A Historian's Handbook for Saving the World

Responding to the Global Climate Emergency

edited by Alexandra Hui and Emily Pawley

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Responding to the Global Climate Emergency

edited by Alexandra Hui and Emily Pawley

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Introduction

Alexandra Hui and Emily Pawley

Soon after the birth of my first child, especially sensitive to the ebb and flow of both postnatal hormone surges and grim news of droughts and hurricanes, I (Alix) descended into a crisis of sorts. Surely I, a smart, healthy, well-organized person, should do more to respond to the climate emergency. Surely I should quit my tenured position at a large research university and return to school to study climate science. Or, alternatively, surely I, a smart, healthy, well-organized, *charismatic* person, should quit my job and become . . . a politician? A policy analyst? Fundamentally, it seemed that there was little I could do as a historian that was helpful.

I poured all of this out to an environmental historian colleague while he was trying to walk past my office door to get to the bathroom. He gently disagreed. He said that I was doing more good by teaching my students—nearly half of whom are first-generation college students, the vast majority from the rural Deep South—than drilling ice cores. History mattered. The doing of history mattered. I chewed on this for several years and got some other projects off my desk. As the worst of the COVID-19 pandemic appeared to be lifting, I reached out to Emily Pawley, whom I had been quietly following on social media because she was part of various climate activist groups working around the edges of academia.

I (Emily) had had similar moments of horror. One came when I was teaching a "History of Climate Change" class in 2020. Pandemic Zoom meant my students were spread across zones of danger as well as time. Some jammed their windows closed but breathed wildfire smoke anyway. Others ventured out in the haze for jobs that kept the Internet on. Still others watched Doppler radar in a separate browser window as hurricanes made landfall near their homes. Talking with them, it was impossible to treat the climate emergency as a distanced academic exercise or a "topic." Using the enforced research stasis of the pandemic, I pivoted toward making space for historians who wanted to respond more

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directly, joining groups and helping organize conversations, conferences, and workshops. Alix's email (subject line: "Harebrained Idea!"), laying out the idea for this handbook, was what I had been waiting for. In our first meeting, we sketched out a project to develop a resource for historians who want to be concretely helpful. Our goal was to emphasize and elevate the skills that historians have and to offer them strategies and tools for mobilizing their networks and expertise to respond to the unfolding climate emergency.

We started reaching out to folks we knew and folks we didn't know, and were shocked by their overwhelmingly positive response. This told us that there was a real and deep desire for the resource we were developing. Historians want to help! Our goal was—is—to underscore that the scholarly work of historians can be an important site for tempering climate change by offering past examples of, say, the experience of unprecedented changes in daily life or the historical infrastructures and political economies of mass human displacement or considering the intertwined grief and hope of scientific knowledge production. These are important stories to tell now, and historians need to be the ones telling them. Additionally, historians know the world was and is complicated, messy, and nuanced. They have cultivated a vast array of methods and skills both to understand complicated worlds and to convey this understanding. In the face of a crisis in the present, it is easy to forget the past. It is easy to forget oneself and one's training. Everyone forgets about the historians—even historians. This book is for them.

This Moment

As we write, climate conversations are changing in ways that require historians' skills and expertise. For decades, in the US especially, battles around climate change were framed as battles about belief in science—American politicians got credit as climate warriors by declaring belief in "the science," crowds "marched for science," scientists had their careers and credibility assailed and defended. Achieving belief was expected to lead to action—persuasion would presumably break politicians and "the public" out of their decades-long stasis. Those battles are not over, particularly in the US, where partisan hardening has fueled what Cara Daggett in this volume calls "climate refusal." Stubborn ranks of deniers are, as we write, bringing about a disastrous swing in national policies. But belief is no longer uncommon. As of 2022, in the US, where denial has the largest hold, only 16 percent of Americans registered denial; 70 percent

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endorsed the reality of climate change, and the majority believed it was caused by humans.[1]

On the policy front, change is both dizzyingly fast and terrifyingly insufficient. To give a snapshot: As of September 2025, 137 countries, along with thousands of cities, states, and provinces, had pledged to work toward "net zero," a state where all emissions of greenhouse gasses drop to a level that theoretically can be removed from the atmosphere by natural processes or (as yet unproved) technology. Despite the withdrawal of the US federal government, these pledges comprehend 74 percent of global emissions, 77 percent of global GDP, and 79 percent of the people in the world.[2] Markets too are changing. Institutions and states controlling funds worth $40.76 trillion have divested from their fossil-fuel holdings.[3] Since 2000, the price of solar photovoltaic power has dropped almost 96 percent.[4] The United Nations (UN)'s "World Investment Report 2025" shows the global sustainable finance market, investments supporting the UN's Sustainable Development goals, reached $8.2 trillion in 2024.[5] Unsurprisingly, much of this funding has remained in China, North America, and Western Europe. For example, in 2022, "developing countries" only received $544 billion in foreign direct investment for renewable energy, far less than the annual $1.7 trillion that the United Nations estimates that they need.[6] Even as the US and parts of Europe retreat from climate action, however, Chinese overseas development has shifted toward renewable energy on a massive scale.[7] Emissions *growth* has slowed, which matters. But greenhouse gases in the atmosphere are still rising. Projected temperatures, though slowly inching down, are nowhere near safe.[8]

When "believe the science" was the mantra, the implicit expectation was that science would produce policy on its own. Now, instead of merely presuming policy action, those concerned about climate change must defend existing policy and push for greater ambition; they must resist the politics of "greenlash," identify greenwashing and fraud, and note places where climate action threatens to replicate and intensify forms of inequality. The debates around the massive net zero policies raise questions that natural scientists can't answer. For example, given that the Global North is responsible for the vast majority of emissions, and the Global South has so far experienced the vast majority of harm, harm exacerbated by colonial past and present, how is the Loss and Damage Fund established for compensation to be funded and distributed? New models of the economy are also contesting for support: "Circular" economies and "degrowth" economies battle what Ajay Chaudhary calls the newly dominant "right-wing climate realism."[9]

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Although outright denial of the *reality* of human-caused climate change is less common, a different kind of denial remains widespread—what Kari Marie Norgaard, following Stanley Cohen, calls "implicatory denial."[10] Norgaard shows how "believers," through a "failure to integrate this knowledge [of human-caused climate change] into everyday life or to transform it into social action," construct a "double reality"; intellectually they "believe," but the basic features of their lives remain the same. Here, cultural and social histories showing the flexibility of firm categories, and histories of social movements and political change, can help as people begin the work of reimagining and restructuring their own lives and helping their communities respond to the ongoing threat.

So, these are not debates for scientists alone. They are social, cultural, and political debates in which history matters. Indeed, people working on climate already regularly appeal to history, from deploying mythologized accounts of the Industrial Revolution in plans for energy transition to debating the effectiveness of protest tactics during the Civil Rights Movement to calculating the damage done by colonialism, slavery, Cold War coups, and sovereign debt crises in negotiating for climate finance. Historians have a role to play in these conversations.

We describe this book as a response to the "climate emergency," and hope to use the expansiveness and pressure of that phrase to build an expansive and urgent community. That said, we are aware of the dangers of "crisis talk" as identified by scholars such as Max Liboiron, Joseph Masco, Candis Callison, and Janet Roitman.[11] We don't want to reduce the climate emergency to a pinpoint of present urgency, an abrupt terrifying disruption from which we hope to extract a return to the status quo by any means necessary. Indeed, we agree, it has deep roots in the structures of exploitation that have produced a violent normal. The disruptions and violence that are sometimes prophesied as part of its future are already part of a long lived experience for many people around the world. As historians, we can feel along those roots and shout their tangled stories to those who aim to forget them. We can show how continuing forms of slow and fast violence feed into the climate crisis, how the institutions rendered fixed in time by crisis talk are themselves the products of human agency. At the same time, we don't want to merge the climate crisis into other kinds of crisis talk, the staticky fearful hum that makes crisis seem perpetual and action seem impossible. As historians, we can find form, shape, and causation in this swirling fog; find solidities to grab hold of; notice shifts that require response; and locate and narrate the lines of adaptation and healing from which we can grow forward.

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What Historians Can Do

When we say that historians can and should save the world, we are not imagining a superhero-style moment where a brave, lone historian engages a primary-source-powered glowing blue cube to reverse the damage to the planet (in a runtime of 150 minutes or less). Nor are we promoting the every-little-bit-helps model of individual action in which we smugly recycle our paper conference programs to "do our bit." The already unfolding damage of the climate emergency is not simple, small, or uniform, and our work to respond won't be either.

Politicians, activists, city planners, diplomats, and people in frontline communities are already making consequential decisions about the climate emergency. The central contention of this book is that historians can help them better brace for storms and prepare for heat waves, plan a transition away from fossil fuels in ways that don't replicate past disasters or intensify historically rooted inequities, imagine more concretely how to organize persuasive campaigns, or protest to shift policy, restructure cities, regenerate toxic landscapes, reimagine food systems, or fight structures of displacement, environmental injustice, or sovereign debt. This is not a job for a solo historian, a single history, or just this book. Like all forms of significant climate action, this work will require creative, sustained, multicentered, collaborative action, both among historians and between historians and everyone else.

We can join the work of saving some of the present world, people, and places by contributing expertise that pushes back against the interests and infrastructures that seek to protect only a narrow (white supremacist) slice of humanity from the unfolding calamities of global climate change. Historians are trained to think about the world in a specific way. We notice—seek out, even—alterity and misery. We are sensitive to the possibility that celebratory narratives of progress presented by powerful institutions often leave out the lived experience of the masses. We know to look for power dynamics and the systems that support and perpetuate them. We can also comfortably toggle between temporal and geographical scales, embracing both microhistories and *longue durée* arcs.

Because we study the world in this way, we notice assumptions and constructed truths. We can help denaturalize the behavior built upon these ideas. We understand that there can be multiple lived experiences of an historical event, so we see a future of possibilities. We can help build more just structures and new truths. We can tell new stories and offer alternative contours for the future. We can pick new fights and support ongoing fights.

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In addition to a worldview that embraces complexity and nuance and even conflicting narratives, historians possess a number of specialized skills to be applied to their craft. A not exhaustive list of tasks we're really good at and practice a lot includes: close-grained reading and analysis of texts, objects, ephemeral traces of senses, emotion, affects, landscapes, nonhuman organisms, and more; examining conflicting, counterintuitive narratives as a means of understanding past worlds; telling stories; explaining why the stories we tell matter, both in their own time and resonating in the present; and mobilizing our (waning) authority as experts, complete with our personal networks, toward causes we care about.

There is a bit of a "rearranging deck chairs on the Titanic" pall over the historical profession at the moment. Academic history is under threat for the same reason it has been for a long time. Reduced research funding, reduced tenure lines, and reshuffled workloads have dramatically altered the day-to-day work of historians over the last two decades. Most of us feel we are too busy updating course online learning platform pages to speak truth to power. More recently, a politicized, bad-faith demand for the diversity of ideas has mobilized the perversion of academic freedom. So-called unbalanced history is presented as a menace, and those who tell uncomfortable stories of the past are bludgeoned with critiques of distortion. In turn, public trust and interest in the expertise of historians—indeed, humanists generally—appears to be faltering. Dozens of think pieces have said so. Few have offered solutions to this complicated problem.

We hope this book can at least offer some paths forward. At its core, this book has been a project of community building. We consider where our community is, where it needs support, and what we can do to provide this support. There are many of us historians—thousands and thousands. And history-ing—that is, the study and practice and teaching of history—is happening all over. We must think expansively about where beyond the (semi-fictional) halls of academia it is being done. History-ing is happening at community colleges, at local historical societies, at school board meetings, at home, and in conversations with strangers on the bus. When we throw open the possibilities for where history is and can be practiced, we resist the logics of austerity that push us to fruitlessly fight for prestige and hopelessly lament our decline.

What happens when we treat the practice of history as work that is urgent and necessary in the present, not for our own egos and interests but rather for humanity? What happens when we acknowledge that we must earn the public's respect, earn our designation as experts? What

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does that good-faith work look like? Or put slightly differently, what if we cherished the humanity of the present like we do our historical actors of the past? What if we applied the care, nuance, and effort to understand past choices and circumstances to navigating human relationships right now?

We should, it seems, think for a moment about who we currently have sustained and meaningful relationships with and who else we could reach out to. The most obvious—for current and potential engagement—are our students, some high schoolers, but mostly undergraduate and graduate students, each with different needs and goals. Another audience is our local communities, from our home institutions to the square miles of folks living around them. We are also our own audience, although those of us who do interdisciplinary work often work with several academic communities. There are a growing number of historians who are explicitly public facing in their work, often collaborating with museums and/or community organizations. Where could and should we reach out more? Just as we always have more to learn, academic historians have much to offer—both the skills we use and the narratives we create with these skills—to journalists, policymakers, litigants, K–12 curriculum developers, and more. We also have much to offer to creatives, from artists to writers to poets. Everything has a history, the American Historical Association says. Everyone does too. Perhaps most broadly, we hope this book will inspire us to do the important work, with lots of humility, of at least *trying* to save the world.

Presentism

In that it responds to an unfolding global emergency, this is an unabashedly presentist book. However, we want to be clear about which of the many practices of "presentism" we're defending. We are not arguing in favor of teleological storytelling, leading inexorably to a single inevitable present. Indeed, a central premise of this book is that multiple possible futures await us, dependent, in part, on our actions now. We are not in favor of anachronistically forcing past concepts into modern categories—on the contrary, we find the strangeness of the past offers a rich field in which to find challenges to modern assumptions and alternative ways of being in the world. We are not arguing that in order to be worthwhile, all historical research needs to have immediate and visible relevance to current events, although we are certainly arguing that much historical research that is described as irrelevant is, in fact, sharply relevant.

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Our presentism comes from our sense that historical storytelling and historical skills *already* matter, and that we are failing in our duty if we elide the links between past, present, and future. We reject the idea that as a beleaguered field, we will be safer or somehow have greater authority if we leave our conclusions and connections implicit, buried in academic references, and if we refrain from advocacy. We are writing at a moment when even the most basic historical knowledge is unavoidably political, where the only way for many historians to be "apolitical" is for them to be silent. Historians are attacked when they are perceived as too political and also when they are perceived as irrelevant and also when they are accused of irrelevancy by those who find them to be too relevant. We aren't rewarded with more authority or safety by declining to speak in places where our voices are needed.

Further, we wonder what definition of safety encompasses institutional safety but not the mortal peril of the climate crisis. Narrow conceptions of safety or practicality or abundance of caution obscure the enormous calamity unfolding before our eyes. We need to reconcile these registers of practicality to build institutions truly ready for this moment. This book is part of that.

Climate Emergency History

Our goal is to take the most expansive view possible of our subject—this is not climate history but *climate emergency history*. Climate emergency history contains, but is not limited to, histories of past responses to climate change, histories of climate science, negotiations of climate treaties, and the emergence of political struggles around climate change. It also includes histories of the roots of climate change—that is, histories of the emergence and extraction of fossil fuels, and the forms of industrial capitalism, as well as the cultures that encouraged fossil fuel uses: the segregated city structures that pushed car dependence, the foreign policies designed to extract or suppress oil, the forms of inequality that greased the wheels of extraction and refinement, the cultures of petromasculinity, of high-consumption iterations of "freedom," "the consumer," and the structures of global "development."[12] The history of causes also includes the rise of industrial agriculture, the emergence of the "Plantationocene," the expansion of settler colonialism, and the cultures of meat eating, the expansion of consumer cultures, and the systems of manufacturing, distribution, shame, identity, expression, and meaning on which they depend.

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Climate emergency history also includes the forms of inequality that have created differential vulnerability. Colonialism, neoliberalism, global debt and global finance, migration, and responses to migration all structure the emerging massive harm of heat and disaster, as well as shape possible responses to them. It includes the processes of racism, xenophobia, and ableism that render the injury or displacement or death of some people as "ungrievable."[13] It also includes the histories needed by activists trying to create change in the present: histories of Indigenous resistance, protest and social movements, advocacy and political mobilization. It includes the histories of social transformation and massive cultural change that remind us that seemingly immutable structures have changed and will change. It includes histories of policy and national and corporate industrial strategy. It includes the deep histories of those practices now being proposed as solutions—histories of solar and wind power; of greenwashing; of "rewilding"; of the emergence of systems of care, repair, and maintenance; of frank profiteering; and of mutual aid.

Some of these histories are in this book and some are not. You may, upon reading this, find that you are already writing or thinking about climate emergency history, perhaps in a way that we have missed. We don't believe there is a single "real story" of the climate emergency for historians to tell. We assert that historians' response to the climate emergency must embrace and amplify a multiplicity of messy, conflicting, and complicated stories. This multiplicity is fundamental to the call we make to our fellow travelers: We are not giving you a single argument or action to carry forward but rather, with humility, identifying where many *different kinds of* historians can play a role.

Relatedly, we argue that there are lots of different kinds of urgent work to be done. We don't want to unify historians around a single set of stories or a particular future because different history-ing is needed in different aspects of the emergency. It is precisely because the conversations about the best possible future are unfinished (and perhaps unfinishable) that we need an expansive community to join the climate fight. Readers do not need to tell all these stories by themselves or even know them all. But conversations about global debt need colonial historians, municipal planning meetings need historians of segregation and environmental racism, climate organizers need historians of social movements, students need to see where the social and cultural meets the seemingly economic and technical. We don't need a single historical story; we need many historical stories (and many historians!) in many places.

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Overview of Parts

This book contains two main forms of contribution: written pieces and resources, organized into six parts. For each part, the essays and interviews are intended to provoke, inspire, terrify, and reassure readers moving toward some form of action. The curated resources are offered as tools and templates for doing so. Each part provides readers with materials to think with and do with. Further, we have compiled additional resources and useful links in an online repository also organized in accordance with the book parts.

One of our goals in this book is not only to urge historians to *start* taking action on the climate emergency but also to amplify and build on the enormous amount of work that has already been done, both by historians who don't think of themselves as climate historians and by a growing number of scholars who are urgently working to take action. We can't fully represent all this work in a single volume, but in each resource part, we include lists of texts intended as gateways into various literatures and organizations that are already doing important work.

Part I, "Historians' Approaches to Climate Change," is a collection of pieces to introduce new readers to the already rich, extant work in the histories of climate knowledge and science, energy history, and historical responses to changing climate. These scholars reflect on lessons to be drawn from these histories, especially the possibility of new scholarly collaborations across disciplines. Resources for part I consist of a timeline, a glossary of sorts, primary and secondary source readings, and a directory of projects documenting the historical experience of climate change and climate knowledge.

Part II, "Teaching and Pedagogy," is our first application-oriented part, offering concrete examples of ways in which historians can bring climate change narratives into their pedagogical practices and aid students in understanding and navigating the effects of climate change. How can we help students to pivot their attention past debates about the reality of climate change to ask different questions and start different fights? Resources for part II include texts on teaching climate change, some strategies for navigating classroom discussions of climate change history, links to useful primary source repositories, and resources for teaching solutions history. Additionally, we include short descriptions in this volume and links to the full materials in the book's online repository of syllabi and assignment inspiration. These are in-class exercises, out-of-class assignments, and sample syllabi developed by our various contributors for a variety of student levels (secondary to graduate students) and

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classroom configurations. Should you want to contribute some of your own materials to the online repository, we heartily welcome them. Please contact us directly to do so.

Part III, "Some Historical Stories That Matter," is also intended to inspire, in this case historians who don't consider themselves to be environmental or climate historians. One doesn't need to be an environmental historian to connect one's scholarly interests to the climate emergency. In their contributions to this part of the book, historians show how applying analytical frameworks from the studies of gender, migration, white supremacy and Blackness, or disability shed important light on aspects of the crisis and potentially aid charting more effective interventions in the present. Resources for part III consist of further reading recommended by the contributors and a brainstorming exercise.

Part IV, "Working with and for the Public," showcases historians applying their craft to public-facing, contemporary issues. Here, public history experts offer contributions on the climate crisis in museums, applied history, collecting "oppositional" oral histories, expert witness work, working with journalists, and best practices for working with communities and avoiding extractive research. Contributors revisit past climate actions, describe current efforts, and consider new directions and sites of intervention. Resources for part IV include a brainstorming exercise to help readers think through how and where they might pursue working with and for the public, lists of groups doing the above work that could use some volunteer historians, strategies for doing oppositional history, and recommended further reading.

Part V, "A Sustainable Academy," looks for expansive answers to the following questions: What would a sustainable academy look like? How might we build and maintain it? What has already worked and what cannot? These contributions discuss strategies for decarbonizing history research, conferencing, and university energy systems, supporting campus activism, resisting corporate funding, bringing one's history-ing skills and expertise to research outside the academy, mobilizing academic societies and unions, and integrating self-care or self-maintenance into academic communities. Resources for part V include a crowdsourced career life-cycle task list for changing organizations at all levels, some self-maintenance strategies, and another brainstorming exercise to consider what should and should not be saved as we commence building a more climate-resilient academy right now.

Part VI, "Preparing for Change and Imagining Futures," is a series of histories that help us imagine and plan futures. One goal of this part

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of the book is to underscore the important roles that historians should play in contemporary conversations around planning and amelioration. More abstractly, the contributions to this part consider what it is to write histories upon which better futures can be built. Some contributors offer narratives of solutions and narratives of care and solidarity. Others present the pasts of "solutions" that did and did not work, to be applied or avoided moving forward. Many wrestle with how the seemingly inevitable has actually been cultural and contingent, and thereby document how perceptions of inevitability have obviated certain paths. All consider how, when historians don't talk about the future, clichés about change are left in place to harden into truths. Here, we encourage historians to shake off their apprehensions about applying their skills and knowledge to the future. Resources for part VI are also intended as tools to help historians recognize the importance of their voices in the present, planning the future.

The closing piece is what we are calling a "Solutions Lightning Round," and we feel it captures the collaborative spirit of the project. We asked contributors to recommend one task that a historian, being a person in the world, could do *right now*. As historians, we spend a lot of time thinking at scales beyond our own daily lives. This book aims to help historians reconcile the work they do and the things they think about with the life they live in deliberate ways, both large and small.

The contents of *A Historian's Handbook for Saving the World* noticeably tilt toward the Global North, the United States especially. This is both justifiable and unforgivable. Saving "the world" clearly can't happen without massive changes in the Global North, since the Global North—again, the US especially—is largely responsible for much of the action and inaction that has caused global climate change. The infrastructures of power, funding systems, and pedagogical traditions of the Global North are also the most familiar to us (Alix, Emily, and the contributors) and therefore the ones we can best offer strategies to intervene into. We expect most of our readers will be in the same position. That said, as Elizabeth Chatterjee observes in this volume, laser focus on particular features of the Global North has dangerously skewed scholarly and activist understandings of the processes now driving rising emissions. Her challenge encourages us to expect that the processes described in this volume are not universal or even predominant. We hope the community of historians will continue to contest and expand our vision.

This is not our only major hole. There are many categories of analysis—gender, sexuality, class, and so forth—that get short shrift in this volume.

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Indeed, it is our central contention that climate emergency history should be almost infinitely multivocal, impossibly large, connected to processes we cannot yet see. When we started, we knew this would be true. In a better world, we would have time and space to include a broader swath of lived experiences and expertise. If, upon reading this book, you become enraged at an absence here and write (or amplify) a book or an article filling it, to us, that is success.

The Coming into Being of This Book

In January 2025, as we pulled together the first draft of this manuscript for outside review, I (Alix) toggled between the MIT Press's style guide and refreshing CalFire maps of the fire lines and evacuation orders in Los Angeles, CA. This exercise grimly captured the cognitive dissonance motivating the creation of this strange supernova of a book. I looked at my hands and considered whether the friends and family that have lost their homes to firestorms over my lifetime exceeded the number of fingers I have, presuming I allotted one home per finger. I decided against making such a tally. It felt like jinxing to count the unconfirmed losses at that moment. We also know, as historians, that numbers don't capture anything close to the story of firestorm loss. It's not just homes and their contents but also neighborhoods, the threads of community, ways of being in the world, and the sight lines and sounds and smells of the landscape. One's most intimate world becomes foreign and uncanny. We want to acknowledge here that many of the contributors to this volume were sick with worry about their homes, families, friends, and precious places full of memories. And we want to acknowledge here that the human devastation of global climate change is here in this book, in its pages.

Over the previous year, *A Historian's Handbook for Saving the World* had quickly accumulated momentum as nearly everybody we asked to join said yes. We devised four different "teams" for contributors—advisory board members, resource "hunter-gatherers," writers and interviewees, and amplifiers—and asked individuals to choose which role worked best for them. From the beginning, we approached this project as a form of community building. We organized gatherings over meals at in-person conferences, advisory board email threads, weekly Zoom meetings for hunter-gatherers to brainstorm and then scour the web together-apart. We also strove to bring in early-career and independent scholars and to find ways to pay contingent contributors for their labor. Additionally, we (Emily and Alix) met weekly to keep track of all the moving parts, check in

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on individuals, cowrite mass emails full of exactly the right amount (lots!) of exclamation points, and keep momentum up. We also took a weeklong writing retreat in the woods, where we wrote this introduction. This project is sprawling and gregariously collaborative. Its success (we hope) is a proof of concept that the historian's journey need not be a solitary one. Indeed, our most important work can and should be done together.

A significant part of the early phase of this project was narrowing the scope and deciding what it was not. This is not a book to teach the basics of climate science; many such books exist already. It's also not a guide for thinking beyond limited climate action; those books already exist too. The resource section at the end of this introduction includes a list of the works that have inspired us to create something new.

A Historian's Handbook for Saving the World is not a zine (many of us wanted a zine) nor is it a blog, newsletter, or website requiring an RSS feed for updates. Although there is an Open Access edition as well as a linked online repository, we felt quite firmly that this must exist as a physical book. Books remain the coin of the realm for historians. We love books! We love reading books! Here is a book to flip through and put in your (large) pocket and pull out again to check something and to underline and dog-ear and revisit to read again or revisit to read something new. It is intended to be a reference of sorts but not a one-size-fits-all set of instructions for what every historian should do.

It is not a manifesto—or rather, it is not Alix and Emily's manifesto. *A Historian's Handbook for Saving the World* gathers the views and voices of our many contributors, invited for these very views and voices. All we did was remind them that the overarching goal was to offer helpful stuff to historians who want to be helpful. They took it from there. The contributors do not speak in a unitary voice; they shout in a productive clamor in a diversity of registers and tones.

As noted above, *A Historian's Handbook for Saving the World* is not a full representation of the scope of climate emergency history as currently practiced, not content wise or in the diversity of expertise, experiences, and geographical locations of the scholars themselves. More than anything, our tight timeline and tolerances for wieldy-ness of so many contributors limited the scale and scope of this project. We recognize and accept critiques that much is left out of the book. We also invite—with enthusiasm—readers to fill the need they see. Tell us about work that is missing here! We want to amplify it!

Having declared all the things *A Historian's Handbook for Saving the World* is not, what is it? It is a labor of love and joy and Zoom meetings

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and diner coffee and walks in the woods. It is also a manifestation of struggles with illness and international bureaucracy, big moves, cries of anguish, and cries of sadness. It is a set of pathways into what historians have done and are doing to tell stories of climate change history and to respond to these stories. It is also a collection of thoughts on what more can be done. And it is a collection of tools, templates, and resources for doing some of these things.

Since historians are a various bunch, we designed this book to be read and used in different ways by different historians. We anticipate more folks will take a choose-your-own-adventure approach than will read from the first page to the last in order. Mileage will, of course, vary, depending on readers' career stage, geographical location, institution type, and so on. Further, we understand readers will varyingly approach saving the world as a task for research, activism, or pedagogy; certainly, our contributors have done so. We hope the variety here will stimulate readers to think creatively about the places this kind of work can fit into their lives.

There are many ways to teach with this book! All of the contributions should be legible to undergraduate readers and certainly for academics and academics in training. The resources in part II include material for in-class exercises and lectures (see also the online repository). For teaching materials related to specific parts and even specific essays, we direct you to the resource sections in those parts of the book.

Despite the slow- and fast-moving disasters of the years since we commenced this project, the prevailing spirit in writing this project has been one of hope. Readers will perhaps notice this both in the tone of much of the text and in the structure itself, from the resource lists integrated into each part to the ordering of the written contributions. Our contributors' voices, and perhaps most especially our (Alix and Emily's) chipper use of exclamation points, are not out of step in the current moment. To be sure, we have struggled against terrible news of unfolding calamities. But our persistent refusal to be dour, even when we were most afraid, helped enlist and energize our *seventy-four* contributors and carried this project along, a dynamic we think worth noting. And we cannot use our words to embrace a future that is open and full of possibilities, multiplicities, if we use language of inevitable doom. As Emily tells us, despair can be analytical failure. *A Historian's Handbook for Saving the World* is deliberately—annoyingly, and a little angrily—hopeful.

There are many pasts, we historians know that. There are also, we know, many possible futures. This book is a collection of possibilities and

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some tools and ideas to realize them. For you—*we hope*—it is the beginning of something.

