *Climatic Change* 33(1996): 10.
[53] Gardiner, "Are We the Scum of the Earth?," 249.

rocker, we generally do not simply mean that he does wrong. Callousness specially connotes *willfulness* in doing wrong, and indifference to those whom one makes suffer. The ease with which the boat-rocker could sit down is therefore essential to our assessment of his character. To illustrate this, we can imagine an alternate version of "rocking the boat" (call it "rocking the boat*") in which each condition is the same as in the original, only the boat-rocker's leg is caught under the seat, such that it would break if he tried to sit down, and he is caught in such a position that he cannot help rocking the boat. In this scenario we might still think that the boat-rocker should sit down, despite the pain it would entail. But we would not, I believe, consider him callous for seeking alternative means of mitigating the effects of his activity. We might think that climate change is more analogous to "rocking the boat*" than to "rocking the boat." Reducing greenhouse emissions would likely be difficult (technically speaking), and expensive, relative to climate engineering. Though we certainly might achieve some emissions reductions at low, or even negative cost, in some cases, it would be more akin to breaking one's leg than to sitting down, for the polluters. As in "rocking the boat*," our final determination might be that mitigation is morally preferable to an equivalently effective amount of climate engineering. But we would not likely think that the decision to explore climate engineering negatively implicates the character of greenhouse polluters in any serious way.

Throughout his writings on climate engineering, Gardiner appears somewhat insensitive to the problem of cost. Though he does not discuss the issue at all in "Are We the Scum of the Earth?," he does raise it briefly in *A Perfect Moral Storm*. There, he dismisses the notion that we should prefer climate engineering because of its relatively low cost, in part because "one doesn't decide whether to embark on brain surgery by focusing on the price of the scalpel."[54] With this statement, Gardiner implausibly suggests that costs should play *no* role in our moral

[54] *A Perfect Moral Storm*, 348.

deliberations about how to respond to climate change. His idea seems to be that, because climate change threatens the very survival of the human species, as an aneurysm would threaten the life of the patient, there is no human cost too dear to pay to avoid it. This argument, however suggestive it might be in this form, is not promising. First, if it really were the case that no human cost would be too dear, then climate engineering would be acceptable, even if it cost us our "souls," through tarnishing. We might, of course, think that a tarnished life is *not* worth living. But this conclusion would require additional argumentative support. Second, climate change is not *currently* like a brain aneurysm. Until we actually enter the "nightmare scenario," we can limit climate change to levels that won't threaten our continued existence. (We are, however, quickly running out of time.) As long as not *everything* is at stake, our deliberations about risks, uncertainties, costs, and benefits, can still inform our policymaking. Finally, though Gardiner is closely interested in how our normative claims might inform our motivations as agents, he seems to underestimate the importance of costs in this respect. The sad reality is that, for many, "the price of the scalpel" (i.e., of health insurance) is *precisely* what determines whether or not one should undergo brain surgery. Likewise, with respect to climate change, the cost of mitigation is among the primary reasons why many countries have done little to mitigate. His dismissal here of cost-benefit analyses therefore initially seems to be an ineffective rhetorical strategy, insofar as it is directed at those who could reduce their greenhouse emissions.

Gardiner does not provide a satisfactory account of the role of cost in our moral deliberation about climate change. But I do believe we can formulate a more plausible Gardinerian view of the matter, by drawing upon Henry Shue's distinction between "subsistence emissions" and "luxury emissions." True, Gardiner could say, greenhouse polluters would have to bear a heavy price to mitigate their contributions to climate change. But many greenhouse

polluters would primarily give up emissions associated with luxuries, such as suburban mansions, SUVs, and intercontinental flights. Moreover, those responsible for luxury emissions would also be those most easily able to afford to reduce their emissions, at least to the point of subsistence. We would therefore likely still consider major polluters callous, to the extent that they sought to avoid these costs by engineering the climate. As an example, consider the scenario, "rocking the boat**." "Rocking the boat**" is identical to "rocking the boat," except that, for whatever reason, the boat rocker can only halt the disturbance he has caused to his vessel by casting overboard his decorative gold monocle, which he bought for himself to impress his cigar smoking buddies at the country club. I believe that even if we were to suppose that the monocle were *more* expensive, in purely monetary terms, than medical treatment for the broken leg in "rocking the boat*," we might still think that the boat rocker in "rocking the boat**" is far more callous than the one in "rocking the boat*." Gardiner, then, might say that we risk abetting moral corruption by focusing on the cost of mitigation, since those who most need to reduce their carbon footprints are those most able to bear the burdens of doing so. As a result, it might actually be less wrong, because less callous, for a poor country to attempt to engineer the climate. Gardiner, however, argues that any likely instance of this would probably entail "an extreme form of domination." Indeed the notion of a poor country engineering the climate out of desperation strikes Gardiner—and me—as a "morally horrifying prospect."[55]

The Gardinerian response to my worries about cost, however, reveals an important weakness in "rocking the boat:" because Gardiner introduces it as part of his consideration of the "nightmare scenario," "rocking the boat" wrongly describes climate engineering in binary terms—*either* we reduce our greenhouse emissions *or* we attempt to engineer the climate. But the most plausible proposals for climate engineering are actually quite limited in both scope and

[55] "The Desperation Argument for Geoengineering," *PS: Political Science & Politics* 46, no. 1 (2013): 9.

duration, and do not by design exclude additional significant mitigation. David Keith, an applied physicist and prominent climate engineering researcher, for example, explains that the "low-probability but high-consequence 'tails' of the probability distribution curve—the small chance that the dice rolls against us—" he writes in his manifesto, *A Case for Climate Engineering*, "account for much of overall climate risk. Moreover, we can't estimate the uncertainty very well; we don't know how much we don't know."[56] Nathaniel Keohane, Vice President of International Climate programs for the Environmental Defense Fund, told me that if climate engineering were to be justifiable, it would be because it aims at reducing these tails.[57] Even an ideal policy, for Keith, would include significant mitigation as well: using almost Gardinerian language, he has written that to "claim that rapid emission cuts are impossible [in the United States] is to shirk responsibility for our actions."[58] Keith's statement, of course, is not necessarily representative of climate engineering rhetoric more broadly. But *if* his perspective were to become the norm, then regardless of whether we believed climate engineering to be prudent, we would find it difficult to portray climate engineering as a vehicle of callousness.

The Gardinerian response cannot easily accommodate this kind of approach, which I will later refer to as "value-sensitive climate engineering," because in seeking to move beyond cost-benefit analyses, it rejects too strongly the genuine moral significance of costs. Gardiner's argument is too forceful for three reasons. First, just because the emissions that we in the developed world must eliminate are "luxury emissions" does not mean that we ought to sacrifice for the sake of the climate, without any thought to cost. I do have the intuition, which Gardiner seems to share, that there is something truly selfish about the world's wealthiest individuals worrying too much about the cost of mitigation, after centuries of carbon pollution. But it does

[56] Keith, *A Case for Climate Engineering* 33-4.
[57] Nathaniel Keohane, Conversation, February 14, 2013.
[58] Keith, *A Case for Climate Engineering* 40.

not follow that every cost-benefit analysis is selfish. Surely *some* "value-sensitive" attention to costs must be permissible. Though my argument does not depend on it, I believe that for us to reject even these limited climate engineering schemes requires covert moral judgments about what the wealthy do with their emissions. For example, the reason we think that the boat rocker in "rocking the boat**" should be willing to lose his gold monocle seems to be not merely because gold monocles are a luxury, in the strict sense of not fulfilling a basic need, but also because they are *opulent*. If, instead of a monocle, the boat rocker were to lose the ability to hike New Hampshire's White Mountains, we might sympathize with him, and allow him to seek alternative means of helping to stabilize the boat. Gardiner himself, to be sure, might accept some "value-sensitive" climate engineering scheme: he admits that one lesson "we cannot draw" from his discussion in *A Perfect Moral Storm* "is that no lesser evil argument for research on, or deployment of, geoengineering can ever succeed."[59] But the point is that "rocking the boat," which underlies his argument that we ought to consider climate engineering tarnishing, leads us astray in this respect.

Second, even if we were to accept that it is wrong to think about the costs of reducing luxury emissions, not every ton of carbon dioxide that we would need to eliminate from the atmosphere could be associated with genuine luxuries. Greenhouse emitting activities are not simply luxuries or necessities. Rather, they span the full range between the two. We might think that we could abstractly develop a set of just global climate policies that would not call for any reductions in the most fundamental "subsistence emissions." But it is unlikely that we could formulate normatively defensible policies that *would not* call, for example, for some rapidly developing countries to reduce their dependence on coal, even at a time when coal is, arguably, supplying the energy necessary for economic progress. It seems unquestionably appropriate for

[59] Gardiner, *A Perfect Moral Storm*, 395.

these developing countries to look for ways to reduce these emissions reductions, insofar as they would entail costs. Moreover, given that, in the non-ideal political world, it is unlikely that global policy will place sufficient priority on reducing "luxury emissions" before any others, we should not demand that developing countries accept the costs imposed upon them, solely so that we can avoid crude consequentialist reasoning.

Third, and finally, I believe that the callousness that might be associated with considering certain kinds of costs too seriously might be significantly mitigated by our current uncertainty regarding the pace of climate change. If, as David Keith writes, it really is true that "we don't know how much we don't know," then we might properly live in a condition of *fear* regarding the damage that climate change will cause. It might seem right now that we will only need to give up our luxury emissions, but depending on the sensitivity of the climate (which refers to the extent to which global average temperatures change in response to a given increase in atmospheric carbon dioxide concentrations), we might worry that even the wealthy will be reduced to giving up subsistence emissions as well. It seems appropriate to deliberate about these costs. Since at least the time of Aristotle, we have had a notion of courage that *excludes* excessive fearlessness, and indeed necessarily includes a healthy wariness of serious threats. If this applies to climate change, then we might think that it would not be "reckless," but rather appropriately *cautious* to consider limited climate engineering, for the purpose of preventing the worst possible outcomes. It may be that, as I quoted above, "there is usually an important moral difference between (on the one hand) preparing for an emergency, and (on the other hand) preparing for an emergency that is *to be brought about by one's own moral failure*."[60] And it may be that this difference morally compels wealthy greenhouse polluters to accept special responsibilities in addressing climate change, including prioritizing mitigation over other kinds

[60] Ibid., 360.

of responses. But under conditions of reasonable fear about what terror climate change will wreak, it might indeed be *unreasonable* to demand an absolute commitment to mitigation.

My discussion of fear indicates that Gardiner might misunderstand why the public might be motivated to engineer the climate. Gardiner discusses the "Arm the Future Argument" as the most salient defense of climate engineering. That argument suggests, roughly speaking, that we should research climate engineering so that future generations might be better prepared, in case global political inertia stalls necessary mitigation. We should do conduct this research, the "Arm the Future Argument" concludes, even if we think that climate engineering would be some kind of evil. Our fear of the "nightmare scenario," however, need not motivate us to prepare for *significant* climate engineering as a last resort. Rather, I believe it would most naturally lead us to deploy a *more limited* form of climate engineering, of the sort that Keith describes, long *before* any nightmare scenario were to actually obtain. After all, depending on our assessment of how deployment of climate engineering would affect the global politics of climate change, we might actually think that limited implementation would reduce the likelihood *both* of climate catastrophe *and* of further climate engineering, by vividly signifying the precariousness of our situation. My claim here is speculative, but it indicates that the decision to research climate engineering might not be borne of moral corruption (i.e., the willingness to do evil), but rather of prudence (the determination to minimize even the "lesser evil"). If this were the case, then Gardiner's concerns would appear misguided once again.

Gardiner does address something like Keith's restricted climate engineering scenario: he worries that "the same forces that oppose substantial mitigation measures will also oppose any other policies that involve serious costs or commitments for the current generation of the world's richer countries, including…(even) huge investment in geoengineering research and deployment,

if that were required."[61] Support for *restricted* climate engineering, therefore, might actually entail the same moral corruption as more ambitious schemes. But as Keith describes, "the specialized aircraft and dispersal system required to get started [engineering the climate on a large scale] could be deployed in a few years for the price of a Hollywood blockbuster."[62] If the cost of climate engineering is negligible, it is difficult to image a scenario in which the world's richer countries would benefit from significantly restricting climate engineering, while they would *also* owe poorer countries a much more extensive intervention into the climate. (Perhaps one exception would be if developed countries had already undertaken massive adaptation schemes, while underdeveloped ones had not.) Furthermore, climate change itself *does* threaten to impose significant costs on developed countries, if only over the course of multiple generations. As long as climate engineering is cheaper than more conventional climate policies, it will likely be initially appealing to rich countries. This will hold true even if climate engineering would require significant investment, in absolute terms. In this respect, Gardiner seems to miss the point that, if climate engineering were not cheap *relative* to mitigation, then we would likely not consider it seriously at all, given its risks.

d. "Rocking the Boat" as a Consequentialist Argument

My argument now brings me to the underlying weakness of Gardiner's argument: he provides no good reasons to reject climate engineering that could not be fully captured by a consequentialist, rather than a virtue ethical framework. Because of this, Gardiner's virtue ethical terminology adds little *either* to our ethical evaluation of the *practice* of climate engineering, *or* to our evaluation of *research* into climate engineering, beyond what a cost-benefit analysis could

[61] Ibid., 364-5.
[62] Keith, *A Case for Climate Engineering* ix.

provide. Recall how Gardiner develops an analogy to climate engineering in his account of "rocking the boat": "Another traveler offers to use his knowledge of chaotic dynamics to try to counterbalance the first, but admits that he needs huge informational resources to do so, cannot guarantee success, and may make things worse."[63] There are two reasons here why we ought to be wary of climate engineering: first, because it is *difficult* (in that it would require "huge informational resources") and second, because it is *risky* (in that its outcome is uncertain). Questions of difficulty and of risk have, in principle, empirical answers, which we could formulate in terms familiar to us from, for example, consequentialist moral theory. We *could* argue that we would not want to be the kind of person who subjects others to unnecessary difficulty and risk, and that therefore, climate engineering would reveal our bad character. But such an argument would be superfluous: we could just as easily say that, for utilitarian reasons, it is wrong to subject others to such burdens, without the detour into a moral framework that Gardiner admits is unfamiliar.

