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The Pivotal Generation

"YOU ARE HERE"

The crucial role we fill, as moral beings, is as members of a cross-generational community, a community of beings who look before and after, who interpret the past in the light of the present, who see the future as growing out of the past, who see themselves as members of enduring families, nations, cultures, traditions.[1]

We continue to live on a stage where there is nothing but the present. Past and future alike have dissolved into a perpetual now, leaving us imprisoned in a moment without links backwards or forwards.[2]

Every decade is consequential in its own way, but the twenty-twenties will be consequential in a more or less permanent way. Global CO_2 emissions are now so high—in 2019, they hit a new record of forty-three billion metric tons—that ten more years of the same will be nothing short of cataclysmic.[3]

Illusions of Separation

Climate change is a matter of time. As we ordinarily think of time, now is the critical time for vigorous action to try to impose some limit on climate change. Human action or inaction during the next decade or so is likely to determine how severe climate change finally becomes. It is still—only barely—possible for us to act just in time to prevent the worst in spite of the fact that invaluable time has been thrown away by callous and corrupt political leaders who have largely wasted the last three decades since the Framework Convention on Climate Change was adopted with much fanfare in 1992 and by the executives in the fossil-fuel industry who have deceived and tricked the public and corrupted our politics so that they can continue business-as-usual for as long as possible.[4] That we still have the opportunity to act just in time makes us here and now the most important generation of humans to have lived with regard to the conditions of life on this planet for us and all the other species. We can be the "greatest generation" for the climate struggle or the miserably self-preoccupied and easily manipulated ones who failed to rise to the occasion and whom future generations will recall, if at all, with contempt. "Time is of the essence," as the lawyers phrase it in the contracts. The time is now, and the time is short. So those of us alive now are the pivotal generation in human history for the fate of our planet's livability.

Yet climate change is also a matter of time in a deeper, more philosophically interesting and morally consequential respect. Ordinarily, we divide time into past, present, and future, taking the here and now for ourselves as the reference point. In Hume's words, we "imagine our ancestors to be, in a manner, mounted above us, and our posterity to lie below us."[5] Nothing is wrong in general with time seeming to be a succession of my todays leading gradually out of my past and into my future. It is difficult enough to get out of bed in the morning when one's focus is simply on the day ahead. If one also always needed immediately to confront the ups and downs of the past as well as the likely ups and downs of

the future, it might seem, or indeed be, overwhelming. The neat conventional divisions into a long past and an indefinite future, separated by a manageably short present, is often helpful and for many purposes perfectly appropriate.

To some degree, we understand, however, that the segregation of our consciousness into present, past, and future is both a fiction and an oddly self-referential framework; your present was part of your mother's future, and your children's past will be in part your present. Again, nothing is generally wrong with structuring our consciousness of time in this conventional manner, and it often works well enough. In the case of climate change, however, the sharp division of time into past, present, and future has been desperately misleading and has, most importantly, hidden from view the extent of the responsibility of those of us alive now.[6] The narrowing of our consciousness of time smooths the way to divorcing ourselves from responsibility for developments in the past and the future with which our lives are in fact deeply intertwined. In the climate case, it is not that we face the facts but then deny our responsibility. It is that the realities are obscured from view by the partitioning of time, and so questions of responsibility toward the past and future do not arise naturally. Other times seem distant, and the people who then lived or will live in them appear to be irrelevant strangers. Acknowledgment of responsibility rests on recognition of connection. The climate connections are often not obvious.

Chapters to come will explore more fully some of the deep continuities inherent in climate change, but one obvious fact is the enormously long lead time built into some of the causal connections within climate. Carbon emissions injected into the atmosphere in a given year can contribute to forcing sea-level rise in not merely later centuries, but later millennia, dozens of centuries after the source of those emissions has disappeared from the earth. Some carbon emissions released early in the Industrial Revolution are yet to have their full effect, which still lies in the future. Present and future emissions matter as much as they do only because of

past emissions and their long-lasting effects stretching far beyond the date of their release and on through the present. These long-lived connections provide a radically different example of the insight about psychology and culture from one of the characters created by my fellow Southerner William Faulkner: "The past is never dead—it is not even past."[7]

And similarly long chains reach from the present into the future. Conventionally, we tend to think that the future is yet to be born or is even only just beginning to be conceived. But the climate future was already beginning to take shape when humans started centuries ago to inject more carbon into the atmosphere than the usual climate dynamics could handle in the usual ways, and climate parameters were forced to start changing. The vast and accelerating carbon emissions of the late twentieth century and the early twenty-first century are building minimum floors under the extent of climate change in future centuries, barring radically innovative corrections of kinds that may or may not be possible and that we will discuss more fully in chapter 4. "The modes of common life that have arisen largely within the last one hundred years, and whose intensity has accelerated only since 1945, are shaping the planet for the next one thousand years, and perhaps the next 50,000."[8] The future is not inaccessible—we hold its fundamental parameters in our hands, and we are shaping them now. In this respect, the future is not unborn—it is not even future.