Notes

1. "Climate Change in the American Mind: Beliefs and Attitudes, December 2022," Yale Program on Climate Change Communication, February 16, 2023, https://climatecommunication.yale.edu/publications/climate-change-in-the-american-mind-beliefs-attitudes-december-2022/.

2. Net Zero Tracker, "Net Zero Stocktake 2025," NewClimate Institute, Oxford Net Zero, Energy and Climate Intelligence Unit, and Data-Driven EnviroLab, accessed January 8, 2026, https://ca1-nzt.edcdn.com/PDFs-and-Excels/Net_Zero_Stocktake_2025.pdf?v=1758570577, 10, 15.

3. Stand.earth, "Homepage," Global Fossil Fuel Commitments Database, n.d., accessed January 9, 2026, https://divestmentdatabase.org/.

4. "Solar (Photovoltaic) Panel Prices," Our World in Data, revised, August 22, 2025, https://ourworldindata.org/grapher/solar-pv-prices.

5. United Nations Conference on Trade and Development, *World Investment Report 2025: International Investment in the Digital Economy* (United Nations Publications, 2025), 129.

6. United Nations Conference on Trade and Development, *World Investment Report 2023: Investing in Sustainable Energy for All*, accessed January 9, 2026, https://unctad.org/publication/world-investment-report-2023.

7. Lei Bian et al., *China's Role in Accelerating the Global Energy Transition,* Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science: 2025.

8. Somini Sengupta, "10 Years After a Breakthrough Climate Pact, Here's Where We Are," *The New York Times*, November 7, 2025, https://www.nytimes.com/interactive/2025/11/07/climate/paris-agreement-climate.html.

9. Ajay Chaudhary, *The Exhausted of the Earth: Politics in a Burning World* (Repeater, 2024), 25.

10. Kari Norgaard, *Living in Denial: Climate Change, Emotions, and Everyday Life* (MIT Press, 2011), 30–31.

11. Janet Roitman, *Anti-Crisis* (Duke University Press, 2013); and Joseph Masco, "The Crisis in Crisis," *Current Anthropology* 58, no. S15 (February 1, 2017): S65–76, https://doi.org/10.1086/688695; Candis Callison, "The Twelve-Year Warning," *Isis* 111, no. 1 (March 2020): 129–137, https://doi.org/10.1086/707823; and Max Liboiron, *Pollution Is Colonialism* (Duke University Press, 2021).

12. Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America* (Alfred A. Knopf, 2003).

13. Judith Butler, "Bodies That Still Matter," in *Bodies That Still Matter: Resonances of the Work of Judith Butler*, ed. Annemie Halsema, Katja Kwastek, and Roel van den Oever (Harvard University Press, 2021), 177–193.

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Resources Related to the Introduction

Alexandra Hui, Elaine LaFay, Samantha Muka, Emily Pawley, Sarah Pickman, and Anna Zeide

1 A Few Starting Places for Thinking About the Climate Emergency

"Global Weirding with Katharine Hayhoe": brief, friendly explainer videos on climate science, a collaboration of PBS and climate scientist Katharine Hayhoe.

Project Drawdown: a long-running online nonprofit project that catalogues, analyses, and rates proposed solutions to the climate crisis.

The Grist: a nonprofit independent media resource on climate news—a good place to start if you're new to climate conversations.

Critical Frequency Podcast Network: an award-winning collection of climate-focused podcasts.

2 Three Books That Inspired Us as We Worked on This Project

Johnson, Ayana Elizabeth, and Katharine K. Wilkinson. *All We Can Save: Truth, Courage, and Solutions for the Climate Crisis*. Random House, 2020.

Solnit, Rebecca, and Thelma Young-Lutunatabua. *Not Too Late: Changing the Climate Story from Despair to Possibility*. Haymarket Books, 2023.

Price, Jenny. *Stop Saving the Planet!: An Environmentalist Manifesto*. W. W. Norton, 2021.

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I

Historians' Approaches to Climate Change

This handbook asks historians to expand what we think of as climate emergency history to include the perhaps infinite number of histories linked to that emergency. But it also rests on decades of historical research examining how different groups of people understood, predicted, and experienced past fluctuations in climate, or tracing changing energy regimes. In this part, we showcase these research currents. We begin with recent histories of familiar topics and work backward chronologically to challenge any sense that only recent histories have relevance.

In the first essay, Joshua Howe argues that rather than reaching for the gargantuan, species-level explanations that the scale of the global crisis may seem to demand, historians should remember that we are "foxes," knowing many things, skillful in complexity and nuance, and capable of shedding light on processes that species-level examinations ignore. Next, in an interview, Elizabeth Chatterjee shows the value of this historical particularity in understanding energy systems at a global scale. Chatterjee argues that narratives about the rise of fossil fuels ascribe too much power to Britain-centered "fossil capitalism," neglecting the very different dynamics visible in what she calls the "Asian Anthropocene," which have driven the majority of emissions growth in the last twenty years. The next two essays tackle the emergence of modern climate science and debates around it. Roger Turner shows how climate science emerged from and was shaped by specific processes of world war and Cold War militarization. Erik Conway then takes us through the experience of uncovering how one Cold War institution, the Marshall Institute, covered up and intentionally confused climate science.

Our next three authors show how knowledge about and experience of changing climate predating the twentieth century can help us rethink historical and current periods of crisis. Lydia Barnett reflects on how we can learn from the shocks of the Little Ice Age and the long string

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of world-ending catastrophes caused by imperialism. Anya Zilberstein demonstrates how a sense of human capacity to change the environment came embedded in the global imperial project of "improvement." David Patterson argues that historians of the Middle Ages should take seriously the science of a Late Antique Little Ice Age without giving it total explanatory power, and finds an even older sense of anthropogenic responsibility for changing climate in the weather wizards of the Early Middle Ages.

It's worth noting that "climate" means several different things in these essays, as does "emergency" and "crisis." Many authors wrestle with the tensions that emerge as new climate data from the past shapes our understanding of past events, tempting us to environmental determinism or anachronistic overwriting of past ways of perceiving and understanding changes in heat and seasonality. Our modern idea of the atmosphere as a kilometers-deep layer of air, animated by vast systems of circulation and shaped by atmospheric chemistry, only emerged with the Cold War expansion of environmental science that Turner describes. Cold War science undergirds the understanding of climate shifts such as the Little Ice Age that Lydia Barnett describes. But the notion of climate they refer to would make little sense to Patterson's medieval weather wizards or Zilberstein's colonial officials, who interacted with seasonality and cold intimately through crops rather than finicky remote-sensing technology and satellite data. The epistemological tensions between these essays are intentionally left unresolved—as environmental historians and historians of science have long observed, using natural science to describe past environments obligates us to investigate our borrowed analytic tools even as we use them.

The resource section for part I allows us to point to a bigger literature beyond our limited number of essays. We've included a timeline of lived experiences and scientific responses to climate change gleaned from our contributors, a catalogue of "-ocenes" that traces the outline of a major debate about human interactions with global environments, some advice about finding primary sources, a starter set of secondaries recommended by our authors, and a directory of projects examining the experience of past climates.

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1

A Hedgehog and a Fox Walk into a Wilderness Through a Side Door *or* A Case for Historians

Joshua P. Howe

There is a line among the fragments of the Greek poet Archilochus which says: "The fox knows many things, but the hedgehog knows one big thing." . . . Taken figuratively, the words can be made to yield a sense in which they mark one of the deepest differences which divide writers and thinkers, and, it may be, human beings in general. For there exists a great chasm between those, on one side, who relate everything to a single central vision, one system less or more coherent or articulate, in terms of which they understand, think and feel—a single, universal, organizing principle in terms of which alone all that they are and say has significance—and, on the other side, those who pursue many ends, often unrelated and even contradictory, connected, if at all, only in some *de facto* way, for some psychological or physiological cause, related by no moral or aesthetic principle . . . The first kind of intellectual and artistic personality belongs to the hedgehogs, and the second to the foxes.[1]
—Isaiah Berlin, "The Hedgehog and the Fox" (1953)

You may be wondering about the title. Fair enough. Small mammals, wilderness, and disciplinary rootlessness are a lot to fit into a heading, especially in a book about historians' engagement with climate change. So sure, I'll start with the title.

The first part of the title is a reference to Isaiah Berlin's 1953 essay "The Hedgehog and the Fox." I suspect that both real hedgehogs and real foxes already face a variety of novel challenges and opportunities as a result of climate change and other human impacts on their environments, but Berlin's essay is not about climate change, so pocket your literalism for the moment. Rather, Berlin, a literary scholar, uses a fragment of a classical parable as a starting point for an investigation of Tolstoy's view of history, particularly as expressed in *War and Peace*.

I'll confess up front that I don't actually know much about either Berlin or Tolstoy. The allusion to Berlin is a bit of a cheap trick, a way to look smart for the humanists in the room without going down a rabbit hole of eco-critical theory that, as a certain type of historian, might give me hives. *Mea culpa*.

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Pretentions aside, however, it turns out that when it comes to climate change, Berlin's small mammals are (*pace* Levi-Strauss) good to think with. For Berlin, to think like a hedgehog is to approach the world from the perspective of a single, unifying problem, concern, theme, or idea—in Tolstoy's case, the Russian national character; in ours, global anthropogenic change. To think like a fox is to approach individual problems on their own disconnected terms, embracing different, independent, and sometimes contradictory ideas in a mosaic view of the world that need not constitute a coherent whole. Almost three-quarters of a century after Berlin's puckish essay (a veritable eternity in hedgehog years), these allegorical woodland creatures help to underscore how the contemporary problem of climate change pulls at the tensions between a problematic and now somewhat out-of-fashion impulse toward hedgehogic universalism, on the one hand, and a careful fox-like attention to the particularities of positionality and power that have come to define careful historical scholarship, on the other.

This is an argument for the foxes. To be clear, I do think we need the hedgehogs. The climate system and its impacts comprise the complex interactions of a variety of disparate variables, from St. Louis's urban forestry practices to Chinese automobile registration codes to reparations for Native American land dispossession. And yet, to understand each disparate variable in terms of anthropogenic climate change requires singularity of focus on a unifying global whole. The subject itself—the global climate, an object we can only access through coordinated compilations of individual measurements and experiences—relies on the totalizing impulse of Berlin's hedgehog for its very existence. But I worry that lately, even the foxiest scholars have been hedging perhaps too far toward hedgehoggery, instinctually framing climate change and the Anthropocene together as a global, universalizing phenomenon, sometimes even an existential threat so ominous as to make any action short of rolling into a collective, species-level quills-out eco-ball a matter of global human suicide. The pendulum has swung toward the hedgehog, and I want to give the fox its due.

More specifically, I want to highlight some of the liabilities of an approach to climate change and the Anthropocene that focuses too heavily on the historical disjuncture and totalizing implications of planetary change. These liabilities are familiar. They echo many of the drawbacks of universalism that historians have grappled with in their narratives about Big Things such as modernity, wilderness, and globalization for decades. With those related historiographical discussions in mind, I want to urge

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historians to resist the temptation toward universal meaning making that has characterized much recent academic scholarship on the subject in favor of the kind of careful attention to context, contingency, and difference that has shaped the problem of climate change and people's various and variable experiences of it. That is, as we historians consider how we might engage with and contribute to academic and public discourse on climate change, I want to encourage us to double down on the things that I think historians already do pretty well. The argument for the foxes is thus also a case for historians.

As a group, historians are probably more complex than Berlin's simple small mammal taxonomy allows, but most of us have been trained to think like foxes. As Sam Wineburg contends in his oft-assigned "Historical Thinking and Other Unnatural Acts," studying the past requires a careful attention to the puzzles of familiarity and strangeness presented by the confusing mosaic of behaviors and ideas that characterize eras not our own.[2] Historians, we say proudly, know many things.

Historians' attention to these puzzles of familiarity and strangeness has also long made us suspicious of the types of moralizing grand historical narratives that our disciplinary forebears from the nineteenth century used to trade in. For example, Marxist analysis remains *au courante* for its focus on class, alienation, and the commodity fetish, but Marx's universal "scientific" stages of historical development read like one of grandpa's embarrassing off-color three-scotch rants at Thanksgiving dinner. Worse still are would-be vanquishers of Marxism who followed Francis Fukuyama's extension of Marxist teleology in declaring an "end of history" in the 1990s, casually brushing off many of the particular and very much ongoing histories of peoples and nations navigating the aftermath of centuries of colonization and exploitation.[3] In these last pitched battles between the universalizers and the particularists that played out during my graduate education, I was under the impression that, within mainstream academia, the foxes had won. Postcolonial intersectional scholarship requires that the historian know many things indeed.

And so it was with no small amount of slack-jawed incredulity that many in the field greeted guiding light of the postcolonial historians, Dipesh Chakrabarty's (2009) "The Climate of History," an essay that proposed no less universalizing an approach than a "species history" that promised to roll the entirety of humanity into a single, undifferentiated Anthropos as a way to respond to the challenges posed to the study of history by a geological epoch made by humans.[4] In the essay, Chakrabarty (who is also difficult to squeeze into small mammalian taxonomy)

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explores how climate change conjoins the timescales of geological and historical change, thereby disrupting a presumed separation between natural and human history that has shaped the discipline of human history for centuries. The insight about how human activity has changed the geophysical context of our collective existence is a compelling one, but his presentation of it also seems to have plunged the discipline back into three key debates about universalism and modernity that most of us—or at least one of us—thought we left in the 1990s.

First and most obviously, the concept of the Anthropocene that frames Chakrabarty's discussion of climate and history has led historians to revisit the meaning and periodization of the concept of "modernity." This is not all bad, and it was, in fact, part of Chakrabarty's project. As he suggests, climate change and the Anthropocene seem to give the lie to some of the bolder liberatory claims of modernity, a useful new take on an older set of debates about modernity's meaning that other historians had already been pecking at without trying to put a name to the term "Anthropocene" itself.[5] But fruitful explorations of meaning also dovetail with repetitive debates about period, both of the Anthropocene and of modernity. At first glance, this seems less politically destructive than just kind of boring.[6] And yet, there is danger here. Historians and other humanists cede some of our street cred when we use scientific knowledge about the lithosphere, biosphere, and atmosphere to legitimize—and mask—perfectly good humanistic arguments about the nature and timing of "modernity." Replacing 1789 with James Watt's 1784 updates to the steam engine hardly solves the problem of using the French Revolution as a token of periodicity. (You still have to contend with Bruno Latour.)[7]

Second, embedded in some of the debates about both meaning and periodization is another throwback concern from the historiography of the 1990s: a concern over the nature and meaning of wilderness. At least since William Cronon's famous "The Trouble with Wilderness," environmental historians have been deeply critical of enlightenment ideas about wilderness and "nature" that elide the deep historical and ecological relationships between humans and the world around them. Wilderness, Cronon argued, is far from "natural." It is, rather, very much a human construct, a fetishized counterpoint to civilization that recapitulates many of the sins of civilization it has been deployed to critique.[8] Generations of graduate students have chuckled at Cronon's takedown of early global warming activist Bill McKibben for this problematic framing of nature and wilderness in his wildly influential *The End of Nature*, which presaged arguments for the Anthropocene that scientists would introduce

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ten years later.[9] And yet, three decades on, many historians have unironically embraced a focus on the disjuncture of climate change that echoes many of McKibben's key talking points on nature as if Cronon never put pen to paper.

In particular, a geophysical definition of "modernity" suggests a sort of before and after snapshot of humans' relationship with nature not so far from where McKibben started in 1989. That snapshot is a vehicle for some grade A wilderness-adjacent nostalgia. Much as McKibben's concern about wilderness did, well-intentioned hand-wringing about the Anthropocene often involves no little lament for a previous era, in this case, the late, great Holocene epoch—those halcyon days, scientists remind us, when humans developed agriculture, cities, water-management strategies, and all the other important trappings of modern civilization. The nostalgia for the Holocene is no more honest than the nostalgia for the American frontier embedded in the idea of wilderness. Few of those most concerned about the Anthropocene really want to go back to the seventeenth century, just as few wilderness advocates would actually want to foreswear Gore-Tex and Subarus for life on the old frontier. Five centuries of dispossession and genocide have given Indigenous people plenty of reasons to pine for a precolonial Holocene, but the mode in Anthropocene discourse is actually a nostalgia for life in an earlier period of the Anthropocene itself—with all of its creature comforts, but without the ethical baggage of knowing about it. Holocene nostalgia thus encodes many of the same contradictory anti-modern impulses as wilderness nostalgia, a sort of side door into wilderness thinking for historians who seem to have missed—or ignored—the wilderness critique the first time around.

And third, the twenty-first-century conversation about climate change carries with it a surprising reprise of historians' debates about globalization and the "end of history" from the 1990s and early 2000s that continues to tie many of us in the profession in knots. Thomas Friedman notwithstanding, the world was not flat then, and it still isn't.[10] History, power, and privilege continue to matter. So too do nation-states and ethnic identities. And yet, the terms we employ to address the environmental legacies of modernity elide historical specifics. As with universalizing concepts such as globalization, the term "Anthropocene" tends to diminish important historical distinctions between groups of people who have consumed resources and produced waste in very different culturally and contextually contingent ways. As Vandana Shiva argued in 1991—like McKibben, without using the term "Anthropocene" itself—treating

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problems such as climate change as threats to an undifferentiated "global" Anthropos presents a potential tool for justifying new forms of political and economic control, a new form of "green" colonialism.[11]

Of course, none of this is to say that historians should give up on productively contributing to conversations about climate change and the Anthropocene. Precisely because the terms we use to talk about planetary change carry with them these familiar liabilities, I think it is imperative that historians follow Julia Adeney Thomas's exhortation to critically engage with both the phenomenon of climate change and the scientists who study it.[12] Climate change is by its nature a historical phenomenon—a phenomenon that describes a pattern of change over time on the scale of human experience. Chakrabarty may be right that climate change reflects humanity's geological agency in a way that requires us to think differently about the timescales of geology and human history, but I don't think that should shake our confidence in the discipline's narrative and analytical strengths.

And to be clear, there are plenty of historians and history-adjacent scholars—including many of the contributors to this collection—doing this quite well, simply by acting like historians.[13] Nowhere is this more evident than in Amitav Ghosh's recent book *The Nutmeg's Curse*. Ghosh explores contemporary concerns about climate change in conversation with both the history and present of European colonialism and global power. Not a historian, but like both Berlin and Tolstoy certainly historically minded, he grapples productively with the inherent challenges of creating geographically and historically situated perspectives on aggregate global environmental phenomena that I made Berlin's creatures hint towards in the introduction to this essay.[14]

According to Berlin, Tolstoy wanted to believe in One Big Thing to help to explain the Russian character and the Russian experience, much as the One Big Thing of climate change creates a common human experience that seems in broad brush to realize the dated universalizing dreams of the old discipline of history. But in the end, Berlin concluded that Tolstoy is no more a hedgehog than I think historians ought to be hedgehogs, and for some pretty similar reasons. Tolstoy's Russians did not *behave* like hedgehogs. They went about their lives like foxes, holding various, variable, often contradictory sets of beliefs as they went about complicated, contingent, situated lives. And neither do historians' subjects—even if lumped into a single category as a species—live like hedgehogs with an eye toward the global. To frame human behavior primarily as

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an engagement with the processes of global climate is to cheapen the contextually specific, culturally differentiated experiences our discipline has been so careful to explore and magnify over the past four decades. As engaged historians, we may think about climate change as a "hyperobject" whose existence implicates and inflects every other earthly concern, but most of the time, our historical actors are just thinking about Tuesday.[15] Taking both things seriously—the situated day-to-day experiences of groups of people in the past and the larger social, political, and environmental changes in which their daily lives are embedded—is, thankfully, precisely what today's historians are trained to do. It is also, I think, what sets us up so well to approach the nature and nuances of climate change, and to help assess potential strategies for confronting it.

Long live the foxes.

Notes

1. Isaiah Berlin, *The Hedgehog and the Fox: An Essay on Tolstoy's View of History* (Simon and Schuster, 1953).

2. Sam Wineburg, "Historical Thinking and Other Unnatural Acts," in *Historical Thinking and Other Unnatural Acts: Charting the Future of Teaching the Past* (Temple University Press, 2001), 3–27.

3. Francis Fukuyama, *The End of History and the Last Man* (Free Press, 1992).

4. Dipesh Chakrabarty, "The Climate of History: Four Theses," *Critical Inquiry* 35, no. 2 (Winter 2009): 197–222.

5. For example, see Linda Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (University of California Press, 2006); and Brett Walker, *Toxic Archipelago: A History of Industrial Disease in Japan* (University of Washington Press, 2010).

6. For a more constructive example, see Sugata Ray, "'Dead as a Dodo:' Anthropocene Extinction in the Early Modern World," *TDR: The Drama Review* 67, no 1 (2023): 126–135.

7. And his career-long collaborators Donna Haraway and Isabelle Stengers (among others). Latour gets the punchline here because of the familiar title *We Have Never Been Modern*, trans. Catherine Porter (Harvard University Press, 1993), but Haraway's *Staying with the Trouble: Making Kin in the Chthulucene* (Duke University Press, 2016) is more genuinely useful in approaching the Anthropocene. The original proposal for 1784 comes from Paul Crutzen, "The Geology of Mankind," *Nature* 415, no. 23 (2002): 23. Debates about periodization range from a "young" Anthropocene coeval with the rapid expansion of human impacts on the global environment after the Second World War—the "Great Acceleration"—to an "old" Anthropocene that proposes a history of anthropogenic global change set in motion with the birth of the species. A recent geochemical confirmation of the Anthropocene from a group of scientists ("Team

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Crawford") focused on Canada's Lake Crawford points to the more recent date as a verifiable geophysical starting point, but in March 2024, a working group of the International Union of Geophysical Scientists voted that the Anthropocene is, from a stratigraphic perspective, not a thing. That announcement has been largely ignored. The Anthropocene horse long ago left the geophysicists' barn. See Francine McCarthy et al., "The Varved Success of Crawford Lake, Milton, Ontario, Canada, as a Candidate Global Boundary Stratotype Section and Point for the Anthropocene Series," *The Anthropocene Review* 10, no. 1 (2023): 146–176.

8. William Cronon, "The Trouble with Wilderness, or, Getting Back to the Wrong Nature," in *Uncommon Ground: Rethinking the Human Place in Nature* (W. W. Norton, 1996), 69–90.

9. Bill McKibben, *The End of Nature* (Random House, 1989).

10. Thomas Friedman, *The World Is Flat: A Brief History of the Twenty-First Century* (Farrar, Straus, and Giroux, 2005).

11. Vandana Shiva, "The Greening of the Global Reach," in *Global Ecology: A New Arena of Political Conflict*, ed. Wolfgang Sachs (Zed Books, 1993), 149–156.

12. Julia Adeney Thomas, "AHR Roundtable: History and Biology in the Anthropocene: Problems of Scale, Problems of Value," *American Historical Review* 119, no. 5 (2014): 1589.

13. Among others, see Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History, and Us* (Verso, 2016); Anna Loewenhaupt Tsing, *Friction: An Ethnography of Global Connection* (Princeton University Press, 2005); and Lydia Barnett, *After the Flood: Imagining the Global Environment in Early Modern Europe* (Johns Hopkins University Press, 2019).

14. Amitav Ghosh, *The Nutmeg's Curse: Parables for a Planet in Crisis* (University of Chicago Press, 2021).

15. Timothy Morton, *Hyperobjects: Philosophy and Ecology After the End of the World* (University of Minnesota Press, 2013).

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2

Re-Centering the Great Acceleration: Fossil Developmentalism in India

An Interview with Elizabeth Chatterjee, September 19, 2024

Emily Pawley: In articles like "The Asian Anthropocene," you've pushed back against an entrenched narrative describing the rise of what historians have come to call "fossil capitalism." Could you give us a sense of this narrative?

Elizabeth Chatterjee: The idea of fossil capitalism is most associated with the human ecologist Andreas Malm, in his 2016 book *Fossil Capital*. It's useful to realize what Malm is reacting against—that is, the idea of the Anthropocene as coined by climate scientists, referring to our present so-called new epoch in which humans have become the most important disruptor of the Earth system. At the heart of the Anthropocene is the figure of the Anthropos, an undifferentiated human species.

And Malm said, "This is not right. First, what does it mean to think of the human species as an agent? It's never active on the historical stage. Second, clearly this masks all sorts of inequalities of class, of nation, and so on." I have a lot of sympathy with that critique. Instead, Malm said, we need to look for the origins of the climate crisis in fossil capitalism, which he traced back to the first Industrial Revolution in Britain, and the takeoff of the steam engine fueled by coal. This is the core of everything terrible that happens afterward.

Previous scholarship had read the takeoff of coal as a product of economics, the scarcity of wood and the relative cheapness of coal. Malm said, "No, that's completely wrong. It really lies in the exercise of class power." He argues that coal and the steam engine took off because British industrial capitalists decided it was in their interests. They could have continued to use waterpower, which was cheaper than early steam engines, but waterpower is spatially fixed, and therefore gave a lot of latitude to workers to revolt. Steam was spatially mobile. It could defy the seasons, and it enabled capitalists to locate factories in cities where there were large potential workforces so they could pick and choose who

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to employ. This is a really influential argument. Especially if you look to the broader environmental humanities, Malm and just a couple of others (Timothy Mitchell, Jason W. Moore) are the historically minded scholars that people are actually reading.

My reservations with this account run in a few different directions. First, it seems to me a very old-fashioned argument—similar to Robert Brenner's famous argument locating the origins of capitalism entirely within Britain's borders. All the movers and shakers are in the West, and Malm explicitly says these are all white, male actors. They're private industrial capitalists who diabolically conspired to promote fossil fuels. So, my spidey sense was tingling because this seems problematic: We have plenty of literature that says we need to look at, for example, slavery and the role of colonies to understand the takeoff of Britain.

Second, this just seems too easy and convenient. It has familiar villains that we can easily identify. You just take all these fossil capitalists, maybe a couple of busloads of them—the heads of evil coal and oil firms—and you drive them off a cliff, and Bob's your uncle! We've solved the climate crisis! That is a nice, comforting story, but unfortunately I don't believe it's true.

Third, I worry that a lot of literature on the climate crisis has become obsessed with the search for a moment of original sin. Everything that follows after the birth of the phenomenon is just taken as read as the globalization of things that happened in Britain or the New World first. That's very odd. If we studied capitalism, we wouldn't say, "Oh, we begin and end by studying merchants in Genoa or Venice." If we studied democracy, we wouldn't be content with just saying, "We only look at the American Revolution, then we just assume the same thing replicates everywhere else." The question of origins doesn't necessarily tell us that much about how massive combustion of fossil fuels and a host of other environmental phenomena spread around the world.

So, I approached the fossil capitalism thesis with some informed skepticism. I was trained by reading revisionist scholarship that took seriously the idea that colonialism brought the *under*development of its colonial peripheries. It would have been surprising if it neatly gifted fossil technologies to those peripheries. If anything, it held back what had been some of the most economically dynamic societies in the world. When I started looking at the early history of electrification in India, I wanted to get back to basics and ask, "Well, is it true that the colonial regime generously delivered what was then a frontier technology across the subcontinent?"

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Surprise, surprise, the answer is no. The British Raj's hallmark was the electric underdevelopment of India, not spreading fossil infrastructure. And this isn't surprising because Britain was actually a laggard in electrification back home. It was unable and unwilling to raise the massive financial resources necessary for big infrastructural investments in its colonies. So, we get a much more complex relationship between colonialism, capitalism, and climate change—in which colonialism was guilty of holding back colonies from this technological frontier, not pushing them forward into the age of electricity. This finding matters: It's electricity, not the steam engine, that is the crucial general-purpose technology that enables fossil fuel dependence to seep into almost every aspect of everyday life.

EP: How can re-centering our stories in Asia help us think differently about energy history and the periodization of the Great Acceleration?

EC: When climate scientists started considering when the Anthropocene might have begun, they compiled pretty graphs of a whole host of indicators, both socioeconomic and environmental. They were very surprised to see that across very different indicators, whether it was population growth, global GDP, freshwater usage, or primary energy use, there was a takeoff into a new phase of nearly exponential growth around 1950. This phase is what is known as the Great Acceleration.

So, we have this idea that there's one long, unbroken acceleration after 1950. A focus on Asia pushes us to disaggregate that. It's clear that for the first generation of the postwar period, the main drivers behind both economic growth and environmental degradation lay in a few societies in the rich, industrialized Global North. And we might want to end that phase, as lots of historians do, roughly around the 1973 oil shock, which marked an economic and an environmental break as the so-called Golden Age came to a rude end in the rich world.

But did that solve climate change? No. Instead, the main drivers of the Great Acceleration shifted toward Asia. In my work, I've started to talk about a "Late Acceleration" centered on Asia from 1980 on, with a second intensification after 2000. China is the big story here, but India plays a big part as well. Let's remember that more than half of all anthropogenic emissions have been released just since the Rio Earth Summit in 1992. Historians are prone to looking all the way back to 1492 or at the very least to Victorian steam power. But maybe we should admit that a little bit of the story might lie toward the end of the twentieth century.