This is not to say, of course, that virtue ethics could not be our presumptive framework for considering climate engineering. But in general, and in a crude sense, we might think that the best reason to appeal to virtue ethical principles is that they refer to concepts that other ethical theories might have trouble identifying, but that we would nonetheless consider meaningful. For example, if we were to consider a soldier who sacrifices himself for his friends on the battlefield, we might have difficulty picking out an instance of "courage" using strictly consequentialist reasoning, whereas we would have no such difficulty, using virtue ethical reasoning. With respect to climate engineering, however, if Gardiner's responsibility argument is flawed, and if all of our other possible reasons for rejecting climate engineering are susceptible to consequentialist analysis, then it is not clear what virtue ethics can do to make our moral analysis

[63] Gardiner, "Are We the Scum of the Earth?," 249.

more compelling, richer, or clearer than it otherwise would be. I will address this concern in Section III, when I discuss alternative virtue ethical approaches to climate engineering.

The usefulness of virtue ethics may be even more limited for our philosophical analysis of climate engineering *research*. If Gardiner were right that we have good reason to believe that relying on limited climate engineering, rather than solely on mitigation, might constitute a significant moral failure, then we would also have good reason to believe that even research into climate engineering to "arm the future" would be morally problematic. (Again, I do not mean to caricature Gardiner's corpus: he has publicly expressed limited support for climate engineering research, provided that there are certain constraints on the way in which it would be organized.[64]) As I discussed above, whatever our abstract scientific interest in such research, Gardiner believes that our ultimate motivation for undertaking it would potentially be to prepare for a "nightmare scenario." The research, as Gardiner explains, might then provide an excuse for those with the power to promote effective mitigation of climate change, and perhaps for humanity more generally, to abdicate its moral responsibilities. These responsibilities may include not only mitigation, but also, for example, compensation for those harmed by climate engineering, or the formation of new global representative institutions. Additionally, research into climate engineering, precisely because it promises to require fewer resources than most other ways of counteracting climate change, may crowd out those alternatives, even if they would be preferable to climate engineering over the long term.[65]

Gardiner's discussion of the ways in which climate engineering could become an excuse for further immoral behavior is illuminating. But if we do not endorse climate engineering as

[64] "Debating the Future of Solar Geoengineering."
[65] *A Perfect Moral Storm*, 355-65.

itself morally objectionable, as "an evil way out," in Gardiner's phrase,[66] then his concerns hinge on empirical investigation. Unless we had very strong reason indeed to think that climate engineering research would lead to outcomes that were, all things considered, much worse than the alternative, then we ought not to restrict research. I phrase the point so strongly because in general, we have a firm presumption in favor of doing scientific research. It may be that eminent scientists, with deep understanding of the climate, believe that climate engineering is likely to be risky, expensive, or difficult. But these are precisely the sorts of determinations that research would aim to make. We therefore cannot appeal to risk, cost, or difficulty to quash research, in the absence of further supporting arguments. Indeed, if climate engineering were very likely *not* to be risky, expensive, or difficult, then, all else being equal, we would be making a serious mistake in *not* researching it.

How then, could we argue against research, if we cannot appeal either to the foolishness, or to the inherent immorality of climate engineering? The only available arguments are those that concern the process of research itself. This primarily refers to Gardiner's structural concerns, which I discussed above, about the way in which climate engineering tempts irresponsible implementation. These problems, however, are not well-suited for virtue ethical analysis. They are, essentially, puzzles for political science. By this I do not mean to suggest that they are trivial, despite my biases as a philosopher. Indeed, next to the question of whether climate engineering would, at least in some general utilitarian sense, do more good than harm, the question of what it would *actually look like* politically is probably the most important for experts to investigate today. Of course, we do need philosophy to help identify which aspects of the politics of climate engineering might be ethically dubious. But this is the work of the ethics of *climate engineering*, not of the ethics of climate engineering *research*. And as I have begun to

[66] Ibid., 360.

argue above, and will continue to argue in Section IV of this essay, we would probably prefer an alternative to Gardiner's virtue ethics, when thinking through the former.

Before I argue that point, however, I will examine other approaches to climate engineering that bear a familial resemblance to Gardiner's, namely, those that examine the implications of the possible status of climate engineering as a "technofix." In looking at these, I hope to determine whether we might be able to productively analyze climate engineering using a virtue ethical method.

III. Climate Engineering as a "Technofix"

a. Technofixes Defined

In this section, I consider three arguments against climate engineering, which I draw from the work of Clive Hamilton, Albert Borgmann, and Holly Jean Buck, Andrea R. Gammon, & Christopher J. Preston. Their arguments characterize climate engineering as a "technofix," and from that characterization, provide reasons for concern about what climate engineering might mean for "who we are." In all three, "we" refers, roughly speaking, to all those engaged in public discourse concerning climate engineering. These analyses relate closely to Stephen M. Gardiner's: they suggest that climate engineering might be morally undesirable not because it would it would entail any particular external consequences, or because it would violate some imposed duty, but rather because it would emerge from, engender, or reinforce particular character traits on the part of the responsible agents.

I will begin by specifying what it would mean for climate engineering to be a "technofix," and by outlining what Hamilton terms "the lure of the technofix."[67] I will then assess Hamilton's, Borgmann's, and Buck, et al.'s particular critiques of climate engineering.

[67] Hamilton, *Earthmasters*, 76.

Hamilton argues that climate engineering might express a wrongly hubristic attitude about our relationship as humans to the natural world, as captured by the phrase "playing God." Hamilton and Borgmann both argue, independently, that climate engineering may enable us to dismiss the need for radical social, economic, and political change. And Buck, et al., argue that climate engineering might reinforce oppressive, gender normative attitudes. I will argue that, of those that I discuss here, only Buck, et al.'s argument provides a plausible critique of climate engineering. However, even theirs requires further conceptual and empirical substantiation, and does not provide a "trumping" argument against most climate engineering policies.

I draw my definition of "technofix" from Borgmann's essay on climate engineering, entitled "The Setting of the Scene: Technological Fixes and the Design of the Good Life." Borgmann defines technological fixes, or technofixes (I prefer the latter, for brevity, though the two are interchangeable) as responses to morally dubious behavior that change "the setting of [the agents'] behavior in such a way that the behavior is no longer inappropriate." For Borgmann, this carries immediate normative implications. He views technofixes as responses "to the failure of reasoning, the failure of rational arguments that are intended to change people's unacceptable behavior."[68] The other writers I consider in this section do not provide any such general definition of the term. Nonetheless, they, like Borgmann, derive their idea of technofixes principally from Alvin Weinberg's seminal 1966 essay "Can Technology Replace Social Engineering?" In that text, Weinberg, a nuclear physicist, does not himself define technological fixes, though he does use the term. But Borgmann's understanding of technofixes is, I believe, consistent with those of Weinberg, Hamilton, and Buck, et al. For this reason, I will use Borgmann's definition throughout my analysis. (Weinberg's moral conclusions, however, differ greatly from Borgmann's. Though cognizant of some of the limitations of what he calls the

[68] Borgmann, "The Setting of the Scene: Technological Fixes and the Design of the Good Life," 189.

"technological fix," Weinberg argues that it is "only by cooperation between technologist and social engineer that we can hope to achieve what is the aim of technologists and social engineers—a better society, and, thereby, a better life, for all of us who are part of society."[69])

We may see immediately how climate engineering might count as a technofix, regardless of our moral disposition towards it. The "behavior" motivating climate engineering is the addition of greenhouse gasses to the atmosphere; the "setting" is our planet, in which changes to the composition of the atmosphere affect the climate, and in which the climate has significantly affected the general character of both human and non-human life. These are not the only possible specifications of the behavior and the setting, but they are reasonable ones. Moreover, they allow us to clearly see climate engineering as a technofix: climate engineering alone would not, by design, change the behavior, but it *would* change the setting. It would, to speak crudely, only "reset" global average temperatures closer to the pre-industrial baseline by which we measure warming, but it would not reduce emissions. Indeed, climate engineering policies specifically aim at reducing the need for emissions reductions (if only partially). Regardless of whether we consider climate engineering to be desirable, we may indeed understand it as "a response to the failure of reasoning," as Borgmann describes: if we humans were perfectly rational, we probably have reduced our greenhouse emissions to such an extent that climate engineering would never become appropriate. To reach this conclusion, we need only assume that climate change is bad, insofar as it harms innocents, though Borgmann believes the moral failings of climate change extend to the dispositions that it expresses, as I will explain.

We would not be able to describe many technological responses to climate change other than climate engineering as technofixes, in the narrow sense I have set out. One example of this

[69] Alvin M. Weinberg, "Can Technology Replace Social Engineering?," *The American Behavioral Scientist* 10, no. 9 (1967): 10.

is carbon capture & storage (CCS). CCS refers to the capture of carbon dioxide at the point of emission, say, from the smokestack of a coal plant, and its subsequent sequestration underground. Once underground, the carbon dioxide can no longer contribute to the greenhouse effect. If we were to implement this technology, we might continue to burn coal, but we would no longer emit greenhouse gasses into the atmosphere in the process. CCS would therefore actually eliminate the bad behavior (greenhouse emissions), rather than merely changing the setting. Insofar as we are concerned with climate change in particular, the bad behavior is *not* the combustion of coal, which only augments the atmospheric concentration of greenhouse gasses insofar as it causes greenhouse emissions. (This is not, of course, to comment on the merits of public policies promoting CCS). By contrast, carbon dioxide removal (CDR) *would* likely count as a technofix. CDR technologies remove carbon dioxide directly from the atmosphere, before sequestering it, or otherwise rendering it inert with respect to climate change. CDR allows the bad behavior to persist, while resituating it in a world in which greenhouse gasses are drawn from the atmosphere. My analysis does not indicate the final moral status of climate engineering. But because it shows the technofix frame to be narrowly tailored, it indicates that the frame may be useful for better understanding the ethics of climate engineering.

I will now canvass the three arguments I mentioned above.

b. *Hubris*

I begin with Hamilton's claim that engineering the climate would be a hubristic instance of "playing God." Throughout *Earthmasters*, his extended critique of climate engineering, Hamilton contrasts two general ways of conceptualizing the relationship between humanity and nature. The first he terms "Promethean," after "the Greek titan who gave to humans the tools of

technological mastery." Prometheanism, writes Hamilton, "is a powerful strand of Western technological thinking and conservative politicking that sees no ethical or other obstacle to total domination of the planet." The second he calls "Soterian," after "the goddess of safety, preservation, and deliverance from harm." Soterians "share a deep mistrust of human technological overreach," and "heed the warning that Nemesis waits in the shadows to punish Hubris."[70] Climate engineering, in Hamilton's account, appeals to the "Promethean urge" to master the natural world and "play God." Hamilton's concern is a relatively common one: Dale Jamieson, for example, argues that even if climate engineering were successful, "it would still have the bad effect of reinforcing human arrogance and the view that the proper human relationship to nature is one of domination."[71]

For Hamilton, this attitude is undesirable, but not for consequentialist reasons. The moral failing of such an attitude is, rather, metaphysical in its origins. Theists, Hamilton writes, might think that the Promethean attitude that gives rise to climate engineering reflects a willingness to trespass into "the dwelling place of God."[72] But even atheists, he claims, might broadly share a strong intuition that "playing God entails humans crossing a boundary to a domain of control or causation that is beyond their rightful place," and that "there is a limit to what humans should attempt or aspire to because the division between domains is part of the proper order of things."[73] Hamilton's critique of climate engineering as "playing God," then, depends on his belief in what he calls an "intuitive metaphysical order," rather than on any particular political judgment.[74] Hamilton does not specify how exactly this metaphysical order gives rise to moral claims. I will discuss this problem later, and suggest that it actually represents a critical weakness

[70] Hamilton, *Earthmasters*, 18.
[71] Jamieson, "Ethics and Intentional Climate Change," 332.
[72] Hamilton, *Earthmasters*, 178.
[73] Ibid.
[74] Ibid.

in Hamilton's argument. But for now, I will say that it is evident that insofar as this question of hubris is concerned, it is clear that Hamilton believes that climate engineering (or at least most instances of it) would entail a moral failure closely linked to the deepest concerns of humanity as a whole. Call this argument *Hubris*.

Hubris is explicitly virtue ethical, in the sense I am using here. Hamilton writes that his discussion is "not about the dire *consequences* of entering the domain of the gods, but that playing God betrays a deep fault in the human character."[75] Indeed, it is not clear how one would even go about measuring the consequences of transgressing a metaphysical order. (He does go on to provide a second argument, for the conclusion that "human aspirations to [the divine attributes of] omniscience, omnipotence, and benevolence invite calamity."[76]) Moreover, it functions similarly to Gardiner's essentially teleological account of *the Challenge*: where Gardiner's formulation posits a possible obligation of humanity, taken as a whole, to adapt to the planet on which we live, *Hubris* claims a more general responsibility for humans not to aspire to that which is "beyond their rightful place,"[77] which includes "remak[ing] 'nature' to serve our purposes."[78] One important difference between the two is that, in certain circumstances, a climate engineering scheme that fails to meet the responsibility that Gardiner describes might entail a negative moral assessment of humanity as a whole, whereas one that *Hubris* would describe as "playing God" would reflect negatively only on those who participated (whether directly or indirectly) in the actual engineering.