"The evil that men do lives after them, the good is oft interred with their bones," declared Shakespeare's character Mark Antony.[9] As an old man who, on the probabilities, ought to die fairly soon himself, I take considerable comfort in the knowledge that this dark assertion is an overbroad and skewed generalization (spoken as part of Mark Antony's maneuvers at Caesar's highly political funeral). The reach of the present—what we who are alive can set into motion—extends far across time for good as well as evil. In some cases—climate change is one—our reach will be long and deep, millennial and profound, whether we wish it or not. And we can make its outcomes good—or, at worst, far better than they

would have been had we continued as we are headed now. One does better to heed what seems more likely to be Shakespeare's own voice and "to love that well which thou must leave ere long."[10]

The generation alive now is the pivotal generation in human history with regard to climate change, because of three features of our historical context. And our responsibilities are awesome especially because of the implications of the third feature. We can first glance at the context and then begin to explore the grounds of responsibility.

The Context That Makes Us Pivotal

First, previous generations of humans have for around two centuries been changing our climate unintentionally and have left us with a global energy regime that now profoundly, progressively, and systematically forces the climate to change. The massive emissions of greenhouse gases (GHGs) that have resulted from the Industrial Revolution (and from the changes in the use of land, such as deforestation and the draining of wetlands, produced by the industrialization of agriculture) are disrupting the climate to which we and other living species had adapted over the previous ten thousand years of the Holocene.

Second, we are the first humans to understand the essential dynamics of our planet's climate; consequently, we have become aware of humanity's unintended subversion of its own environment through its uninformed past choices of energy sources. Scientists whose work is relevant to climate have produced remarkable—sometimes stunning—results. Much uncertainty remains, of course, but the basic outlines of climate science are clear—and far more advanced than they were only a few decades ago.[11] This impressive new knowledge puts us for the first time in a position to affect the climate intentionally by escaping from our inherited energy regime and to act on transition plans that have a reasonable chance of accomplishing their goals. Humans have been and still are in fact radically changing the planet's climate

without any plan, but we are newly in the position to try to get a grip on the effects of our own behavior and attempt to exercise some intentional control.

Third, specifically what the science shows is that the default outcome is that the situation will become progressively worse, and human economic business-as-usual will make the future more threatening than the past for most living species—certainly including many humans, especially those with the fewest resources with which to adapt to the rapid, interacting changes.[12] Our unintended changes are rapidly undermining our own security. Therefore, we are not only the first to be able to understand what to do, but—most importantly—we may also be the last to be in a position to act before we exacerbate some major threats. This gives us an awesome responsibility. Humans have accidentally set our own house on fire, and if we do not douse the flames while they are no more extensive than they are now, it may not be possible ever to extinguish them. It is urgent for humans to get a grip on what we in aggregate are doing to the planet on which we live by blindly continuing the combustion of fossil fuels (and the destruction of natural ecosystems by industrial agribusiness) and instead to employ our recently gained knowledge of the climate system to design a transition to an energy regime that does not undermine our civilization.

Annual global carbon emissions in 2019 were the highest ever,[13] after a quarter century of mostly empty talk about tackling climate change, and the long-term trajectory of carbon emissions is at present sharply upward. Accordingly, the cumulative atmospheric accumulation of CO_2 reached its highest point in human history of 421.21 ppm in April 2021.[14] If other greenhouse gases like methane are also counted, the atmospheric accumulation was already in December 2020 the equivalent of about 500 ppm of CO_2.[15] The pre-Industrial-Revolution level was around 270 ppm, so doubling is well within sight. The explanation of why inaction would see matters worsen, and action is therefore urgent, is empirical and draws on various aspects of science. It is briefly summarized in

the first chapter of a special report of the Intergovernmental Panel on Climate Change, *Global Warming of 1.5 °C*, usually referred to informally as the "Special Report on 1.5."[16] Here is the short version: because climate change is primarily driven by the cumulative atmospheric concentration of carbon dioxide (CO_2), and CO_2 that reaches the atmosphere is extraordinarily persistent, climate change will not stop becoming more severe until injections of CO_2 into the atmosphere completely stop—that is, until human society reaches net zero carbon. For any given degree of climate change, there is a budget of cumulative atmospheric carbon: more carbon, more change. To limit average global temperature rise to 1.5°C, annual global net anthropogenic CO_2 emissions must decline by about 45% from 2010 levels by 2030 and reach net zero around 2050; to limit the rise to below 2°C, CO_2 emissions must decline by about 25% by 2030 and reach net zero around 2070.[17]

If one follows the science, one can see why carbon emissions must rapidly be brought to net zero globally if future generations are to live securely. Every society's energy system needs to be completely decarbonized by totally eliminating the use of fossil fuels in order to stop the accumulation of carbon in the atmosphere within a relatively tolerable cumulative carbon budget. The *minimum* necessary for the safety of future generations, then, is a prompt global Energy Revolution. We are the pivotal generation, the only ones who can set the revolution strongly into motion while there is still time.