The dynamics of this Asian-centric phase of the Great Acceleration also look quite different. In the rich Global North, scholars have

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convincingly laid out that its hallmarks include the power of private enterprise, the consolidation of consumer society, and a faith in infinite economic growth peddled by neoclassical economists. We might think of car culture as symptomatic.

Once we start looking at the story in Asia, we see that none of those features capture what's going on. I deliberately use this term "Late Acceleration" because this idea of lateness is key—the idea of having to catch up with the early movers. And first, that prompted a leading role for the postcolonial state and public agencies rather than private enterprises in driving both increasing energy use and environmental degradation. Second, it led to what I've started to call the "primacy of politics."

This was also the great age of democratization in many parts of the world, and really everywhere, a new idea of the social contract between states and citizens: States were now expected to deliver at least a modicum of public services to their citizenry. In India, this played out in attempts, often honored in the breach, to extend electricity to an enormous poor population in ways that sometimes actively undermined the interests of industrial capitalists. The centrality of the state and this moral economy of cheap energy as almost an entitlement of citizens, rather than just an industrial input, are very striking hallmarks of the Late Acceleration.

EP: Could you elaborate on your concept of "fossil developmentalism"? Is this a term that applies more broadly across the Global South beyond Asia?

EC: At the core of fossil developmentalism is this divergence I'm trying to draw with fossil capitalism—that is, the primacy of the state in pushing development forward, and the idea that extending the fossil economy becomes something bigger than just a question of short-term profit for a few industrial capitalists—it becomes something much more like a national moral project. This phenomenon is detectable across a lot of the Global South, but we can also see its contours even in places we might not expect. In places like Britain and France, electricity, coal, and so on are seen as too important to leave in the hands of private enterprise. Even in the United States we can see moments where the state is newly obliged to deliver electricity to, for example, farmers, even when they can't bear its full costs. So, studying cases like India, we can generate new theories that travel back to the Global North. It's not just about sketching exotic analytical exceptions in the Global South.

EP: In what ways have fossil capitalism and developmentalism intersected or clashed? Is it even right to characterize them as different entities?

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EC: They are clearly heuristics that have all sorts of overlaps. In my work on electricity, one thing that I've found is, remarkably late into the twentieth century, just twelve multinational corporations dominated the entire power plant manufacturing industry virtually everywhere in the world (India was a partial exception). So, there were fossil capitalists who actually provided the equipment for developmental states elsewhere in the world. But we really can see clashes too. And this is why I would never want to collapse fossil developmentalism altogether into the analytic of untrammeled fossil capitalism.

India is a great case to understand this because that clash played out really dramatically. For example, the biggest environmental revolution in India in the 1960s is what's known as the "Green Revolution"—that is, the input-intensive remaking of agriculture with a lot of financial and technical aid from the United States. It's typically thought of as a matter of spreading new hybrid seeds. But really it centered on new irrigation technologies, especially electric tube wells pumping up groundwater. This meant that farmers began to have a key interest in cheap electricity, and they mobilized on the streets. Huge farmers' movements started to take off in the early 1970s in the Green Revolution heartlands of India to protest against any rise in electricity tariffs. In some states, they succeeded in securing *free* electricity, so they ran those pumps the whole time power was flowing. Dreadful ecological move. That means in regions like Punjab, you are growing rice, a very water-intensive crop, in arid areas.

That set up a clash between the interests of farmers and industrialists. Who was going to pay for all that cheap or free power farmers were getting? Indian utilities cross-subsidized it by charging industrialists some of the most expensive power tariffs in the world. And when power ran scarce and planners had to decide who will bear the brunt of cuts, they said, "Sorry, industry. Your factories are going to have to stop work because we're going to devote power to electric tube wells." So actually, it's coming out of the pockets of Malm's fossil capitalists to bankroll small agrarian capitalists of a different stripe.

EP: In "The Asian Anthropocene," you point out that one of the first major policy moves of independent India was an effort to increase supplies of firewood to reduce the burning of dung. Is there a Great Acceleration biofuel story that we're missing?

EC: This is not a policy dilemma that is familiar to twentieth-century states in the rich world. At Independence in 1947, Indian policymakers

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looked around and said, "Well, what energy sources are people actually using? Wood and cow dung." Along with that arrived a real paranoia about the distinctive ecological problems accompanying this kind of energy regime, which come to be seen as hallmarks of what it is to be underdeveloped: deforestation, soil exhaustion (because the dung that you want to use as fertilizer is being burnt), soil erosion, and so on.

But it was too expensive to build out big, centralized infrastructures like the grid. So, it became a question of, on the one hand, improving management of those traditional sources—managing forests better—and, on the other hand, all sorts of experiments like developing biogas plants that run on dung. India had about four hundred thousand household-scale biogas plants by the 1980s, and China had about six million, mostly running off pig shit. So, very interesting alternative energy paths come out of this, which speak to a set of environmental anxieties in postcolonial states that differ from the stories that we're familiar with in the rich world.

There still is the expectation that people are chomping at the bit to move into the wonderful clean world of gas and electricity. But even today, lots of rural households in India still prefer to cook with wood or dung because the food tastes better and because the hearth is the heart of the home. Also, going out to gather wood is arduous, but it's a rare opportunity for rural women to socialize. So, some of these "traditional energy sources" remain remarkably sticky.

This also raises complicated questions around fossil fuels. More than two million people in India today die every year from air pollution, not least from household cooking. So, the government has promoted liquefied petroleum gas to cut down on this problem. A certain kind of environmentalist is going to see yet another source of fossil fuel dependency there. But it promises great gains in women's health. Studying India shows that we have to bear in mind the emancipatory potential of fossil fuels as well as the ecological side. Taking that moral complexity seriously is what I really try to hammer home.

EP: How can thinking about fossil developmentalism help us rethink what successful and just global climate negotiations and climate finance might look like?

EC: I am, like many people, quite depressed about international climate negotiations, and feel like this has been the wrong model to solve the climate problem. Rather than thinking that one single deal will be the silver bullet, we need to start thinking in terms of much more specific actors, much more specific subproblems, and how we can make those tractable.

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For example, the fossil developmental thesis shows that we need to take seriously the fact that state-owned enterprises and public utilities are among the most crucial actors in the energy sector today. Of the twenty companies that contributed most to climate change between 1965 and 2020, twelve are state owned and headquartered outside the West. Companies like Saudi Aramco or Gazprom don't operate by the same logic as the big private oil majors that we're more familiar with. We need to work out how to help them transition.

We also need to think more precisely about the urgent environmental problems that states are facing. I gave the example of electric tube wells being used for overpumping groundwater for crops, like rice, that should not be grown in semi-arid areas. That's maybe the most existential problem that many areas of India face today. It has more local, immediate solutions that aren't reducible to a global climate deal. We shouldn't lose sight of the fact that climate change is not the sum total of all the problems we face. We could solve this carbon issue (not that we look very likely to) while also being left with all of these connected ecological predicaments.

I've become depressed by the provincialism of environmental debates in the United States at the moment—this fixation on the Inflation Reduction Act and so on. The fact is that today, annually, the whole of North America accounts for about 17 percent of emissions. Europe is about 12 percent. And Asia is well over 50 percent. The first key reality for negotiations is that the future will be determined in Beijing and New Delhi, and a host of smaller cities. The second is that there is a huge moral difference. Energy consumption in India remains, per capita, a seventh of that in the United States. We have to be able to recognize these two things simultaneously.

America lost its moral leadership on this issue a long time ago. But if it wants to make a really big difference, it's going to be in helping those countries where energy use is rightly going to continue growing to come up with the cleanest possible power portfolio. Climate finance and technology transfer should be front and center here. So, I think keeping in mind that planetary frame is really crucial while also trying to break it into more tractable environmental problems at the same time.

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3

Global War, Global Warming

Roger Turner

Historians of nineteenth- and twentieth-century science have taken the lead in writing about the history of climate change, perhaps because, for many years, our engagement with climate change had been mediated through science, especially the datasets and models that scientists first used to apprehend the global climate as a thing, and as a thing that could change. James Rodger Fleming's 1998 book *Historical Perspectives on Climate Change* historicizes climate as a scientific category, exploring the concept's changing meanings from Aristotle into the twentieth century, with compelling excursions into topics such as theories of climatic determinism.[1]

Two more recent books offer engaging narratives useful for introducing the history of climate science to undergraduates or more general readers. Carbon dioxide plays the central character as Spencer Weart describes how scientists from various disciplines experimented, theorized, and gathered evidence in *The Discovery of Global Warming*. The multifarious forms of water that drive climate, from vapor to ocean currents to ice sheets, star in Sarah Dry's *Waters of the World*, a book built around the biographies of six scientists who made formative contributions to what we know now as climate science. (My eight-year-old daughter lit up when she learned a woman named "Dry" wrote a book about water.)[2]

Here, I will follow a different historiographical thread, tracing how knowledge about climate change emerged from the distinctive ways that people fought global wars in the twentieth century. In surprising ways, modern climate science is built upon research driven by the operational needs of airplanes, submarines, and ballistic missiles, as well as the effects of nuclear weapons. An intensely militarized century structured what kinds of questions scientists asked and how they could know the global environment. The military paid to train scientists and funded their research, while technologies first built for the military also enabled

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scientists to access extreme environments. The First and Second World Wars were emergencies that compelled militaries and scientists to improvise new relationships. The decades of Cold War that followed entrenched a patronage relationship that privileged some kinds of research, especially in the geophysical sciences. Certain kinds of scientists became influential policy advisers whose views led to meaningful change.

But historians have also shown that the ideological character of the Cold War shaped the politics of knowledge in ways that continue to influence contemporary responses to the climate crisis. The rivalry for ideological allegiance between capitalism and communism could support global science projects and even encourage cooperative solution making to transnational or global environmental problems. But that rivalry also entrenched anti-communism amid policymakers and their advisers in the United States, significantly contributing to climate denialism after the end of the Cold War.

Knowing the Atmosphere as a Global Entity

New weapons systems deployed during the First and Second World Wars required new kinds of geophysical knowledge to be used effectively. Aviation's importance in the First World War initiated a transformation in mesoscale and hemispheric meteorology. Robert Marc Friedman and James Rodger Fleming show that story runs through Bergen, Norway, where a group of mostly Scandinavian physicists developed a three-dimensional meteorology built around fluid dynamics, introducing now familiar concepts of air masses and storm fronts. Acolytes of the "Bergen School" spread across Europe and North America during the 1920s and 1930s as nascent airlines sought ways of understanding the weather that could keep their flights on schedule.[3]

The Bergen School forecasting techniques required regular and extensive measurement of the air aloft, challenging to procure when each data point required a pilot willing to climb to the edge of hypoxia with a meteorograph strapped to the wing. International data exchanges and the balloon-launched radiosonde introduced in the late 1930s helped, but it was the vast expansion of aviation to fight the next global war that fortified the Bergen School's vision of weather forecasting as a practice of three-dimensional geophysical calculation, as my own research explores. Each new airfield needed a weather observing station, greatly increasing the observations made in the Arctic and the tropics. New squadrons needed weather officers; the US military recruited Bergen acolyte

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Carl-Gustaf Rossby to design a university-based program that trained more than six thousand weather forecasters during the Second World War.[4]

After the war, Rossby and several of those wartime trainees set to work with John von Neumann and another wartime creation: the digital computer. In *Weather by the Numbers*, Kristine Harper traces the development of numerical weather prediction, the computer simulations that form the starting point for virtually all contemporary weather forecasts and climate models. A collaboration between military weather officers, academic researchers, and the civilian US Weather Bureau constructed the first operational electronic weather models during the decade immediately after the end of the Second World War. Paul Edwards picks up the story of climate modeling in *A Vast Machine*, showing the central role of computers in mediating our knowledge of the global atmosphere. Both weather prediction and climate simulation depend on extensive and dense sets of atmospheric observations made by intercalibrated instruments mounted on ground stations, balloons, aircraft, and satellites. Scientists rely on computers not only to solve the equations that model the atmosphere's behavior but also to clean and assimilate the automated weather observations that initialize the models. By the end of the twentieth century, no tool was more central to scientists' understanding of climate change than computer models, nor so vulnerable to politically motivated attack.[5]

The Cold War Drives Science

The explosions at Hiroshima and Nagasaki made it clear that a third world war would be fought with nuclear weapons. But nuclear weapons presented a new set of issues that threw into the air potential connections between science, the national security state, and the environment. Some issues had considerable continuity with the First and Second World Wars. Militaries would still have to deliver atomic bombs to their targets, and the military looked to scientists to help it understand the environments through which bombers flew, ships sailed, and newly developed ballistic missiles rocketed. The poisonous radioactivity created by nuclear weapons created global anxieties, simultaneously opening new possibilities and funding for scientists to use new networks of global surveillance to trace out the circulation of winds or ocean currents by tracking radioactive particles. Finally, the sheer power of nuclear bombs, and the central role of scientists in producing them, created new relationships between

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scientists and policymakers. As the Cold War settled in, these aspects each shaped how scientists came to know about what we now call "global warming," and how they responded to its alarming implications.

Historians agree that the Cold War brought money and intellectual transformations to many disciplines within the earth and geophysical sciences, as Ronald Doel has synthesized.[6] Naomi Oreskes has described the ambiguous consequences this transformation wrought in oceanography in *Science on a Mission*. Patronage from the US Navy supported mapping the seafloor in astonishing detail, and the discoveries of deep ocean circulation, seafloor spreading, and hydrothermal vents. Although not all patrons are interested in truth, "during the Cold War the US Navy was," Oreskes argues, because the Navy wanted accurate information so its sailors could travel and fight effectively.[7] Sometimes, operational questions could lead to discoveries that proved crucial for the emerging understanding of the planet's climate drivers. For instance, the Stommel-Arons model of deep-ocean circulation emerged from operational concerns about thermoclines, discontinuities in water temperature that could hide submarines from sonar.

Navy patronage, however, limited what kinds of questions scientists asked and what kinds of studies were funded. As Oreskes argues, "the military context of motivation led oceanographers to view the ocean primarily as a medium through which sound was transmitted and men and machines would travel, and not as an abode of life."[8] The Navy was not much interested in fish or CO_2 or global climate. Naval funding helped create a community of oceanographers, but organizations such as the Scripps Institution of Oceanography only took up climate science with vigor after Navy funds were on the decline in the late 1980s.

For climate science, one of the most consequential events of the new arrangements of the Cold War was the International Geophysical Year (IGY) of 1957–1958. The IGY was not organized for the purpose of measuring climate, but it did fund a tiny project by Charles David Keeling to measure the background concentration of atmospheric CO_2, the start of the "Keeling Curve" dataset that tracks humanity's transformation of the atmosphere. The IGY was both a continuation of the pre–Cold War International Polar Year tradition (building on international coordination in studying the polar regions in 1882–1883 and 1932–1933) and science on a radically increased scale. About sixty thousand scientists from sixty-seven nations converged in ambitious studies of the oceans, atmosphere, and near-space environment. Although initiated by scientists, leaders in the United States and the

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USSR both saw in scientific cooperation opportunities to gauge each other's strength, gain scientific knowledge that could be militarily advantageous, and demonstrate world leadership to potential allies. As Spencer Weart notes, the project helped to build a shared language and patterns of cooperation among scientists from disciplines who had not previously been in communication—a fundamental change that underlay the decades-long discovery of global warming by making it possible to perceive a global phenomenon spread across so many different regions and disciplines.

The increasing entanglement of science and national security took scientists to extreme environments such as the Greenland ice cap, where the US military explored building a missile base in the 1950s. As glaciologists drilled core samples to study the stability of the ice, they revealed a record of the changing atmosphere that stretched back hundreds of thousands of years. Sarah Dry explains how new understandings of isotopes and the availability of mass spectrometers to measure them made possible paleothermometry—estimating the globe's past average temperatures.

Measuring isotopes offered scientists new ways to understand material flows that affect global climate. Nuclear explosions produced distinctive isotopes such as carbon-14 and strontium-90. The great pulses of carbon-14 released by hundreds of nuclear weapons tests in the 1950s enabled oceanographers to see the role of the oceans in absorbing carbon from the atmosphere, and eventually led to an understanding of the carbon cycle as a biogeochemical process full of feedbacks between rocks, gases, water, and living things. Meteorological studies of nuclear fallout furthered scientists' understanding of the global circulation of the atmosphere, contributing to the urgency for an international treaty banning above-ground nuclear weapons tests signed in 1963 and connecting climate concerns with the nuclear disarmament movement in the 1980s.[9]

Anti-Communism and the Politics of Science

The deep entanglement of earth science with national security during the Cold War created for scientists the expectation that they would have the ear of policymakers. In *Science in an Age of Anxiety*, Jessica Wang explores the relationship between science and US politics at the dawn of the Cold War from 1945 to 1950, seeing that as a critical phase when the Cold War political consensus was built.[10] After the Second World War,

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Wang writes, "elite scientist-administrators regularly entered the inner sanctum of government," advising policymakers about the foreign-policy implication of military technologies as well as about technical matters and environmental issues.[11] The influence of these advisory roles was borne out by negotiations around the Limited Test Ban Treaty in 1963 and even more dramatically in the 1980s around the ozone hole. The discovery of human-caused thinning of the ozone layer quickly led to the first global agreement governing the atmosphere, the Montreal Protocol in 1987. The Montreal Protocol, in turn, became the model for the first attempted climate agreement, the United Nations Framework Convention on Climate Change, negotiated between 1990 and 1992.

But integration into the national security state cost scientists a particular kind of political freedom. The anticommunist political repression of the post–Second World War Red Scare coerced scientists toward an ideology of "Cold War liberalism," as Wang writes. This ideology "denied the importance of popular politics and insisted that all social problems were amenable to nonideological negotiation through guidance by responsible elites."[12] Although Cold War liberalism could produce results such as the Test Ban Treaty and the Montreal Protocol, its separation of scientists from popular politics proved disastrous for climate action once the Cold War ended.

Joshua Howe's book *Behind the Curve* argues that scientists' expectation that government leaders would act on their expert opinion made it hard for climate scientists to react to the very different politics that emerged around climate change as the Cold War ended.[13] In the face of determined political opposition, they continued for decades to work through the same official channels of communication that had served them so well before. But the collapse of communism had changed the game, not just in international negotiations but also in domestic US politics.

As Naomi Oreskes and Erik Conway show in *Merchants of Doubt*, ideological splits in the community of scientists at the end of the Cold War helped undergird the emergence of climate denial.[14] Although the majority of climate scientists maintained the reality of anthropogenic climate change with increasing urgency, former cold warriors Frederick Seitz, Robert Jastrow, and Bill Nierenberg, from the National Academy of Sciences, NASA, and the Scripps Institution, concerned by what they saw as the communist tendencies of environmentalism, would spin off to form the Marshall Institute, which, in the 1990s, effectively cast doubt on the reality of climate science using those same official channels.

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Our ability to perceive global warming today emerges from scientific techniques and institutions developed to support global wars during the twentieth century. The national security implications of science and technology gave scientists a privileged place in US policymaking for several decades. But Cold War anti-communism also constrained the political freedoms of scientists who wanted to maintain security clearances, military funding, and access to policymakers. To maintain a livable planet for the twenty-first century, we need to reimagine the relationship between science, security, and politics.

Notes

1. James Rodger Fleming, *Historical Perspectives on Climate Change* (Oxford University Press, 1998).

2. Spencer Weart, *The Discovery of Global Warming: Revised and Expanded Edition* (Harvard University Press, 2008); and Sarah Dry, *Waters of the World* (University of Chicago Press, 2019).

3. Robert Marc Friedman, *Appropriating the Weather* (Cornell University Press, 1989); and James Rodger Fleming, *Inventing Atmospheric Science: Bjerknes, Rossby, Wexler, and the Foundations of Modern Meteorology* (MIT Press, 2016).

4. Roger Turner, "Teaching the Weather Cadet Generation: Aviation, Pedagogy, and Aspirations to a Universal Meteorology in America, 1920–1950," in *Intimate Universality: Local and Global Themes in the History of Weather and Climate*, ed. James R. Fleming, Vladimir Jankovic, and Deborah R. Coen (Science History Publications, 2006), 141–173.

5. Kristine C. Harper, *Weather by the Numbers: The Genesis of Modern Meteorology* (MIT Press, 2008); and Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (MIT Press, 2013).

6. R. E. Doel, "Cold War and Earth Sciences," in *Handbook of the Historiography of the Earth and Environmental Sciences*, ed. Elena Aronova, David Sepkoski, and Matthew Tamborini, Historiographies of Science (Springer, 2024), https://doi.org/10.1007/978-3-030-92679-3_25-1.

7. Naomi Oreskes, *Science on a Mission* (University of Chicago Press, 2021), 479.

8. Oreskes, *Science on a Mission*, 15.

9. E. Jerry Jessee, "A Heightened Controversy: Nuclear Weapons Testing, Radioactive Tracers, and the Dynamic Stratosphere," in *Toxic Airs: Body, Place and Planet in Historical Perspective,* ed. James Rodger Fleming and Ann Johnson (University of Pittsburgh Press, 2014), 152–180; and Matthias Dörries, "Nuclear Winter and Global Climatic Change," *Osiris* 26 (2011): 198–223.

10. Jessica Wang, *Science in an Age of Anxiety* (University of North Carolina Press, 1999).

11. Wang, *Science in an Age of Anxiety*, 3–4.

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12. Wang, *Science in an Age of Anxiety*, 289.

13. Joshua Howe, *Behind the Curve: Science and the Politics of Global Warming* (University of Washington Press, 2014).

14. Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (Bloomsbury Press, 2010).

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4

Coming to Grips with Climate Change Denial: One Historian's Story

Erik M. Conway

I was working on a contract history from the NASA History Office to write a history of atmospheric science in NASA, which was published in 2008.[1] Sometime that spring, I was at the Scripps Institution of Oceanography's archives working in the papers of one of the institute's former directors, William Nierenberg. Nierenberg had been a member of the NASA Advisory Council in the early 1980s. I wanted to know what the Advisory Council had recommended about NASA's earth science programs, and Scripps was the closest place to look at those records.

In the finding aid for his papers, I had noticed an entry for the George C. Marshall Institute. I had encountered them earlier in my research as one of the organizations spreading doubt about the science of stratospheric ozone depletion, but I didn't know much about them, and they were hardly the focus of my research. It wasn't, after all, a scientific research organization—or part of NASA. I ignored it until I had some time left toward the end of the day. When I finally looked at the Marshall files, I was horrified to find that Nierenberg had been one of the founders of the organization. This discovery would eventually become the basis of my 2010 book with Naomi Oreskes, *Merchants of Doubt*.[2]

The Marshall Institute had been set up as an anti–Union of Concerned Scientists (UCS). Initiated by astronomer Robert Jastrow, the former head of NASA's Goddard Institute for Space Studies, the Marshall Institute's original purpose had been to promote and defend President Reagan's Strategic Defense Initiative (SDI) against a scientists' campaign led by Carl Sagan, Hans Bethe, and the UCS. SDI was a national priority—tens of billions of dollars for a national missile defense program supposed to render "nuclear weapons impotent and obsolete."[3] It had been proposed in response to a vast uprising against the nuclear weapons establishment, the Nuclear Freeze Movement.[4] As an act of politics, SDI proved successful. The Nuclear Freeze Movement disintegrated. As an

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act of weaponeering, its legacy was far more mixed. Some useful detector technology came from it, but no deployable weapons, let alone the spaceborne weapons platforms that quickly became part of the program.

After Reagan left office and SDI vanished, the Marshall Institute didn't go out of business. Instead, it took on the UCS's other major focus: environmental concern. It began casting doubt on the existence and severity of environmental problems, especially ozone depletion and acid rain.

Looking through Nierenberg's papers, it was pretty clear what happened to this man of science. As he'd moved out of the realm of science into politics, the pro-business, antienvironmental, and anti-communist politics Reagan had brought into power began to dominate his thoughts. As the science in question began to show real harm, he kept his political allegiances intact by turning against the evidence.

I found this experience unsettling. It wasn't a large collection of material, and I read it all in an afternoon. I felt like I'd watched a man's mind disintegrate in an instant, whereas in his lived experience, it was a period of around twenty years.

There's a coffee patio at Scripps with a billion-dollar view of the Pacific, and after the archivists kicked me out at the end of the day, I sat there detoxifying. The archival record seemed to show a classic case of groupthink. Having surrounded himself with like-minded fellows, he'd been encouraged into more and more extreme views. It would be easy for anyone to fall into a similar trap.

I didn't intend to do anything with this material I'd discovered. Organized denial wasn't my subject.

I met Oreskes later that year at a history of meteorology meeting in Germany, organized by the International Commission for the History of Meteorology. I presented a paper on the development of satellite meteorology, and she did one on Gordon J. F. MacDonald, a geophysicist who was an early adopter of global warming but who also went to his grave doubting plate tectonics.[5] I didn't know it at the time, but she and some students were working on a paper about the overwhelming scientific consensus on anthropogenic climate change that was published late that year in *Science* and which later featured prominently in the documentary film *An Inconvenient Truth*.[6] The paper on MacDonald and the *Science* article were both in pursuit of her own larger intellectual project of understanding how scientists decide when there's enough evidence to accept a hypothesis as proven—and what kinds of evidence count in that decision.

But that *Science* paper brought her under attack by the organized climate change denial effort, Marshall Institute included. We had a phone

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call about it, and that's when I told her about the Marshall Institute materials that were just up the street from her office at Scripps. That launched a conversation that eventually resulted in our book *Merchants of Doubt*. Oreskes's discovery of the tobacco connection, the role two of our actors had played in casting doubt on the health effects of tobacco, "made" the book, in a sense. The combination of acid rain, stratospheric ozone depletion, and climate change with SDI and tobacco was what distinguished the book concept from other books already on the market.[7] The breadth of subject led to our argument that sowing doubt about these scientific areas wasn't about the content or quality of science. Rather, it was about protecting the political ideology of market fundamentalism.[8]

The industry effort to cast doubt on the findings of harm to people and ecosystems was an example of what Robert Proctor named "agnotology," the cultural production of ignorance.[9] The goal of all these mis- and disinformation campaigns was to ensure that enough of the public remained confused and uncertain about the truth of environmental and health claims that nothing would be done to restrict the industrial activities causing the problems. Our actors, and the networks of think tanks and businesses supporting them, were not so much trying to destroy knowledge as to prevent it from being accepted by the public. They were, in effect, attempting to inoculate the public against scientific findings. In a forthcoming essay, Proctor has set out a typology of the (many) kinds of agnotology that he thinks exist. Our story represents "deliberate or diabolical" agnotology, distinguishing it from, for example, structural agnotology resulting from such things as selective creation or preservation of knowledge.[10]

We have also referred to these disinformation activities as a form of pollution. A basic tenet of market theology is that free markets produce optimum allocation of resources if market participants have access to perfect information. But they don't, at least partly because the information stream participants live in is polluted by disinformation, misinformation, propaganda, and marketing.[11] Information pollution has real effects. The particular kinds of information pollution we studied encourage people to make choices that benefit polluters and not necessarily the people making the choice. To adopt economists' own jargon and viewpoint, markets are therefore "distorted" by these efforts and don't deliver the promised "optimum allocations."

As the above story suggests, we developed the book through traditional historical methods and a little serendipity. We relied on archival materials, books, and articles in the relevant subject areas. The major

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digital repository we used was the tobacco industry document library released in 2002 by the University of California, San Francisco.[12] But we did not do much interviewing for the book. In addition to the basic problem that memory is unreliable, there was the reality that some of our living historical actors had a reputation for using lawsuits to silence people. Oreskes and I give one example of that in *Merchants*.[13] We didn't want those actors to gain the opportunity to silence us, so we didn't approach them for interviews. Thus, one unexplored avenue, for example, was how S. Fred Singer became involved with the Unification Church. David Lipsky may have figured this out recently though.[14]

Questions not asked, finally, fall within Proctor's definition of structural agnotology; in this case, legal structures influenced the information we deemed safe to collect. Anthropogenic climate disruption itself is a subject rife with deliberate and structural ignorance. Did the reality that NASA was the principal funder of climate research in the US for three decades or so influence the kinds of data that was collected or the hypotheses pursued? I'm sure the answer is yes. Funders structure knowledge creation even without any sort of nefarious intent. There will be endless avenues for future historians of climate disruption to explore.

Notes

1. Erik M. Conway, *Atmospheric Science at NASA: A History* (Johns Hopkins University Press, 2008).

2. Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Climate Change* (Bloomsbury Press, 2010).

3. "Address to the Nation on Defense and National Security," March 23, 1983, https://www.reaganlibrary.gov/archives/speech/address-nation-defense-and-national-security.

4. David S. Meyer, *A Winter of Discontent: The Nuclear Freeze and American Politics* (Praeger, 1990); and William M. Knoblauch, *Nuclear Freeze in a Cold War: The Reagan Administration, Cultural Activism, and the End of the Arms Race* (University of Massachusetts Press, 2017).