(Elsewhere, Hamilton also suggests, in a somewhat similar vein, that we might understand our relationship as humans to nature in Heideggerian terms, where climate

[75] Ibid., 180.
[76] Ibid.
[77] Ibid., 178.
[78] Ibid., 179.

engineering is "a vain attempt to take control of destiny rather than enter a free relation with technology.[79] I will not explore this suggestion further in this essay, and note it only to provide context in which the reader might better understand *Hubris*.)

As I understand it, *Hubris* argues: many theists and non-theists share belief in "an intuitive metaphysical order that defines 'the scheme of things' within which one can find what it means to be human."[80] Climate engineering would likely constitute an attempt on the part of humanity to alter this order, by pretending to "higher" power. Therefore, climate engineering is a violation of the "intuitive metaphysical order" and as such, is morally wrong.

Hubris is close in both scope and force to Gardiner's accounts of *the Challenge* and "rocking the boat." With respect to scope, the disposition that Hamilton describes here is appears likely to manifest itself in almost every instance of climate engineering. In the arguments I will discuss below, the *social implications* of the idea of climate engineering are morally problematic. But in *Hubris*, we do not need to situate climate engineering in any particular social conditions to critique it. We can simply examine the *concept* of engineering the climate, of "managing solar radiation."[81] This broadens the range of climate engineering schemes to which *Hubris* might apply. (We might *not* include among these, for example, only attempts at engineering the climate as "self-defense" against *natural*, rather than anthropogenic, climate change.) The intended force of *Hubris* appears similarly greater than the other two. As I described above, Hamilton argues that climate engineering might contradict certain of our strongly held metaphysical, and perhaps teleological intuitions. If *Hubris* were valid, then any countervailing argument in favor of climate engineering would have to appeal to equally fundamental premises to succeed: the hubris argument purports to appeal to the deepest possible principles of human morality. Moreover,

[79] "What Would Heidegger Say About Geoengineering?,"(2013), 1.
[80] *Earthmasters*, 178.
[81] Ibid., 76-7.

Hubris concludes that climate engineering would introduce a novel wrong, and would not simply perpetuate a new one. All else being equal, we might consider the former to be worse than the latter. In considering climate engineering a potentially *fundamental* and *novel* evil, *Hubris* is similar to Gardiner's arguments.

I begin by criticizing the validity of Hamilton's argument. I framed *Hubris* in teleological terms, so as to relate it to Gardiner's account of *the Challenge*. In this framing, *Hubris* indicates that humanity is not merely *part of* a metaphysical order to which we have epistemic access: remaining stably in that order is one of humanity's most important *goals*. We might justify this claim by, for example, arguing that if the metaphysical order allows us to "find what it means to be human," then the maintenance of that order is a precondition to all knowledge of morality. The failure to maintain that order would therefore be a *moral* failure. But there is a risk that *Hubris* impermissibly derives an "ought" from an "is." *Hubris* asks us to accept that we have a duty to respect the metaphysical order simply because that order exists. This is not a valid deduction. Even when we supplement *Hubris* with the teleological concepts that I have just described, we risk the same error. Finding "what it means to be human" appears to be a purely *descriptive* endeavor. For the failure to find "what it means to be human" to count as a *moral* failure, we would need a much more robust metaethical argument, relating our moral duties to the metaphysical condition of humanity.

An additional problem with *Hubris* lies in the substance of Hamilton's account of what he calls "an intuitive metaphysical order that defines 'the scheme of things' within which one can find what it means to be human."[82] Hamilton suggests that this intuition is common. Perhaps it is, but it is certainly contestable. To those who contest it, this premise may not only be dubious, but somewhat incomprehensible, for it describes something that is necessary beyond

[82] Ibid., 178.

mundane reach. It is not clear how one might persuade someone who does not share Hamilton's intuition to accept *Hubris*. At the very least, doing so would require a much more elaborate argument than what Hamilton presents. We can imagine some strategies that Hamilton might use in a case like this. For example, he might appeal to some form of interpersonal respect, whereby, roughly speaking, one ought not to act in contravention of another's most fundamental beliefs. But Hamilton might face a serious obstacle in our intuition that one's private, unverifiable metaphysical suppositions should not influence public decision-making. My general point is that arguments such as *Hubris*, which naïvely appeal to broad metaphysical intuitions, will face serious difficulties in persuading a broad audience. This is not, of course, to say that those who do not share Hamilton's intuitions could not, for example, think that humility with respect to one's humanity is a virtue. Indeed, as Dale Jamieson has suggested, we might wish to adopt a more modest attitude towards nature than climate engineering would express. But the desirability of such an attitude would likely not have nearly so strong a claim against climate engineering as a metaphysical argument such as *Hubris*.

A third, related problem targets the *force* of concerns derived from our metaphysical intuitions. I claimed above that Hamilton intends his argument to give us significant concerns about many forms of climate engineering. But for many, even metaphysical claims to which we really are sympathetic do not so readily override significant concerns about human welfare, such as those created by the threat of catastrophic climate change. As an example, Hamilton discusses the debate over human genetic enhancement as one area where "the playing God argument has been prominent,"[83] and perhaps, has even been persuasive, despite more mundane possible counter-claims. But we could also take as an example contemporary discussion of *agricultural* genetic enhancement. Surely, such interference looks to be a possible candidate for "playing

[83] Ibid.

God:" even if we are not actually attempting to redefine "what it means to be human," we *are* attempting to alter "the scheme of things" in which the answer to such a question is, in principle, discoverable. And yet, many have argued publicly that our interest in the adequate nutrition of the world's poor is controlling in our decision whether or not to genetically modify crops. It is certainly conceivable, indeed, even probable, that many of those who are happily willing to support such interventions into nature also share Hamilton's intuition, without any self-contradiction. In the absence of a more robust metaethical analysis revealing how to weigh competing normative concerns, it is far from evident why we should prioritize not "playing God" over the potential benefits of climate engineering, whatever those may (or may not) be.

Finally, even if we accept Hamilton's account of an intuitive metaphysical order, and even if we accept that the claims that that order generates are particularly important, there remains the problem of what *counts* as "playing God." It is certainly true that climate engineering, if it were to happen, would be unprecedented in several important respects. To name only one of the most important, humans have never before intentionally sought to regulate the climatic system as a whole. This, for Hamilton, is indeed what would make climate engineering an instance of "playing God."[84] But there is no clear reason why certain acts seem to qualify as "playing God," while others do not. For example, for American astronauts to land on the Moon was certainly shocking, and may even have provoked some to reconsider the place of humanity in the cosmos. (Witness, for example, Hannah Arendt's account of the "immediate reaction, expressed on the spur of the moment," to the launching of Sputnik, namely, "relief about the first 'step toward escape from men's imprisonment to the earth.'"[85]) But it would be very strange indeed if one were to suggest that the Moon landing was an act of hubris. Likewise,

[84] Ibid., 180.
[85] Hannah Arendt, *The Human Condition*(Chicago: The University of Chicago Press, 1958), 1.

however bold we may think nuclear fission to have been, and whatever reasons we might have to be concerned about its offspring—namely, nuclear weapons—, few, I believe, would consider it to have been hubristic in and of itself. The problem with fission lay in its consequences. My point here is not that climate engineering could not be a violation of the "order of things," but rather that our intuitions about what counts as such a violation seem, at least *prima facie*, to be inconsistent. Perhaps, then, in the absence of further argumentation, we ought not to rely on those intuitions to make decisions concerning the lives of billions of people. Moreover, even if some did consider space travel or nuclear fission hubristic when they were first attempted, that intuition seems to have become less widely shared in the ensuing decades. If our judgments that certain technologies are hubristic tend to weaken as we become more familiar with the technologies, we may not wish to place too much weight on those judgments.

c. *Revolution*

I will now proceed to discuss Hamilton's and Borgmann's claims that climate engineering may serve as an excuse for holding morally shortsighted attitudes towards the structure of society as a whole. Hamilton argues strenuously in *Earthmasters* that we ought to greatly prefer cutting emissions as our global strategy for avoiding the worst consequences of climate change. Hamilton's principal evidence for this conclusion is scientific and political: he describes the uncertainties he believes to be inherent in climate engineering, and analyzes the ways in which climate engineering might serve irresponsible private interests. But his argument also has an important moral dimension: "Calls for a technofix," writes Hamilton, "including

geoengineering, are…deeply conformable with existing structures of power and a society based on continued consumerism. The slippery slope to the technofix [for advocates of climate engineering] promises a substitute for the slippery slope to 'revolution.'"[86] Likewise, Borgmann worries that climate engineering threatens to substitute for the "intelligent and confident advocacy of the good life," which would amount to a "structural and cultural program that [would] make SRM unnecessary."[87] An important part of this program, for Borgmann, would be the tempering of consumer society: "The economy," he writes "needs to be directed by degrees toward a life of competence and comprehension."[88] I refer to these two arguments together as *Revolution*.

In *Revolution*, we might discern two distinct moral claims: one "positive," and another "negative." By the *positive* claim, I mean the suggestion that climate change itself presents an opportunity to confront evils not directly related to the *effects* of climate change, such as consumer society or "existing structures of power." Hamilton and Borgmann are not alone in making this positive claim: climatologist Mark Maslin, for example, has suggested optimistically that climate change may actually be "good for humanity," for it "is making us face the forgotten billions of people on the planet" suffering from dire poverty.[89] And Buck, et al., whom I will discuss below, note that "[m]ore than one high-profile commentator has suggested that climate change provides both a challenge and an opportunity."[90] By the *negative* claim, I mean the suggestion that climate engineering might engender further blindness towards certain deep-rooted sociopolitical injustices. In my reading, *Revolution* holds this blindness to be morally

[86] Hamilton, *Earthmasters*, 175.
[87] Borgmann, "The Setting of the Scene: Technological Fixes and the Design of the Good Life," 199.
[88] Ibid., 198.
[89] Mark Maslin, *Global Warming: A Very Short Introduction*(Oxford: Oxford University Press, 2009).
[90] Holly Jean Buck, Andrea R. Gammon, and Christopher J. Preston, "Gender and Geoengineering," *Hypatia* (2013): 13.

undesirable in and of itself: we need not appeal to any deeper principles, in their view, to justify our condemnation of these attitudes. This claim evinces a virtue ethical approach, in the sense that it evaluates the moral standing of climate engineering by assessing what it would mean for "who we are," where "we" is some specified set of relevant agents. Only *Revolution's* negative claim is therefore germane to my discussion here, because only the negative claim pertains to the *attitudes* that climate engineering might foster, rather than to the possible *consequences* of its implementation. These two claims are logically independent of one another: climate engineering might encourage moral blindness even if climate change did not otherwise present an "opportunity" for the promotion of social justice.

Revolution, in short, argues that the world today is deeply unjust, socially, politically, and economically. Some of these injustices are caused by the concentration of power, broadly construed, as well as by the excesses of consumer society. Climate change presents an opportunity to remedy some of these injustices, because effectively reducing greenhouse emissions may entail diffusing this power, and tempering consumer society. Climate engineering, to the extent that it would render greenhouse emissions reductions unnecessary, threatens to distract those developing climate policy from this opportunity. Those same agents would therefore be less likely to consider certain deep questions of justice as part of their work. Not considering these matters of justice when it is appropriate to do so is morally undesirable. Note the importance of *Revolution*'s first premise: if one does not believe that the world is deeply unjust, then *Revolution* will be uninteresting, as well as wrong. If Hamilton and Borgmann did not believe that the world was unjust, they would not have been motivated to warn us that climate engineering might make revolution less likely.

Hamilton and Borgmann intend *Revolution* to be narrower and weaker than *Hubris*, while still raising serious concerns about most instances of climate engineering. *Revolution* argues that climate engineering might express morally insensitive attitudes about society. It might therefore permit some "value-sensitive," but still proactive climate engineering policy, whereas *Hubris* would likely only allow climate engineering as a kind of self-defense. However, because *Revolution* raises a concern about the very idea of applying technofixes to climate policy, rather than just about the particular characteristics of solar radiation management, it may be difficult to minimize the value-*in*sensitive aspects of particular climate engineering schemes. Moreover, *Revolution* identifies a flaw in how climate engineering would relate to attitudes about social justice as a whole. For this reason, it seems that there are many important values towards which climate engineering might be insensitive. This also heightens the *force* of *Revolution*: it would be particularly bad to be blind to so many different moral considerations, rather than just to one, all else being equal. The same argument, however, may weaken *Revolution*, relative to *Hubris*: insofar as *Revolution* concludes that climate engineering may perpetuate *already ubiquitous* undesirable attitudes, it is unlikely to identify climate engineering as "tarnishing." This seems particularly plausible because those attitudes are likely to persist even without the reinforcement of climate engineering.

To assess *Revolution*, we would need empirical evidence that climate engineering really is distracting us from questions of justice. An indication of this effect could, by itself, compel us to take *Revolution* seriously. However, it is not clear what kind of evidence could persuasively demonstrate this, because *Revolution* suffers from significant conceptual weaknesses. *Revolution*, it seems asks us only to consider "the good life," in Borgmann's phrase, as we develop climate policy. But *Revolution* provides little guidance for determining what constitutes the good life.