What I want to begin to explore a bit here, and elaborate in later chapters, is why we current humans ought to take the actions that are urgently necessary to stop climate change from becoming increasingly dangerous. The philosophically uninteresting reasons are self-interested, and there are tons of those. For example, the kind of megawildfires recently experienced in California and Australia as a result of climate-change-induced drought and heat produced horrifying human deaths and misery and monumental economic costs, including the contentious bankruptcy of the largest California utility, PG&E, which in turn threatens important

renewable energy firms that were counting on long-term contracts with PG&E, which in turn undermines the firms' efforts to stay in business and provide energy without producing the damaging carbon emissions that contributed to the conditions for the wildfires—one downward social cascade.[18] We obviously need to protect ourselves from such economic vicious circles that undermine our own current interests.

Arbitrary Demands?

The focus in this book will instead be the converging moral reasons for action, which turn out to be multiple. I will concentrate on why we ought to act urgently and vigorously enough to protect future people from what will otherwise be the effects of perpetuating our present way of life permeated by an energy regime dominated by fossil fuels—why we ought to change to a way of life fit for a future on the carbon-sensitive planet we happen to live on.[19] The science demonstrates that if robust and extensive action is not taken, conditions for living things will be progressively more challenging and threatening. The remaining practical question is, why should we now have to do more than the very substantial amount that is already in our own interest? Climate change will worsen until it is limited, but a global Energy Revolution in the next couple of decades sounds like a heavy lift. Why should we in the here and now be expected to do so much? Does this not seem arbitrarily demanding?

For a start, that particular reaction seems at least as arbitrary as the situation might seem. One can focus on oneself and feel sorry for oneself: why poor me? But short-term and narrow self-interestedness is not inevitable, however easy, and it is no less reasonable to have a broader focus, on the rest of the planet besides oneself and on time beyond the immediate future, and to embrace the situation as an exciting opportunity to lead a meaningful and valuable life that could benefit people in the future—perhaps even all future people—or at least avoid depriving them of good

options. How should one feel? Which attitude should one adopt? Should one resent the "burden" or embrace the "challenge"? Does the task demand inordinate sacrifice, or is it a historic opportunity to do something exceptionally worthwhile?

Our historical circumstances open up an intriguing prospect: what if some generations are called upon to meet challenges, or even to make sacrifices, that are unique to them? That do not fit any standard formula? Could this be? Climate scientists are telling us that we are now moving through an utterly crucial juncture. For a century and a half, carbon emissions were steadily climbing. Then, for the last three decades, they have been soaring: more than half of all the emissions since 1850 have occurred since 1986.[20] Now we must quickly make emissions level off and then "bend the emissions curve downward"—launch a steady decline in emissions at an angle across time that will bring the world to net zero carbon in two or three decades—certainly within the middle years of the lives of those who are now under forty years old.

Otherwise, the only ways to hold total cumulative emissions to any total compatible with any remotely tolerable amount of temperature rise, and of all the other manifestations of climate change, would be either a later precipitous plunge in carbon emissions that is probably politically and economically impossible and would be utterly catastrophic socially if it actually occurred; or miraculous amounts of carbon capture and storage (CCS), carbon dioxide removal (CDR), or solar radiation management (SRM), technologies in which the fossil-fuel companies have for decades steadfastly refused to invest, preferring to pour capital into exploration and production of more and more of the fuel that must never be burned without some such technologies. The choices, then, are in fact only four: dangerous levels of climate change from too much CO_2 accumulated in the atmosphere; a steady and sharp decline in emissions starting immediately; an unmanageable collapse in emissions later; or infeasible levels of CCS, CDR, SRM, or other geo-engineering technologies.[21] I am obviously omitting the shading in the picture, but this is the general outline.

Any way you slice it, it is absolutely crucial what the current generation does now. This is it. We face what in another context Martin Luther King Jr. called "the fierce urgency of Now."[22] But this may seem to ask too much of the current generation, each member of which is living the only life she will ever live and has some rights to enjoy. How, in the Churchillian phrase, could so much be asked of so few? Isn't the burden of promptly and firmly initiating a global Energy Revolution too heavy for the current generation alone to be expected to bear?

Unique Historical Period, Incomparable Moral Responsibility

This question about the perhaps exceptional extent of this generation's responsibility is difficult to consider in a sensible manner, and I explore this topic further in the second half of chapter 3 and in chapter 4. As people ordinarily think of generations, at any given time three generations are alive: grandparents, parents, and children. From here on, I refer to these three together, however, simply as "the current generation"—those alive now. The heart of one implicit complaint seems to be that it is somehow unfair to the current generation that the challenges we face are so much greater than what one might think is "the average burden for the average generation"—it's altogether too much to ask.

That, however, is an oddly ahistorical way of thinking, a bit like asking why I couldn't have been born into some other, pleasanter century. Perhaps the allusion to Churchill provides a hint. Was it fair that the so-called greatest generation of the 1940s had to confront the Nazis by themselves? Wouldn't it have been fairer if the task could have been shared with, say, the people of the laid-back 1960s (when I was "military age")? But the people of the 1960s could have helped to defeat the Nazis only if the Nazis were still undefeated in the 1960s, presumably by then much more entrenched. It is a good thing for all the rest of us who have

followed that the generation of the 1940s rose fully to the occasion, and we remember them proudly.