5. Naomi Oreskes, "The Devil Is in the (Historical) Details: Continental Drift as a Case of Normatively Appropriate Consensus?," *Perspectives on Science* 16, no. 3 (2008): 253–264, https://doi.org/10.1162/posc.2008.16.3.253.

6. Naomi Oreskes, "The Scientific Consensus on Climate Change," *Science* 306 (2004): 1686, https://doi.org/10.1126/science.1103618; and *An Inconvenient Truth*, Participant Productions, 2006, directed by Davis Guggenheim.

7. Ross Gelbspan, *The Heat Is On: The High-Stakes Battle over Earth's Threatened Climate* (Addison-Wesley, 1997); Andrew Revkin, *The North Pole Was Here:*

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Puzzles and Perils at the Top of the World (Kingfisher, 2006); Karen Litfin, *Ozone Discourses: Science and Politics in Global Environmental Cooperation* (Columbia University Press, 1994); Maureen Christie, *The Ozone Layer: A Philosophy of Science Perspective* (Cambridge University Press, 2001); and Robert N. Proctor, *Cancer Wars: How Politics Shapes What We Know and Don't Know about Cancer* (Basic Books, 1995).

8. George Soros, "The Capitalist Threat," *Atlantic Monthly* 279 (February 1997): 47–58.

9. Robert N. Proctor, "Agnotology: The Cultural Production of Ignorance," in *Agnotology: The Making and Unmaking of Ignorance*, ed. Robert N. Proctor and Londa Schiebinger (Stanford University Press, 2008), 1–38.

10. Robert N. Proctor, "Agnotology: 30 Years in the Making," in *Ignorance Unmasked: Essays in the New Science of Agnotology*, ed. Robert N. Proctor and Londa Schiebinger (Stanford University Press, 2025).

11. Oreskes and Conway, *Merchants of Doubt*, 250.

12. UCSF Industry Documents Library, https://www.industrydocuments.ucsf.edu/tobacco/.

13. Oreskes and Conway, *Merchants of Doubt*, 191–193.

14. David Lipsky, *The Parrot and the Igloo: Climate and the Science of Denial* (W. W. Norton, 2023).

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5

This Is Not Our First Time at the Climate Rodeo: Climate Change and Climate Consciousness in the Early Modern World

Lydia Barnett

Why does climate history matter? What can past episodes of climate change tell us about our climate-changing future?

These are big questions that many historians have taken up by turning to the last major episode of climate change in Earth's history, a natural cooling period known as the Little Ice Age (LIA) that preceded our present era of anthropogenic global warming. In the words of the environmental historian Alan Mikhail, the LIA warrants our attention as "the last most significant instance of a historical epoch shaped by the political, social, and economic consequences of climate change."[1] Although the geophysical causes of early modern climate change were crucially different—and it remains imperative to insist on those differences to counter climate denialism and hold greenhouse gas emitters responsible—the social impacts and cultural responses offer some intriguing parallels and potentially useful lessons.

The LIA witnessed climate-related droughts, storms, diseases, and famines, which were implicated in wars, uprisings, economic turmoil, and regime changes. There were also remarkable instances of adaptation and resilience, along with a wide range of cultural and affective responses that can't be neatly categorized as either "resilience" or "collapse." The diversity of reactions to a changing climate reflects the diverse positionalities, both social and ecological, from which early modern people experienced climate change. This is a social fact that is just as true now as it was then.

History is not repeating itself, not exactly. History never does. Climate change today is fundamentally different from climate change in the past. This time, there's a clear culprit, the rate of change is far more rapid, and the consequences are likely to be far more severe. But the oft-repeated claim that our current era of climate change is totally unprecedented is one that historians can and should push back on. We are ideally positioned to show what climate change has meant to past societies and how

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their responses—like ours—were shaped by power and positionality as well as context and contingency. By shining a spotlight on these historical precedents in all of their socially-differentiated complexity, historians have a vital role to play in shaping more just futures.

Early Modern Climate Change

Scientists and historians are actively researching how long the LIA lasted (fourteenth or sixteenth through the nineteenth century), how much of the planet it affected, and which geophysical forces were most responsible for initiating and sustaining it. All agree that the LIA was less severe than our present age of fossil-fuel-fueled global warming and that it led nevertheless to profound dislocations in the human and other-than-human worlds.

Generally speaking, the LIA was characterized by colder-than-average winters and short, cool, wet summers across the Northern Hemisphere, as well as frequent storms and floods. The Southern Hemisphere and equatorial regions experienced fewer variations in temperature but suffered through alternating periods of drought and extreme precipitation. Volcanic eruptions periodically released particulate matter into the atmosphere that blocked the sun's rays even as solar activity fluctuated, disrupting ocean currents and weather systems. Major cooling periods such as the Grindelwald Fluctuation (1560–1630) and the Maunder Minimum (1680–1720) were punctuated by periods of average and even above-average temperatures. Because the causes of the LIA were unevenly distributed across space and time, so too were its effects. For this reason, some researchers argue that the LIA is best understood as "an age of unpredictable meteorological extremes, rather than universal or uninterrupted cooling."[2]

Living through an age of meteorological extremes, even absent unidirectional and rapid climatic change, proved acutely challenging. Changing precipitation patterns disrupted growing seasons and harmed plant growth, crop yields, and animal livelihoods. In northern Europe, food insecurity led to widespread famine and disease almost as soon as the first wave of cooling began in the fourteenth century, leading to a mass mortality event known at the time as the "Great Famine" or simply the "Great Death," which killed an estimated 10–15 percent of the population—a precursor to the better-known Black Death, whose possible connection to the LIA is still being investigated.[3]

Food insecurity often led to social crisis. The century and a half of European witch trials coincided with one of the coldest continuous periods of the LIA in Europe. Some of the most common accusations leveled

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against suspected witches—that they had conjured bad weather, blighted crops, or caused the deaths of livestock—were also common ecological consequences of the period's climatic shifts. Witchcraft accusations were most frequently leveled at individuals who were regarded by their communities as violating norms around gender or sexuality, suggesting that scapegoating marginalized groups in times of resource scarcity was a common feature of early modern climate change.[4]

Histories of the LIA often adopt the narrative framework of crisis and collapse, although recent scholarship also emphasizes episodes of resourceful resilience. Iberian peasants developed ingenious drought-mitigation strategies in the seventeenth century, while the Comanche forged new interspecies relationships with horses and bison and built a vast empire on the Great Plains in the eighteenth century.[5] Dagomar Degroot's recasting of the Dutch Golden Age as a lesson in successful climate adaptation in *The Frigid Golden Age* pairs generatively with Timothy Brook's *The Price of Collapse* and Sam White's *The Climate of Rebellion*, which show how price shocks, popular uprisings, and unpredictable weather destabilized the early modern Ming and Ottoman Empires.[6]

The value of the crisis-and-collapse narrative is to show us how bad things can get. If anything, the fact that the LIA was a far "softer" period of climate change than our own and still sowed so much chaos should scare the pants off us. The value of the adaptation-and-resilience narrative is to remind us that we are not doomed, that choice and agency remain in how we respond to climate change. People make their own history, even if not under climatic conditions of their own choosing.

Taking a more global view of the power struggles of the early modern period also reminds us that crisis and resilience are often a matter of perspective. Historian Thomas Wickman has shown how climatic shifts in the 1690s systematically advantaged Indigenous Americans and disadvantaged European settlers in the dense forests of the northern Atlantic Coast. During the extreme cold and deep snows that characterized that decade, the Wabanaki successfully defended their homelands by mobilizing traditional knowledge of winter ecologies and technologies, executing successful hunting and raiding parties on snowshoes that brought in a steady supply of food—deep snow made moose and deer easier to track and kill—while driving back English settlement. When English settlers adopted Wabanaki snowshoe technology in the eighteenth century, it tipped the balance of power back toward the English and facilitated the dispossession of Wabanaki lands.[7] Sometimes, one man's crisis is another man's resilience.

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Early Modern Climate Consciousness

Other stories are possible, and equally necessary. Sugata Ray's *Climate Change and the Art of Devotion* shows how worshippers of the Hindu god Krishna created a new theology deeply attuned to the landscape of the sacred pilgrimage site of Braj during a period of prolonged drought and catastrophic disturbances to the monsoon season.[8] In Christian Europe, religious writers and record keepers began to interpret extreme weather events as the Christian God's punishment for sin, an interpretation that was largely absent from sermons and weather chronicles before the onset of the LIA.[9] Christian and Hindu theology changed with the climate in ways that were specific to culture and environment and are not quite so easily enrolled in narratives of either crisis or resilience.

The range of cultural responses to early modern climate change—at least in early modern Europe and the Euro-American Atlantic world, my own areas of expertise and the focus of this essay going forward—registers as both deeply strange and eerily familiar. During the bitterly cold winter of 1683–1684, a deeply religious English scientist named Thomas Burnet developed a theory that the earth used to have a warm, spring-like climate that was forever lost. The motor of this global climatic shift was human sin, which provoked God to send Noah's flood, which changed the earth's climate and made it dramatically less hospitable to human life and health. Although terms such as "climate grief" and "climate anxiety" are of recent coinage, the structures of feeling they name may be much older. Burnet's climate grief, if we want to call it that, was complicated by his sense of humanity's complicity in the climate's degradation. This, too, is a structure of feeling that is familiar to many people alive today.[10]

Burnet's fantastical yet weirdly resonant account of a changing planet raises what is, for me, one of the most interesting questions about the LIA: Did early modern people know that they were living through a period of climatic change? Further research is needed, but the evidence so far is suggestive. We have hundreds of weather reports with titles such as "Curious and Historical News of the Extraordinarily Harsh and Long Winter of 1740," printed in the German city of Leipzig after a winter that climatologists have since confirmed was one of the coldest of the last five hundred years.[11] We even have claims that the climate—as they understood it, usually as a local or regional phenomenon rather than a planetary one—was changing. When temperatures in eastern North America were rebounding from the extra-cold Maunder Minimum in

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the 1780s, elderly settlers in Virginia told Thomas Jefferson that winters were shorter and milder than they used to be, from which Jefferson concluded that "a change in our climate . . . is taking place very sensibly."[12]

How was this possible? One answer is that the LIA, like our current age of global warming, was punctuated by what eco-critic Sarah Dimick calls "climate arrhythmias," or unseasonal indicators of climate change.[13] As I began writing this essay in January 2024, the grass in Chicago was still green; the ground hadn't frozen yet. This is a climate arrhythmia. In ten years of living here, I have yet to experience a major snowstorm like the ones longer-term residents tell me used to be common. Jefferson's elderly informants were likewise indexing climate arrhythmias when they said rivers in Virginia used to freeze in winter but "scarcely ever do so now."[14] Climate arrhythmias happen on local scales and do not require a global infrastructure of weather data or sophisticated computer models to notice or to record. No one in the early modern world could have known they were living through the Little Ice Age (coined in 1939) in the same way that we know ourselves to be living through a period of accelerating global warming. But it does seem as if climate change was genuinely experienced and noticed on a local level by some early modern observers.

Jefferson's musings on the changing climate of Virginia may have reflected climatological awareness; they definitely typified ideas about climate that were circulating widely in European and Euro-American knowledge systems, including the idea that (local) climates could change and humans could play a role in changing them. His speculation also reflected anxieties about climate and climate change that accompanied European overseas colonialism from the sixteenth century onward. Settlers frequently expressed fears that the tropical climates of "the Indies" were unhealthy and would make them sick—or worse, in their eyes, "native."[15]

As modern racial categories took shape in the violent cauldron of overseas imperialism and the transatlantic slave trade, the dominant explanation in European culture for racial difference was climatic. Different climates were thought to produce different—that is, raced—bodies. Traveling from one climate to another therefore raised the specter of involuntarily changing one's race. Spanish settlers in the sixteenth century tried to maintain their familiar Iberian diet by importing cattle and wheat, anxious that the foodstuffs growing in the Mesoamerican climate would cause not only illness but also more permanent bodily changes. In the eighteenth century, English settlers in the Northeast and mid-Atlantic addressed this "problem" by hatching ambitious plans to change the climate, usually

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by razing forests or draining wetlands, which they hoped would improve air quality and temperature. Making the American climate more like England's was supposed to keep settlers' bodies "English" as well.[16]

Although colonists' attempts at climate and racial engineering failed, their deliberate destruction of forests and wetlands and their importation of Old World plants and animals did succeed in transforming the lands and waters of the Americas, undermining Indigenous sovereignty and furthering colonial expansion. Moreover, the mindset of those who undertook colonial climate engineering projects may offer some insight into the kinds of climate consciousness that sustain knowing participation in anthropogenic climate change.

Besides grief, anxiety, and complicity, we find examples of pleasure, curiosity, obliviousness, and even denial, which likewise reflected the varied religious, political, social, and ecological positions from which people experienced early modern climate change. Priests in Württemberg delivered sermons in the coldest years of the Grindelwald Fluctuation, reassuring parishioners that their climate was uniquely fertile and blessed by God.[17] When the Arno River froze in the bitterly cold winter of 1604, Florentines threw a party on the ice with music, games, parades, and costumes, including Christian men dressing up as Turkish women. Venetians picked up on this theme when their lagoon froze solid in 1789, staging a mock battle on the ice between "Turks" and "Christians."[18] Climate arrhythmias could serve as the occasion for joy, play, and gratitude even as they gave rise to ritualized performances of communal identity and exclusion.

Documenting these diverse cultural responses helps us avoid the trap of environmental determinism, demonstrating that many responses to climate change are possible. Some are admirable, others reprehensible. All of them represent the kinds of things people will do to and for each other when they're trying to survive. Some people burned their neighbor as a witch. Some people threw a party on the ice. Some people cut down a bunch of trees in a desperate bid to preserve their whiteness. Some people used their ancestors' teachings to hunt moose and fend off invaders. Some people created new devotional practices as the monsoon went haywire. Some people fantasized about an earlier, better climate, now irrevocably lost. These varied responses also remind us that responses to climate change, whether it's consciously apprehended or not, are intimately tied to power and positionality.

Finally, the claim that our present crisis is unprecedented is itself a historical narrative shaped by the varied subject positions from which

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we view the past. Taking aim at the "Brave New Anthropocene" tenor of climate discourse in the twenty-first century, the philosopher Kyle Powys Whyte (Potawatomi) reminds non-Native readers that Indigenous people have already lived through environmental apocalypse, wave upon wave of world-ending events that destroyed ecosystems and traditional lifeways alike. The idea that we ("we") are facing an unprecedented ecological crisis, Whyte argues, only makes sense from a settler point of view. We have been here before, whether all of us know it or not.[19]

This is not our first time at the climate rodeo. Past eras of climate cooling are not a perfect analogy for our present era of anthropogenic global warming. But the analogies needn't be perfect to be useful. The broad strokes of similarity and difference sketched here represent just the beginning of the work that historians and memory keepers of all stripes have done to illuminate the past as a rich and complex resource for the present.

Notes

1. Alan Mikhail, "Enlightenment Anthropocene," *Eighteenth-Century Studies* 49, no. 2 (2016): 211.

2. Dagomar Degroot, "Climate Change and Society in the 15th to 18th Centuries," *WIREs Climate Change* 9 (2018): 3, https://doi.org/10.1002/wcc.518. See also Raphael Neukom, et al., "No evidence for globally coherent warm and cold periods over the preindustrial Common Era," *Nature* 571 (July 25, 2019), https://doi.org/10.1038/s41586-019-1401-2.

3. Philip Slavin, "The 1310 Event," in *The Palgrave Handbook of Climate History*, eds. Sam White, Christian Pfister, and Franz Mauelshagen (Palgrave MacMillan, 2018), 495–515.

4. Wolfgang Behringer, *A Cultural History of Climate*, trans. Patrick Camiller (Polity Press, 2010).

5. Mar Grau-Satorras, et al., "Prudent Peasantries: Multilevel Adaptation to Drought in Early Modern Spain (1600-1715)," *Environment and History* 27, no. 1 (2021): 3–36; Pekka Hämäläinen, *The Comanche Empire* (Yale University Press, 2008); and Dagomar Degroot, "Little Ice Age lessons," *Aeon*, November 11, 2019, https://aeon.co/essays/the-little-ice-age-is-a-history-of-resilience-and-surprises.

6. Dagomar Degroot, *The Frigid Golden Age: Climate Change, the Little Ice Age, and the Dutch Republic, 1560–1720* (Cambridge University Press, 2018); Timothy Brook, *The Price of Collapse: The Little Ice Age and the Fall of Ming China* (Princeton University Press, 2023); and Sam White, *The Climate of Rebellion in the Early Modern Ottoman Empire* (Cambridge University Press, 2011).

7. Thomas Wickman, "'Winters Embittered with Hardship': Severe Cold, Wabanaki Power, and English Adjustments, 1690-1710," *William and Mary Quarterly* 72, no. 1 (2015):57–98.

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8. Sugata Ray, *Climate Change and the Art of Devotion: Geo-Aesthetics in the Land of Krishna, 1550–1850* (University of Washington Press, 2019).

9. Trevor Dean, "Natural encounters: climate, weather and the Italian Renaissance," *European Review of History* 18, no. 4 (2011): 550–551.

10. Lydia Barnett, *After the Flood: Imagining the Global Environment in Early Modern Europe* (Johns Hopkins University Press, 2019).

11. Johann Rudolph Marcus, *Curiöse und historische Nachricht von dem im ietzigen 1740ten Jahre eingefallenen ausserordentlich strengen und langen Winter* (Leipzig, 1740).

12. Thomas Jefferson, *Notes on the State of Virginia*, 2nd ed. (London, 1787), 134.

13. Sarah Dimick, *Unseasonable: Climate Change in Global Literatures* (Columbia University Press, 2024).

14. Jefferson, *Notes*, 134.

15. Anya Zilberstein, *A Temperate Climate: Making Climate Change in Early America* (Oxford University Press, 2016); and David N. Livingstone, *The Empire of Climate* (Princeton University Press, 2024).

16. Katherine Johnston, *The Nature of Slavery: Environment and Plantation Labor in the Anglo-Atlantic World* (Oxford University Press, 2022); Jan Golinski, "American Climate and the Civilization of Nature," in *Science and Empire in the Atlantic World*, eds. James Delbourgo and Nicholas Dew (Routledge, 2008), 153–174; and Rebecca Earle, "Climate, travel, and colonialism in the early modern world," in *Governing the Environment in the Early Modern World*, eds. Sarah Miglietti and John Morgan (Routledge, 2017), 22–37.

17. Sky Michael Johnston, "Accounting for a Fruitful Little Ice Age: Overlapping Scales of Climate and Culture in Württemberg, 1560–1590," *Environmental History* 27, no. 4 (2022): 722–746.

18. Mary M. Young, "The Ice Festival of Florence, 1604," in *Waterborne Pageants and Festivities in the Renaissance*, ed. Margaret Shewring (Routledge, 2013), 243–264; and Dario Camuffo, et al., "When the Lagoon Was Frozen Over in Venice from A.D. 604 to 2012: Evidence from Written Documentary Sources, Visual Arts and Instrumental Readings," *Méditerranée* (2017), https://journals.openedition.org/mediterranee/7983.

19. Kyle Powys Whyte, "Our Ancestors' Dystopia Now: Indigenous Conservation and the Anthropocene," in *The Routledge Companion to the Environmental Humanities*, ed. Ursula K. Heise, Jon Christensen, Michelle Niemann (Routledge, 2017), 206–215.

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6

The Premodern Anthropocene and Why It Still Matters

Anya Zilberstein

Amid the ongoing war of words among various experts over whether to designate "our" era of climate crisis as a distinct geological epoch or event as the Anthropocene—the Human Age—or a delimited variation and when it began, a handful of researchers have pointed out that the debate itself has a history.[1] The long, if discontinuous, history of climate debate stretches back to the preindustrial period, a precedent that should be interesting to anyone integrating anthropogenic climate change into their research and teaching. Read about the premodern Anthropocene and you will see that—perhaps unsurprisingly—contestations over the idea that people might be agents of climate change dates to a series of interconnected textbook events in Global North history: expanding capitalism and colonialism, the Reformation and Counter-Reformation, the Scientific Revolution and the Enlightenment, the emergence of nation-states following the Age of Revolutions, and the Industrial Revolution.[2]

Curiosity about the nature of climate and its susceptibility to human action was central to early political, economic, and scientific culture in Europe and the Americas. To illustrate what anthropogenic climate change meant in this period, I begin with an example from the archives. Polymath Benjamin Vaughan's unpublished writings about climate were not unique except in their panoptic scope. But because Vaughan (1751–1835) was alert to the variety and ideological elements of learned discussions about human-caused climate change before the nineteenth century, his work crystallized their content, tone, and spirit, which, as I'll return to, are what makes this history of largely outdated science still matter, or at least useful for thinking about current debates.

Sometime around 1800 in coastal Maine, Vaughan assigned himself the task of teaching climate history to undergraduates. He aspired to produce a pamphlet-length addendum to Harvard's geography textbook to update the curriculum with the latest science, including the controversy

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over whether settlers had recently changed the climate. Vaughan surveyed Western knowledge about the physical globe, but the "great geographical question for the American student," he emphasized, "regards the changes of climate said to have occurred in the United States," especially "the supposed softening of the climate . . . in consequence of their increasing cultivation." A "softened" climate meant more consistently temperate weather, balanced seasons, and fewer and less extreme weather events, winds, temperatures, and humidity. It was an entirely anthropocentric, culturally specific definition of clement weather based on European ideals of bodily comfort and conditions best suited for daily life in a commercial society. And the supposition Vaughan referred to was that climatic moderation resulted from economic development ("cultivation" or "improvement" in the eighteenth-century idiom).[3]

In other words, Vaughan was motivated most of all to educate American students about anthropogenic climate change—a hotly debated theory with an ancient pedigree that had been affirmed or challenged by prominent contemporaries such as the Comte de Buffon, David Hume, Vaughan's close friend Benjamin Franklin, and countless more obscure writers. Since the sixteenth century, naturalists had been trying to determine and document the causes and consequences of environmental changes they experienced. The most prevalent argument for climate change was that agricultural modernization, settler population growth, and other forms of development had destabilized local climates, making excessive, prolonged cold winters or hot summers milder, changes that seemed conspicuous in rapidly growing colonies, where settlers instigated Indigenous dispossession, deforestation, and other extractive enterprises. By the end of the eighteenth century, these and other conjectures about mostly auspicious, human-caused climatic instability became a standard part of scientific correspondence across and beyond the Atlantic world. Vaughan's pamphlet dutifully explained that naturalists combined reports of regional phenomena—weather trends across the colonial Americas, Africa, and Pacific world; declining water levels in the Baltic and Caspian Seas; and melting glaciers in the Arctic and Alps—to argue for a worldwide shift in climate attributable to sustained human population and economic growth.[4]

But like Franklin, an early proponent who later became a skeptic, Vaughan did not endorse the hypothesis that climate was subject to historical transformation. To prove his position, Vaughan fixated on the "Counter Facts" of China and Japan, where climate had remained unchanged. "Since the world began . . . No countries in the world of the same extent have been longer & more uninterruptedly settled or more closely peopled than these

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two great Eastern empires; yet human industry appears to have wrought no material change in the extremes of their seasons during a multitude of centuries." These compelling "instances" demonstrated to Vaughan that naturalists had misinterpreted weather variability as permanent climate change. "Even the industry of man in whatever multitudes combined," he concluded, "can never overcome" climate.[5]

Vaughan's unpublished notes on climate are notable for two reasons: first, their tantalizing prefigurement of twentieth-century economic historians' attempts to puzzle out the "Great Divergence" between East Asia and the West; and second, their synthesis of climate knowledge on the cusp of industrialization, mechanization, and increasing fossil fuel reliance. But in another way, they are just another attestation of how commonplace was the conviction that people had the capacity (even duty) to transform the natural world. Although Vaughan disputed anthropogenic global warming or cooling, he was entirely convinced that humanity, and societies with powerful states in particular, were responsible for profound environmental change. "Man," he declared, "is the only animal whose operations materially change the surface of the earth and when the efforts of whole nations are exerted to extend cultivation where it was before wanting . . . much may be done in this way."[6]

Despite his location in a rural periphery, Vaughan was privileged and powerful in every way that mattered in the transatlantic world of that period. He was a married man with a prominent extended family, and he was a wealthy merchant and landowner with lucrative properties in the United States, England, France, and the Caribbean, where he also held property in enslaved people.[7] Educated at Cambridge and Edinburgh, he cultivated lifelong connections to illustrious individuals and institutions. He was also politically influential (a former British MP; a consultant to several early American presidents). Just before he began working on the geographical pamphlet, the geography of his own life had been rearranged by the repercussions of Atlantic revolutions, an uprooting that helped fuel his interest in the connections between political and environmental history.

Those political upheavals, we now know, occurred at the culmination of a series of ecological revolutions that reshaped territorial, aquatic, and aerial environments across and beyond the Atlantic world. Preceded in the eleventh through fourteenth centuries by hemispheric processes (the expansion of maize; the onset of Little Ice Age [LIA] conditions), after 1500, Native Americans both affected and were affected by increasingly global changes: imperial scrambles for precious metals, cod, fertile soil, and other commodities; transoceanic plant, animal, and disease transfers;

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massive demographic, technological, and economic shifts resulting from dispossession and ongoing immigration of settlers and the enslaved, who worked to convert indigenous coasts, forests, and fields into profitable resources. All together these people made radical, and in many cases long-lasting interventions in landscapes and marine environments. In the late eighteenth century, these ecological pressures were further exacerbated by the Second Agricultural Revolution, Industrial Revolution, and the energy transition to coal that some identify as the Anthropocene's beginning.

Generations of Native peoples and newcomers witnessed the palpable consequences of these material and cultural transformations, from extensive wetland drainage and urbanization to scores of commercial extirpations of native flora and fauna. Nevertheless, and despite ongoing vulnerability to destructive nonhuman forces—earthquakes, pandemics, pests, and weather-related disasters intensified by the lingering LIA—by the time Vaughan relocated to Maine, settler colonists like himself became increasingly confident of their power to overcome them, especially to ensure they could continue to draw on the continent's abundance. Vaughan couldn't have known all the changes historians have since traced, but from his vantage, he expressed a collective knowledge (heavily inflected by his position as a beneficiary of empire) of environmental history in universal, secular, and optimistic terms.

It is that last part—Vaughan and his peers' sanguine attitude toward their sweeping improvements to nature, such that they might even affect the ancient nature of climate—that is simultaneously different from and consistent with what we face today. Despite that, their science was eclipsed, and arguably they had no directly comparable sense of a climate *emergency*.[8] And whereas Vaughan and his ilk embraced responsibility for causing widespread ecological change, they considered these as life-enhancing improvements that needed to be maintained so as not to trigger a reversal of fortunes, as still do so many in similarly privileged positions who disagree with environmentally minded citizens warning of irreversible, life-threatening degradation. These ironic continuities and about-faces are what make premodern ideas about anthropogenic climate change matter. The Anthropocene concept emerged in the context of European empire and colonialism. It was articulated by those who most benefited from the conquest of land and other Indigenous resources. The legacies of these influential ideas—in manifold and subtle ways—inform attitudes about climate science and climate change up to the present. This is why it is crucial to apprehend that the concept of the Anthropocene—not just "planetary consciousness" but specifically the belief that human

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manipulation of environments causes lasting changes to everything from weather patterns to the composition of bedrock—long predated the Great Acceleration. It even predates the Industrial Revolution, as Crutzen and Stoermer originally proposed in popularizing the neologism. Irrespective of whether we agree with proponents of the Orbis Spike proposal that the more persuasive (and politically ethical) origin of significant material change on a geological scale was the coincidence of European invasions of the Americas and the LIA's Maunder Minimum, it was in this period that educated elites explicitly debated the validity of anthropogenic climate change as a scientific theory.[9]

This history also makes untenable Dipesh Chakrabarty's widely cited claim that until the onset of late modernity, human and environmental history had always been distinct concepts. The premodern Anthropocene debates demonstrate that the notion itself is not new: People believed they had the power to change Earth's terrestrial environments—including, some even thought, its regional or global climate—long before the rise of petrostates, plastics, and radioactive waste. It suggests that the many colonial, Eurocentric, Whiggish, and capitalist assumptions integral to this notion—about who had the power to shape climate, the kinds of activity these groups promoted as a means to do so, and the many consequences of wielding that power—continue to inform many people's imagination about how to respond to climate change now, whether through concentrating decision-making in institutions based in the Global North, by sponsoring technoscientific solutions, or by ignoring the severity of the crisis and continuing to support economic growth for the foreseeable future.[10]

In the past decade or so, more historians have focused their research on climate, among which the more prominent to date include: (1) interdisciplinary collaborations to reconstruct past climate change and political, technological, and cultural responses to it; (2) reinterpretations of the many origin stories and explanatory frameworks for thinking about human–nonhuman relationships on a planetary scale—from geological and evolutionary theories to ancient cosmologies that incorporate explanations for the elemental forces of nature; and (3) the intellectual and political history of modern climate science. These histories can serve as hermeneutics, helping inform how the climate crisis has been documented, communicated, experienced, and perceived in different parts of the world or by different people.[11] As historians, we can also usefully draw attention to the vast spaces of unknowing that remain in scientific understandings of the causal and correlative relationships between the physical climate and human history, which has been modeled by modern climate science

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historians. That scholarship emphasizes the fluidity of science rather than taking the current state of knowledge as a fortress built of unimpeachable facts. But given the numerous global crises hampering real progress in addressing the real problems of climate change, it might come in handy for historians and other humanists to recognize that controversy surrounding climate knowledge has a much deeper and explicitly political history.[12]

Notes

1. Raymond Zhong, "Are We in the 'Anthropocene,' the Human Age? Nope, Scientists Say," *New York Times*, March 5, 2024; and Steve Metz, "The Neologismecene," in *Break Up The Anthropocene* (University of Minnesota Press, 2019).