Borgmann, unlike Hamilton, does provide the beginnings an answer to this question, through his criticism of consumer society. But while we can easily understand how consumerism might be partially responsible for the need to engineer the climate, it would be more difficult to show that the reverse would be true, than that climate engineering would perpetuate consumerism. Moreover, initial research has disputed the notion that climate engineering would necessarily entail moral blindness: one study from the Cultural Cognition Project at Yale Law School has indicated that those who are more informed about climate engineering are also slightly more concerned about the risks of climate change than those not informed.[91]

Revolution is also not specific enough to climate engineering to constitute a significant contribution to our ethics of climate engineering. There are many ways that we could change our behavior (emitting greenhouse gasses) without seriously engaging moral questions. As technology progresses, for example, reducing emissions may not require the bicycles, books, and canoes of Borgmann's imagination,[92] but instead the cars, screens, and jet skis of today—only running on new sources of energy. We may likewise see carbon pricing, which is today considered to be among the most important mechanisms for reducing emissions, as fostering the same blindness to Borgmann's values. It is a *technocratic* solution to climate change, even if it is not a technofix: once the government values the social cost of greenhouse emissions, "the market" will adjust itself, and climate change will be mitigated. Private vices will produce public benefits. Likewise, with respect to distributive justice, we might worry that, contra *Revolution*, climate change fosters *dis*engagement with the world's poorest populations, because they are negligible emitters of greenhouse gasses. Indeed, given that poor countries might, under some circumstances, attempt to engineer the climate, even against the wishes of the wealthiest

[91] Dan M. Kahan et al., "Geoengineering and Climate Change Polarization: Testing a Two-Channel Model of Science Communication," *Annals of American Academic of Political & Social Science* (2012).
[92] Borgmann, "The Setting of the Scene: Technological Fixes and the Design of the Good Life," 198.

countries, we might think that climate engineering would force *heightened* concern for marginalized peoples, if only for geostrategic purposes. Without specifying further *why* climate engineering, in particular, threatens to encourage moral blindness, we are left only with a vague injunction to consider certain moral issues while developing climate engineering policies.

d. *Gender*

I draw my third and final analysis of climate engineering as a technofix from Buck, et al.'s "Gender and Geoengineering." In this essay, the co-authors seek to outline a path towards "value-sensitive design" of possible climate engineering schemes.[93] One important aspect of their discussion is their characterization of climate engineering as a manifestation of a "masculine temperament." To support their argument, Buck, et al. draw upon the sociological work of Wendy Faulkner, which has indicated that the rhetoric of engineering to employ strongly gendered categories. In line with Faulkner's analysis, Buck, et al. suggest that climate engineering "arguably aligns much more closely with what might be considered this (culturally constructed) masculine temperament, highlighting activity/dominance, objectivity, and technicality (versus passivity/submission, subjectivity, and sociality characteristic of the feminine temperament)." These traits are manifest, Buck, et al. claim, in the premises that underlie climate engineering as a response to climate change, i.e., the possible desirability of intervention, "the assumption of objectivity," and the "simultaneous play and display of technical prowess" of what Faulkner terms "the masculine 'ritual of tinkering.'"[94]

Buck, et al. suggest that, even if we find positive value in "activity/dominance, objectivity, and technicality," the *discourse* of climate engineering publicly asserts the

[93] Buck, Gammon, and Preston, "Gender and Geoengineering," 13.
[94] Ibid., 7.

normativity of the traits that comprise it, to the exclusion of those who do not display them. Gender norms therefore seem to fulfill an undesirable public *function* in the way in we think about climate engineering. The authors explain:

> Though her work ultimately problematizes the dualisms of engineering she identifies, Faulkner argues that the dualisms reinforce *and are reinforced by* gender: that gender and these prevalent dualisms are co-constitutive, and that the organizational structures and occupational ethos of engineering perpetuate this co-constituency. At present, the geoengineering discourse appears complicit in perpetuating these patterns.[95]

Later in their essay, Buck, et al. argue that climate engineering proposals should reflect a concern for what Seyla Benhabib calls the "concrete other" of feminist ethics as opposed to the "generalized other" of "masculinist justice approaches to ethics."[96] Buck, et al. view the gendered character of climate engineering as partially responsible for the prevalence of appeals to the welfare of the "generalized other" at the expense of the "concrete other," in discussions of climate engineering policy. Climate engineering discourse, in their view, tends towards a *technical*, rather than a *social* view of climate change, which is to say, towards "a mathematical approach to analytical problem-solving in which problems are 'reduced' to their physical properties and social complexity is pared away."[97] In "paring away" the social complexity of climate policy, climate engineering discourse threatens to promote the misrecognition of globally marginalized populations. These are the same populations for which climate change threatens the most damage, and for whom climate engineering would be most significant. Climate engineering, therefore, might display, and indeed, might reinforce, a morally undesirable attitude. This would not *simply* be the consequence of climate engineering's status as a technofix,

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[95] Ibid.
[96] Ibid., 10.
[97] Wendy Faulkner, "'Nuts and Bolts and People': Gender-Troubled Engineering Identities," *Social Studies of Science* 37, no. 3 (2007): 332.

but also of the particular character of engineering as a discipline that, in its current form, encourages "activity/dominance, objectivity, and technicality." Call this argument *Gender*.

Gender, unlike *Hubris*, lacks any obvious teleological dimensions. Nonetheless, Buck, et al. do describe concepts similar to Hamilton's. For example, they suggest that climate engineering might reflect a "hubristic attitude" that seeks "to use science and technology to thoughtlessly remake the earth at will for the satisfaction of human needs and desires."[98] Such language indicates that one can meaningfully ask "who we are" in thinking through the ethics of climate engineering, without appealing to any highly contestable metaphysical notions. Theirs is clearly an ethical outlook that does not reduce all deliberations to the determination of consequences. We could draw similar conclusions about *Revolution's* argument that climate engineering might foster moral blindness. That a non-metaphysical virtue ethics is possible does not prove that any particular virtue ethical analysis, will actually be accurate, or useful. But it does tentatively show that we should not dismiss virtue ethical accounts of climate engineering simply because we are wary of the historical pedigree of virtue ethics more generally.

I will assess *Gender* shortly. But as a preliminary statement, I claim that we may understand *Gender* as bringing together important aspects of *Revolution* and *Hubris*, and in this sense, providing a particularly powerful formulation of the technofix critique of climate engineering. Like *Revolution*, *Gender* concludes by advocating for a significant reorientation of climate policy towards non-oppression, which for them ought to be informed by principles of ecofeminism. On this point, Buck, et al. write:

> At best, geoengineering offers a chance to reduce the massive human suffering and environmental losses in store as a result of climate change…there is [through geoengineering] the potential to begin remaking society along more just and

[98] Buck, Gammon, and Preston, "Gender and Geoengineering," 15.

> compassionate lines. This will require paying particular attention to the needs of those most structurally disadvantaged by industrialization and globalization.[99]

There is, then, important substantive overlap between *Revolution* and *Gender*. But *Gender* provides an important conceptual tool for understanding why this particular technofix might be dangerous. The phrase technofix intuitively suggests our common understanding of technology as "gadgets," as well as, perhaps, the "masculine ritual of tinkering" that Wendy Faulkner describes. But a technofix, as I have defined it, is merely a particular approach to solving a problem. It need not be a "gadget," but can be any means of "changing the setting" of our behavior, rather than changing the behavior itself. It need not be *technological*, in the usual sense. *Revolution* might apply to *any* technofix, understood in this sense, provided the broader social conditions were appropriate. But *Gender's* focus is more specific: the moral challenges it identifies truly relate to the *engineering* aspect of climate engineering.

Additionally, *Gender* might explain why we might consider climate engineering technology "hubristic": the use of these gendered concepts entails a failure of recognition, which reduces some subjects to the "generalized other." This disregard for the particular interests of others might beget a disregard for the independence of the world outside the self. And this latter disregard seems to constitute an important aspect of hubris. In short, then, even before assessing the three analyses I have presented here, we might think that *Gender* is, *prima facie*, the most plausible. *Gender* includes much of the intuitively appealing content of the other two, but generates it internally, from its account of the manifestation of gender norms in engineering, rather than asserting it as a premise.

In reduced form, *Gender* argues: the practice of engineering often manifests certain gender norms. In particular, it tends to privilege the "(culturally constructed) masculine

[99] Ibid.

temperament, highlighting activity/dominance, objectivity, and technicality (versus passivity/submission, subjectivity, and sociality characteristic of the feminine temperament)."[100] Climate engineering, as a form of engineering, is likely to do the same. When we privilege "activity/dominance, objectivity, and technicality" over their "feminine" opposites, we are likely to misrecognize those who are, in practice, oppressed, by treating them in "generalized," rather than "concrete" terms. Moreover, the speech practices, public policies, and institutional arrangements that these attitudes promote generally perpetuate social, economic, and political oppression. Therefore, climate engineering is likely to be wrong, insofar as it *expresses* the privileged status of "activity/dominance, objectivity, and technicality," and also insofar as it *publicly reinforces* their status. The concern regarding what climate engineering expresses is virtue ethical, insofar as it relates to the attitudes of those responsible for the policy. The concern regarding what climate engineering does publicly is consequentialist, insofar as it relates to the actual oppression that those attitudes perpetuate.

Gender, so construed, is narrower than both *Hubris* and *Revolution*. Like Hamilton and Borgmann, Buck, et al. believe that a "value-sensitive" climate engineering scheme is possible. They therefore claim that they wish to "avoid the conclusion that geoengineering is an *irredeemably* masculinist project."[101] The contingency of their concerns emerges from the contingency of the gendered character of climate engineering: recall that they write, "*At present*, the geoengineering discourse *appears* complicit in perpetuating [patterns of gender]" [emphasis added].[102] *Gender*, then, does not apply to every conceivable climate engineering scheme, nor even every politically feasible one. Rather, it applies to climate engineering, and to climate engineering discourse, as they actually exist today. However, because the gender structures they

[100] Ibid., 7.
[101] Ibid., 15.
[102] Ibid., 7.

describe are deeply embedded in the decision-making structures they hope to influence, the reorientation of concerns that they describe may be difficult to achieve. Nonetheless, the *Gender* is not quite so broad in scope as Gardiner's argument: insofar as Gardiner describes *the Challenge* and "rocking the boat," he warns that humanity may become "the scum of the earth," whereas, Buck et al. view climate engineering as providing a potential opportunity to "begin remaking society along more just and compassionate lines."[103] *Gender*, then, admits the justifiability of a broader range of climate engineering policies.

Gender is also weaker than *Hubris* and *Revolution*. Buck, et al. do not intend *Gender* to be decisive, at least in the first instance, in the decision of whether or not to attempt to engineer the climate. Rather, they wish to advocate for less interventionist strategies for addressing climate change, or for "value-sensitive" climate engineering policies. Their intention is captured thus: Insofar as climate engineering is a technofix, it "views climate change as merely a technical problem and in so doing flattens out its environmental, social, and ethical dimensions. This…hides the structural injustices that created the problem in the first place, injustices potentially perpetuated by geoengineering."[104] These are serious charges, but they are not quite as dire as Gardiner's warnings about "tarnishing evils." Buck, et al. might describe some particular climate engineering policy as unethical enough to tarnish the lives of those responsible for it. But like *Revolution*, *Gender* warns that climate engineering might reinforce *existing* structures of oppression that are likely to persist regardless of whether anyone attempts to engineer the climate, not that it would create *new* ones that would not exist without such an attempt. As I discussed above, we might think that this indicates that this weakens *Gender*.

[103] Ibid.
[104] Ibid., 13.

We might begin to critique *Gender* by arguing that climate engineering is not, in fact, likely to prize "activity/dominance, objectivity, and technicality," in such a way as to entail misrecognition. We might readily accept that the discipline of engineering has historically been a "boys' club." Moreover, we might agree that an important reason for this exclusion has been the emphasis on those traits, which are socially associated with masculinity. Nonetheless, we might not think that these two facts relate, in any important way, to the moral character of engineers' professional work. After all, there seems to be little reason why one would not both conceive of one's work as active, objective, and technical *and* incorporate thoroughgoing concern for the "concrete other." Indeed, we generally think that part of "technicality" in engineering is attention to detail. Where those details relate to human beings, technicality may even motivate engineers to consider others as "concrete selves with idiosyncratic family histories, individual needs, and particular circumstances."[105] *Gender* may therefore seem unfair to engineers, and those who think like engineers, in that it unwarrantedly applies a concern about the *discipline* of engineering generally to the *practice* of engineering itself.

This objection does accord with certain aspects of our everyday experience of engineering. Thomas Pogge reminded me that engineers do not usually rely on general approximations in their projects, but on specific calculations, borne out of a concern for the particular: "Do bridge engineers…focus on the average load a pillar is able to bear or do they pay attention to ensuring that each particular pillar is able to bear the load needed to support the bridge (and then some)?" These bridges, in turn, can have significant consequences for the people using them, which result from the particularities of their design. Perhaps, then, we should not expect climate engineers to "miss the fact that, while the average temperature has been stabilized, millions are facing new climate challenges related to either extreme heat or extreme

[105] Ibid., 11.

cold." [106] Likewise, Faulkner, whose research provides the empirical basis for *Gender*, writes that "the technical" and "the social" are "in a very practical sense *inseparable*" in engineering,[107] even as she describes the gendered characteristics of engineering identities.