Decades and centuries are not standardized, and we have no reason to expect the challenges they bring to be comparable. While reasonable sacrifices by individuals certainly have some limit, that limit seems to have nothing to do with any notion of standard generational burdens, a notion that could only be made to seem plausible by ignoring historical context. A complaint that burdens are unfair makes sense only if those burdens could be redistributed and thereby made fairer, but most large-scale historical challenges cannot be postponed, rescheduled for a more convenient time, or subdivided among different generations. Of course, some threats, if ignored, die away on their own. Other threats, if not met when their outcome is still up for grabs, build momentum or become entrenched and create radically new realities on the ground. Defeating them later may be harder than defeating them now, if it is even still possible. Contingent facts matter, and one must choose one's fights knowledgeably.

For better or for worse, you live at the time when you live. You confront what you confront. "You are here," as the street maps say. You can embrace your historical location or curse it—you are free in your response—but this response will have the effects that such a response has in such circumstances, at this point in history. You choose your response, but history, made by the earlier responses of others to their own circumstances, provides your social circumstances, which interact with your response to produce your effects and the different social circumstances to be faced by future generations.

We youths of the 1960s could not help with the battles of the 1940s because one cannot reach backward through history. The Hubble Telescope can show us what happened millions of years ago, but it does not enable us to intervene retroactively and change the universe's course. For purposes of action, time—for us humans, history—moves only forward. A complaint about generational

unfairness in the case of historically embedded current challenges fundamentally makes no sense: no lighter schedule of imminent tasks is possible. The only alternatives we have are the responses actually available now. Historical context matters.

Moreover, while one cannot reach back to effect change, one can reach forward. In fact, one cannot avoid reaching forward! It is not that we could decide, if we wished, to stretch out and change future history, as if "history itself" were somehow already going to go in one direction of its own until people bent around and diverted it into a different direction from the one originally set. Unavoidably, we are partly making the future, like it or not: the human future, the planet's future, will head in the direction we set.

Historical context matters, but so do human action and choice. More precisely, future people's starting place will be where we leave off. The future is partly in the present. History is a continuing drama with narrative threads running through many generations, and we humans are powerful players in the drama. If we leave a planet with a climate still dominated by a fossil-fuel regime, the next generations will have to struggle to escape from this regime within the far worse climate that continuous combustion of fossil fuels will have produced by then, because we did not arrange a timely escape. Future people cannot reduce our challenges, but we—and only we—can reduce theirs. Or, we can indulge existing consumption habits and energy practices to make their challenges worse—our choice, their inheritance.

In the remainder of this introductory chapter, I want to separate out three closely connected reasons why it is especially important that our generation makes an exceptionally robust effort on climate change: (1) future generations will very likely face burdens and dangers greater than ours, (2) the worsening dangers are currently unlimited, and (3) less effort by us may well allow climate change to pass critical tipping points. In sum, the burdens and dangers for future generations will probably be worse and are now worsening, are still without limit, and are potentially unbearable.

That is why the struggle to stop the destabilization of the climate is our generation's fight.

Heavier Burdens

In the past, when philosophers and economists have thought about principles of intergenerational justice, they have usually assumed that there must be some kind of standard formula—for example, a single discount rate—that can be applied reiteratively. John Rawls, for example, originally wrote that when we are considering what principle should guide the current generation's relation to the next, we should ask what principle we could have expected the previous generation to have adopted with regard to us—a kind of slightly asymmetric intergenerational Golden Rule.[23] The previous people should have done such-and-such for the current people, and the current people should do about the same, but perhaps a bit more or a bit less, for the next people.[24]

Rawls's approach seems to me unhelpful for climate change because of three of its assumptions. The first is the one criticized in the previous section: that one can adequately characterize the situation faced by every generation in general terms in the abstract as if history had no integral fabric with periods of war and periods of peace, times of stability and times of disruption. Different generations may confront radically different circumstances demanding incommensurable types and levels of burdens and opportunities. His comment that "presumably this rate changes depending upon the state of society" does not seem to capture with sufficient vividness how extreme the differences between even adjacent generations can be in the wake of some exponential change.[25] Ideal theory cannot guide us.

Second, he formulates the obligations as exclusively between adjacent generations (with reiterations), without serious examination of possible direct obligations now to whoever lives in the distant future, whose situation needs to be taken seriously by current planning in the context of a phenomenon like climate change

that locks in effects over millennia. The time lags between cause and effect in the dynamics of the climate system are far longer than most causal connections we ordinarily encounter.

The third is that what Rawls sees as called for on behalf of future people are mainly positive contributions: how much should we save for them? However, our current effects with regard to climate change on whichever people live in future is in fact quite different and potentially much more negative. All decisions about the degree of ambition for emissions mitigation in the present are unavoidably also decisions about how to distribute risks and burdens forward among this generation and multiple future generations, as we will see more clearly in the section on "Bequeathing Risks" in chapter 4. The less risk we bear, the more risk others bear. The avoidance of damage—and protection against damage—looms larger than the provision of savings, although the provision of alternative energy technology, which is a kind of embodied savings, is a crucial element in avoiding damage and disruption.[26]

Mitigation is more ambitious insofar as it contributes to reaching zero emissions of CO_2 globally at an earlier date—and therefore at a lower level of cumulative atmospheric accumulation of CO_2 and resultant climate change. That the extent of our efforts profoundly affects future climate dangers is fairly obvious. Even if there were one fixed quantity of risks that had to be dealt with by some combination of people now and people later, the fewer the risks that were dealt with by people now, the more of those same tasks would remain to be dealt with by people later, along with the tasks that would in any case arise only later. Of course, tasks for which now is the last chance may simply go forever unfulfilled.