2. Lydia Barnett, *After the Flood: Imagining the Global Environment in Early Modern Europe* (Johns Hopkins University Press, 2019); Jan Golinski, *British Weather and the Climate of Enlightenment* (University of Chicago Press, 2007); Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History and Us*, trans. David Fernbach (Verso, 2016); Richard H. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (Cambridge University Press, 1995); and Anya Zilberstein, *A Temperate Climate: Making Climate Change in Early America* (Oxford University Press, 2016).

3. Benjamin Vaughan Papers: Series IV, "Climate," AMs, Subject Files: No. 5, Miscellaneous Mss.B.V46p, Folder 7 (American Philosophical Society, n.d., ca. 1780s–1804); and Thomas M. Wickman, *Snowshoe Country: An Environmental and Cultural History of Winter in the Early American Northeast* (Cambridge University Press, 2018).

4. Anya Zilberstein, *A Temperate Empire*, introduction and chapter 5; Vaughan, "Climate."

5. Vaughan, "Climate"; Benjamin Vaughan Papers: Series IV, "Notes on Weather," AMs, Subject Files: No. 5, Miscellaneous Mss.B.V46p, Folder 8 (American Philosophical Society, n.d., ca. 1780s).

6. Vaughan, "Climate" and "Notes on Weather."

7. Centre for the Study of the Legacies of British Slavery, "Benjamin Vaughan," accessed February 5, 2024, https://www.ucl.ac.uk/lbs/person/view/45943.

8. Cf. Anya Zilberstein, "'A Considerable Change of Climate': Glacial Retreat and British Policy in the Early-Nineteenth-Century Arctic," in *Governing the Environment in the Early Modern World: Theory and Practice*, ed. Sara Miglietto and John Morgan (Routledge, 2017), 134–152; and Joyce E. Chaplin, *The Franklin Stove: An Unintended American Revolution* (FSG, 2025).

9. Simon L. Lewis and Mark Maslin, *The Human Planet: How We Created the Anthropocene* (Yale University Press, 2018); Heather Davis and Zoe Todd, "On the Importance of a Date, or, Decolonizing the Anthropocene," *ACME* 16, no. 4 (2017): 761–780; and Paul J. Crutzen and Eugene F. Stoermer, "The 'Anthropocene'

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(2000)," in *Paul J. Crutzen and the Anthropocene: A New Epoch in Earth's History*, ed. Susanne Benner et al. (Springer International, 2021), 19–21.

10. Dipesh Chakrabarty, *The Climate of History in a Planetary Age* (University of Chicago Press, 2021).

11. Alison Bashford, Emily N. Kern, and Adam Bobbette, eds., *New Earth Histories: Geo-Cosmologies and the Making of the Modern World* (University of Chicago Press, 2023).

12. Mark Carey, *In the Shadow of Melting Glaciers: Climate Change and Andean Society* (Oxford University Press, 2010); Paul Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (MIT Press, 2010); Jacob Darwin Hamblin, *Arming Mother Nature: The Birth of Catastrophic Environmentalism* (Oxford University Press, 2013); Joshua Howe, *Making Climate Change History: Documents from Global Warming's Past* (University of Washington Press, 2017); Joshua Howe, *Behind the Curve: Science and the Politics of Global Warming* (University of Washington Press, 2014); and Steven Shapin, "Is There a Crisis of Truth?," *Los Angeles Review of Books*, December 2, 2019.

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7

We Are All *Tempestarii*: Thinking Early Medieval in the Anthropocene

David Patterson

The Early Middle Ages have long been portrayed as dreary. When the Italian poet and humanist Petrarch declared that the post-Roman centuries were cast in *tenebrae* (darkness), he meant that they were culturally benighted, deficient in knowledge and artistic or political achievements.[1] But in modern historiography, another form of darkness—an atmospheric gloominess—has also clung to the period. Since Hubert Lamb's elucidation of a European "cold regime" beginning in the sixth century, the "Dark Ages Cold Period" has been understood mainly through paleoclimate proxy data, indirect indicators of past conditions found in tree rings, ice cores, and other natural archives.[2] Some traditional documentary sources also paint an inclement picture of early medieval weather, although we should bear in mind that the authors of annals, saints' lives, and sermons had narrative aims other than accurately recording weather. This is especially clear in descriptions of magical storms conjured by weather wizards (*tempestarii*).[3] Hardly evidence for meteorological norms, such vivid accounts nevertheless evoke the environmental hardships faced by medieval farmers.

Although recent efforts to discard or even invert the "Dark Age" image of early medieval society have met with great success, the idea of an early medieval *climate* downturn has been harder to dispel. Indeed, the atmospheric gloom has recently grown thicker: A vague "Dark Ages Cold Period" has given way to a sharply defined "Late Antique Little Ice Age" (LALIA) from 536 to ca. 660 C.E., initiated by a series of volcanic eruptions and potentially exacerbated by reduced solar activity.[4] Although these new developments in our understanding of early medieval climate variability once again derive largely from paleoclimate proxies, historians have offered more nuanced pictures of societal responses, often via interdisciplinary collaborations adopting methodologies from both history and the sciences.[5] Yet this interdisciplinarity can also become a space of

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uneasy tensions: Are historical sources there merely to reinforce scientific data, or is science there to support historical narratives? Some proponents of a "consilience" approach argue that both can and should have equal weight.[6]

Reconstructions of past climates help scientists understand and contextualize modern warming, but historians can help us better understand the resilience and vulnerability of past societies both to extreme weather events and to climate variability (long-term changes in average weather). In doing so, we inevitably grapple with the specter of environmental determinism. Early efforts to illuminate the premodern past with paleoclimate evidence tended to draw connections between climate, civilization, and racial characteristics, justifiably leading historians to consign this work to the dustbin of rejected determinism.[7] Yet amid the urgency of modern anthropogenic warming, historical narratives that center environmental factors have recently experienced a resurgence.[8] Perhaps most influentially, Kyle Harper has drawn on new evidence for LALIA to link the decline of the Western Roman Empire with climatic deterioration.[9] Such studies have been aided by the abundance of new paleoclimate research seeking to establish baselines of natural variability against which modern warming can be measured. Since the Intergovernmental Panel on Climate Change's first report in 1990, this work has made clear the consequences of even small shifts in global average temperatures.[10] Thus, premodernists must find a balance: Even as we strive to avoid simple determinism, it is no longer tenable to minimize the effects of even seemingly small climatic fluctuations on human societies past and present.

Historians have become increasingly interested in nuancing our understanding of the ways in which past societies grappled with climatic variability.[11] This work emphasizes not only vulnerability but also resilience and adaptation.[12] Crucially, these factors vary within as much as between societies, heavily influenced by social status, charitable norms, and baseline social inequality at the outset of a crisis.[13] Such societal characteristics can play a larger role than exogenous shocks. We have come to understand famine, for example, as less an environmental disaster than the result of unequal distribution and shifting entitlements.[14] Historians are applying these lessons to premodern societies, analyzing social dynamics alongside environmental factors.[15] More work remains to be done in this vein, although scholars of antiquity and the later Middle Ages have already begun to examine the complex social dimensions of hunger.[16] Some premodern historians have sought to draw explicit lessons from historical examples of societal resilience.[17] It is heartening to think that in our own age of precarity, premodern examples might point a way forward.

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We must treat such prescriptive narratives cautiously, however, bearing in mind the key differences between modern anthropogenic warming and the natural climate variability of the past, which often resulted from volcanism.[18] Indeed, the relatively minor climate epochs of the medieval period have turned out to be geographically and temporally heterogenous, more localized than global phenomena.[19]

Today, we are altering the climate in unprecedented ways, though the idea that human beings hold agency over short-term weather and even long-term meteorological trends is not new. Here, I return to the *tempestarii*, for despite the burgeoning literature on medieval climate, there remains a shortage of scholarship treating its cultural dimensions.[20] If paleoclimate proxies offer glimpses of past conditions that help contextualize present warming, then textual records are windows into the thought worlds of medieval people that help contextualize modern societal responses. They suggest alternative ways of understanding the relationship between human beings and the atmosphere(s) they inhabit. Simultaneously remote and proximate to modern experience, the *tempestarii* provide a compelling model for examining both the alterity and the resonance of the past.[21] Historians are now working to illuminate these cultures of weather. Jean-Pierre Devroey's study of the relationship between nature and kingship in the era of Charlemagne attends closely to nuanced responses to famine and other ecological maladies tied to climate.[22] Likewise, Thomas Wozniak's *Naturereignisse im frühen Mittelalter* takes steps toward understanding the ways in which medieval people interpreted natural calamities in an uncertain world.[23]

The Early Middle Ages have been viewed as a nadir for the scientific understanding of atmospheric phenomena.[24] Yet, "Dark Age" observers were paying close attention to their skies. Late antique writers, including Isidore of Seville and the Venerable Bede, sought systematic explanations for the functioning of the winds and other natural phenomena.[25] A little later, the ancient science of astrometeorology—elaborated in the Islamicate world and translated from the Arabic in the eleventh and twelfth centuries—transformed meteorology with long-lasting effects.[26] This scrutiny resulted, in part, from an assumption that the heavens were a potential medium for divine communication, visible and open to the interpretation of all. Omens, miracles, and divine punishments in the form of drought, storms, or other biblical bad weather could represent divine (dis)favor. In the Frankish world, court theories linked the conduct of the ruler to long-term weather trends: A good king would bring beneficent weather and abundant harvests, whereas a bad ruler would bring the opposite, inextricably linking politics and climate. As one contemporary observed during a

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period of particularly brutal conflict, the elements themselves could wage war against humanity when its political leaders fell into moral laxity.[27]

Carolingian rulers thus had something in common both with weather wizards and with us. Weather magic and cosmic kingship implied a two-way relationship with the atmosphere, an intimate reciprocal link in which human beings felt the effects of weather in their daily lives but could also reach out to touch the heavens. And like the Carolingian ruler, *tempestarii* could be held accountable for their influence by an angry community.[28] As we come to grips with our own individual and collective climate impacts amid the present crisis, these medieval examples suggest that human beings in very different social and political contexts have long felt themselves to be atmospheric movers and shakers, and have even tried to hold one another accountable for changes in the weather.

We, of course, really *are* changing the climate, whereas medieval people were (probably) not.[29] All the same, they believed fundamentally that human actions and human morality shaped and reshaped the natural world. Today, even as we stretch planetary boundaries beyond their safe operating limits, the concept of the Anthropocene—a new epoch defined by human impacts—encounters stiff scientific resistance as perhaps too novel, too hasty, too rash.[30] Medieval precedent suggests otherwise. One fifth-century bishop, Avitus of Vienne, even proclaimed that it was humanity's expulsion from the Garden of Eden that brought an end to the perfect weather of Paradise, initiating an endless cycle of meteorological tumult. Rather than gathering the bountiful fruits of Eden, humanity now had to eke a living from unforgiving soil under forbidding and often uncooperative skies.[31] For Avitus and like-minded thinkers, bad weather was among the wages of human sin. In this medieval reading of Genesis, the end of Eden's abundance (and the beginning of an uneasy relationship between agriculturalist humanity and the weather on which we depend) began with just one bite of forbidden fruit. Call it the Appleocene, perhaps.

Notes

1. Theodor Mommsen, "Petrarch's Conception of the 'Dark Ages,'" *Speculum* 17, no. 2 (1942): 226–242.

2. Hubert Lamb, *Climate, History, and the Modern World* (Methuen, 1982), 159; Frank McDermott et al., "Centennial-Scale Holocene Climate Variability Revealed by a High-Resolution Speleothem δ18O Record from SW Ireland," *Science* 294 (2001): 1328–1331; and Samuli Helama et al., "Dark Ages Cold Period: A Literature Review and Directions for Future Research," *The Holocene* 27, no. 10 (2017): 1600–1606.

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3. Agobard, *De grandine et tonitruis*, in *Agobardi Lugdunensis Opera Omnia*, *Corpus Christianorum: Continuatio Mediaevalis*, ed. L. Van Acker, vol. 52 (Brepols, 1981), 1–15; and Paul Dutton, "Thunder and Hail over the Carolingian Countryside," in *Charlemagne's Mustache: And Other Cultural Clusters of a Dark Age* (Palgrave Macmillan, 2008), 169–188.

4. Ulf Büntgen et al., "Cooling and Societal Change during the Late Antique Little Ice Age from 536 to around 660 A.D.," *Nature Geoscience* 9, no. 3 (2016): 231–236.

5. Michael McCormick et al., "Volcanoes and the Climate Forcing of Carolingian Europe, A.D. 750–950," *Speculum* 82, no. 4 (2007): 865–895.

6. Edward Wilson, *Consilience: The Unity of Knowledge* (Vintage Books, 1998).

7. Ellsworth Huntington, "Climatic Change and Agricultural Exhaustion as Elements in the Fall of Rome," *The Quarterly Journal of Economics* 31, no. 2 (1917): 173–208; and Ellsworth Huntington, *Civilization and Climate* (Yale University Press, 1915).

8. Kristina Sessa, "The New Environmental Fall of Rome: A Methodological Consideration," *Journal of Late Antiquity* 12, no. 1 (2019): 211–255; and Werner Marx et al., "Climate and the Decline and Fall of the Western Roman Empire: A Bibliometric View," *Climate* 6, no. 90 (2018): 1–34.

9. Kyle Harper, *The Fate of Rome* (Princeton University Press, 2017); and John Haldon et al., "Plagues, Climate Change, and the End of an Empire: A Response to Kyle Harper's *The Fate of Rome* (1): Climate," *History Compass* 16, no. 12 (2018): 1–13.

10. Valerie Masson-Delmotte et al., "Summary for Policymakers," in *Global Warming of 1.5°C. An IPCC Special Report* (World Meteorological Organization, 2018).

11. Dagomar Degroot et al., "Towards a Rigorous Understanding of Societal Responses to Climate Change," *Nature* 591, no. 7851 (2021): 539–550.

12. John Haldon et al., "History Meets Palaeoscience: Consilience and Collaboration in Studying Past Societal Responses to Environmental Change," *Proceedings of the National Academy of Sciences* 115, no. 13 (2018): 3210–3218.

13. Adam Izdebski et al., "The Social Burden of Resilience: A Historical Perspective," *Human Ecology* 46 (2018): 291–303; Paolo Squatriti and Hendrik Dey, "Late Antique 'Natural' Disasters: De te fabula narratur?," *Antiquité Tardive* 29 (2022): 67; and John Haldon et al., "Between Resilience and Adaptation: A Historical Framework for Understanding Stability and Transformation of Societies to Shocks and Stress," in *COVID-19: Systemic Risk and Resilience*, ed. Igor Linkov et al. (Springer Nature, 2021), 235–268.

14. Amartya Sen, *Poverty and Famines: An Essay on Entitlements and Deprivation* (Clarendon Press, 1982).

15. Jean-Pierre Devroey, *La nature et le roi* (Albin Michel Littérature, 2019); and Tim Newfield and Inga Labuhn, "Towards a Messy History of Crisis and Climate in Carolingian Europe," *Historical Climatology*, November 11, 2016, http://www

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.historicalclimatology.com/features/towards-a-messy-history-of-dearth-and-climate-in-carolingian-europe.

16. Peter Garnsey, *Famine and Food Supply in the Graeco-Roman World: Responses to Risk and Crisis* (Cambridge University Press, 1988); and William Jordan, "The Great Famine: 1315–1322 Revisited," in *Ecologies and Economies in Medieval and Early Modern Europe*, ed. Scott Bruce (Brill, 2010), 44–61.

17. Peter Peregrine, "Social Resilience to Nuclear Winter: Lessons from the Late Antique Little Ice Age," *Global Security: Health, Science and Policy* 6, no. 1 (2021): 57–67.

18. Ulf Büntgen et al., "Prominent Role of Volcanism in Common Era Climate Variability and Human History," *Dendrochronologia* 64 (2020): 125757, https://doi.org/10.1016/j.dendro.2020.125757.

19. Raphael Neukom et al., "No Evidence for Globally Coherent Warm and Cold Periods over the Preindustrial Common Era," *Nature* 571, no. 7766 (2019): 550–554.

20. Paul Dutton, "Observations on Early Medieval Weather, Bloody Rain in Particular," in *The Long Morning of Medieval Europe: New Directions in Early Medieval Studies*, eds. Jennifer Davis and Michael McCormick (Routledge, 2008), 167–180.

21. Paul Dutton, "Thunder and Hail," 169–188.

22. Devroey, *La nature et le roi*, 39ff.

23. Thomas Wozniak, *Naturereignisse im frühen Mittelalter* (De Gruyter, 2020).

24. Joëlle Ducos, *La météorologie en français au Moyen Âge, XIIIe–XIVe siècles* (Honoré Champion, 1998), 32; and Anne Lawrence-Mathers, *Medieval Meteorology* (Cambridge University Press, 2019), 14.

25. Barbara Obrist, "Le diagramme isidorien des saisons, son contenu physique et les représentations figuratives," *Mélanges de l'École française de Rome. Moyen Âge* 108, no. 1 (1996): 95–164; and Barbara Obrist, "Wind Diagrams and Medieval Cosmology," *Speculum* 72, no. 1 (1997): 33–84.

26. Lawrence-Mathers, *Medieval Meteorology*, 194ff.

27. Devroey, *La nature et le roi*, 153; Cathwulf, *Epistolae variorum Carolo Magno regnante scriptae* 7, ed. E. Dümmler, *Monumenta Germaniae Historica (MGH), Epistolae* 4 (Berlin, 1895), 502–505, drawing on a seventh-century Hibernian treatise, Pseudo-Cyprianus, *De XII Abusiuis Saeculi*, in *Texte und Untersuchungen zur Geschichte der altchristlichen Literatur*, ed. Siegmund Hellmann, 34.1 (J. C. Hinrichs, 1909), 32–60.

28. Agobard, *De grandine*, 4; and *Leges Visigothorum* 6.2.4, ed. Karl Zeumer, *MGH, LL nat. Germ* 1 (1902): 259.

29. William Ruddiman, "The Anthropogenic Greenhouse Era Began Thousands of Years Ago," *Climatic Change* 61, no. 3 (2003): 261–293.

30. Jan Zalasiewicz et al., "What Should the Anthropocene Mean?," *Nature* no. 632 (2024): 980–984.

31. Avitus of Vienne, *De spiritualis historiae gestis*, ed. R. Peiper, *MGH AA* 6.2 (Hannover, 1883), 197–294.

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Resources Related to Part I

Alexandra Hui, Elaine LaFay, Samantha Muka, Emily Pawley, Sarah Pickman, and Anna Zeide

I.1 A Timeline of Lived Experiences, Scientific Study, and Responses to Climate Change

No single timeline encompasses the myriad events and developments we attempt to address in this part of the book. On the other hand, big incomplete gestures are sometimes useful. We asked our contributors to submit dates that felt important to them based on their own work, and this is what they came up with. If you notice glaring absences or think of things you would want to add, send them to us, and we'll add them to the online version of this resource.

900–1300 C.E.	Medieval Climate Anomaly
1300–1850	The Little Ice Age
1493	*Bos taurus* (cattle) arrive in the Western Hemisphere
1510	Permanent establishment of cattle ranching in the Americas
1560–1630	Uptick in witch persecutions in Europe, linked to harvest-impacting severe weather events
1600–1700	Maunder Minimum
1600–1700	Increased deforestation in the Americas
1610	Orbis Spike—a sudden drop in CO_2 possibly caused by reforestation following mass death in the Americas
1712	Thomas Newcomen invents first steam engine to pump water from coal mines
1769	James Watt invents more efficient steam engine
1815	Eruption of Mount Tambora (Indonesia) leads to the Year Without a Summer
1829	First commercial steam train—George Stephenson's "Rocket"

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1837	British-constructed Madras Railway becomes operational in India
1856	Eunice Foote identifies warming effect of CO_2 (independently confirmed by John Tyndall, 1859–1862)
1864	James Croll proposes theory of orbital climate force to explain Ice Ages
1876–1878	First of a series of severe famines in India, exacerbated by El Niño drought and British imperial policies; more than eight million dead
1896	Svante Arrhenius calculates that a doubling of atmospheric CO_2 could increase Earth's surface temperature by several degrees Fahrenheit
1918	Fritz Haber receives the Nobel Prize in Chemistry for developing the Haber–Bosch Process responsible for much of the nitrogen in your body
1930s	Dust Bowl droughts (US and Canada)
1938	Guy Callendar publishes "The Artificial Production of CO_2 and Its Influence on Temperature" in the *Quarterly Journal of the Royal Meteorological Society*
1945	Trinity Test, marking the beginning of epoch of global testing and wartime use of large nuclear bombs
1949	First commercially successful hydraulic fracking for oil and gas
1950	Conventional starting point for the Great Acceleration—see glossary
1957–1958	International Geophysical Year
1957	Roger Revelle and Hans Seuss publish "CO_2 Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO_2 During the Past Decades" in *Tellus*
1958	Keeling Curve documentation of atmospheric CO_2 commences
1962	Rachel Carson publishes *Silent Spring*
1970	First Earth Day
1970	Clean Air Act (US)
1971	Japanese Court finds Showa Denko Co. to be responsible for the Niigata Minamata disease

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1972	United Nations Scientific Conference, First Earth Summit, articulates shared concern about global climate change
1972	"Blue Marble" photograph of Earth from Apollo 17 spacecraft published
1972	Japanese court finds multiple petrochemical producers to be responsible for Yokkaichi asthma
1979	Three Mile Island nuclear accident (US)
1980	Starting point of the Asia-centered "Late Acceleration" defined by Elizabeth Chatterjee
1982	Protests in Warren County, North Carolina (US), over hazardous waste dumping organize into self-identified movement of "environmental justice" against "environmental racism"
1985	Vienna Convention for the Protection of the Ozone Layer
1986	Chernobyl nuclear disaster (then Soviet Union)
1987	United Nations General Assembly adopts "Environmental Perspective to the Year 2000 and Beyond"
1988	Intergovernmental Panel on Climate Change (IPCC) established
1989	Bill McKibben publishes *The End of Nature*
1989	Exxon Valdez oil spill (US)
1989	Montreal Protocol on Substances that Deplete the Ozone Layer
1990	Second World Climate Conference
1990	Formation of Indigenous Environmental Network
1991	First National People of Color Summit—adopts "Principles of Environmental Justice"
1991	Alliance of Small Island States proposes that the countries most contributing to global climate change should aid those most affected by it
1992	"Earth Summit" in Rio establishes United Nations Framework Convention on Climate Change (UNFCCC)
1995	First Conference of the Parties to the Convention—adopt Berlin Mandate

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1997	Kyoto Protocol adopted
2002	Bali Principles of Climate Justice laid out
2003	European heat wave death toll exceeds 30,000
2003	British Petroleum (BP) popularizes concept of the carbon footprint
2005	First Annual Global Day of Action
2006	Release of *An Inconvenient Truth,* documentary film, which would subsequently win an Oscar and enable Al Gore and the IPCC to win the Nobel Peace Prize
2007	*Massachusetts v. EPA* case found that the Environmental Protection Agency was obligated to regulate CO_2 and other greenhouse gases as air pollution
2007	350.org founded
2010	Deepwater Horizon oil spill (Gulf of Mexico)
2011	Fukushima Daiichi nuclear disaster (Japan)
2011	Keystone XL pipeline protests (US)
2014	Hottest year in modern records globally to date
2014	People's Climate March (US)
2015	Hottest year in modern records globally to date
2015	Paris Agreement adopted
2015–2024	*Juliana v. United States* case found the US Federal government, by causing dangerous CO_2 concentrations, violated young plaintiffs' constitutional rights
2016	Hottest year in modern records globally to date
2016–2017	Standing Rock Sioux Tribe protests the Dakota Access Pipeline
2016	Fort McMurray wildfire (Canada)
2017	People's Climate March (global)
2018	First School Strike for the Climate, also known as Fridays for Future
2019	Global Strike for the Climate
2019	Introduction of Green New Deal legislation (US)
2020	Australian wildfires
2022	Passage of the Inflation Reduction Act (US)
2022	COP27 agreement on the formation of a Loss and Damage Fund
2023	Hottest year in modern records globally to date

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2024	Hottest year in modern records globally to date
2026	US leaves the UNFCCC

I.2 -ocene-O-Rama! (A Glossary of Terms Mostly Ending in "-ocene")

Anthropocene: A proposed geological epoch suggested by Paul Crutzen and Eugene F. Stoermer in 2000. In an article that provoked a decades-long debate in stratigraphy, Crutzen and Stoermer argued that human activity had become the most significant geophysical force, shaping the earth through processes such as urbanization, the vast increase in livestock, the seeming exhaustion of fossil fuels, the release of sulfur dioxide, the dominance of nitrogen fixation, and the release of greenhouse gases. They suggested the late eighteenth century as marking the beginnings of these changes, coinciding with the invention of the steam engine. Other proposed starting points have included the beginning of nuclear testing, the development of agriculture, and the Orbis Spike—a dip in global CO_2 around 1610, which Simon Lewis and Mark Maslin suggest was caused by reforestation following mass death caused by colonialism in the Americas. Although the International Commission on Stratigraphy rejected this term in 2024, it has remained an important organizing concept in the humanities and social sciences. Paul J. Crutzen and Eugene F. Stoermer, "The 'Anthropocene' (2000)," in *Paul J. Crutzen and the Anthropocene: A New Epoch in Earth's History*, ed. Susanne Benner et al. (Springer International, 2021), 19–21.

Capitalocene: A term intended as a rebuke to the species-wide blame implied by the term "Anthropocene." Proponents of the Capitalocene, such as Jason W. Moore and Andreas Malm, argue that it is not humanity writ large but rather the structures of capitalism in particular that have driven interlocking global environmental crises, including climate change. Andreas Malm describes the Capitalocene in terms of the rise of "fossil capital" in nineteenth-century Britain, a process that both drove and depended on global inequality. Jason Moore sees capitalism as a whole as bound up in a set of strategies for the production of "cheap nature" and sees the beginnings of the Capitalocene as a "system of power, profit and re/production in the web of life" stretching back to the long sixteenth century. Andreas Malm and Alf Hornborg, "The Geology of Mankind? A Critique of the Anthropocene Narrative," *The Anthropocene Review* 1, no. 1 (April 1, 2014): 62–69; and Jason W. Moore, "The Capitalocene,

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Part I: On the Nature and Origins of Our Ecological Crisis," *Journal of Peasant Studies* 44, no. 3 (2017): 594–630.

Carbocene: The age of hydrocarbons, especially coal. A term introduced by Timothy LeCain to underscore the role of "nonhuman material things" such as coal and cotton in the Industrial Revolution and then plutonium, plastics, and precious metals in the postwar period, bent by humans to their will. LeCain argues that the term "Carbocene," as an echo to the Carboniferous period, additionally highlights humans' enormous dependence on hydrocarbons. Timothy LeCain, "The Matter of Humans: Beyond the Anthropocene and Toward a New Humanism," in *The Matter of History: How Things Create the Past* (Cambridge University Press, 2017), 306–340.

Chthulucene: Donna Haraway's rebuke to the anthropocentric Anthropocene, emphasizing interconnection, entanglement, "tentacularity," and multispecies agency. A concept for "learning to stay with the trouble of living and dying in response-ability on a damaged earth" as a "fierce reply to the dictates of both Anthropos and Capital" that seek to exterminate ancient and contemporary Chthonic ones; manifold "monsters in the best sense" that writhe and luxuriate and make and unmake. Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Duke University Press, 2016), 2–3.

Cybercene: Defined by Vetri Nathan as "a pivotal period in which online on-screen 'realities,' digital representations, and narratives have quickly and effectively transformed identities and substituted the value of actual bodies and living habitats." https://www.thecybercenelab.org/.

Great Acceleration: Inspired by Crutzen and Stoermer's proposal of the Anthropocene, the synthesis project of the International Geosphere-Biosphere Programme assembled a collection of socioeconomic and earth systems graphs, tracking indicators of human-driven change, including atmospheric concentration of CO_2, tropical forest loss, nitrogen fixation, marine fish capture, population, foreign direct investment, water use and paper production, real GDP, fertilizer consumption, and primary energy use. They found a rapid increase in many of these indicators beginning around 1950. This period came to be called the "Great Acceleration." Will Steffen et al., "The Trajectory of the Anthropocene: The Great Acceleration," *Anthropocene Review* 2, no. 1 (2015): 81–98; and John R. McNeill and Peter Engelke, *The Great Acceleration: An Environmental History of the Anthropocene Since 1945* (Harvard University Press, 2016). For a

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modification of this concept see Elizabeth Chatterjee's definition of "Late Acceleration" in this volume.