We should certainly not make any too sweeping claims about the discipline of engineering. Nonetheless, I do believe that *Gender* plausibly identifies a possible normative deficiency in climate engineering. Below, I sketch five reasons why we might worry that climate engineering might foster morally insensitive attitudes. First, to the extent that the sexism of engineering discourse actually excludes individuals who display "feminine" values from the discipline of engineering, traits such as passivity/submission, subjectivity, and sociality, may be less well represented in climate engineering policymaking. This lack of representation may encourage would-be climate engineers to disregard normative standards other than those that they find intuitive. If we believe that there is any normatively important difference between "masculine" climate policies and "feminine" ones, then we cannot ignore entirely our concerns about the engineering discipline when assessing the policies that the discipline might produce. To believe that such a difference might indeed exist need not mean devaluing "masculine" policies entirely; it means only thinking that "feminine" approaches have distinct normative implications, at least some of which would provide valuable additions to our climate policy.

Second, we might think that accounting for others as "concrete selves" is extraordinarily difficult in the case of climate engineering, and that it is therefore unlikely engineers will be able to sufficiently do so, insofar as they view their work as "active, objective, and technical." For example, Buck, et al. discuss climate scientist Alan Robock's suggestion that climate

[106] Thomas Pogge, E-mail, April 13 2014.
[107] Faulkner, "'Nuts and Bolts and People'," 336.

engineering might dangerously weaken the Asian monsoon.[108] (Note that David Keith strongly disputes the notion that we currently have good evidence for thinking that any disruptions to the monsoon from climate engineering would be more harmful to the affected populations than climate change itself.[109]) We may really never be able to think of all those affected by this shift as "concrete others." But even just to begin to take seriously their moral claims would be a massive undertaking: the engineers designing the intervention would have to consult with economists, agricultural scientists, sociologists, political scientists, and many others, just to begin to consider the ramifications of their proposals. This would be difficult for anyone. But it would be particularly difficult for those who view themselves as "objective" and "technical," because they might be less likely to think that their own analyses require supplementation from others.

Third, we might worry that, insofar as a would-be climate engineer is "masculine," in the sense that I have described, he will think that he has the authority to mold the world according to his standards, without the need for intersubjective justification. Consider the three values I have been discussing. First, "activity/dominance" might motivate the impulse to intervene comprehensively into the climatic system. While we might think that a *comprehensive* intervention would be more likely than a partial one to account for the diversity of its possible outcomes, we might also worry that such an intervention leaves those *besides* those fashioning the climate engineering policy with little power over their own fates. "Activity/dominance," therefore, might underlie a tendency to deny autonomy to the other. Second, "objectivity" might lead climate engineers to dismiss as irrelevant the values of those whom their interventions would affect. Objectivity, of course, might benefit us, insofar as it prevents us from improperly valuing one set of interests over another. But if we think of ourselves as valuing objectivity, then

[108] Alan Robock, "20 Reasons Why Geoengineering May Be a Bad Idea," *Bulletin of the Atomic Scientists* 64, no. 2 (2008): 15.
[109] Keith, *A Case for Climate Engineering*

we may be too quick to dismiss those who seek to reorient our debate. Third, and finally, "technicality" might lead policymakers not to consider the important social dimensions of their work. While we should not dismiss the importance of technical rigor in exploring climate engineering schemes, we might worry that excessive technicality might cause us to overlook the ways in which climate engineering alone might be insufficient. For example, while we might devise a system of compensation for harms from climate engineering, technicality might divert us from cultivating a public *ethos* of international redistribution, which might be essential to the successful implementation of our policies.

Fourth, we might have conceptual and historical reason to worry that climate engineers would take an inappropriately reductionist view of human concerns, even if they do not take a similar view of the physical systems with which they typically work. Consider, for example, Hannah Arendt's account of the "problem-solvers" implicated by the Pentagon Papers, in her essay, "Lying in Politics." "The problem-solvers," she writes, "were remarkably free from the sins of the ideologists; they believed in methods but not in 'world views.'"[110] They were, in short, "objective" and "technical." And from the bellicosity of the policy they advocated, we can see that they were certainly "active" as well. Yet, the problem-solvers were above all misguided, for "they were eager to discover *laws* by which to explain and predict political and historical facts as though they were as necessary, and thus as reliable, as the physicists once believed natural phenomena to be."[111] To be sure, climate engineering would principally entail seeking "laws" (in the sense of predictable outcomes) governing *physical processes* that would *affect* politics and history, rather than for "political and historical facts". But it would also entail tailoring the intervention into the climate to diverse human ends. These ends, as I wrote above,

[110] Hannah Arendt, "Lying in Politics," in *Crises of the Republic* (San Diego: Harcourt Brace & Company, 1972), 40.
[111] Ibid., 11.

may not obey law-like patterns. Even if we *could* discover such patterns, subsuming individual behaviors into them might violate the injunction to respect others "concretely." To be sure: engineers design products all the time, often without disrespecting the people whom they serve. But the point is that engineering-like interventions into human society, with all the negative connotations that phrase might entail, in light of *Gender*, have precedent. In the case of climate engineering, where the intervention would affect people whom the engineers could not begin to know concretely, we might risk that this precedent would be dispositive.

Fifth, and finally, scientific limitations on climate engineering technology might lead otherwise morally sensitive climate engineers to adopt inappropriately generalizing attitudes. I draw this point directly from "Gender and Geoengineering." In their article, Buck, et al. admit that their "general point about unevenness of impacts and attendant obligations is widely recognized" [112] in public discussion of climate engineering. However, even if we, as the individuals responsible for climate engineering "recognize" that our intervention would not affect all individuals equally, we may slide back into the masculinist tendencies about which *Gender* warns us. This risk arises because climate engineering *as such* would by definition affect the globe as a whole. Even if we know we have some *moral* obligation to consider its regional consequences, the most natural object of our *scientific* attention will be the climatic system. Our global focus might persist through both research and implementation. As philosopher Martin Bunzl explains, "[y]ou cannot encapsulate part of the atmosphere," and so, any non-virtual studies of climate engineering must be global in scope. Likewise, Buck, et al. cite climate scientist Alan Robock's worry that, after we attempted to engineer the climate it would not "be possible to determine which adverse situations were caused by the geoengineering, and which were just bad weather luck." As Robock describes, this problem renders compensation for the

[112] Buck, Gammon, and Preston, "Gender and Geoengineering," 10.

harms of climate engineering difficult.[113] Even if we were strongly committed to concern for "concrete others," then, we might find the nature of climate engineering defeating our efforts to act morally. This problem will persist at least as long as our technology is not sophisticated enough to allow us to tailor locally tailor our interventions into the climate.

Taken together, my responses indicate that *Gender* plausibly identifies a serious moral concern about climate engineering, namely, that its characteristics as a technofix render it conducive to inappropriately generalizing attitudes. These attitudes, moreover, have historically fostered oppressive social, political, and economic arrangements, such as the global distribution of wealth, which are likely to be affected by any attempt to engineer the climate. My arguments, however, are far from decisive. We might still think that, if we are to take *Gender* seriously, we must define concepts such as "activity/dominance, objectivity, and technicality" more clearly, and show the particular ways in which they tend to be manifest in the practice of engineering. Moreover, like *Revolution*, *Gender* faces a problem of specificity. Since gender norms are so pervasive throughout society, we must be able to show that *Gender* identifies a *particular* danger in climate engineering, and not one that would be manifest in the same way with any technocratic climate policy. (*Gender* is more focused than *Revolution*, in that it does discuss engineering in particular, but it does not indicate why engineering is special with respect to gender norms.) These questions are beyond the scope of my essay, because they would require thorough engagement with other disciplines, such as gender theory and sociology. But if *Gender* is to withstand final scrutiny, we must be able to answer them.

Even if we *did* answer these questions, *Gender* would still require empirical substantiation. In particular, we would have to determine whether this discourse actually

[113] Alan Robock, "Will Geoengineering with Solar Radiation Management Ever Be Used?," *Ethics, Policy, & Environment* 15, no. 2 (2012): 203.

manifest misrecognition. The question remains, however, of how one would go about investigating attitudes of misrecognition. One way would be to follow the example of Wendy Faulkner, the sociologist whom Buck, et al. cite to support their claim that engineering tends to express and to reinforce undesirable patterns of gender. For her article, "Nuts and Bolts and People," Faulkner conducted "ethnographic field work in two UK offices of a building design engineering consultancy company."[114] Likewise, for "Dualisms, Hierarchies, and Gender in Engineering," she undertook "two months' observation of a single software development project in a large telecommunications company in the USA."[115] We can imagine, for example, a similarly fruitful study of the scientists most actively researching climate engineering, who form what journalist Eli Kintisch has collectively dubbed the "Geoclique." Indeed, according to Kintisch, David Keith already casually divides his peers in this field into the "Blue Team" and the "Red Team." The Blue Teamers here are more inclined towards intervention into the natural world[116]—Buck, et al. might say, towards "activity/domination."

Buck, et al., however, are not only concerned with moral attitudes among climate engineers, or among policymakers. They are also interested in the character of *public discourse* regarding climate engineering. Determining the moral status of this discourse might prove more difficult than determining the attitudes of the "Geoclique," for two reasons: first, we might disagree about what language *counts* as expressing misrecognition, and second, we might think that, even when we can make a plausible argument that certain language *does* express misrecognition, we might disagree about how *relevant* that expression is to our overall moral assessment. For example, let us say that most newspaper articles describe a particular proposal to engineer the climate in terms of its aggregate projected impact on global GDP. *Gender* might

[114] Faulkner, "'Nuts and Bolts and People'," 332.
[115] "Dualisms, Hierarchies and Gender in Engineering," *Social Studies of Science* 30, no. 5 (2000): 761.
[116] Kintisch, *Hack the Planet*, 8.

warn us that when we make policy on the basis of claims such as this, we risk treating individuals too abstractly. The economist responsible for calculating the figures might respond, however, with two claims. First, he might claim that, though he had not sought to predict the consequences of climate engineering for each particular individual, he *had* sought to provide the information he considered most relevant to ethical climate policy. The economist might dispute, then, that his work was not value-sensitive. Second, the economist might claim that even if his analysis *had* expressed misrecognition, this would not have negated its social value. Those reading about his work would be motivated, whether rightly or not, by the effect of climate engineering upon global GDP. His most important moral concern, then, should not be expressing concern for "concrete others," but rather producing work that will accurately inform the determinations of those influencing policy.

The economist's claims, of course, need not dictate our final determinations about his work. We might respond, for example, by suggesting that given the dark history of gendered injustice, we should not allow potential oppressors to dictate when they are acting rightly. The economist, insofar as he adheres to a social paradigm that privileges the masculinist traits I have been discussing, is a potential oppressor. Those who would suffer as a result of his misrecognition, therefore, should at least help determine which policies are appropriate. This response provides only the beginnings of a procedural account of identifying misrecognition in climate engineering discourse, one demanding more robust, and more globally representative structure of governance. But given the generality of the concept of misrecognition is, even with the further specification of its relation to the culture of engineering, we might prefer such a procedural account to a substantive one that purports to exhaust all possible instances of immorality identified by *Gender*. We might further respond to the economist by reminding him

that, even if *Gender* does not exhaust our moral assessment of climate engineering, we can still use the argument to motivate our own behavior. By claiming that others *do* care about global GDP, the economist resigned himself to the judgments of others. But *Gender* can provoke us to look for ways in which to imbue our work with moral sensitivity.

Gender, therefore, though contestable, can contribute to our moral thinking about climate change: it can remind us, when we propose policies, to look at whether we are fostering attitudes consistent with historical structures of oppression. Moreover, it can remind us not to use our newfound power over the whole of the climatic system as an excuse to ignore the ways in which our actions would differently affect individuals with whom we might have little direct contact. *Gender*, however, does more than indicate important general principles of morality. It plausibly explains *why* climate engineering, in particular, threatens not to satisfy those principles, by showing how the characteristics of engineering, as a discipline, might be manifest in morally salient ways in the development of public policy.

e. The Technofix Discussion Concluded

Where does my discussion of *Hubris*, *Revolution*, and *Gender* leave the ethics of climate engineering? I have argued that none of these three arguments compels a strong initial presumption against climate engineering, taken as a general category. *Hubris*, cannot provide even a minimum of moral guidance, insofar as we construe it as a virtue ethical argument. It is not clear, to begin with, that the argument is valid. Even if it were valid, its premises relating to the "intuitive metaphysical order" and to climate engineering as "playing God" are highly contestable. And even if we accept the argument, it is not clear what kinds of conclusions we could derive from it. *Hubris* may, at most, provide a salient *consequentialist* warning against

technological overreach. *Revolution*, I believe is severely underspecified, and it is not evident that we could construct a conceptually similar argument in a more robust form. In the absence of persuasive empirical evidence suggesting that climate engineering may indeed encourage blindness towards important questions of power, distribution, and "the good life," we have little reason to fear climate engineering, on the basis of *Revolution*. However, insofar as political actors think through the ethics of climate engineering, *Revolution* suggestion that we situate climate engineering in the broad context of the promotion of the good, may become useful. As political actors, we may gain a special kind of insight into the threat of climate engineering serving as a temptation, in the way that Hamilton and Borgmann describe.

The most plausible argument I have discussed here is *Gender*. *Gender* would require further empirical support, as I have explained. But it nonetheless provides a conceptually coherent account of considerations weighing against climate engineering that cannot be easily assimilated into cost-benefit analyses. These considerations can, in principle, help us formulate climate policies by specifying important values to which we should be sensitive. What even *Gender* does not do, however, is provide us with a "trump" against any particular climate engineering schemes. To put it in Gardiner's language, *Gender* does not describe climate engineering as tarnishing. Even if we accept *Gender*'s conclusions, there might always be particular circumstances in which they are outweighed by other concerns. Moreover, as I have explained, though *Gender* does identify how the social nature of climate engineering technology is conducive to improperly gendered thinking, the argument does permit some justifiable climate engineering policies. "At its best," Buck, et al. write, "geoengineering offers a chance to reduce the massive human suffering and environmental losses in store as a result of climate change."[117]

[117] Buck, Gammon, and Preston, "Gender and Geoengineering," 15.