But since over time the climate risks specifically are in fact expanding in number, increasing in severity, and in some cases feeding upon each other, that fewer of the present tasks are tackled means not only that relatively more of them may remain to be tackled in the future, if it is not then already too late, but also that the number and seriousness of the dangers will be absolutely greater than if we had acted decisively, because our failure to deal

with current threats will leave open doors to danger that we could have closed. Not only may some of the original risks remain still to be tackled, but additional risks that could earlier have been headed off entirely will instead have emerged and need to be confronted too.

Positive feedbacks cause some climate risks to reinforce others. For instance, when the white Arctic sea ice melts, the dark ocean water uncovered absorbs more heat than the white ice used to, and so the warming water melts the remaining sea ice faster still, revealing even more dark water. This is the primary reason the Arctic has warmed far faster than the remainder of the planet (which scientists call "polar enhancement" of temperature rise). I will look at feedbacks later in this chapter. For now, let us simply note that unless climate change is stopped, it will grow worse because, for one thing, in crucial respects it feeds on itself.

If we allow climate change to grow by unpredictable increments of severity over an unspecified further expanse of time, the burdens that fall upon some future generations may vastly exceed the burdens that we face now. And they will become heavier then than they would have been if we had acted more energetically now. Thus, the threats to whoever lives in future generations will be more severe by two distinguishable standards: more serious than ours are now and more serious than the burdens then would have become if we had acted otherwise. Is it fair to leave future people to face a much harder, and increasingly hard, challenge because we refused to face an easier one?

These heavier climate burdens also come in two distinguishable varieties: the biophysical and the sociopolitical. On the one hand, as long as CO_2 continues to be emitted by human economic activities, physical climate change will become progressively worse because it is the long-lived cumulative concentration of CO_2 in the atmosphere that is the primary driver of climate change. (1) The more cumulative CO_2 in the atmosphere, the greater climate change. In addition, climate change feeds on itself through positive feedbacks. (2) The more climate change, the greater climate change still. These are physical sources of heavier burdens

for future humans for as long as the carbon emissions that drive climate change are not brought under control.

On the other hand, the current sociopolitical situation in at least the nations with the wealth and power—not in Yemen, not in Syria, not in Eastern Congo, but in most affluent countries—is relatively malleable, or at least not desperate, compared to the situation that is likely to arise in the future if climate change is permitted to worsen unabated. The current situation is unfavorable to climate action in important respects; for example, fossil-fuel interests now control the legislative branch of the US federal government and the Russian, Saudi, Australian, and Brazilian governments. The United States in particular confronts migrants fleeing oppression and poverty in Central America that is exacerbated by droughts and hurricanes worsened by climate change. US social discourse is increasingly uncivil and bitterly partisan, repeated local massacres are carried out with unregulated guns including military weapons, and Black citizens are regularly murdered by White police. Nevertheless, major nonviolent social change, including radical change in the energy system, still appears to be possible and recently to have become likely, although extremist violence is also growing. Neither the sociopolitical situation, which I discuss more fully in chapter 5 in the context of what action to take next, nor the physical climatic situation is yet completely out of control or impossible to change through essentially normal political action.

At some unpredictable time, if climate change continues to worsen, some phenomenon such as genuinely massive migrant flows—external or internal, from flooded coastal cities—may come to seem so threatening that the prospects for civil, cooperative, constructive responses are likely to decline much further and perhaps give way to social conflict. These are highly complex social phenomena, and I do not want to speculate. The fact is simply that, however unfavorable to cooperative action on climate change one thinks the political situation is now, politics could become much more dysfunctional, with social disruptions that would further

smooth the path for demagogues with pseudosolutions and nationalists blind to global solutions, and such domestic deterioration could create higher obstacles to constructive international cooperation on problems that cannot be dealt with by individual societies. If we cannot accomplish positive multilateral action on climate change in our present situation, however absolutely good or bad one thinks it is, there is good reason to believe that positive action could become relatively much harder precisely when the physical/climatic threats themselves worsen. Future people, in sum, could face worse climate threats in less favorable sociopolitical circumstances with more violent and misinformed opposition. The challenges for future people will be greater than ours almost no matter what. The challenges will be greater still than they would have been if we do not do what urgently needs to be done now.

Unlimited Threats

More telling still is the crucial fact that, so far, we have failed to place any outer limit on the severity of climate change, either its physical manifestations or its sociopolitical effects. For now, physical climate change can simply worsen indefinitely. If certain tasks must be done sooner or later, and if we complete fewer of them, other people in future will need to do more. But climate change is not so benign. It is not merely that we may leave work against the dangers unfinished—the dangers are multiplying, thanks to our continuing profligate combustion of fossil fuel. If we do less now, the worst in future will not only be worse than it otherwise would have been, but, as of now, worse without constraint. Specifically, until CO_2 emissions reach net zero, there will be no limit on how severe climate change must become. It is intolerable that we should acquiesce in contributing to a potential runaway global danger.