Little Ice Age: A period of cooling, primarily in the Northern Hemisphere between 1300 and 1950. Historians and scientists use this term differently. Increased glacierization occurred between 1300 and 1950, with a cooler climate occurring between 1570 and 1900. Historians most commonly refer to the second era as the Little Ice Age. Causes of the cooling period also remain contested (sunspots, rapid population decline in North America). See John A. Matthews and Keith R. Briffa, "The 'Little Ice Age': Re-Evaluation of an Evolving Concept," *Geografiska Annaler: Series A, Physical Geography* 87, no. 1 (2005): 17–36; and Dagomar Degroot, *The Frigid Golden Age: Climate Change, the Little Ice Age, and the Dutch Republic, 1560–1720* (Cambridge University Press, 2018).

Necrocene: Designates the present as "the new era of death," driven by capitalist consumption and modern patriarchal technopolitics; a grim successor to the Cenozoic "era of life." A biopolitical, geopolitical, geo-ontological concept that builds on Achille Mbembe's "Necropolitics" and Justin McBrien's call to reframe the expansion of capitalism as "the process of becoming extinction" of cultures in addition to species. Justin McBrien, "Accumulating Extinction: Planetary Catastrophism in the Necrocene," in *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism*, ed. Jason Moore (PM Press, 2016), 116–137; and John P. Clark, *Between Earth and Empire: From the Necrocene to the Beloved Community* (PM Press, 2019).

Plantationocene: "The devastating transformation of diverse kinds of human-tended farms, pastures, and forests into extractive and enclosed plantations, relying on slave labor and other forms of exploited, alienated, and usually spatially transported labor." Donna Haraway, "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin," *Environmental Humanities* 6, no. 1 (2015): 159–165. The term was generated by six anthropologists (Donna Haraway, Noboru Ishikawa, Gilbert Scott, Kenneth Olwig, Anna L. Tsing, and Nils Bubandt) in a 2015 discussion for *Ethnos*. See Donna Haraway et al., "Anthropologists Are Talking—About the Anthropocene," *Ethnos* 81, no. 3 (2016): 535–564.

Plasticene/Plastocene: "Plasticene" refers to the impact of large amounts of nonbiodegradable, synthetic plastics on the geological record. The term was first used by Christina Reed in the *New Scientist* in 2015. Christina Reed, "Plastic Age: How It's Reshaping Rocks, Oceans and Life,"

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New Scientist, January 28, 2015. "Plastocene" refers to the outweighing of synthetic materials on Earth to biological materials. The term first appears in Christopher Preston's book. He uses the term neutrally—we can use the Plastocene to revive and restore the world. Christopher Preston, *The Synthetic Age: Outdesigning Evolution, Resurrecting Species, and Reengineering our World* (MIT Press, 2018).

Thanatocene: Christophe Bonneuil and Jean-Baptiste Fressoz coined this term to highlight the ways that the colossal global wars and heightened militarization of the twentieth century drove environmental change through the direct destruction of combat and the massive footprint of militaries and by supercharging fossil fuel dependency and forms of industrial production in ways that markets later absorb. Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History and Us* (Verso Books, 2016).

Wasteocene: A term coined by Marco Armiero and Massimo de Angelis describing contamination and the spread of toxicity as an integral feature of global capitalism, established through the accretion of "wasting relationships." "In my interpretation of wasting," Armiero writes, "the key issue is not that waste is 'matter out of place' but, rather, that places (including humans and nonhumans) are produced through the power of classifying who and what is disposable and who and what is not." Marco Armiero, "The Case for the Wasteocene," *Environmental History* 26, no. 3 (2021): 425–430.

Steve Mentz offers a similar glossary of the following additional -ocenes: Agnotocene, Anglocene, Anthrobscene, Econocene, Homogenocene, Jolyonocene, Mathropocene, Misanthropocene, Naufragocene, Phagocene, Phronocene, Planthropocene, Polemocene, Sustainocene, Symbiocene, Technocene, Thalassocene, Thermocene, and Trumpocene. See Steven Mentz, "The Neologismcene," in *Break Up the Anthropocene* (University of Minnesota Press, 2019). See also Timothy LeCain, "Against the Anthropocene: A Neo-Materialist Perspective," *International Journal of History, Culture, and Modernity* 3 (2015): 1–28.

I.3 Different Types of Primary Sources Used in Climate Change History

There are two rough categories for sources that can tell us something about climate and people in the past. The first category comprises a cluster of what we might call the "archives of society," or the remnants that humans leave behind. These are the bread and butter of historical research. Examples

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include archival sources such as oral histories, diaries, correspondence, ship logbooks, or observatory reports; archaeological evidence; or printed primary sources such as newspapers, meteorological journals, treatises, travelogues, or institutional records. We can also consider visual culture, such as paintings, sketches, photographs, or rock art, within this category.

The second category contains sources culled from the "archives of nature." These are physical remnants of changes in Earth's climate in the natural world, as variations in temperature, precipitation, volcanic activity, wind patterns, and other atmospheric phenomena can have far-reaching effects on what are also known as "paleoclimate archives." Samples from the archives of nature include tree rings, lake and ocean sediment, ice cores, coral skeletons, pollen grains, and cave deposits, among others. Paleoclimatologists across a range of subspecialties can measure these effects for evidence of what climate may have been like stretching back hundreds and millions of years, long before the rise of weather instrumentation. For further on this, see Jayson Porter's interview in part IV and Samantha Muka and Anna Guasco's essay in part VI.

Further reading: Stefan Bronnimann et al., "Archives of Nature and Archives of Society," in *The Palgrave Handbook of Climate History*, eds. S. White, C. Pfister, and F. Mauelshagen (Palgrave Macmillan, 2018), 27–36; Dario Camuffo et al., "When the Lagoon Was Frozen Over in Venice from A.D. 604 to 2012: Evidence from Written Documentary Sources, Visual Arts and Instrumental Readings," *Mediteranée* (February 2017): 1–59, https://doi.org/10.4000/mediterranee.7983; and Joshua Howe, *Making Climate Change History: Documents from Global Warming's Past* (University of Washington Press, 2017).

I.4 "First Step" Readings to Begin Further Study of Climate Change History

The book you are holding!

Histories of climate change science:

Barnett, Lydia. *After the Flood: Imagining the Global Environment in Early Modern Europe*. Johns Hopkins University Press, 2019.

Bashford, Alison, Emily N. Kern, and Adam Bobbette, eds. *New Earth Histories: Geo-Cosmologies and the Making of the Modern World*. University of Chicago Press, 2023.

Coen, Deborah. "What's Next for Histories of Climate Change." *Los Angeles Review of Books*. January 25, 2024.

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Edwards, Paul. *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. MIT Press, 2010.

Hamblin, Jacob Darwin. *Arming Mother Nature: Birth of Catastrophic Environmentalism*. Oxford University Press, 2013.

Howe, Joshua. *Behind the Curve: Science and the Politics of Global Warming*. University of Washington Press, 2014.

Fressoz, Jean-Baptiste, and Fabien Locher. *Chaos in the Heavens: The Forgotten History of Climate Change*. Translated by Gregory Elliott. Verso, 2024.

Golinski, Jan. *British Weather and the Climate of Enlightenment*. University of Chicago Press, 2007.

Merchant, Carolyn. *The Anthropocene and the New Humanities: From Climate Change to a New Age of Sustainability*. Yale University Press, 2020.

Morgan, Ruth A. *Climate Change and International History: Negotiating Science, Global Change, and Environmental Justice*. Bloomsbury, 2024.

Weart, Spencer. *The Discovery of Global Warming*, revised and expanded edition. Harvard University Press, 2008.

Histories of the causes of climate change/the Anthropocene:

Amrith, Sugata, *The Burning Earth, A History*. W. W. Norton, 2024.

Bonneuil, Christophe, and Jean-Baptiste Fressoz. *The Shock of the Anthropocene: The Earth, History and Us*. Translated by David Fernbach. Verso, 2016.

Brooke, John L. *Climate Change and the Course of Global History: A Rough Journey*. Cambridge University Press, 2014.

Chakrabarty, Dipesh. *The Climate of History in a Planetary Age*. University of Chicago Press, 2021.

Chatterjee, Elizabeth. "The Asian Anthropocene: Electricity and Fossil Developmentalism." *Journal of Asian Studies* 79, no. 1 (2020): 3–24.

Davis, Heather, and Zoe Todd, "On the Importance of a Date, or, Decolonizing the Anthropocene." *ACME* 16, no. 4 (2017): 761–780.

Fressoz, Jean-Baptiste. *More and More and More: An All-Consuming History of Energy*. Penguin, 2024.

Goffe, Tao Leigh. *Dark Laboratory: On Columbus, the Caribbean, and the Origins of the Climate Crisis*. Knopf Doubleday, 2025.

Grove, Richard H. *Ecology, Climate, and Empire: Colonialism and Global Environmental History 1400–1940*. White Horse Press, 1997.

Hayman, Eleanor, Colleen James, and Mark Wedge. "Future Rivers of the Anthropocene or Whose Anthropocene Is It? Decolonising the Anthropocene!" *Decolonization: Indigeneity, Education & Society* 7, no. 1 (2018): 77–92.

Herschthal, E., and J. L. Brooke. "The Plantation Carbon Complex: Slavery and the Origins of Climate Change in the Early Modern British Atlantic." *The William and Mary Quarterly* 81, no. 2 (2024): 255–306.

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Jones, Christopher F. *Routes of Power: Energy and Modern America*. Harvard University Press, 2014.

Jonsson, Fredrick Albritton and Carl Wennerlind. *Scarcity: A History from the Origins of Capitalism to the Climate Crisis*. Harvard University Press, 2023.

Lewis, Simon L., and Mark Maslin. *The Human Planet: How We Created the Anthropocene*. Yale University Press, 2018.

Livingstone, David N. *The Empire of Climate: A History of an Idea*. Princeton University Press, 2024.

Malm, Andreas. *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming*. Verso Books, 2016.

McNeill, John R., and Peter Engelke. *The Great Acceleration: Environmental History of the Anthropocene*. Harvard University Press, 2014.

Richards, John F. *The Unending Frontier: An Environmental History of the Early Modern World*. University of California Press, 2003.

About the science of extinction:

Barrow, Mark. *Nature's Ghosts: Confronting Extinction from the Age of Jefferson to the Age of Ecology*. University of Chicago Press, 2009.

Jørgensen, Dolly. *Ghosts Behind Glass: Encountering Extinction in Museums*. University of Chicago Press, 2025.

Qureshi, Sadiah. *Vanished: An Unnatural History of Extinction*. Random House, 2025.

Sepkoski, David. *Catastrophic Thinking: Extinction and the Value of Diversity from Darwin to the Anthropocene*. University of Chicago Press, 2020.

About agnotology:

Kourany, Janet A., and Martin Carrier, eds. *Science and the Production of Ignorance: When the Quest for Knowledge Is Thwarted*. MIT Press, 2020.

Oreskes, Naomi, and Erik M. Conway. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. Bloomsbury Press, 2010.

Proctor, Robert N., and Londa Schiebinger, eds. *Agnotology: The Making and Unmaking of Ignorance*. Stanford University Press, 2008.

Past experiences of changing climate:

Acuna-Soto, Rodolfo, David W. Stahle, Malcolm K. Cleaveland, and Matthew D. Therrell. "Megadrought and Megadeath in Sixteenth-Century Mexico." *Emerging Infectious Diseases* 8, no. 4 (2002): 360–362.

Brook, Timothy. *The Price of Collapse: The Little Ice Age and the Fall of Ming China*. Princeton University Press, 2023.

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Carey, Mark. *In the Shadow of Melting Glaciers: Climate Change and Andean Society.* Oxford University Press, 2010.

Cavert, William M. "Winter and Discontent in Early Modern England." In *Governing the Environment in the Early Modern World*, edited by Sara Miglietti and John Morgan, 114–132. Routledge, 2017.

Dean, Trevor. "Natural Encounters: Climate, Weather and the Italian Renaissance." *European Review of History* 18, no. 4 (2011): 550–551.

Degroot, Dagomar. *The Frigid Golden Age: Climate Change, the Little Ice Age, and the Dutch Republic, 1560–1720.* Cambridge University Press, 2018.

Earle, Rebecca. "Climate, Travel, and Colonialism in the Early Modern World." In *Governing the Environment in the Early Modern World*, edited by Sara Miglietti and John Morgan. Routledge, 2017.

Hoffmann, Richard C. *An Environmental History of Medieval Europe.* Cambridge University Press, 2014.

Johnston, Sky Michael. "Accounting for a Fruitful Little Ice Age: Overlapping Scales of Climate and Culture in Württemberg, 1560–1590." *Environmental History* 27, no. 4 (2022): 722–746.

Ray, Sugata. *Climate Change and the Art of Devotion: Geo-Aesthetics in the Land of Krishna, 1550–1850.* University of Washington Press, 2019.

White, Sam, Christian Pfister, and Franz Mauelshagen, eds. *The Palgrave Handbook of Climate History.* Palgrave Macmillan, 2018.

Wickman, Thomas M. *Snowshoe Country: An Environmental and Cultural History of Winter in the Early American Northeast.* Cambridge University Press, 2018.

Zilberstein, Anya. *A Temperate Empire: Making Climate Change in Early America.* Oxford University Press, 2016.

I.5 A Directory of Projects Documenting the Histories of Climate, Energy, and Climate Science

All Our Yesterdays: A long-running blog project by Dr. Marc Hudson, posting and analyzing primary source documents on climate science and climate politics daily since December 31, 2021.

The Appraising Risk Partnership at the Indian Ocean World Centre, McGill University: A research collaboration examining the critical role of climatic crises in the past and future of the Indian Ocean World. With support from the Social Sciences and Humanities Research Council of Canada, the goal of the partnership is to document human-environment interaction and interdependence during periods of climate change through the development of a comprehensive spatial and temporal database.

Climate Change and History Research Initiative: Examines the effects of climatic changes across the last two millennia on societies in the eastern Mediterranean basin and the Eastern Eurasian steppe.

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The Climate History Network: A scholarly network devoted to reconstructing past climate changes and documenting their effects on human history.

The Collection Ecologies Research Collective: A team of international scholars and artists interested in collections and in reassessing the value of scientific collections for multidisciplinary research in the light of environmental issues.

The Discovery of Global Warming Website: An extensive resource based at the American Institute of Physics, offering a comprehensive look at major topics in the history of climate science. The companion to Spencer Weart's classic *The Discovery of Global Warming*, rev. ed. (Harvard University Press, 2008).

Palaeo-Science and History: The "Palaeo-Science and History" Independent Max Planck Research Group explored the ways in which history as a humanistic discipline converges with the environmental sciences that focus on the past.

The Petrocultures Research Group: A global network of energy humanities researchers examining the socio-cultural effects of oil and energy on individuals, communities, and societies. Based at the University of Alberta.

The Program in the Study of the African Environment: An international collaboration based at Boston University, working to develop a better understanding of the complexities of human interactions with the environment through the integration of research perspectives from the humanities, the social sciences, and the biological and earth sciences.

Water Justice and Technology Studio: An ongoing gathering place for research, stories, art, and action that address the intersection of technology and water.

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II

Teaching and Pedagogy

For many working historians, the richest opportunity for communication and broader impact comes through our interactions with our students. Here, we think through some of the ways that we can shift our teaching. Just as we've come to expect that gender history and the histories of race and class should infuse all our teaching (an expectation that is now the target of attacks on higher education), so too should historians draw in the intertwining threads of the climate emergency.

In the first essay, editors Alix and Emily encourage readers to think broadly about connecting the climate emergency to our teaching, and brainstorming ways to evade the barriers to teaching about climate that many historians face. Elsa Devienne and Camille Suarez then put this into practice at the syllabus level, showing how they've woven climate crisis and environmental content through their standard US history surveys, encouraging teachers to think about how questions and issues shift when viewed through that lens. Next, Alexander D'Alisera takes this to the lesson plan level, showing how he guides his students through environmental consciousness found in a medieval poem. In "Teaching Solutions History," Emily shares the strategies she's developed to help students see that, just like climate problems, "climate solutions" have a past as well as a future. Finally, Grace Bartlett, Robert Fitzgerald, Richard Hughes, and Keith Pluymers explore the enormous potential and radically different requirements of K–12 teaching to address the history of the climate emergency.

Although this is the part most directly focused on pedagogy, every part of this book is a teaching resource. By showing how climate intersects with other major conversations in history, for example, the pieces in part III will help historians trying to build climate crisis conversations into other classes, and the pieces in part IV, describing different community

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connections, could be useful in brainstorming community-based or public-facing student projects.

Resources for this part include lists of gateway texts into rich, ongoing conversations on climate and environmental pedagogy, advice on accessing climate-focused primary source collections, thoughts and resources for managing climate denial in the classroom, and quick descriptions of assignments, handouts, and syllabi from our contributors. A more complete set of materials is hosted on our online resource.

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8

One Slide Versus One Lecture Versus One Course Versus One Degree Program: Different Points of Entry to Include More Climate Change History in Your Teaching

Alexandra Hui and Emily Pawley

This part of the book is devoted to the project nearly every historian takes on at some point in their career: teaching. To riff on the American Historical Association's mantra "everything has a history," let us say that everything has a climate history. This essay discusses strategies for integrating climate crisis history into your history teaching. We present the ideas here (along with the following essays in this part) not as the definitive historians' response to teaching climate emergency history but rather as an appeal to acknowledge the necessary variety of possibilities. Recognizing that different courses, different institutions, and differences in instructor career security can limit how climate change history can be taught, these strategies are varied; mix and match and dial up or down the activism as needed.

Perhaps we should first articulate the benefits of teaching climate history. Consider your current students. Most of them completed high school and launched into their lives under the pall and restrictions of COVID-19 as well as an endless march of wildfires, flooding, and hurricanes. They were likely in middle or elementary school—so, not paying attention—when the Paris Accord was signed. Now that they are paying attention, they are inundated with misinformation designed to manipulate and mislead. They have come of age unable to avoid the existential threat of climate change but are also often convinced that nothing can be done to mitigate it. Trying to anticipate the future is a daily task for many students. Discussing climate change history helps them do this. It gives them a language and a grammar for using the study of the past to understand our present.

Put another way, teaching climate change history seeds a humanist army. At a moment when successful academic monographs often sell no more than three hundred copies, in the US more than 140,000 students took a college history class in 2023, a figure that doesn't include the thousands in community college or the millions in high school history. Local,

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national, and global responses to climate change are still being argued on technical grounds, focusing on the science. Teaching climate change history gives students the tools to frame responses on social grounds. Teaching climate change history can validate a culture of care, a future in which we consider others and take care of each other. Since our students are tightly knit into a high-emitting society, it can help them consider their place in local, national, and global communities of humans in relation to the causes and effects of climate change.

Addressing the climate crisis historically, *particularly in courses that don't directly focus on it*, can help us bring climate conversations to students who aren't already focused on climate and the environment. But we don't just want to be evangelists for climate science, carrying its messages unchanged to our students. Bringing aspects of the climate emergency into conversations we already have with history students about race, gender, and class and about the complexities, messiness, and possibilities of social change will alter how they and we conceptualize the climate crisis in ways that will shape how they and we respond to it.

It may be tempting to set yourself against the deniers. Debating deniers was the task of the climate movement for so long that those rhetorical habits are ingrained. But presently, most people, even in the US, accept the reality of anthropogenic climate change. You might have to work around the odd denier, but avoid the temptation to argue the reality of climate change. It's worth thinking about the persuasion chart that Emily received while a graduate employee union organizer: Some people will always hate the union—move on from them. Some people will always love the union—activate them! Some people are in the middle, convinced there is a problem but uncertain of how to conceptualize it—these are the people who you should talk to the most. You can't teach students to tackle the whole climate emergency, but you can train them to face it, to find things out, to question simple narratives, to make considered judgments, and to move forward. You can do each of the things, at least some of the time.

Of course, what you can do to bring the climate emergency into your courses will depend on your institutional terrain and level of power. Tenured faculty tinkering with courses over years can do different things than can new faculty building up syllabi from the ground or graduate students working under a supervisor or adjunct lecturers receiving their course assignments mere days before classes start. People teaching a 5–5 load and those teaching a 1–0 live in different worlds, as do people teaching lectures of three hundred or seminars of nine, and those teaching in supportive or hostile departments, schools, states, or countries.

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Rather than simply lamenting these power gradients, we ask that those teaching in more secure circumstances think about how to support those in less secure ones. Support contingent faculty and graduate workers in your own departments, share course materials, and offer information on labor actions. Normalize the teaching of climate emergency history. Those with less security should not feel obligated to make grand pronouncements of your pedagogical recalibrations during lecture or in your syllabus, especially if your institution and/or local political climate is unsupportive of or hostile to such goals. Trojan horse it (yes, we just used "Trojan horse" as a verb).

We find it helpful to sort courses for possible intervention into three types. First and most labor-intensive is the creation of entirely new courses framed around the history of the climate emergency. These could be local, national, or global in scope, covering a few decades or several centuries. They could be history of science courses, colonial history, gender history, environmental history, and so on. A second course-level site of intervention would be integrating climate change narratives into an "on the books" course already in your teaching quiver. The big, grand survey courses are especially ripe for some additional climate change narratives (see Elsa Devienne and Camille Suarez's contribution in this part of the book). Finally, and related to the established courses, would be what we're calling Trojan horse courses. Such courses would not in their titles or, necessarily, in their syllabi indicate even a whiff of the various interventions we suggest in this essay. But in the framing of the lectures or class discussions, connections can be articulated between, say, the history of capitalism and climate change, or foodways and climate change, or settler colonialism and climate change, and so on.

Particularly given the many differences in teaching circumstances, we note that there are many levels and scales of pedagogical intervention. In a lecture-based course, scaling can range from adding a single slide of an illustrative example, to devoting a single lecture to a climate change narrative, to organizing a course unit over several weeks to go more in-depth into a broader narrative or a rich case study, to designing an entirely new course, to pulling together the curriculum for a new certificate or major on climate change. Or consider an "Easter egg" approach. I (Alix) have started noting, as I work through the grand narrative of modern European history, moments that have been tapped as indicators of the transition to the Anthropocene: the global awareness prompted by large volcanic eruptions, industrialization, intensive poultry production and distribution, nuclear weapons tests, and so forth. In a smaller, more discussion-based classroom,

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consider adding a new in-class exercise or a new unit exercise or capstone project. These could be based on primary sources available on the Internet, holdings in your institution's special collections, or "fieldwork" and the collecting of oral histories. If climate change history is also the focus of your research, model it for students. Show them how they too can do it. Although intervention scales with teaching circumstances, committing to making any change is great, no matter how small. (*Handbook*-to-reader high-five! Yeah!)

As with most undergraduate teaching, the goal is not to spawn new professional historians but rather to help students learn to *think* historically and to prepare them to live in a world shaped by history. More than one kind of historical story will help them do this. Direct stories matter, of course. A basic history of the United Nations climate negotiations can help students understand the frameworks within which global leaders are operating, and give a political explanation for the crucial periods of inaction in the 1990s and early 2000s that have left us with such steep curves to now overcome (or repeat). But stories that many historians *already* tell in their courses provide equally important frameworks for moving forward in the face of crisis. Accounts of how US segregation has shaped cities may help students understand how to make their community more resilient in the face of disaster. Accounts of the rise of consumer culture can give students a richer sense of how consumerism has come to feel so urgently connected to identity, and perhaps can offer more realistic ways of thinking about how consumerism might be challenged. Accounts of large-scale social movements can give them a clearer sense of how political change occurs and how movements might be mobilized to respond to climate change. More broadly, the intellectual habits that we routinely cultivate in our students prepare them to expect and look for complexity, to explain a changing world to themselves and others, to talk about what forces are acting and what kinds of capabilities different groups have to respond, to show more realistic pathways to political action, to see themselves as existing in the middle of larger stories, and, not least, to expect contingency and to believe in the possibility of profound change in seemingly immovable cultural categories and social structures.

The teaching and learning goals at the graduate level are, of course, different. The dismal state of the academic job market for history MAs and PhDs, as well as a growing sense that pipelines need to be built for not-academic history jobs, has motivated students and faculty (not in equal measure) to push for training in a broadening set of skills. These are long-standing conversations, but it feels like a shift has occurred; the calls for

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changes in graduate training are not the usual inward-gazing existential crises of decades past. Graduate students are now also reckoning with the unstable futures of a dramatically changing climate, with associated economic and political churn, and are asking their mentors for guidance navigating these externalities. Graduate-level history training must increasingly include pedagogical experience, digital humanities skills, public history projects, community-based social justice work, and so on. And many programs are already doing this!

The centerpiece of graduate training remains, however, the historiographical seminar. Here, we offer a few exercises that can be integrated into existing courses. The goal is to help students develop a grammar for doing academic history in a time of climate emergency. Like the larger goals of this *Handbook*, they—we—ask how one does meaningful work in the present by studying the past. In an effort to underscore to my graduate students the many skills they are mastering in graduate school, I (Alix) have started to include at the beginning of each of my class meetings a quick check-in on the history-ing everyone did the previous week. That is, when did you use your history muscles? Did you read a scholarly monograph? Did you talk about it in or out of class? Did you talk to friends or family about a primary source you got excited about? Did you try to distill your dissertation into a haiku? Could it fit into a cross-stitch design? Could Maggie Smith play any of the historical actors in your narrative, should a serial television drama be made from it? Did you get in an online argument with a stranger and begin a sentence with, "Well, *actually* . . ."? Did you translate a primary source or organize your files into a spreadsheet? And so on. The point is to help them see how the ways in which they do history informs the way they move through the world and that these skills can be turned outward or inward at will. In one of my courses, this culminated in a short writing exercise of "What Will You Include in Your Historian's Climate Emergency Go Bag?" in which students were asked to describe the history-ing skills that would be important for responding to the current climate emergency and pivoting social and cultural structures (we include a version of this in the resources to part VI). Their answers were lovely, ranging from "organizing a science fiction book club to build a collective sense of the future we want" to "the ability to read a lot of forgotten, discarded, actively ignored texts to trace out agnotological forces at work."

Another small intervention that can work nicely in graduate courses that focus on the craft of writing history: Ask students to take an explicitly activist stance and write a history manifesto or an op-ed. Ask them to wrestle with an authoritative voice and language of inevitability and

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accusations of misrepresenting the past for political expediency in the present. Is your audience other historians or another community? How does this change the way you frame the task of history?

A final note: We have both found that bringing the climate emergency into our teaching, has gradually challenged not just our students preconceptions but also our own, transforming our research and our sense of our field as well as our teaching. A path that starts with one changed slide, with one new date on a timeline, with one question at the end of class can lead us to new forms of curiosity, threads to pull, and stories to write, and with an expanded and fulfilling urgency and sense of purpose. In times like these, such things are both a necessity and a joy.

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9

How to Blow Up a Framework: Bringing Climate Change into the US History Survey

Elsa Devienne and Camille Suarez

Do you or your students have climate anxiety? Do you want to bring the environment into your teaching? In this essay, we propose concrete examples of how to do that in the context of the US history survey. One way to integrate the environment is to challenge—or blow up—the traditional frameworks of progress and abundance that underlie most history surveys.[1] To reframe your survey as a *longue durée* narrative of climate change, you can do three things. First, ask how and why humans have changed the environment in relation to crucial moments in US (or elsewhere) history. Second, think of nature as one of many historical actors. Third, consider historical humans' attitudes and valuations of nature. By blowing up the framework that has the climate crisis beginning in the twentieth century with disasters, your survey can show that the idea of profits over peoples is, in fact, rooted in the centuries-old idea of profit over people *and* nature.

Although the following four examples are specifically about US history, we hope that they will inspire you to consider how most survey courses can be reframed as a climate change origin story.

One

Historians often teach the pre–Civil War US within a framework of nation building around questions of labor and citizenship. Rarely does the environment enter the analysis. Consider Virginia, where most studies of American chattel slavery begin. The traditional narrative charts how English colonists developed a commodity agricultural economy dependent upon racialized slavery. What if we also consider how and why slavery, the enslaved, and enslavers changed the environment? Enslaved people razed forests and altered waterways to plant cotton, a non-native cash crop, for their enslavers. This is environmental change! Slavery exploited enslaved bodies and the land.

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We can also consider how the characteristics of Virginian soil shaped slavery. Virginian soil lacked the nutrients to sustain cotton. Thus, the production of cotton leached already nutrient-weak soil and eroded the topsoil. Given the maximum profit model of cash crop plantation slavery, enslavers abandoned their depleted plantations and moved westward. "New land" was cheaper than sustaining the land. Enslavers viewed the lands of North America as endless and, therefore, disposable.[2] By considering the environmental changes caused by slavery, students can unearth the roots of the idea that natural resources and laborers are cheap commodities and in endless supply. The ideas of profit over people, nature, and sustainability are as old as the project of the United States.