Gender, then, may serve a different practical function than a supposedly "trumping" argument: rather than leading us to ask Gardiner's anguished question, "*has it really come to this?*," *Gender* would encourage us to engage with the particulars of different climate policies, and to work to introduce moral values into public discourse.

IV. Virtue Ethics, Motivation, & the Politics of Climate Engineering

a. Tarnishing Evils & Moral Motivation

My discussion now brings me to the final topic I will consider in this essay: the practical importance of virtue ethical arguments about climate engineering. Earlier, I considered Gardiner's argument, which sought to show that, because climate engineering would entail a failure of *the Challenge*, it is also likely to entail the tarnishing of the human species, or at least of those individuals directly responsible for the decision to engineer the climate. I argued that Gardiner's argument failed. I then discussed three other virtue ethical approaches, all of which criticized climate engineering as a technofix. However, the most successful of these arguments, *Gender*, did not identify climate engineering as tarnishing at all. It appears unlikely, then, that climate engineering would be tarnishing. Nonetheless, because tarnishing would be so undesirable, we might still wish to take the possibility seriously, insofar as we, as morally engaged individuals, can influence climate policy. In this section, I will consider whether even a good *theoretical* reason to consider climate engineering tarnishing wrong would give us good *practical* reason to attempt to prevent the engineering of the climate. In short, I argue that it need not, and that worries about tarnishing are therefore likely to be, in Gardiner's phrase, "both pointless and misguided."[118] Though I will primarily discuss Gardiner's virtue ethical argument, my analysis will also apply to all such arguments that climate engineering would be tarnishing,

[118] Gardiner, "Are We the Scum of the Earth?," 255.

as well as to certain *deontological* arguments (meaning those that ask, roughly, "what should we do?," rather than "who are we?").

I will begin by discussing the moral significance of tarnishing. As a hypothetical reply to his argument against climate engineering, Gardiner raises the problem that it would be misguided to lament the tarnishing of humanity, when tarnishing seems inevitable. I will argue that, under conditions where climate engineering appears necessary, it would be wrong *both* to act as though tarnishing were inevitable *and* to act as though climate engineering were tarnishing. I will suggest, by drawing upon two non-philosophical, empirical suggestions, that we ought instead to act to *limit* the evil climate engineering would entail. This would mean *not* treating climate engineering as tarnishing, practically speaking. I will then conclude by arguing that worries about tarnishing, though they may identify important moral characteristics of climate engineering that we might otherwise ignore, is limited in its ability to guide individual actions regarding climate engineering, because the global nature of climate change creates a disjuncture between the responsibilities of individuals and the responsibilities of humanity as a whole. In Section II, I attempted to show that Gardiner's argument was *wrong*. Here, I hope to show that, even if it were correct, it would not fulfill one of the central purposes for which we might analyze the ethics of climate engineering, namely, to see *what we should do*.

For Gardiner, recall, a tarnishing evil is one that begets "a negative moral evaluation of an agent's action (or actions), that is licensed when the agent (justifiably) chooses the lesser evil in a morally tragic situation, and which results in a serious negative moral assessment of that agent's life considered as a whole." [119] Even if the evil is not "blighting," which would mean that it would tarnish *irredeemably* over the course of the lifespan of the agent, the tarnishing cannot be "wiped away" within the local context of the tragic situation. Moreover, Gardiner argues that

[119] *A Perfect Moral Storm*, 387.

tarnishing can occur even in circumstances beyond the control of the agent, citing Aristotle's account of Priam of Troy, who failed to achieve flourishing, despite his virtue. [120] This does not mean, for Gardiner or for Aristotle, that Priam's life was merely lamentable, in some general sense. Rather, it indicates as well that, in some sense, Priam's life was undesirable in *the same way* as it would have been, had he not been virtuous. The desire to avoid tarnishing, then, is a *moral* one. Tarnishing is evidently a virtue ethical concept, since it entails the aggregation of goods across an agent's identity. But we can imagine a deontological analogue to it: if one violates an absolute duty, then we might not think that some other action could simply erase the negative moral evaluation that the violation would rightfully beget.

Gardiner himself identifies a practical problem emerging from the notion of tarnishing evils. Normally, we might think that when we are faced with difficult scenarios, morality obliges to do the best we can, according to whatever set of standards it specifies. But if we believe that our lives might be *tarnished*, then we incur a more specific obligation, namely, to *avoid the tarnishing*. In Gardiner's account, we act virtuously so that we can flourish. But if our lives were to be tarnished, then flourishing would impossible, and hence the teleological basis of our morality would be destroyed. Likewise, if we risked violating an absolute moral duty, in a deontological framework, we would have an obligation to *avoid that violation*. This is, after all, what it means for a duty to be absolute. But what if it appears *inevitable* that our lives will be tarnished, or that we will violate an absolute duty? Gardiner suggests, as a hypothetical rejoinder to his own argument, that, in these cases:

> …invocations of marring at least are ineffective and inappropriate. 'Ought implies can,' it is claimed; hence, it is both pointless and misguided to evaluate the behavior of those who have no real choice about what they do. In context, if we

[120] "Are We the Scum of the Earth?," 250.

> must pursue geoengineering anyway, as a 'lesser evil,' then discussion of these matters is useless, and should be avoided.[121]

When we believe tarnishing to be inevitable, merely describing our moral failure cannot contribute to our determination of how to act. To treat an evil as *tarnishing* would mean to try to avoid it entirely. But to treat an evil as *necessary* would mean to resign one's self to it, and therefore to consider "invocations of marring" as "ineffective and inappropriate." That we consider the evil tarnishing would have no bearing upon our practical judgments. Likewise, we could not, in these circumstances, simply accept the tarnishing as inevitable, while "doing the best we can" (my phrase) to mitigate the evil for which we are responsible. We are always obligated to mitigate such evils, but we are obligated to mitigate tarnishing evils absolutely. Therefore, as long as we "do the best we can," we are not treating the evil for which we are inevitably responsible as tarnishing. Note that we can make these claims regarding *tarnishing*, and not only about *blighting*, which is the permanent form of tarnishing. This is because avoiding tarnishing is an absolute prerogative in all discrete moral decisions; other concerns can compensate for tarnishing only *after* we have been tarnished. The same would also hold true of any absolute duty not to engineer the climate provided by a *deontological* moral theory: insofar as we consider a duty absolute, we ought to fulfill it completely.

Gardiner proposes three responses to this problem. First, he claims that we should be careful about conceding when evils are necessary, lest we abet the morally corrupt. This response is purely prudential, and is consistent with Gardiner's admonitions to take the moral status of "lesser evils" seriously. Second, he claims that we should be attuned to the further moral responsibilities even of those who *are* morally justified in engineering the climate, such as providing compensation for those harmed. This response indicates that climate engineering

[121] Ibid., 255.

schemes can take many forms, and encompass a broad range of moral responsibilities to which we must be attuned. Third, Gardiner claims that ethical analysis can play an important role not merely in guiding action, but also in "bearing witness."[122] This response relates to the "moral environment" of climate engineering, and suggests, consistent with Gardiner's question, "who are we?", that moral analysis can serve important ends beyond determining how we ought to act.

The second of Gardiner's responses is most salient to my analysis here, because it is inconsistent with my interpretation of our moral obligations under the threat of inevitable tarnishing. It indicates that, far from encouraging resignation, tarnishing would motivate us to "aid, comfort, and seek forgiveness from" those whom we would have victimized by engineering the climate.[123] This might be psychologically accurate: we might be more likely to assist those whom we have harmed when we think that we have been tarnished by our having harmed them. But it is theoretically misleading. We might be obliged to provide compensation for the victims of climate engineering, but only because climate engineering would be *wrong*, insofar as it harmed them, not because it would be *tarnishing*. That climate engineering might be so wrong as to beget "a serious negative moral assessment of that agent's life considered as a whole"[124] bears only indirectly upon our determination that we might owe some populations compensation. If we *were* to consider climate engineering tarnishing, then, I believe that we would indeed face precisely the same problem that Gardiner describes in his hypothetical objection to his argument.

Gardiner's first response, regarding when to concede evils as necessary, is not inconsistent with my interpretation, for we might read it to imply that the hypothetical objection is valid, and that the appropriate way to reply to it is simply to deny the premise that climate engineering is inevitable. His third response, regarding "bearing witness," is irrelevant to my

[122] Ibid., 255-6.
[123] Ibid., 255.
[124] *A Perfect Moral Storm*, 387.

discussion here, because by definition, "bearing witness" cannot inform our judgments concerning how we ought to act. We only bear witness after we have already acted. Prior to acting, we could conclude only that climate engineering is the sort of act about which we ought to bear witness. But to say this is to say little more than that climate engineering is morally important, without substantively specifying its moral status.

b. Inevitable Tarnishing & Climate Engineering

Now that I have set out the objection to Gardiner's account of tarnishing, I will explain why it poses a serious challenge to his analysis of climate engineering. Considering climate engineering tarnishing would lead us to *imprudent* behavior, in the fully moralized sense of the term. I begin by describing what our moral obligations would be, if we were to consider climate engineering tarnishing.

Gardiner's response implicitly accepts the dilemma I identified above: if climate engineering were tarnishing, then we would be obligated to try to prevent it, but if climate engineering were also *inevitable*, then treating it as tarnishing would mean resigning one's self to it. If Gardiner's analysis permitted us to "do the best we could," then he would have responded that we would be obligated to mitigate the evil of climate engineering, when tarnishing is inevitable. Instead, Gardiner only claims that we should take care when admitting the inevitability of tarnishing. There is, for him, no "middle way" between preventing tarnishing, and resigning one's self to it. This dilemma does obtain in the particular case of climate engineering. If climate engineering is such a serious evil, then no matter what else we were to do, humanity's having engineered the climate might be "sufficient to undermine [the] claim"[125] that humanity were flourishing. Insofar as we *properly* take a moral interest in humanity as a

[125] "Are We the Scum of the Earth?," 250.

whole—and certainly, Gardiner's "responsibility argument" indicates that our interest in humanity *is* proper—we ought to act so as to prevent humanity from being tarnished. Recall, additionally, *why* climate engineering might constitute a moral failure, for Gardiner: the tarnishing emerges not merely from the physical act of climate engineering, but also from the fact that we, as a species, would have *forced ourselves* to engineer the climate. "Acting so as to avoid the tarnishing of humanity," therefore, would very likely include advocating for further reductions in greenhouse emissions.

If we were to accept that climate engineering would be tarnishing, then the "dilemma" that I have I identified would pose no serious problem, so long as climate engineering is avoidable. But where we would have good reason to think that climate engineering *might* be inevitable, we would be faced with a choice between resigning ourselves to merely "bearing witness" (if we *did* think it was inevitable), or to doing all that we could to prevent the engineering of the climate (if we *did not*). I will argue that the most defensible option would instead be to act as though climate engineering were not tarnishing, and therefore to "do the best we can," by reducing the evil that climate engineering would entail. I will show that treating climate engineering as tarnishing would motivate us to adopt a counterproductive political strategy. Whether or not we considered climate engineering *inevitable*, we would absent ourselves from specific debates over policy, either because we could only lament that "it had really come to this," or because we could only advocate for further mitigation. I will argue this point using two empirical suggestions, both of which I draw from the work of individuals engaged in the policy questions surrounding climate engineering. These particular suggestions may not be convincing for all readers. However, as long as we believe that our moral judgment

must respond to politics, we are likely to think that the language of tarnishing is too strong, because it leads us to think in moral absolutes.

My argument reveals a "genuine moral dilemma" that emerges when we think of climate engineering, though one different from that which Gardiner identifies. Even if we hold the theoretical belief that climate engineering is tarnishing, I argue that we should not adopt that belief as the basis for our conduct. The theoretical belief, then, has limited practical value. One must choose, then, between our theoretical morality, and our practical morality, by examining both more closely. This is precisely what I did in Section II of this essay, when I rejected Gardiner's arguments that climate engineering would likely be tarnishing. I do believe, therefore, that "invocations of [tarnishing] at least are ineffective and inappropriate."[126] And if we were to generalize this conclusion to deontological arguments against climate engineering, we would have good reason to think that climate engineering would not violate any *absolute* moral duties either. Though my argument does count against Gardiner's concept of tarnishing, I do believe that my conclusion is sensitive to his general ethical concerns. I hope to show that, far from fostering "morally irresponsible" thinking on climate change, accepting climate engineering as necessary may actually help *moralize* public discourse.

I will begin by briefly clarifying what it would mean to reduce the evil of climate engineering, if climate engineering would (almost) always be tarnishing, regardless of our actions. If we think that climate engineering would be tarnishing because it would entail a serious failure of our responsibilities as a species to the Earth, then we might consider the details of our climate engineering policies to be irrelevant. But, as Gardiner recognizes (witness his discussion of compensation), climate engineering would raise many other important ethical questions. There are some forms of climate engineering that would be deeply morally

[126] Ibid., 255.

problematic not because they would entail intervention into nature, but because they would cause patent injustices. One hypothetical example of this is *predatory* climate engineering, where one country seeks to manipulate the climate to the disadvantage of others. Another is *opportunistic* climate engineering, where one country seeks to manipulate the climate for its own advantages, *despite* the disadvantages to others. Other serious ethical concerns might apply even to apparently more responsible forms of climate engineering. For example, some policies might fail to fulfill the standards described by *Gender*. Almost all climate engineering schemes would, as I discussed in the Introduction to this essay, delay the recovery of the hole in the ozone, increasing global mortality due to skin cancer.