If any human duty is unconditional, it is the duty to preserve the fundamental conditions, including the physical preconditions, of human society by avoiding dangerous threats to those

conditions. Yet in blindly toying with the climate, we are daring to experiment with modifying these very preconditions of human physical and social life, in a manner famously noted well over half a century ago by Roger Revelle and Hans E. Suess: "Human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future. Within a few centuries we are returning to the atmosphere and oceans the concentrated organic carbon stored in sedimentary rocks over hundreds of millions of years."[27] Equally famously, and more sardonically, another great climate scientist, Wallace Broecker, quipped, "The climate system is an angry beast and we are poking it with sticks."[28]

No responsible scientist believes that climate change is yet fixed on a trajectory toward human extinction. But numerous scientists have embraced the idea that we should think of the period of history that we have recently entered as the "Anthropocene" because this has become an age in which the most powerful force changing our planet is aggregate human activity, including centrally the anthropogenic emissions that are increasingly modifying the planet's climate.[29] Without intending to, we are gradually wresting control of the climate, among other things, from the natural forces that used to determine it. Like someone who knocks the rider out of the saddle of a galloping horse and climbs on without knowing how to ride, we are taking control away without gaining control ourselves or, chillingly, having any good plan about how to keep it. The planet's climate is being thrown into confusion by the originally unpredicted and unintended effects of growing human consumption powered by expanding carbon energy.

The most elementary advice given to people who planned to visit a casino in the days before ubiquitous credit cards and phone banking was to decide while they were still at home how much was the maximum amount they could afford to lose and take only that much cash with them. In other words, put a firm limit on maximum losses in the face of uncertainty. Those who opt for less ambitious mitigation than is readily possible are ignoring this

basic advice with regard to the well-being of future generations. They are leaving potential absolute losses for people in the future unbounded.

It is well established that as long as the atmospheric concentration of greenhouse gases—and especially CO_2—continues to expand, climate change will continue to become more severe.[30] And as long as CO_2 is emitted in amounts that produce net additions to the atmospheric concentration, that concentration will of course continue to expand. Accordingly, until global carbon emissions reach net zero, no outer limit on the maximum severity of climate change has been set. The severity of climate change can worsen indefinitely until carbon emissions reach zero. Decarbonization must be thorough and prompt to cap the atmospheric concentration, which requires vastly more ambitious mitigation than nations are currently committed to. The less ambitious mitigation is, the later the date that the atmospheric accumulation will stabilize. As long as climate change remains unbounded, the costs of the gamble inflicted upon future generations has no upper limit. This imposed gamble is explored more fully in "Bequeathing Risks" in chapter 4.

I should be more explicit about what I mean here by "unlimited," by which I am not claiming that the climate will change an infinite amount. And by "limited" climate change I do not mean a climate that completely stops changing and never changes again. As some opponents of action to slow the current climate change like to point out, the climate has always changed and will always change. The climate of the earth will always be influenced by changes in the earth's orientation toward the sun, and many other nonhuman factors.[31] I restrict "limited" and "unlimited" to anthropogenic change. Unlimited anthropogenic climate change is the maximum climate change that humans can cause. Limited climate change is less change than humans could have caused. So when I say that climate change is currently unlimited, I mean that nothing currently stands in the way of anthropogenic climate change becoming maximum anthropogenic climate change. We

are currently on course to do however much damage to the climate of our own planet humans are capable of doing. But "anthropogenic" is a long word, so I will not keep repeating this qualifier.

The sociopolitical downside also remains unlimited. This is chilling. Unbounded danger is difficult to judge judiciously. Human beings at their best are inexpressibly remarkable, with their indomitable spirits and their unrelenting resilience. I do not recommend generally betting against the human race. And yet, human civilization can be surprisingly fragile. Remember the armed looters in the British Virgin Islands and St. Martin after Hurricane Irma in 2017, stealing food and water from their neighbors, as often happens after disasters. Remember how quickly the Hungarian government of authoritarian Victor Orbán fenced out all Syrian refugees. Remember the rabid insurrectionists at the US Capitol in 2021, beating fallen police with flag poles. Somewhere in the shadows of stress, the social norms begin to tear.

That physical stresses lead to conflicting political demands, which themselves can rend the social fabric, is hardly a new insight. One may have supposed that Thomas Hobbes was displaying a capacity for dystopian imagination when he wrote, "There is no place for industry, because the fruit thereof is uncertain, and consequently no culture of the earth; no navigation, nor use of the commodities that may be imported by sea; no commodious building; . . . no arts; no letters; no society. And, which is worst of all, continual fear and danger of violent death; and the life of man, solitary, poor, nasty, brutish and short."[32] But according to Geoffrey Parker's monumental global history, *Global Crisis: War, Climate Change & Catastrophe in the Seventeenth Century*, Hobbes actually needed only to look around at the state of the world in what we now have understood as the heart of "the Little Ice Age"—roughly, the 1640s to the 1690s.[33]