Two

Historians often frame the California Gold Rush as a moment of economic transformation that brought the region into the US. But the Gold Rush is a moment of immense environmental change![3] What if you began this history, as any history of California must begin, with the acknowledgment that the nineteenth-century California landscape was the most biodiverse region of North America because of Indigenous land management? In the Sierra Nevada mountains and the American River watershed, the Southern Maidu practiced controlled burning, among other techniques, to maximize the production of specific plants and trees.[4] This is sustainable environmental change! It is important to include these moments in our classes too!

In their search for gold, miners dug into the earth, diverted and manipulated waterways, and, when they decided to stay, razed trees to build cities. We often discuss the impact mining for wealth had on the water systems of California but not on trees. By the 1870s, loggers, at the behest of industrial entrepreneurs, felled one-third of California's trees, many of which were redwoods. Much like the planters of the US South, California settlers viewed lumber as "inexhaustible." By the twentieth century, only four percent of the old-growth redwoods remained. In deforested regions, shrubs and other trees took over the land, making it impossible for regrowth; animals, such as grizzlies, which depended on the redwood environment, went extinct; and more sediment, no longer held together by redwood roots, made its way to rivers, damaging waterways and salmon populations.[5] By bringing the environment into our studies of the California Gold Rush, we continue to explore the idea of profit over people and nature.

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Three

Now, let's move on to the twentieth century. The history of the postwar US is usually taught within the dominant framework of prosperity. When we use phrases such as "postwar affluence," "the good life," and "the postwar boom," we picture familiar images of suburban backyards, brand-new cars, and fully stocked Smeg fridges. Of course, surveys mention the fact that racial and ethnic minorities did not benefit from affluence in the same way that their white counterparts did. Yet, prosperity remains the main (rosy) lens through which the period is framed.

What if you swapped the framework of prosperity for that of the Great Acceleration—the idea that the period from 1945 onward witnessed a rapid escalation of human-caused environmental change in the form of increased carbon emissions and dramatic anthropization of land, eventually leading to biodiversity collapse and climate change? What if, instead of focusing on US affluence (and its inequalities), you emphasized the "petrolization" of society? By petrolization, historians designate not only the swift postwar transition to a petrochemical consumer-based economy but also, more broadly, how oil shaped politics and social relations.[6] The affluent society was predicated on cheap oil. "Cheap oil," historian Adam Rome wrote, "meant cheap food, cheap housing, cheap clothes, cheap vacations—well, cheap everything."[7] Fossil fuels, in other words, made the prosperous American middle class or, as Robert Self put it, "the hydrocarbon middle-class family." Children, cars, and houses—the engines of the US economy and the foundation of middle-class status—were all dependent on access to cheap energy.[8] Now that this model is reaching its environmental limits, there is no guarantee of its survival. Remind your students that the period of Americans' voracious burning of fossil fuels since 1945 is "a brief blip in human history, environmental history, and Earth history."[9] So, how about renaming the affluent society the "blip society"? The "cheap energy" society? Ask your students for alternative labels!

In its wake, the petrolization of US society left behind "sacrifice zones"—places where the toxic legacies of oil-related infrastructure (refineries, petrochemical plants, pipelines, etc.) continue to shorten the lives of humans and nonhumans. How about, then, opening your postwar lecture with a slide juxtaposing a still from the classic 1950s family sitcom *The Adventures of Ozzie and Harriet* with an image of the Big Inch pipeline (the longest in the world when it was built during the Second World War) or that of an offshore oil platform, such as the one that would eventually lead to the first major US oil spill in Santa Barbara in 1969? The confrontation of the

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two images would capture the main framework for the rest of the lecture: that one would not have been possible without the other. The gender and social politics of the suburban, middle-class family sitcom of the 1950s, such as *Ozzie and Harriet*, seem outrageously outdated to us. But we have yet to reevaluate the material foundations of the white middle-class suburban household in the same way. Swapping "prosperity" for "Great Acceleration," and "affluence" for "petrolization," is a good place to start.

Four

Focusing on petrolization can also help with reinserting fossil fuels, and thus climate change, in the story of the birth of the modern environmentalist movement. Although US history surveys usually identify the Santa Barbara oil spill (1969) and the Cuyahoga River fire (also 1969) as two disasters that sparked environmental awareness in the US, these events are rarely contextualized in terms of the nation's addiction to cheap oil. From the tarred-up seabirds dying on Santa Barbara's beaches to the oil-soaked debris that fueled the Cleveland fire, evidence of oil's grip on US society was everywhere in the late 1960s. In the case of Santa Barbara, the shock was immense because the wealthy beach city was exactly the type of place that was supposed to be spared from industrial pollution. Cleveland's refineries along the Cuyahoga River and the people who lived nearby, in contrast, had long been abandoned by politicians and industrialists as a sacrifice zone in a modern industrial economy.

The modern environmental movement, which led to the adoption of a regulatory framework for air and water pollution, was revolutionary precisely because it demanded that this division, between areas preserved from pollution and sacrifice zones, end. At its heart, it demanded for all Americans to have the right to live in a safe environment and, even more importantly, to know what pollution they were exposed to.

A Final Takeaway

When you're teaching the "birth" of the modern environmental movement in reaction to an environmental "crisis," keep in mind that this framing has two major flaws:

1. It implies that inhabitants of the American continent had no environmental awareness of the harmful consequences of capitalistic and industrial logics on their surroundings before that period. That is simply not true!

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2. Using the phrase "the environmental crisis"—which became popular in the 1970s—also makes it sound as if environmental harm was a new, recent problem.

The period of the Great Acceleration did generate unprecedented levels and forms of pollution. But the environmental "crisis" has much older roots. If you reframe your US history survey to follow the environment–human nexus, as we suggest here, then it will make sense to remind your students that the crisis actually started on the shores of the Chesapeake Bay with the arrival of the first slave ships. From enslavers exhausting the soils and bodies of enslaved people to miners blowing up rivers for gold, an extractive mindset set the US on its course toward climate change. This is not to say that history could not have gone differently or that the trajectory cannot change. The rise of the modern environmental movement *did* represent a turning point. We're breathing cleaner air and our rivers are in better shape than in 1970. Nobody can predict how the climate change story will end. But one thing is certain: Tackling climate change requires a fundamental change to our relationship with land, natural resources, and labor.

Notes

1. The title of this essay is a reference to Andreas Malm, *How to Blow Up a Pipeline: Learning to Fight in a World on Fire* (Verso Books, 2021).

2. David Silkenat, *Scars on the Land: An Environmental History of Slavery in the American South* (Oxford University Press, 2022), 2, 8, 14–15; and Christopher Morris, "A More Southern Environmental History," *The Journal of Southern History* 75, no. 3 (2009): 581–598.

3. California state history standards are emblematic of this narrative: https://www2.cde.ca.gov/cacs/id/web/4207.

4. M. Kat Anderson, *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources* (University of California Press, 2005).

5. Andrew Isenberg, *Mining California: An Ecological History* (Hill and Wang, 2005), 76, 98.

6. Renaud Bécot and Gwenola Le Naour, eds., *Vivre dans un monde toxique. Violence environnementale et santé à l'âge du pétrole* (Le Seuil, 2023).

7. Adam Rome, "Crude Reality," *Modern American History* 1, no. 1 (2018): 77–82.

8. Robert Self, "Cataclysm in Suburbia: The Dark, Twisted History of America's Oil-Addicted Middle Class," *Salon*, August 30, 2014, https://www.salon.com/2014/08/30/cataclysm_in_suburbia_the_dark_twisted_history_of_americas_oil_addicted_middle_class/.

9. John R. McNeill and Peter Engelke, *The Great Acceleration: An Environmental History of the Anthropocene Since 1945* (Harvard University Press, 2016), 5.

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10

Teaching the Climate Catastrophe with an Early Medieval Poem

Alexander D'Alisera

"Still, there, in my long slumber,
in all my sorrow, I gazed at the Savior's Tree.
And then I heard it make a sound!
The best Wood began to speak words:

'It was long, long ago—and yet I remember it still!—
that I was hewn at forest's end,
and ripped apart, root and stem. There, strong enemies seized me,
wrought me into a spectacle, demanded that I carry their outlaws.'"
—*The Dream of the Rood*, ll. 24–31 (trans. Alexander D'Alisera)

The Dream of the Rood (*The Dream*) is an extraordinary poem from Britain's early middle ages, a period usually demarcated by the withdrawal of the Roman Empire around the year 400 and the Norman Conquest in 1066.[1] In the text, the anonymous poet alters the traditional biblical narrative of the crucifixion, instead centering the voice of the talking tree that unwillingly served as the instrument of Christ's torture.[2] Given the poem's eco-apocalyptic resonances, teachers may find use in deploying the text as a primary source in environmental history courses in order to connect premodern perspectives with discussions about the ongoing climate catastrophe. This essay provides guidance for non-medievalists who wish to teach *The Dream* in such a way as they engage their students with a longer view of environmental history that predates modernity and the Industrial Revolution.

The Dream, like the epic poem *Beowulf*, was composed in Old English, a multidialectal language that was one of many vernacular tongues spoken across early medieval Britain.[3] In the poem, a speaking tree descends from the sky and reveals, to an unnamed dreamer, the horrors that humans have wrought upon it. The dreamer realizes that this tree is not just any tree but rather the actual cross upon which Christ was crucified. The tree describes

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how people brutalized the forest in which it grew and hewed it from the ground, so that it might serve as an instrument of torture and death. It agonizes in the memories of how it quivered and bled when humans nailed the god-man to it. It speaks of how it was buried before warriors unearthed it and gilded its bloodied wood with precious metals. And although it was once forced to serve as this human-made object of anguish, now it endures as a hopeful symbol for those seeking the righteous path. In its concluding monologue, the tree foresees the end of days—the apocalyptic eschaton—during which time the slaughtered god-man will return and judge humankind. And still, despite the trauma it endured at human hands, the tree reminds the dreamer that if its story is told, then all will be well at the end of all things. Hope, in the face of fear about the future, stands as one of the poem's most timeless messages.

Narrative aside, the poem's material survival in stone, manuscript, and silver offers further glimpses into a medieval world in which constructed, natural, and imagined environments (trees, rocks, metals, graves, writings, peoples, gods) were key components of daily life. The text is partially attested in runic carvings on the eighth-century Ruthwell Cross, a glorious stone monument that stood on the shores of what is now southwestern Scotland. *The Dream*'s most complete version survives in script in the tenth-century Vercelli Book, an important manuscript from southern England. A third reference was etched into the silver of the eleventh-century Brussels Cross Reliquary, also from southern England. In the poem's earliest form, students encounter a real stone cross that was utilized in local liturgical practice, relaying the voice of an imagined tree. In its major form, the poem was copied down on parchment, an animal-skin material from which the process of butchery is inseparable. Its final attestation is inscribed into silver, a precious metal mined and extracted from the earth. These three material forms, localized to the early medieval British milieu but bearing imagery derived from ancient Mediterranean stories, bespeak the entanglement between resource extraction and the mobility of ideas in the premodern period. Contemporary students might find these confluences provocative and even strange, but to the early medieval audience, it would be no surprise that a tree cut down in ancient Palestine could speak, in Old English words, to a dreamer in Britain via hewn stone, animal skin, and mined silver.

At once, it is important to remember that *The Dream* relies on a Christian tradition rooted in biblical accounts of Christ's crucifixion. At the same time, much of the poem's rhetorical effectiveness depends on how it diverges from these canonical narratives, and how it (like many sources

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reflective of medieval Afro-Eurasia's many diverse Christianities) localizes its story to a specific regional context. Assigning relevant excerpts from any of the four canonical gospels will be of use in orienting students toward these narratives—for example, Matthew 27:11–28:10, Mark 15:1–16:20, Luke 23:1–24:53, and John 18:28–21:25. For *The Dream*'s Vercelli text, Roy M. Liuzza's excellent translation is freely available online.[4] My own translations of the Vercelli text, the Ruthwell runes, and the Brussels inscription may also be utilized if teachers wish their students to engage with all three sources together.[5] Rather than assigning specialist secondary sources, lest they lose the forest for the trees, teachers might instead think about some of the following questions as they guide their students through this unusual poem:

1. Although the current climate catastrophe is existential in scale, people today are far from the first to be concerned about the future of humanity vis-à-vis a changing environment. After reading the poem, how do you think ordinary people in medieval Britain imagined their own futures? In what ways do you think their concerns were different from ours? In what ways might they seem similar?
2. How might people today explore their own theologies of human pain and fear through the agony of the tree? What is implied about the medieval human–environment relationship by the fact that the poet gives voice to the tree to speak of its own experience?
3. What can be read into the fact that, although it suffered at the hands of humans, the tree takes time to offer the human dreamer care and hope about the future? How does this centuries-old narrative read with and against contemporary narratives about deforestation?
4. What are the ecological implications of humans not merely chopping down the tree but also turning it into technology intended for torturing fellow humans (and, in the case of Christian theology, killing the god-man whose very role on earth is to save humanity)?
5. What is the role of resource extraction in the text, especially with reference to deforestation? How does the imagined story interplay with the poem's real, material attestations in stone, on parchment, and in silver, three materials that are extracted from the earth through human processes such as mining and animal butchery?

From their reading of *The Dream*, and their engagement with some of these questions, students will learn to appreciate premodern sources from

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an eco-critical perspective. More broadly, students will expand their historical perspectives on the relationship between humans and environments before modernity, while also gaining new outlooks on the long histories of resource extraction and apocalyptic angst. As the very existence of this volume illustrates, we are collectively facing our own era's climate catastrophe with an anxiety not unlike that of the medieval dreamer, sitting on a hill, who yet finds hope by listening to the words and wisdom of an ancient tree.

Notes

1. For an introduction to the period as a whole, see Robin Fleming, *Britain After Rome: The Fall and Rise, 400 to 1070* (Penguin, 2010).

2. For an introduction to the poem, see Alexander D'Alisera and Samuel Osborn, "The Dream of the Rood: A New Translation and Introduction," in *New Testament Apocrypha: More Noncanonical Scriptures*, vol. 3, ed. Tony Burke (Eerdmans, 2023), 110–129.

3. Important secondary sources for teachers to consult are Seeta Chaganti, "Vestigial Signs: Inscription, Performance, and The Dream of the Rood," *PMLA* 125, no. 1 (2010): 48–72; Éamonn Ó Carragáin, *Ritual and the Rood: Liturgical Images and the Old English Poems of the Dream of the Rood Tradition* (British Library and University of Toronto Press, 2005); Elaine Treharne, "The Form and Function of the Vercelli Book," in *Text, Image, Interpretation: Studies in Anglo-Saxon Literature and Its Insular Context in Honor of Éamonn Ó Carragáin*, ed. Alastair Minnis and Jane Roberts (Brepols, 2007), 253–266; and Matthew Scribner, "Tree and Technology: Articulating the Ecological in The Dream of the Rood," *Interdisciplinary Studies in Literature and Environment* 23, no. 2 (2016): 240–258. See also the bibliography found at Alexander D'Alisera and Samuel Osborn, "Dream of the Rood," *e-Clavis: Christian Apocrypha*, accessed June 30, 2025, https://www.nasscal.com/e-clavis-christian-apocrypha/dream-of-the-rood/.

4. Roy M. Liuzza, trans., "The Dream of the Rood," in *The Broadview Anthology of British Literature: One-Volume Compact Edition* (Broadview, 2015), 54–57. As of June 30, 2025, this translation is freely available online from the Poetry Foundation: https://www.poetryfoundation.org/poems/159129/dream-of-the-rood-translation.

5. D'Alisera and Osborn, "The Dream of the Rood," 123–129.

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11

Teaching Solutions History

Emily Pawley

I originally started teaching solutions history because, like a lot of environmental educators, I found that a stream of students were coming to my office to cry.[1] They reported a sense of helplessness, an inability to face their reading, and often planned to turn away from environmental issues as a whole. These conversations taught me that I had been making some significant mistakes, undermining their ability to respond to environmental crisis. Slowly, I've come to realize that these same mistakes have warped my own understanding of the past and the present.

First, I realized that I spent almost all my class time tracing big structural causes contributing to the climate emergency and emphasizing the emergency's deep roots in the past. (This was good! I still do this!) But when I talked about possible solutions, I fell back on clichés—variations of this common mantra: "Previous generations have really screwed things up, but your generation will be the one to save us!" The assignment version of this error is what I now think of as "the last paragraph solution." In this form, students spend all of the paper laying out, say, the causes or consequences of car culture but finish with a sort of courtesy paragraph or sentence that waves at a solution—a few lines on bikes or a gesture to public transit. Students were so used to these final paragraphs that they included them even if I hadn't asked for them and got frustrated when I gave them readings that came without at least a fig-leaf-sized solution at the end. Once I noticed this pattern, I realized that I sometimes designed courses this way too—with a chirpy little "what can be done" final slide or a day of "solutions brainstorming" at the ragged tail end of the semester. Through such tactics, it seemed to me, my students had gotten accustomed to relatively rich analyses of problems and thin, spindly descriptions of responses; descriptions that they understandably found unconvincing.

I also noticed that the solutions that my students did describe often had a weird quality. They described them in terms of what I have come to think

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of as "false futurity"—that is, solutions were framed as phenomena existing only in the future. Here is an incomplete list of things my students have described as brand new or existing only in the future: bikes, solar power, tree planting, carbon trading markets, rewilding, urban gardens, global climate negotiations, and pipeline protests. As historians, we know that all of these phenomena have deep histories. Some, such as photovoltaic solar power, stretch back decades; others, such as large-scale planned tree planting, stretch back centuries. Of course, my students often knew that many of their "future solutions" already existed. But the rhetorical forms of solution description encouraged them to describe them either as newly hatched or as pipe dreams.

This observation shifted my sense of why it might be important to teach the histories of proposed "solutions." Failure to do so is not just a psychological stressor, I argue, it's also a significant historiographical problem: a mischaracterization of the past leading to multiple mischaracterizations of the present.

For one thing, false futurity empties solutions of their politics. If students don't know that plant-based plastics are older than petroleum-based plastics, they don't know how to ask the ecological, social, and labor questions that would spring to mind if they knew the horrors of colonial rubber.[2] If they cast carbon capture and storage as an untried technology, they lose any understanding of its roots in fossil fuel extraction.[3]

Second, treating solutions as though they existed only in the future robbed my students of some straightforward lessons about precursors and models for action. For example, in thinking through the dangers of rare earth extraction for the new battery economy, it helps to think about the history of the now very recycled and ubiquitous lead–acid battery.[4] Likewise, in thinking about how to build a climate movement, it helps to know the contours of the climate movement that has been building for the last twenty years and the different currents and tensions that fed into it.[5]

Third, false futurism led students to mischaracterize the kinds of work needed in responding to the climate emergency. It encouraged them to prepare for context-free "blue-sky thinking" and "innovation." Rather than planning to join decades-old organizations, to strengthen, modify, or critique existing efforts, they set themselves up for wheel reinvention and blind alley rediscovery.

Fourth, and, historiographically, most importantly, false futurism made it hard to explain past change. We can't understand the ideologies and structures that formed in defense of transatlantic slavery without tracing the antislavery movement that put it on the defensive. Similarly, we can't

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understand, for example, the twentieth-century development of the U.S. coal industry without understanding the provisions of the Clean Air Act.[6]

As you may have noticed, my definition of "solution" is broad. I don't mean "things that alone will solve climate change," since those don't exist. Nor do I mean "things that are definitely a good idea." Historical analysis can help us reject some proposed solutions—for example, ethanol or turning half the world into unpopulated "wilderness."

So, how has this shaped my teaching? Now, when I teach a problem, I spend a comparable amount of time looking at responses. In some classes, after introducing and discussing environmental problems, I have the groups of students brainstorm some solutions to that problem, in as many registers of action as they can, from federal and global to grassroots and local. The idea here is to find solutions that could happen at lots of levels, not just "the individual" or some kind of nebulous "system." Then, I ask them to Google their solution at each level to see who is already working on the problem. Then we have a discussion about what they have found. This exercise helps convince them that the solution has a complex present and a past as well as a possible future.[7]

In more climate-focused classes, I have my students directly research the histories of climate solutions. The version of this that I use at the moment starts with Project Drawdown—a long-running collaborative project that catalogues and ranks climate solutions. They only examine mitigation options—that is, options that promise to reduce emissions or remove greenhouse gases from the atmosphere. So, I encourage the students to think about adaptation as well as activism and advocacy work. Then, I ask them to try to answer two straightforward questions: (1) What is a major historical arc of your solution? (2) What lessons can we learn from its past that can help us understand how to implement it (or not) in the future?

I used to wince at this kind of thing. So earnest! So presentist! But it helps students escape another intellectual pitfall, when they inevitably find a problem with their chosen solution and conclude that change is actually impossible. In class, we call this the "problem–solution–problem" sandwich. Hitting this moment, I encourage my students to ask, "Now what?" and to research responses to the new layer of problems they've uncovered. It's important to steer the line between thoughtless boosterism and similarly thoughtless hopelessness and to make steering that line part of the assignment.

Lately, influenced by my fellow authors in this book, I'm starting to think bigger and shifting my students' work toward public communication. Many of them want to be teachers or museum professionals. Can I

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help them imagine new lesson plans that build in the histories of climate solutions? Can we build public commemorations—design plaques for early solar houses, museums for mass tree planting or wind-power installations, the way that we have train and coal mining museums? Can we commemorate the mutual-aid networks that sprang up after Hurricane Maria or the People's Climate Marches that helped move forward the Paris Agreement and, when the US backed out, the US Climate Alliance?

My efforts have not resolved my students' fears, and they shouldn't. There is plenty to be afraid of. But students tell me that it helps them to unfreeze, to better understand the crisis, and to see how they might respond. For me, that's enough.

A final note that I reflect on in part VI: Since it's not the students who developed the clichés that mislead them, we might ask how, as historians, we participate in setting these expectations, and to what extent we share them. Why is it embarrassing to write solutions history? Why is the literature I send students out to find relatively thin? What would a historiography look like that made solutions work easier?

Notes

1. I should note that I have a tenured position at Dickinson College, a sustainability-focused liberal arts college. When I teach climate change, about half of my students have already studied it before from multiple perspectives. Others are hearing about it seriously for the first time from me because they're taking the class to meet our sustainability requirement.

2. Gregg Mitman, *Empire of Rubber: Firestone's Scramble for Land and Power in Liberia* (New Press, 2021).

3. Holly Jean Buck, *After Geoengineering: Climate Tragedy, Repair, and Restoration* (Verso Books, 2019), 123-125.

4. James Morton Turner, *Charged: A History of Batteries and Lessons for a Clean Energy Future* (University of Washington Press, 2022).

5. Ellen Griffith Spears, *Rethinking the American Environmental Movement Post-1945* (Routledge, 2019).

6. Allen Dieterich-Ward, "'We've Got Jobs. Let's Fight for Them': Coal, Clean Air, and the Politics of Antienvironmentalism," *Ohio Valley History* 17, no. 1 (2017): 6–28.

7. James Morton Turner's excellent Big Green Machine student-led IRA tracking project may have the same effect: https://www.the-big-green-machine.com/.

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12

Teaching Future Generations: Environmental History, High School Classrooms, and Teacher Training

Grace Bartlett, Robert Fitzgerald, Richard Hughes, and Keith Pluymers

School strikes have been crucial in the global climate movement, but what role do schools play? In the United States, standards and curricula originate at the state level. Some have responded by seeking to incorporate climate change into state educational standards, beginning with New Jersey in 2020.[1] For many people, passing requirements such as these and defending them against vigorous and well-organized attacks is at the core of bringing climate into K–12 education.[2] As college faculty that train a significant number of secondary school history educators in the state, however, we know state-level curriculum changes and culture war fights often miss the day-to-day issues facing educators who want to bring environmental history into their classrooms, including those working in states where teaching climate change is actively encouraged. Middle and high school history / social science teachers are the largest group of historians working in the United States—they must be included in any efforts to bring history to bear in the fight for climate justice.[3]

When, where, and how do history / social science educators learn about environmental and climate work in history and related disciplines? Where are resources for lessons, units, or activities? How do we convince colleagues or administrators who see climate and environment as STEM content? For example, New Jersey's climate standards focus on geography, with only one history and two civics standards, and the instructional resources that the New Jersey Department of Education provides include only one social science unit for civics/government. California's Education and the Environment Initiative offers a wider set of unit and lesson plans for world and US history, government, and economics.[4]

This essay offers insights from historians working with future teachers—who constitute a substantial number of students majoring in history—and current K–12 educators about their successes and struggles bringing climate and environmental history into our work. We hope

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to spark conversations about how history educators can feel confident delivering high-quality lessons on climate history.

Although culture wars have centered content, teacher education programs in history have increasingly embraced pedagogy promoting student inquiry rather than memorization of facts. Drawing on the National Council for the Social Studies' Inquiry Design Model, teacher candidates learn to design lessons that ask students to assess varied evidence, deliberate compelling questions, and craft arguments about the past and present. The integration of environmental history provides educators with a powerful framework to teach complex national, transnational, and global histories that resonate with students already interested in environmental issues. Furthermore, the ability of environmental history to link past and present reinforces another ambitious component of the Inquiry Design Model, the final step of "Taking Informed Action," a key component in schools' commitment to civic engagement.[5] Lessons focused on inquiry ask students to assess our contemporary world and take specific action beyond the classroom.

Environmental history is well-suited to pedagogy-focused, student-centered approaches that are best practices in history education. The challenge is translating this promise into action. We narrate the experiences of our coauthors, Grace Bartlett and Robert Fitzgerald, following Grace's path from undergraduate history education student, including courses with Keith and Richard, to interning and student teaching with Bob, to her first years teaching history and social studies at an Illinois public high school.

Grace had long considered herself an environmentalist, but a class with Keith in 2020 offered her first opportunity to explore environmental history. This became an important foundation for her approach to bringing environmental history into her classroom. In response to the uncertainties that COVID-19 created, the class met outside and centered on immersive, sensory history case studies. Grace recalls that history became more personalized and tangible through the case studies, with students being particularly open and engaged in the material. She completed her major assignment for the course, a four-week instructional unit plan with lessons, assessments, and resources, in consultation with Bob as a part of her internship at University High School (U-High), where she went on to complete her student teaching the next semester. This assignment adapted the approach and some topics from Keith's course to a secondary social studies classroom.

Grace had a unique experience where college coursework, an internship, and student teaching aligned closely. U-High is one of two laboratory

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schools connected to Illinois State University. It embraces the idea of being a Deweyian model school by connecting the learning experiences of its students with real-world issues and translates that into experimental and elective courses. Bob began teaching a "Current Issues" course and had, for three years before Grace's student teaching, included a unit on environmental issues in other elective courses. In his units, students read foundational environmentalist writers such as Henry David Thoreau, John Muir, Aldo Leopold, Rachel Carson, and Terry Tempest Williams. Other lessons concerned topics such as bright and deep green ecology, big green environmental group advocacy, and what contemporary author Richard Louv has labeled "nature deficit disorder." The last of these, described in his book *The Nature Principle* as a threat to "our health, our spirit, our economy, and our future stewardship of the environment," informed a daylong field trip to a local nature preserve, where students were given the day to experience nature in the manner he encourages.[6] Grace's unit fit easily here. Her internship allowed her to discuss the unit and its place in the "Current Issues" course while she worked on it and then to receive feedback while teaching it from the mentor-teacher who had watched it develop, the professor for whom she had initially produced it, and her history education professor.

Grace's unit began with a sensory experience, dedicating one class to each of the five senses. At a time of hybrid instruction, these lessons sought to ground the unit in students' embodied experiences. The class then moved through a variety of topics: the application of environmental history, environmental racism, food deserts, and climate change. As their final assignment, students created an environmental action plan to demonstrate their growth and to craft a plan for further engagement afterward.

This level of alignment between a content course, internship, and student teaching, and the open and smooth collaborations between everyone involved is nearly ideal. Unfortunately, this is atypical. Many current and future history and social science teachers did/may not take an environmental history course. Those with course experience may not find an opportunity during their student teaching to try out something from it. Social studies educators teach world and American history, sociology, psychology, geography, economics, and government courses, and a student teacher may be asked to cover any of those areas. Environmental history works well across disciplines and curricula, but it can be challenging for novice teachers to see how to incorporate it without support. If we expect teachers to bring environmental and climate history to their classrooms, we must

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create opportunities for the types of alignment between content, pedagogy, and experience that Grace had.

After graduating, Grace has taught at two Illinois public high schools, including a Title I school, and has continued to bring environmental history into her classroom. Teachers often have very little say in what courses they teach, and the curricula in those courses are often fixed. Grace struggled to bring the same depth of instruction she had as a student teacher into a sophomore civics course with one lesson on "Environmental Issues" in a unit on "Community Issues." Since graduating, she has incorporated elements of her sensory and environmental history unit and has worked to connect students' reflections to environmental regulations, agencies, and policies at the municipal and state levels. Doing so required a creative approach. Grace had to make space within her department's pacing guide and show how her approach represented a focus on grassroots organization and personal advocacy—concepts and vocabulary taken from the textbook.