Gardiner *does* directly discuss instances of climate engineering such as these, and he indicates that they, too, would likely entail tarnishing.[127] But there is an important difference between climate engineering policies that would be wrong *both* because they involve climate engineering *and* because they violate well-established political norms, and those that would be wrong *only* because they involve climate engineering: we can, in principle, much more easily mitigate *political* flaws in a climate engineering scheme than we can *intrinsic* ones. We need not, therefore, consider all these politico-moral failures inevitable, even if we think that climate engineering is inevitable, and that it inevitably entails tarnishing. Unless we think that the political aspects of climate engineering could *never* be justifiable, we could at least imagine possible structures of governance under which we would avoid tarnishing. Economist Gernot Wagner has argued precisely this point: "it's not a question of *if* but *when* humanity will be compelled to use geoengineering, unless we change course on our climate policies (or lack thereof)," but also that the appropriate response is "more research and a clear, comprehensive governance effort on the part of governments and serious scientists—not a ban of geoengineering

[127] "The Desperation Argument for Geoengineering."

that we cannot and will not adhere to."[128] Moreover, determining climate engineering policy may not solely consist of mitigating evils: except for the inherent evil of engineering the climate (which I accepted for purposes of this argument), climate engineering might actually count as a positive *good*, by, for example, enabling poor countries to further develop their economies.

My discussion indicates that, even if we consider climate engineering to entail inevitable tarnishing, we might still mitigate much of what would make particular climate engineering policies evil. The question, then, is whether we should actually act upon our belief that climate engineering is tarnishing, and refuse to abet its implementation, or whether we should enter the political fray as an advocate for better policies. I argue that, *pace* Gardiner, we may run the greatest risk of moral blindness in this case precisely by treating climate engineering as tarnishing. By doing so, we might actually enable unjust climate engineering policies, as well as a morally insensitive public discourse. To support this conclusion, I present two closely related ways of thinking through the politics of climate engineering that might inform our normative analysis. The first relates to *who* should participate in public discussion of climate engineering, while the second relates to *how* they should participate.

I begin by drawing upon a suggestion from David Keith. Keith told me that, as a proponent of climate engineering research, he has been frustrated with the strong *prima facie* skepticism that some journalists and environmentalists have expressed towards his ideas.[129] (Keith has said elsewhere that both experts and laypeople "show acute—and sensible—concern for the risks and are deeply concerned about implementation, and both show significant support for further research.[130]) This skepticism, Keith claimed, has impeded robust discussion of his

[128] Gernot Wagner, "Geoengineering: Ignore Economics and Governance at Your Peril," *Huffington Post*, October 31 2012.
[129] David Keith, Telephone Conversation, February 24 2014.
[130] "Technology to Cool the Planet: An Interview with David Keith."

ideas, and those like his, by focusing public attention on the mere novelty of climate engineering. Keith worried that this was not conducive to rational discussion of climate policy. We might think that the public would be skeptical of climate engineering for emotional, rather than philosophical reasons. They might not consider climate engineering "tarnishing," but rather, "crazy," or "absurd:" in a recent article describing Keith's research in the *Boston Globe Magazine*, for example, the headline reflected one common reaction to the prospect of intentionally dispersing pollutants across the stratosphere, asking, "are you sitting down?"[131] But the source of the skepticism probably does not matter: in each case, at least some individuals in a position to affect public policy would likely deny that climate engineering might be justifiable. These individuals would probably not contribute to discussions of climate engineering policy.

Among these skeptics would likely be those most closely attuned to the ethical challenges of climate change, because they would be keenly aware of the dangers of large-scale intervention into the climatic system. But if climate engineering appears inevitable (either within a stable institutional framework or, as Gernot Wagner fears, without one[132]), then we would want these morally upright individuals to participate in developing appropriate policies. We would not want them to stand outside the debate, worrying that they would "get their hands dirty" by participating in it: this would only leave the morally corrupt in control of discussion surrounding climate policy. For someone like Gardiner, who greatly values the moral character of our public discourse, this prospect should be highly undesirable. My suggestion here depends on my belief that one can engage in "value-sensitive" discussion of climate engineering policy. It is a question of emphasis—of whether we *only* enumerate the reasons why we ought to be skeptical of the technofix, or if we *also* acknowledge that we will probably not have direct control over the

[131] Chris Berdik, "David Keith Hopes We Don't Have to Use His Ideas to Reverse Global Warming," *Boston Globe Magazine*, October 20 2013.
[132] Gernot Wagner, Telephone Conversation, February 27 2014.

decision to engineer the climate, and therefore conclude that we must not silence ourselves into irrelevance. (Note that Gardiner himself has extensively discussed governance structures for climate engineering research. Nonetheless, I believe that his notion of tarnishing theoretically motivates unequivocal opposition to climate engineering.)

In suggesting that we might "silence ourselves into irrelevance," I raise an important new suggestion: we might abstain from discussion of climate engineering policies not only because we do not wish to "get our hands dirty," but also because we believe that abstention will be an effective strategy for promoting our ends. This relates to my second empirical suggestion, which indicates that this belief might actually stem from an overestimation of our capacity to influence public policy. According to Nathaniel Keohane, the Environmental Defense Fund Vice President, there is a kind of "taboo" regarding climate engineering within the environmental community. This "taboo," if it exists, would likely reflect the same skepticism that David Keith described. But as Keohane suggested to me, there might be an important practical difference between upholding a taboo that could persist indefinitely, and upholding one that is very likely to be broken, regardless of our actions.[133] If it would be seriously evil to engineer the climate, and if significant discussion of climate engineering appears unlikely, then we would be wise to try to quell what discussion does exist, consistent with norms of free expression. However, if climate engineering appears inevitable, and if we have good reason to think that our moral perspective might not be well represented without our direct contribution, then we may defeat our own moral intentions by choosing to remain silent. We may enable those less morally sensitive than we to dictate the fate of the Earth. By silence, as above, I do not mean only refusing entirely to discuss climate engineering; I also mean refusing to discuss the moral challenges of particular climate engineering policies.

[133] Keohane.

To Gardiner, my analysis of Keohane's suggestion may seem to evince moral corruption. Recall that Gardiner's first response to the problem of how to act when a tarnishing evil appears necessary is to warn us that we should be careful about conceding when evils are necessary, lest we abet the morally corrupt. I have been supposing that, in the case I have been discussing climate engineering really does *seem* inevitable. But we could probably not *know*, with any certainty, that it actually *was* inevitable. Gardiner, then, might deny the premise of my critique, and simply call for a greater burden of proof for our description of climate change as a "necessary evil." By criticizing individuals whom I admit are morally sensitive, before we have even had a chance to assess the actual consequences of their opposition to climate engineering, we are arguably falling into a moral trap. This trap is captured by Gardiner's epitaph to his discussion of climate engineering in *A Perfect Moral Storm*, which he takes from Benjamin Franklin's *Autobiography*: "So convenient it is to be a reasonable Creature, since it enables one to find or make a Reason for everything one has a mind to do."[134] We *know* that many in the developed world have hardly even begun to confront the ethical challenge of climate chance. To simply call climate engineering inevitable, and thereby to concede its moral defensibility for all practical purposes, would likely mean nothing more than to "conveniently" relinquish moral responsibility for the fundamental decision of whether to engineer the climate or not.

Those whose intuitions align more closely with Keohane's might dismiss this Gardinerian argument as utopian, for it denies the need for moral compromise. I sympathize strongly with this perspective, but also believe that we ought to take Gardiner seriously. The job of a moral philosopher, broadly speaking, in evaluating the ethics of a political decision, such as the one to engineer the climate, might be precisely to see past "convenience," of the sort potentially exploited in debates over climate policy. Put another way, cynical descriptive claims

[134] Gardiner, *A Perfect Moral Storm*, 339.

seem to dominate our political world. As Gardiner writes, "it is a favorite strategy of the corrupt to insist that the evils they wish to pursue are overridingly 'necessary,'"[135] We therefore may need moral philosophers to retain particularly high *normative* standards, so that our considered judgments can appropriately balance "ought" and "can." Moreover, my suggestions about the inevitability of climate engineering have been empirically speculative, whereas this Gardinerian warning appeals to a deep and general moral intuition. The former, it seems, requires specific substantiation; the latter does not. In the absence of better reason to think that climate engineering really is inevitable, then, we may wish, as a matter of moral prudence, to act upon Gardiner's warning.

Despite this qualification, however, the problem I identified in Gardiner's analysis still remains. In Section II of this essay, I argued that we should not accept Gardiner's argument that climate engineering would very likely constitute a tarnishing evil. But if we accept that climate engineering would entail tarnishing, and if we believe that climate engineering is likely to be inevitable, then Gardiner's theory of tarnishing permits us only two mutually exclusive courses of action: first, we could do everything in our power to stop the engineering of the climate, thereby treating climate engineering as *tarnishing*, but *not* inevitable, or we could resign ourselves to history, and withdraw from public discussion of climate engineering, thereby treating climate engineering as truly *inevitable*. I have shown, however, that at least *prima facie*, the normatively preferable option may be to treat *some form* of climate engineering as inevitable, while attempting to mitigate its *contingent* evils. Even if we generally defer to Benjamin Franklin's warning, it is clearly defeasible, and indeed, we might think Keith and Gardiner's suggestions do defeat it. There is, therefore, some reason to think that our theoretical and practical judgments will diverge from one another, when we adopt Gardiner's theory. We can

[135] "Are We the Scum of the Earth?," 255.

further generalize this conclusion to count against *deontological* prohibitions of climate engineering as well: if we have an absolute duty not to engineer the climate, then acting upon that duty would mean trying to prevent climate engineering. We might therefore count my argument as further reason not to accept, for example, some deontological formulation of Clive Hamilton's argument against "playing God." My argument is not decisive on its own: we may think that our moral considerations against climate engineering are, somehow, more important than the purpose for which we develop such considerations, namely, informing our moral judgments. But my argument does identify a significant weakness in Gardiner's arguments, and arguments like his, which, I believe, they are not likely to overcome.

c. Tarnishing & the Distribution of Responsibility

Now that I have shown *how* our theoretical and practical judgments concerning climate engineering can diverge, I will briefly discuss *why* they diverge. I argue that the divergence emerges because Gardiner's theory, and theories like his, portray climate engineering as tarnishing for *humanity*, without explaining why it would also be tarnishing for the *individual*, whom the theory seeks to motivate. As I discussed above, Gardiner believes that climate engineering would be tarnishing not only because it would constitute an intervention into the climatic system, but also because it would be, in a sense, the culmination of a broader failure to "adapt to the planet on which we live," in particular, the emission of greenhouse gasses at such a high rate as to cause dangerous climate change. However, we cannot easily allocate responsibility for this failure, because it is very broadly distributed, and so, it seems that we can meaningfully speak of climate engineering as tarnishing for humanity as a whole. (I leave aside the problem of whether such claims are, in the final analysis, analytically defensible.) Once

again, the same reasoning would likely apply to many deontological arguments against climate engineering: it is not clear why we would consider many individuals to have violated an absolute moral duty not to engineer the climate, just because humanity as a whole had violated it.

This is not to say that responsibility for climate change is *equally* distributed. Certainly, we could, for example, identify individuals who have freely chosen emissions intensive lifestyles. To them, we would properly assign greater blame, and perhaps, a greater "share" of any tarnishing. But as well justified as these assignments might be, they would certainly be incomplete. We could always appeal, for example, to the common American imperative for conspicuous consumption to explain why some individuals live in suburban mansions, or to the pernicious influence of the fossil fuel industry to explain why the United States Congress has not set a price on greenhouse emissions, or to the legacies of Western imperialism to explain the contemporary drive of developing countries to industrialize. These are, of course, sweeping claims, so broad as to be analytically useless. But the point is that we can almost always abstract away from particular individuals, so as to expand the unit of moral responsibility for climate change, and therefore, for climate engineering. Even if we were to examine climate engineering as a discrete act, for purposes, say, of identifying *who* would be "playing God," we would likely find responsibility to be similarly diffuse. Few of the broad social, economic, and political forces would become causally irrelevant merely because we were considering climate engineering, in particular, rather than climate change, more generally.

These considerations indicate that, just because we might believe that climate engineering would tarnish *humanity*, we need not believe, as a consequence, that it would tarnish all individuals in a position to influence climate engineering policy. And the tarnishing of climate engineering would not transfer to all individuals in a position to affect climate policy, then our

assessment of those individuals' moral duties need not correspond to our assessment of humanity's moral duties, because tarnishing was, supposedly, the controlling motivation of those duties. We might properly take an interest in preventing the tarnishing of humanity, but normatively, it seems unlikely to me that this ought to be our dominant concern. We probably rather ought to mitigate the evil of climate engineering, in the way that I described earlier. The possible failure of tarnishing to transfer accounts for the discrepancy between our theoretical and our practical reasons for action, which I discussed above: the theoretical reason would apply to humanity as a whole, whereas the practical reason would apply to individuals. This is not to say that our global assessment does not apply at all to individuals: to the extent that an individual could drive or mitigate climate change, or climate policy, she would be responsible for the ultimate decision to engineer the climate. We might say, then, that climate engineering compels a negative evaluation of the life of that individual, in direct proportion to her responsibility. But this share of responsibility would, in most cases, be miniscule. Tarnishing refers to an assessment of an individual's life, in its entirety. It would be strange to say that *any* causal connection between an individual and a tarnishing evil must be cause for such a comprehensive negative judgment.