The Little Ice Age consisted of climate change of only a single degree of average global temperature—downward, not upward, of course—but this modest bit of climate change, and especially the resultant disturbances to agricultural production and food prices,

were one side of what Parker aptly calls a "fatal synergy" that was an exacerbating factor in a global mélange of troubles, ranging from the Thirty Years War in Europe to the violent Ming/Qing transition in China. Well before large numbers of individual people will collapse from heat stress from climate heating in the twenty-first century, their societies will be liable, at some unpredictable point, to become incapable of farsightedness, fairness, or even cooperation, and to disintegrate into conflicts over places to live and places to grow food, and over priorities for the distribution of these places.[34]

Yale historian Timothy Snyder has marked one more recent pathway steeply downward:

> When an apocalypse is on the horizon, waiting for scientific solutions seems senseless, struggle seems natural, and demagogues of blood and soil come to the fore. A sound policy for our world, then, would be one that keeps the fear of planetary catastrophe as far away as possible. This means accepting the autonomy of science from politics, and making the political choice to support the pertinent kinds of science that will allow conventional politics to proceed. . . . As Hitler demonstrated during the Great Depression, humans are able to portray a looming crisis in such a way as to justify drastic measures in the present.[35]

In the sociopolitical arena too, it is wise to call a halt well short of any cliff edges.

Let me be explicit about what I am not suggesting. In recent decades, it has become almost a reflex among moral philosophers to assert that climate action is urgent because otherwise the apocalypse is around the corner. I do not think that the apocalypse is around the corner—nor is human extinction, nor even—just yet—is the Hobbesian unraveling of civilization that I am invoking.[36] For now, I am appealing only to the solid fact that all such threatening possibilities (and many others less serious than these, but still serious) persist until we stop feeding climate change. Each

kind of disaster is possible and can be reached easily from the route that we are now on, until limits make it impossible. A climate that is worsening indefinitely leaves all bad options open. We have inadvertently opened the barn door, and some of the horses have bolted. But other valuable horses, for reasons of their own, have lingered in the barn. For now, nothing is stopping them from leaving too. It is past time, then, to relock the barn door securely and save all that can still be saved.[37]

It would be reprehensible to take no action even if indefinitely worsening climate change were a purely natural phenomenon. (If it were purely natural, it would be more difficult to figure out how to go about slowing it down.) Yet, for us simply to sit idly by and watch anthropogenic climate change become progressively worse and prepare to engulf future people would be even more shameful and pathetically weak. And since we are in fact driving climate change with our own GHGs, especially our carbon emissions, we do at least understand what needs to be done for us to stop making conditions worse by our own behavior. And it is obviously all the more our responsibility—a negative one simply not to wreak havoc—for its being driven by our own actions.

Scientists have clearly explained various mechanisms by which climate change could escalate in severity, and empirical findings show that we are provoking, or coming near to provoking, particular ones of these mechanisms. I have previously tried to establish that if one understands the mechanisms, and one is finding evidence that one of them is being activated, that is all one needs to know for action to be required.[38] Lauren Hartzell-Nichols has developed this kind of argument extensively in her book *A Climate of Risk*.[39] One strength of this argument is that it has relatively weak premises: only the theoretical claim that mechanisms are understood, and the empirical claim that evidence is accumulating that the mechanisms are being engaged.

When one adds to the satisfaction of those two premises the fact that no limit has been established on how dangerous climate change may become,[40] it is utterly irresponsible for those of us

alive now not to do our utmost to limit, at the very least, our own contributions to the future danger and instead to continue the present practices—most notably, casually burning vast quantities of fossil fuel—that are adding continuously to the mushrooming danger. On the one hand, how much, if anything, the people alive at a given time ought to do positively with regard to whichever people are yet to come, numbers and identities of whom are of course unknown because neither numbers nor identities have yet been determined by events including our choices, is a contested matter. Ought we to try only to see that they are no worse off than we are?[41] Should we try to make their lives better than ours, with or without discounting? And so forth.

On the other hand, the additional consideration here is comparatively and absolutely less controversial: we ought not to continue to increase dangers to future people—potentially, all future people—without limit when we understand the mechanisms by which the dangers can increase and have evidence that the mechanisms are in motion. I cannot imagine a plausible moral view that would not embrace this imperative. To deny this negative imperative would accord zero value, worth, and respect to numberless future people. To reject it would constitute calmly contemplating the possible undermining of the necessary conditions for civilized societies and even the possible creation of the sufficient conditions for human extinction, since climate change can produce levels of heat and other phenomena that humans cannot endure.