I am not claiming that *no* individuals might be tarnished by the decision to engineer the climate. The United States Senator who fails to provide a decisive vote in favor of a carbon tax, the oil company executive who leads a propagandistic misinformation campaign about his industry, and perhaps, even the small island country prime minister who initiates a reckless climate engineering program to save his home from annihilation might all be tarnished. But these are exceptional cases. Nor am I claiming that individuals with less direct influence on climate policy might not also be tarnished. Gardiner persuasively suggests that experience teaches that

the lives of individuals *can* be tarnished "by their connections to various groups." "In the recent past," Gardiner writes, "some have been ashamed to be white South Africans during the time of apartheid, or Germans during the time of the Nazis. Moreover, for many this shame persisted even when they not only played no direct role in the evil activities of these regimes, but actively resisted them as well."[136]

Simply because some individuals have *felt* shame, however, does not mean that were *justified* in feeling shame. We might wish to give special weight to the Germans' and South Africans' accounts of their own experiences, and assume *prima facie* that their lives were indeed tarnished. But we cannot defer our judgments absolutely. We might worry that the Germans and the South Africans would properly have felt ashamed about the situation in which they found themselves, and not about the character of their own lives. Moreover, in the absence of a more robust historical account, we might not accept Gardiner's descriptive account; perhaps the Germans and South Africans really did feel ashamed only about their general situation. Finally, even if we accept that this "tarnishing by association" is possible, we certainly need not consider it inevitable. One would still need a specific account of how the tarnishing of climate engineering would widely transfer to individuals. Given how broadly responsibility for climate engineering would be distributed, I believe that our initial supposition should be that the tarnishing would *not* transfer to most individuals, and that the burden of proof would therefore fall upon Gardiner to show that it actually would.

d. The Tarnishing Discussion Concluded

If my arguments have been successful, concerns about tarnishing are likely to be "pointless and misguided," insofar as we are concerned with aligning our reasons for action with

[136] Ibid., 254.

our theoretical moral reasoning, under certain circumstances. Moreover, as I argued above, Gardiner's particular argument for considering climate engineering as tarnishing is implausible, and therefore unlikely to contribute much even to our theoretical understanding. But this does not mean that all virtue ethical arguments concerning climate engineering are all "pointless and misguided." To conclude this section, I will suggest two ways in which virtue ethics (and by extension, following my analysis above, deontological ethics) might contribute to practical moral understanding of climate engineering.

First, concerns about tarnishing, or about absolute moral duties, might be valuable if climate engineering is not likely to be inevitable. Both of my empirical suggestion assumed the inevitability of climate engineering. If we contest this premise—and it certainly it is contestable—, then those who think climate engineering would be tarnishing might doubt that my argument has accomplished much, for it would apply only to a hypothetical scenario. If climate engineering is not apparently inevitable, then, they would suggest, we probably ought to continue treating it as tarnishing, lest we risk the kind of moral corruption that Gardiner describes. After all, I conceded here that we probably *do* properly take a moral interest in humanity as a whole. This argument is not as straightforwardly persuasive as may first appear. I did not *only* identify practical limitations of the analysis of climate engineering as tarnishing, I also provided a theoretical explanation of why those limitations might apply to climate change, in particular. This theoretical account did *not* refer to the apparent necessity of climate engineering, only to more general considerations of who would be responsible for it. The problem I identified above, then, still potentially persists: our theoretical conclusions about humanity as a whole might not accord with the principles upon which we as individuals should act. I do not believe, however, that this rejoinder is necessarily fatal to concerns about tarnishing:

whether our reasons diverge in the way I am describing is evidently an empirical matter, and it may be that the theoretical concerns I have raised here simply do not manifest very strongly in practice. A sound conception of climate engineering as tarnishing, then, might still contribute greatly to our practical moral assessment, depending on the circumstances.

Second, even if we reject the idea of tarnishing altogether, or do not think that it would apply to climate engineering, my argument has done nothing to weaken the general virtue ethical method of asking "who we are, ethically speaking." Such a method may still help us to identify practically salient features of the moral environment of climate engineering. This is precisely the function of Buck, et al.'s argument, which I discussed in the previous section. Such a contribution need not relate to the status of climate engineering as a technofix: Melissa Lane, for example, provides an extended analysis in her book, *Eco-Republic*, of how virtue ethical (and in particular, Platonic) concepts can inform an "intelligent response to ecological necessity."[137] (Though her work relates most directly to climate change, she does not specifically discuss climate engineering.) A deontological account of climate engineering might be similarly useful, once we account for the difficulties of trying to act upon categorical imperatives.

We might worry that even these more mild virtue ethical and deontological critiques would stumble over the diffusion of responsibility for climate engineering. It seems that, so long as there may be discrepancies between the moral obligations of humanity, and those of the individual, these critiques may have limited practical value. But I believe these problems worsen as the demandingness of our ethical assessment increases, and would *not* be significant for assessments such as Buck, et al.'s, or Lane's, which do not refer to tarnishing, or to absolute duties. To act in accordance with a critique like Gardiner's would mean to adhere to very

[137] Melissa Lane, *Eco-Republic: What the Ancients Can Teach Us About Ethics, Virtue, and Sustainable Living*(Princeton: Princeton University Press, 2012), 6.

specific and very strong moral obligations. But to act in accordance with a weaker critique would mean to adhere to relatively vague and relatively weak obligations. It would therefore be easier, under the latter, to normatively justify our conduct. As an example, take Buck, et al.'s argument that climate engineering discourse might manifest unacceptable gender norms. Insofar as we act with respect to climate engineering, Buck, et al.'s argument presumably defines some obligation to mitigate this flaw. But we might fulfill this obligation through actions as disparate as drawing attention to the disparate local effects of climate engineering, and using language that does not fit into the masculinist engineering paradigm. The risk, when considering these more general assessments of climate engineering, is that they become so vague as to be useless in guiding our actions.

V. Conclusion

In Section II, I first argued that Gardiner's argument against climate engineering is, at worst, unpersuasive, and at best, superfluous. Probably it is both. His argument is *unpersuasive* because *the Challenge* is vague and implausible, and because "rocking the boat" is significantly disanalogous from most plausible climate engineering scenarios. His argument is *superfluous* because the ethical concerns it introduces about climate engineering can be expressed more conveniently in other terms, particularly those of consequentialism. Gardiner purports, in setting out *the Challenge* and "rocking the boat," to move our ethical analysis of climate engineering beyond familiar consequentialist terms, into the language of virtue ethics, and thereby to argue that we should hold a strong presumption against climate engineering. But if my argument succeeds, then Gardiner has failed in this task. Moreover, my argument indicates that virtue ethical arguments will likely face significant difficulties in establishing unique, trumping

concerns about climate engineering. Gardiner's is, in my view, the most robustly developed such argument specific to climate engineering. If Gardiner's fails, then the others will likely require further specification, so as to be differentiated from his. For those other arguments to carry the purported strength of Gardiner's, they will have to relate the virtue ethical failure of climate engineering to the deepest aspects of the lives of those responsible for it. My discussion of *the Challenge* suggests that persuasively doing so would be difficult, without falling into our usual consequentialist or deontological arguments.

In Section III, I canvassed three alternative virtue ethical arguments, *Revolution*, *Gender*, and *Hubris*, all of which criticize climate engineering as a technofix that would allow those responsible to elide important moral considerations. Descriptions of climate engineering as a technofix are commonplace. Clarifying those arguments is therefore important to our public discourse. I argued that *Hubris*, which is the most similar of the three to Gardiner's arguments about *the Challenge* and "rocking the boat," is not a promising basis for understanding the ethics of climate engineering. It rests on contestable metaphysical premises, purports to produce stronger conclusions than it warrants, and is too vague to guarantee that it would even apply to climate engineering. Perhaps most problematically, it also appears to rest upon a fallacious appeal to nature. *Revolution*, though perhaps more promising than *Hubris*, is significantly underspecified. Because of this, *Revolution* would be difficult to substantiate empirically, though this would be necessary to render the argument persuasive. *Revolution's* underspecification also leads it to raise concerns that are not specific to climate engineering, and that are therefore less likely to be valuable contributions to our public discourse. *Gender*, I argued, is the most plausible of the three. It provides a specific, plausible reason why climate engineering might fail to meet an important ethical criterion, and indicated how climate engineering policies might

avoid this failure. However, *Gender* is, in parts, conceptually underspecified. It would also require empirical evidence to count against engineering the climate.

In Section IV, I assessed the usefulness of certain intrinsic arguments about climate engineering. I argued that accepting Gardiner's description of climate engineering as tarnishing would impose a very strong upon us to prevent the engineering of the climate. However, under conditions in which climate engineering appears inevitable, treating climate engineering as tarnishing may lead us to a practically ineffective political strategy. We may therefore be morally obligated to act as if climate engineering were *not* tarnishing, by allowing it to proceed, while mitigating the evil that it would entail. I suggested that this disjuncture between our theoretical and our practical moral judgments may emerge because responsibility for climate engineering would be broadly distributed: even if climate engineering were tarnishing for humanity, it would probably not be tarnishing for most individuals. My discussion indicated more generally that virtue ethics is unlikely to produce an argument against climate engineering that would be both strong (in the sense of able to defeat most arguments in favor of engineering the climate) and practically relevant (in the sense of able to inform our judgments about how to act with respect to the engineering of the climate).

Where do my arguments leave climate engineering, ethically speaking? I conclude with four suggestions. First, even if we should avoid claiming that climate engineering would be tarnishing, we could still raise virtue ethical concerns about climate engineering, such as those identified by *Gender*. Though these concerns may not be decisive by themselves, they may enrich our ethical understanding. Because I analyzed three of the most thoroughly developed technofix arguments, however, it does seem unlikely that this frame will contribute further to our moral judgment. Any other plausible virtue ethical argument, then, would probably differ

substantially from any of those that I have discussed in this essay. We might begin to formulate a plausible alternative to the positions that I have discussed in this essay by examining the implications of climate engineering for our attitudes towards non-human life. Climate engineering, by enabling humanity to avoid some mitigation of climate change, almost ensures the further acidification of the oceans, to potentially devastating effect on marine life. I believe that we have good reason to worry, then, that climate engineering might allow us to instrumentalize beings that, arguably, have some intrinsic moral worth. My argument, in any case, leaves this possibility open.

Third, though we might reject Gardiner's arguments about "rocking the boat," or Hamilton's formulation of *Hubris*, insofar as they relate to "who we are," we might still consider them valuable as consequentialist warnings against naïve intervention into the natural world. As Gavin Schmidt, the NASA scientist whom Gardiner cites, explains, climate engineering clearly would require "huge informational resources…cannot guarantee success, and may make things worse."[138] We simply may not know enough about the climate right now to determine whether or not climate engineering would be justifiable, in the final determination. Gardiner and Hamilton remind us that under conditions such as these, we should remember the extent of our ignorance, before we assert our own moral purity. To be sure, we could reach this conclusion without Gardiner's and Hamilton's misleading arguments. But to the extent that their depictions of the "hubris" and the "callousness" of the climate engineer hold intuitive appeal, we might think that they could still play an important role in our moral deliberation, by making prudential advice more vivid.

Third, my arguments have provided no indication that any climate engineering policies would satisfy the concerns that I mentioned in Section I, relating to consequences and

[138] Gardiner, "Are We the Scum of the Earth?," 249.

governance. Though my essay focused on intrinsic challenges to climate engineering, these "policy" challenges are no less morally important. Indeed, they constitute, as I claimed above, the substance of almost all of our moral-political judgments about public policies. That climate engineering might be morally permissible in principle, in the sense that I have described in this essay, does not mean that it would be morally permissible in practice. In practice, climate engineering might be catastrophic. To name only a few possible outcomes, it might allow present generations to dominate future ones;[139] it might impose grave harms for which we could never provide suitable compensation;[140] and it might violate norms of distributive, intergenerational, and procedural justice.[141] Not all of these worries would be germane to all climate engineering policies, but they are neither irrelevant nor trivial. Indeed, these will likely remain among the central issues of climate policy for several decades, until humanity has avoided the worst of climate change—or succumbed to it.

Fourth, and finally, even if climate engineering *were* justifiable, Gardiner's question, "*has it really come to this?*" would not be misplaced. I do believe that if we greenhouse polluters had begun acting morally three decades ago—climate change first became a matter of serious public concern—we would not seriously consider engineering the climate. That we are considering shows that we have failed. By this, I do not mean that we have failed *the Challenge*. Rather, we have failed to respect the dignity of future generations, and of those already suffering today. We have failed, indeed, to extricate ourselves from the tides of narrow self-interest. We may feel only resignation when we think upon our failure. We may think that our politics here is doomed either to technocracy, or to cynical manipulation. But as Arendt reminds us, the

[139] Smith, "Domination and the Ethics of Solar Radiation Management."
[140] Robock, "Will Geoengineering with Solar Radiation Management Ever Be Used?," 203.
[141] Toby Svoboda et al., "Sulfate Aerosol Geoengineering: The Question of Justice," *Public Affairs Quarterly* 25, no. 3 (2011).

revolutionary tradition, the exemplar of politics as such, "appears abruptly, unexpectedly, and disappears again, under different mysterious conditions, as though it were a fata morgana."[142] There is hope in Arendt's words for a new politics of climate change, however ambiguous it may be, in which those whom our pollution starves and floods would appear to us as equals. By remembering that "it has come to this," we may not be able to summon this fata morgana, but we can at least recall how much time has past since it last appeared.

[142] Hannah Arendt, *Between Past and Future*(New York: Penguin, 2006), 5.

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