Tipping Points

We have in addition another compelling reason for robust immediate action in recently acquired understanding of the dynamics of the planetary climate. While we are discussing climate change that is anthropogenic, it is crucial to keep in mind that whenever human action sets off positive feedbacks, what was originally anthropogenic to some degree takes on a life of its own.[42] Andreas Malm characterizes it nicely: "Society having touched

off climate change, nature does the rest of the work. . . . Global warming is not built but triggered."[43] We are confronting climate change that is initiated by humans, but this increasingly includes the positive feedbacks produced by the already operative climate dynamics into which we are recklessly intruding. Extensive theoretical understanding and solid evidence suggest that we are in fact approaching a number of critical "tipping points," such as threshold ocean surface temperatures that will precipitate the collapse of massive Antarctic ice sheets and Greenland ice sheets, driving sea levels much higher and gradually inundating sea coasts around the world and driving populations out of cities with locations like Mumbai, Shanghai, Miami, and New York—and, of course, much of The Netherlands and Bangladesh.[44] While the current climate change is anthropogenic—driven by society's failure to mobilize against the primitive and dirty energy sources of coal, oil, and gas—the direct changes provoke natural responses that feed into further change. In short, while humans began the process, it could run away. Notoriously but horribly, natural species have been rapidly crashing for years.[45]

If enough positive feedbacks fed into each other to launch what the scientists call a cascade of positive feedbacks, it could lead to a "Hothouse Earth."[46] These scientists are now suggesting that a cascade is liable to begin soon if we persist in our failure to take prompt and serious measures to reduce carbon emissions. In my argument here, however, I pull back to the simple fact that for now cascades remain possible because climate change remains unlimited. I do not rely on an assumption that a cascade of positive feedbacks is definitely about to begin or even that it is likely to begin, although this may very well be true. I assume only that an anthropogenically launched cascade is entirely possible because various individual tipping points are likely to be passed as long as climate change continues without restraint.

It is, then, *likely* that the near future is the last chance to avoid passing significant tipping points and entirely *possible* that the near future is the last chance to avoid provoking a cascade of tipping

points.[47] These tipping points are significant because they unleash either or both of two conceptually separable but often empirically inseparable processes. Passing a tipping point means triggering irreversible change, and frequently these irreversible changes themselves also become long-term positive feedbacks, sometimes exacerbating other processes of climate change so that they become exponential, a "cascade." Conceptually, a change's being irreversible and a change's being a positive feedback are two different matters. (And changes' being at any given time unlimited in number is a third matter.)

Obviously, even an irreversible change that was not a positive feedback would still by itself contribute to making climate change worse until it ran its course. If the melting of an ice sheet becomes irreversible, the melting will contribute to sea-level rise (because the water in ice sheets now rests on land) until the ice has all melted. When the ice is all gone, that particular process will stop. This melting may be irreversible, but the process need not continue indefinitely. So a particular process could be irreversible, but also be limited, and not be the source of positive feedback.[48]

Nevertheless, if one process after another will contribute to making climate change worse, the overall climate change would worsen without limit, even if each contributing process would run a limited course, until all contributing processes had run their various courses. If the West Antarctic Ice Sheet melts, that will make sea-level rise worse until that ice is gone. If the Greenland Ice Sheet melts, it in turn will make sea-level rise worse until that ice is gone. So too the East Antarctic Ice Sheet.[49] Each case of melting is obviously constrained by the amount of ice available to melt, but the quantities are staggering. Recent calculations show "that Earth lost 28 trillion tonnes of ice between 1994 and 2017. . . . The rate of ice loss has risen by 57% since the 1990s."[50] Climate change—here, sea-level rise—can continue until all the ice in all the ice sheets is gone. At some point, many millennia from now, the residual effects of humans might fade out, especially if humans are gone. Or perhaps the course of geological history would have

been forever diverted from the path it would otherwise have followed if humans had not existed and created an Industrial Revolution based on moving carbon from under the earth into the air. Either way, the damage caused would be immeasurable.

Conclusion

I have separated out three conceptually distinct strands of the basis for urgent and robust action to stop climate change from worsening: inevitably more difficult challenges for future people, no limit yet on the extent to which humans will modify the climate, and the danger of passing critical points of no return: tipping points that launch irreversible change. What is truly scary is empirical combinations of two or more of these factors, especially if one of the factors is the third: passing tipping points for abrupt worsening. For instance, it is already worrying that we have so far imposed no limit on the disruption that we are causing to the climate, but that could mean only that we were very slowly and incrementally making matters worse for a while. But if we leave the disruption unlimited for long enough that we meanwhile pass critical tipping points like initiating irreversible melting of additional major ice sheets, then the most limited that the damage can possibly ever be will be far worse than otherwise. The other side of the coin, of course, is that if we throw ourselves into the effort, we can make a huge positive difference for the lives of virtually every future person who lives on this planet.

The processes sketched just above are concrete embodiments of the reality that time is continuous, not partitioned, except for practical convenience in our own consciousness. Any attempted separation of the flow of human history, its causes, its effects, and the responsibilities of those of us who will unavoidably contribute to the future direction of the flow into discrete periods is at best an oversimplification and often an illusion or an evasion. I live amid the wealth, ease, and technological wonders of a postindustrial society only because of the fossil-fuel combustion that drove the

Industrial Revolution in my past and created my present standard of living. My present immersion in a growth-obsessed, plastic-strangled consumerist society that still burns ever more fossil fuels each year (except the pandemic year of 2020) is locking in critical and dangerous features of the future climate of people I erringly tend to think of as distant strangers. For me to deny that this past and this future are part of who I am and what I do would be to fail to acknowledge fundamental realities and to shirk inescapable responsibilities. Or so I will try further to show in what follows.

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