She has worked to bring her work in environmental history to other parts of the social studies department. Grace began a small, informal collaboration over lunch with a colleague who teaches psychology, who felt that her sensory approach to environmental history could also work well in a psychology course.

For Grace, bringing climate and the environment into the high school classroom has been challenging and, at times, daunting. Even with Illinois's broad, skills-based standards, textbooks and fixed curricula can leave teachers feeling as if there is little space to try something that might be perceived as new or unusual.[7] Grace has found success by taking a patient approach and building supportive relationships with her colleagues. She recognizes that although the sensory approach has its benefits, there are other ways to do environmental history. But the process of building new instructional units is also very time-consuming. Grace has been continually honing the unit she developed as an undergraduate, frequently working to improve it and adapt it outside of her contractual planning hours. Without compensated time to plan and professional development, it can seem impossible to build something new, particularly if it is difficult to fit in existing curricula.

Teachers have a profound influence on historical consciousness around the country. Teachers such as Grace and Bob have been working for years to find places for environmental humanities. We want to make work such as theirs more widespread. To do so, we need to both shift the structure and funding of education and find creative ways to get engaged right now.

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Changing state standards is a difficult and often lengthy process involving work with legislators and/or collaboration with and committee work for state education agencies—efforts to do so should always be coupled with actions to ensure that educators feel empowered to teach environmental/climate history. Teacher training programs must create more opportunities for students to engage with environmental history throughout their education and to think critically about how to bring their coursework into their future classrooms. Current teachers need professional development opportunities and resources to build the environmental history curriculum. The Chicago Teachers Union (CTU) has charted a path, linking expanded and immersive opportunities for students and professional development for teachers through the Environmental Justice Freedom School and the Climate Justice Education Project and winning green infrastructure improvements in their most recent contract.[8]

Academic historians and graduate students can and should contribute to these efforts, but it must be as collaborators and facilitators working with teachers. We can begin now by having conversations across the K–12 / Higher Ed divide, by seeking opportunities to contribute to and build professional development opportunities, and by showing solidarity and support for transformational actions such as CTU's Green Schools campaign. Ensuring that teachers are empowered to bring climate and environmental histories to their students is a long process reaching from college classrooms to professional development sessions to department lunchrooms to bargaining tables. It will require new collaborations and hard work. It is time to get started.

Notes

1. New Jersey Department of Education, "Climate Change Education by Grade Band," January 2, 2024, https://www.nj.gov/education/climate/learning/gradeband/. The Campaign for Climate Literacy tracks bills on climate education and their status in state legislatures at https://climate-literacy.org/state-policy/legislation/.

2. Kimi Waite, "Bills Banning Critical Race Theory also Threaten Climate Education," *Grist*, June 17, 2021, https://grist.org/fix/justice/teach-kids-climate-change-systemic-racism-crt/; and Anya Kamenetz, "New Jersey Is Teaching Kids About Climate. Opponents Call It 'Indoctrination,'" *Grist*, June 7, 2023, https://grist.org/politics/culture-wars-come-for-climate-education-new-jersey/.

3. There were approximately 148,500 high school social science educators in 2022 and 20,610 historians working at postsecondary institutions in May 2023. National Center for Education Statistics, *Digest of Education Statistics* (2022), Table 209.50, https://nces.ed.gov/programs/digest/d22/tables/dt22_209.50.asp

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?current=yes; and US Bureau of Labor Statistics, "Occupational Employment and Wages, History Teachers, Postsecondary," May 2023, https://www.bls.gov/oes/current/oes251125.htm.

4. New Jersey Department of Education, "Instructional Resources," December 21, 2023, https://www.nj.gov/education/climate/instructional/; and California Education and the Environment Initiative "History-Social Science," 2021, https://www.californiaeei.org/curriculum/history-social-science-units/.

5. C3 Teachers, "The Inquiry Design Model," https://c3teachers.org/inquiry-design-model/.

6. Richard Louv, "What Is Nature-Deficit Disorder?," October 15, 2019, https://richardlouv.com/blog/what-is-nature-deficit-disorder; and Richard Louv, *The Nature Principle: Human Restoration and the End of Nature-Deficit Disorder* (Algonquin Books, 2011), 5.

7. Illinois State Board of Education, "Social Science Standards," May 5, 2025, https://www.isbe.net/Documents/IL-Social-Science-Standards.pdf.

8. Chicago Teachers Union Foundation, "Environmental Education," January 7, 2026, https://www.ctuf.org/ee/; and Nick Limbeck and Lauren Bianchi, "Chicago Teachers Win Greener Schools," *Labor Notes*, April 16, 2025, https://labornotes.org/2025/04/chicago-teachers-win-greener-schools.

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Resources Related to Part II

Alexandra Hui, Elaine LaFay, Samantha Muka, Emily Pawley, Sarah Pickman, and Anna Zeide

II.1 Further Reading on Pedagogy and Climate

Atkinson, Jennifer, and Sarah Jaquette Ray. *Existential Tool-Kit for Climate Justice Educators: How to Teach in a Burning World*. University of California Press, 2024.

Quinn, Eithne, Elsa Devienne, J. T. Roane, Alexis Young, Christine Okoth, John Wills, and Francis Henderson. "In Practice: Teaching Environmental American Studies in a Time of Crisis." *Journal of American Studies* 55, no. 5 (2021): 1246–1271.

Singh, Vandana. *Teaching Climate Change: Science, Stories, Justice*. Taylor & Francis, 2024.

Siperstein, Stephen, Shane Hall, and Stephanie LeMenager. *Teaching Climate Change in the Humanities*. Taylor & Francis, 2016.

Wakild, Emily, and Michelle Berry. *A Primer for Teaching Environmental History: Ten Design Principles*. Duke University Press, 2018.

Windschitl, Mark. *Teaching Climate Change: Fostering Understanding, Resilience, and a Commitment to Justice*. Harvard Education Press, 2023.

II.2 Responding to Climate Change Denial in the Classroom

When we encounter a student who claims that climate change is a hoax, it can feel like a direct threat, not only to the cohesion of the classroom environment or to our authority but also to the health and future of our planet. Leading scholars on this issue agree that although confronting misconceptions about the science itself and cultivating scientific literacy are important, equally important is grappling with the emotions about and identities tied to stances on climate change. Exploring areas such as human psychology and behavioral economics with your students can help them see how human minds work and how we may tend toward cognitive biases. Asking open-ended questions and inviting students to openly discuss their values and sources

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can help diffuse the sense of confrontation, depending on the intensity of the denial. Discussing mitigation strategies and proposed solutions, rather than causes or specific policies, can help move the conversation to more neutral ground. Preempting the confrontation through exploratory surveys and anonymous responses can also help you prepare how to frame the class discussions.

For more reading on this topic, see James S. Damico and Mark Baildon, *How to Confront Climate Denial: Literacy, Social Studies, and Climate Change* (Teachers College Press, 2022), which especially addresses high school social studies teachers, and research by environmental communication, psychology, and sociology scholars such as Riley Dunlap, Barbara Hofer, Aaron McCright, Arunima Krishna, and Gabrielle Wong-Parodi. See also the work of organizations such as the Center for Research on Environmental Decisions.

II.3 Online Resources for Teaching Climate History

Climate History Network: https://www.climatehistory.net/teaching.

Supporting documents from Alan Singer's book, *Teaching Climate History*: https://alansinger.net/teaching-climate-history/.

Radical Hope Syllabus: https://radicalhopesyllabuscom.wordpress.com/syllabi/.

World Wide Climate and Justice Teach-in: https://gps.bard.edu/world-wide-teach-in/about.

"The Climate Crisis has a History" from the Zinn Education Project: https://www.zinnedproject.org/news/climate-crisis-has-a-history/.

II.4 Collections and Repositories of Primary Sources Useful for Teaching Climate Change History

Materials related to climate history can be found throughout this book. Here, we gather some primary sources for instructors who are perhaps new to climate history and who would like a place to start when tuning or creating their courses.

The Climate Files (https://www.climatefiles.com/): A project of the Climate Investigation Center that archives industry and lobbyist documents illustrating the history of organized climate denial. Mostly uncovered from lawsuits, they also encourage industry whistleblowers to send them donations. NB: Don't send all your students there at the same time; it may crash the site.

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The Evolution of the Conservation Movement, Library of Congress: The Library of Congress site contains a timeline of events in the conservation movement (1850–1920) along with links to relevant documents.

Environment and Society Portal Multimedia Library: Library of the Rachel Carson Center, LMU Munich, and the Deutsches Museum.

Wiley Environmental Science and History: Primary source materials tracing the impact of human activity on the natural world.

McKibben, Bill, ed. *The Global Warming Reader* (Diatrope Books, 2011): A collection of texts and speeches from climate scientists, activists, and deniers.

II.5 Class Assignment Inspiration and Examples

As inspiration, we've gathered together some examples of teaching climate history that were shared by our contributors. Below are brief descriptions. The full materials can be found in our online resource.

WRITING ASSIGNMENT: The Historian's Go Bag
Undergraduate or graduate level
Designed by Alexandra Hui

Good preparation for emergencies includes putting together a "go bag," should you need to leave your home quickly. Usually, one's go bag includes important papers, documentation of medications, contact information, pet microchip numbers, sturdy shoes, weather-relevant clothing, N95 masks, gloves, some food, water, and cash. The idea is these are the necessary items to tide you over until things settle down into a rebuilding stage. But what will you need to rebuild? As a historian, what humanist insights from past calamities do you think are necessary?

In a ten- to twelve-page paper, describe the contents of your historian's go bag for the climate emergency. What skills, objects, and ideas will you bring with you to help rebuild your community? What do you need to acquire for your go bag? What do you already have? Be sure to draw on the assigned reading for the course, but consider also interviewing other historians.

CLASS ASSIGNMENT: How Cold *Was* It at Valley Forge?
Undergraduate level
Designed by Claire E. Campbell

In this assignment, students work in pairs to investigate climate in the eighteenth century—specifically, during the era of the Revolutionary War

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(1770–1790). Was it unusually cold, or was Washington just unprepared (and without central heat)? How did people think about climate and weather? How did they respond and adapt? What can this tell us about climate and climate change today?

You'll want to choose an intersection of time, place, issue or theme, and body of sources. For example:

1. 1776, Philadelphia versus Monticello, Thomas Jefferson's weather keeping
2. 1775–1777, blizzards and snowstorms, in Philadelphia newspapers
3. 1776–1777, weather predictions, in selected almanacs
4. Sample one newspaper over a decade for references to weather (e.g., the *Farmer's Journal*, published in Danbury, CT)
5. Measure treatises on natural history (e.g., Samuel Williams, *A Natural and Civil History of Vermont*, 1794) against newspaper or almanac records from that year

LESSON PLAN: Conference of Parties and Politics of Global Climate (In)Justice Simulation
Undergraduate level
Designed by Paul Nauert, adapted from materials developed by Mikael Wolfe in 2019

For full simulation, including group preparation materials, in-class questions, and follow-up, see online resource.

In this single-day lesson plan, each group represents a different society or perspective participating in the global politics of climate (in)justice and coordinating climate action at the 2019 COP meeting. Students represent the US (national government, led by the Trump administration), subnational groups within the US that have broken with the US national government to support the 2015 Paris Agreement goals, the EU, China, India, the Maldives, Costa Rica, Angola, nonhuman nature, and a global delegation of young people visiting from 2119. Students must represent the position of their group and work toward consensus while responding to surprise incursions by protestors and global economic change.

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SEMESTER-LONG ASSIGNMENT: A Climate Change Game
Upper-division undergraduate level
Designed by Samantha Muka

For full environmental history and gaming syllabus, see online resource.

Throughout the course, we have researched both issues in climate change and theories about how games work and how they might fit into the world of human cognition and learning. You will draw on all of this literature to produce a Climate Change Game.

Your game can involve any aspect of climate change. It can have any goal. It can be geared toward any audience. It can also be any medium. However, all your choices must be explicated through course readings/materials.

There are two sections to final submission at the end of the semester:

1. In-depth game explanation—structure this section in any way you like, but include the following: name of the game, medium of the game, rules of the game, the point/purpose of the game, and the audience of the game. You must also include visuals, either that you create yourself or that you borrow (with proper citation).
2. Annotated bibliography—arranged into four sections (audience, goals/purpose, game structure, and visualizations/medium), list the sources you used in this project. For each listed source, include a reflection on how that source contributed to your thinking about your project.

LAUNCH PAD: Teaching Environmental History Through Panoramic Maps
High school or undergraduate level
Designed by Richard Hughes

Beginning in the decades before the American Civil War, Americans increasingly encountered panoramic maps, sometimes called "bird's-eye" or perspective maps, depicting large cities and small towns throughout the growing nation. Panoramic maps, popularized before aviation and widespread photography, provided aerial cartographic views of communities during a period of rapid urbanization, industrialization, economic change, and population growth. Most prevalent between 1870 and 1900, these maps illustrated aspects of American communities such as streets, housing, education, churches, factories, transportation, and natural

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resources. The searchable panoramic map collection at the US Library Congress holds more than 1,500 digitized maps depicting locations in almost every state and as varied as New York City in 1851, Key West, FL, in 1884, and Butte, MT, in 1904.

Although students often perceive maps as literal depictions of historic and geographic reality, the pedagogical value of the panoramic maps lies, ironically, in their subjective nature. Civic leaders commissioned such maps to sell copies, promote investment, and encourage settlement. Sometimes, maps included planned developments rather than realities. The maps hold enormous potential for teachers, as they inevitably reflect dominant but problematic views of the relationship between humans and the environment during the period. The illustrations convey a sense of how communities perceived themselves as shaping and using natural resources within a romantic story of unfolding progress. For example, many maps include factories, trains, and ships bellowing smoke not as dangerous air pollution but rather as a celebrated symbol of economic growth and technological innovation. These "bird's-eye" maps provide wonderful opportunities for teachers and students to unpack the perceptions and priorities of Americans, compare cities, and assess the evolution of the maps and their depictions of the environment over a half century of seminal change.

Library of Congress, Panoramic Maps
https://www.loc.gov/collections/panoramic-maps/about-this-collection/
View from Above: Exploring the Panoramic Map Collection
https://www.arcgis.com/apps/instant/media/index.html?appid=3c525318a2bf4898bc376fdb10f7d07b
Alton, IL, 1867
https://www.loc.gov/item/73693340/

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III

Some Historical Stories That Matter

Part III aims to broaden our vision from climate history to climate emergency history. Contributions to this part show how historical narratives and frameworks that might not seem like climate history are both connected and crucial. First, an interview with Cara Daggett picks up on the energy history questions raised in part I. She locates the Western petrocultures and forms of consumption responsible for the majority of historical emissions in gendered ideas forged in and about the 1950s. Marcy Norton and Gabriel Rosenberg's story of the rise of the modern high-emitting meat complex traces processes of commodification, extraction, dispossession, and alienation that run from the early modern Spanish Empire to the industrial feeding operation. Extending the animal focus, Whitney Barlow Robles and Kristoffer Whitney and ask us to consider how stories centering on two very different insects—the fragile, lost Xerces blue butterfly and the seemingly indestructible cockroach—can help us reflect on the ways that both insects and humans are constructed as vulnerable or disposable.

In her essay, Emily Merchant shows how proposals blaming climate change on population growth have their roots in eugenics, and examines their limits in describing reality. Extending the framework of consumption, Kendra Smith-Howard then traces the histories of ideas about consumer virtue and consumer-driven destruction. Theodora Dryer and Ramya Swayamprakash foreground the violent creation of borders that globally intensify the damage of crisis. Elaine LaFay and Mary Mendoza examine the production of vulnerability and power in climate disaster through a disability lens. Finally, Danielle Purifoy shows how "Black towns" in the US were sources of white wealth extraction through both polluting petrocultures and "climate-friendly" industry, but also were places of possibility where communities have long built alternative ways of being.

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For the resource section for part III, we include a brainstorming exercise to help readers reflect on potential connections between their own research and the wider climate emergency. We have also collected book suggestions from our contributors for readers desiring to dig deeper into these topics.

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13

Petromasculinity and Gender in the Climate Crisis

An interview with Cara Daggett, February 22, 2024

Emily Pawley: We thought we'd start with this kind of central question: What is petromasculinity? Where is it most visible in global political culture? And where is it present and influential but more covert?

Cara Daggett: I started thinking about petromasculinity during the first Trump election in 2016. From ecofeminist theory, I had learned to see how sexual oppression and the exploitation of the nonhuman world are historically and materially connected. Ecofeminism helped me to recognize this pattern in right-wing movements in the US and globally. Two features recur in these movements. First, there is a ubiquitous embrace of heteromasculine domination, which is evident in the overturning of reproductive rights in the US, and in the Right's anti-trans and anti-queer politics. Second, there is fossil fuel boosterism and climate refusal; their only plan for the climate crisis is to accelerate extractivism and militarize borders. These two are mostly treated as separate phenomena in public discourse. Even social movements often counter them as separate problems.

But it is no coincidence that misogyny and fossil fuel boosterism tend to appear together. Historically, sexual hierarchies have been important in the exploitation of the nonhuman world. Nature and women are both conceived of as needing masculine control, and improvement, because they have been intimately linked as they are devalued; feminized and natural bodies are supposedly too chaotic, too passive, too cyclical, or too wasteful when left alone. The practical effect of this ideology is that certain kinds of work, and material inputs, are undervalued or made invisible, or assumed to be freely given by nature—this is work that is sometimes called "reproductive labor" or "care work," although the line between what counts as productive and reproductive is murky.

The connection between gender and ecological domination is obvious once you point it out, and it has been gratifying to see a feminist concept like petromasculinity excite public interest. It has excited interest on the Right too. Far-right groups like Turning Point and their followers trolled

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me when I first published "Petromasculinity," and I was put on the Professor Watchlist, but from what I saw, these people did not take issue with my premise. They took issue with a feminist complaining about it. In fact, the Heartland Institute, a right-wing think tank funded by the Koch brothers, held a workshop called "Embracing Petromasculinity."

You also asked where petromasculinity is covert. While petromasculinity is fairly obvious on the Right, its long history is still covert. Petromasculinity is not a new thing, and neither is petromasculinity limited to the far right. Modern petrocultures, in which we all live, are deeply bound to petromasculinity, which is also something that a historical perspective helps to illuminate.

EP: I think that's really important to think about. I wonder if you could just elaborate for me a moment on the concept of climate refusal.

CD: Over the last decade, antienvironmental actors have moved away from denying the facts of climate change, which was the original strategy. As historians of science Naomi Oreskes and Erik Conway showed in *Merchants of Doubt*, fossil fuel companies knowingly deceived the public for decades by sowing doubt about climate science.

Recently, the strategy has diversified. Climate change is increasingly impossible to deny, though there is still not a widespread acceptance of the human (colonial capitalist) causes or the severity of the crisis. Fossil fuel companies now deploy more greenwashing and other stalling tactics, such as funding some of the biggest energy and climate institutions at elite universities in the US, including at Princeton and UC Berkeley. Politically, the Right engages in climate refusal, which is different from classic denial. This can look like a shrug of the shoulders, as if to say that if the climate is changing, that only underlines the need for more militaristic and authoritarian violence to defend the status quo.

That is not the reaction that climate scientists and environmentalists hoped would follow from the acknowledgment of climate change. The expectation, very much stemming from Enlightenment assumptions about education, was that knowledge will lead to rational action. In other words, once people recognize the problem of climate change, they will be more likely to support climate action.

The evidence is clear that when people experience climate crises, they may turn toward a variety of political reactions—including violent authoritarianism—to defend a way of life. This is climate refusal: People may not deny climate crises, but they refuse to change in ways that would mitigate it.

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EP: In your work, you show how petromasculinity not only emerges, partly, from twentieth-century developments, but also feeds on kind of fantasy versions of the twentieth century. Could you give us a sketch of both of these developments?

CD: Petromasculinity—like industrialization, colonial capitalism, or climate change itself—has a longer history, but the middle of the twentieth century was an important, formative period, especially in the US. This was the moment of acceleration, when fossil fuel use intensified and petrocultures were cemented, literally, in many of the infrastructures and practices that are still with us today.

There are a few facets of this history of petro-acceleration in America that are worth stressing because they are often overlooked.

First, this is a global history. The US has a large domestic supply of fossil fuels that contributed to the American way of life, the famous mid-twentieth-century fantasy of suburban homes, cars, and heteronuclear families. But the fossil fuel economy has always been transnational in terms of supplies and profits, as well as how US and European statecraft helped to support the oil industry.

For example, looking only at the US or Europe, some may assume that petrocultural development is connected to democratic norms. In other regions, in contrast, scholars have studied a phenomenon called the "oil curse," where countries that are heavily reliant upon fossil fuel profits have tended to be more authoritarian, such that the oil wealth does not benefit most of the public. But this story ignores transnational capitalism and imperialism. The work of Timothy Mitchell, in *Carbon Democracy*, tells a more complex history. Before the 1970s, the problem was not how to get more oil but rather how to keep too much of it from entering the market.

Oil could not be allowed to flow freely because the supply would swamp demand, suppressing profits. The US and Europe were involved in controlling oil flows for the benefit of Global North oil companies, as well as in supporting automobility, city planning, trade rules, and other policies that would help build demand for fossil fuels. In order to control oil supplies, Mitchell argues that the US and Europe had an interest in supporting authoritarian regimes in the Middle East and oil-producing regions, and opposing democratic movements, because authoritarian regimes could more reliably exert control and were less likely to nationalize oil, as many Leftist movements in these regions demanded. The US's historical involvement in Iran, which is in the news in 2024, is just one example of this. The politics of fossil fuels have had this uneven character, with democratic

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order in some places and authoritarianism elsewhere, but these were connected developments and not the result of different political cultures.

The second facet worth emphasizing is the history of consumption. When fossil fuels accelerated in the mid-twentieth century, they were not meeting a preexisting demand for more energy, and all things related to oil, including petrochemicals—all the plastics and other oil-dependent materials that now make up 95 percent of the things we have around us, in our commodities. Demand had to be cultivated. Ways of life had to shift dramatically, and the state was part of that too, especially in terms of infrastructure and urban planning.

A third facet would be to relate these developments to gender and racial domination. The infrastructure of petrocultures reinforced the separation between a private home space, for relatively separate nuclear families, and a public civic and workspace, where masculinized labor and citizenship happens. At that point, the housewife was still a relatively novel figure. Feminist historians have traced the emergence of the white housewife in the nineteenth century as a figure of gender domination that was intimately tied to imperialism and racism. Ecofeminist Maria Mies calls this the "housewifization" of the world, the devaluing of reproductive work through colonial capitalism. White supremacy was spread, in part, through this vision of sexual and labor hierarchy, with a separation between industrial productivism where a male breadwinner earns a wage and the ordered home of reproduction where the housewife is protected from the public world of strife and grime. In the mid-twentieth century, petrocultures helped to further separate these sites in time and space, with automobiles necessary to move across them. Suburbs and automobile culture, at the expense of denser urban planning and public transit, also furthered racial segregation, where the private home was also a white retreat from a mixed-race public, and with new highways built right through thriving Black communities.

The second part of your question was about the fantasy of the mid-twentieth-century way of life. Of course, there is fantasy in the idea that the suburban lifestyle was a democratic place of joy, especially when you consider those who did the housework—not just housewives but also the cleaners, cooks, and childminders who were hired to help maintain the suburban home and were often working class and women of color. And that brings up an even deeper fantasy element: the fantasy that this way of life does not rely upon unjust and underpaid extraction of other people's labor and nonhuman labor too. Really, the fantasy is that this way of life is innocent, that it is actually an expression of freedom rather than the result of injustice.

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EP: I feel like we're actually really starting to see the answers to this next question in your last question. But another of our contributors for this volume, Elsa Devienne, has criticized the way that US history textbooks continue to depend on periodizations like the post–Second World War "Age of Affluence" marking increases in fossil fuel consumption as unquestioned positives. I'm hearing that also in what you are saying. I'm wondering how could thinking about petromasculinity change the ways that historians write and teach about the twentieth and twenty-first centuries?

CD: In addition to the things I mentioned, historians can help in recognizing that energy systems are also cultural systems. Petromasculinity points to how fuel can function not only as a material resource but also as a symbolic one. Burning fuel also has affective elements as an expression of a way of life. Fuel systems are therefore tied up with many phenomena of interest to historians—things like labor, segregation, housing, and reproductive justice.

The mainstream of energy studies can be a very technical discipline, and I fear that many people do not engage with questions of energy because they assume that, in order to contribute, they would need to become experts in batteries or know their way around an electrical circuit. That is a shame. Now, more than ever, energy debates need to be transdisciplinary, democratic, and much more humanistic. The problem of energy is much more than a technical problem. An energy transition requires cultural and political economic change if it is to be sustainable and just. Historians have a lot to tell us about how cultures change or how infrastructures get built.

EP: How could observing the dynamics around petromasculinity help climate activists think differently about how to respond to or dismantle climate refusal or how to build a kind of post-carbon politics?

CD: First is to recognize how emotions and narratives are important to mobilization for climate change. Climate and energy policy are still dominated by technocratic thinking, with neoliberal ideas about change through behavior and markets and new technologies. Social studies and humanities scholars have a more complex understanding of how change happens. As a concept, petromasculinity is a reminder that identities and ways of life must also change. The demand to use the Earth intensively, and cheaply, is connected to the demand for reproductive labor to be cheap, and gender and racial hierarchies have helped to justify this kind of exploitation. Undoing one thing—intensive ecocide—will put pressure on the other structures of extraction. This kind of change will be an antagonistic process that involves more than switching one fuel for another.

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This is also a reminder of the importance of solidarity across movements. For example, feminist movements should keep in mind the connection between reproductive rights and ecological violence. The Project 2025 report, which is the plan for the first days of the next Trump administration, certainly has this connection in mind. The preface to the report has four foundations. The first is family, which they define as removing reproductive rights and expanding their anti-trans and anti-queer campaigns. The third is protecting America's borders and "bounty," and a significant part of this section is devoted to fossil fuels as the lifeblood of economic growth. The report sees little need to explain why family and fossil fuels are connected; they seek to intensify petromasculinity.

EP: So we've pretty much focused on petromasculinity as a central concept here. And we know that your work is not limited to that. You write also about ecomodernism as emerging from different conceptions of the masculine. Could you talk about that, and then maybe help us think about where else we should be looking for gender in fossil fuel politics or in the climate crisis more generally?

CD: A colleague of mine, Martin Hultman, who is a Swedish academic, has done groundbreaking work on ecomodern masculinities. Ecomodernism hopes to make capitalist growth environmentally friendly, mainly through technological innovation. Ecomodernism dominates energy and climate policymaking in the most influential governments and institutes. Hultman, along with other feminist scholars like Sherilyn MacGregor, points out that this mainstream approach to green transition is gendered, in the sense that ecomodernism treats the Earth as a set of forces in need of control and improvement. Care, commons, low-tech or low-profit ideas, humility, maintenance—all these other practices receive only shallow support at best when compared to the excitement and funding given to high-tech, for-profit endeavors. This includes the many big geo-engineering ideas for carbon storage or management, or the Silicon Valley notion that artificial intelligence will solve climate change—these are technological utopias that are unproven and wildly expensive, but they are embraced, whereas feminist and decolonial ideas are often dismissed as impractical.

Ecomodern masculinities and petromasculinities are, in many ways, different styles of the same impulse. They may sometimes seem like opponents—one for fossil fuels and illiberalism, the other for green tech and liberal politics—but they share a dependency on extraction, which has been advanced through racial, gender, and ecological hierarchies. If energy transitions are run according to the dreams of ecomodern masculinities, then it is unlikely that the root causes of the climate crisis will be addressed.

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14

Modern Meat

Marcy Norton and Gabriel Rosenberg

At the time of writing, the farming and slaughter of ninety-two billion animals for meat annually—conservatively—is directly responsible for almost 20 percent of the earth's greenhouse gases that cause climate change. These emissions come from two primary sources. Deforestation, largely driven by the expansion of grazing pasture for cattle and soybean production for feed, accounts for 11 percent. Methane from belching ruminants (cattle, sheep, and goats) account for about 5 percent of global emissions. Additionally, industrial farming practices that rely on heavy fertilizer use account for another 3 percent, and refrigeration and transportation cause further emissions. Beef, pound for pound, may be the most globe-heating substance people will come into contact with on a regular basis: One pound of beef might result in almost a hundred pounds of greenhouse emissions.[1] Half of the world's habitable land is devoted to agriculture, and 80 percent of that land is used for meat production (including both pastureland for grazing and cropland for growing animal feed).[2]

The deleterious environmental—and social—effects of animal agriculture are not limited to climate change. Raising livestock also results in soil degradation, groundwater pollution and river death, zoonotic illness, habitat destruction, and mass extinction. There are the ongoing assaults on racialized groups by the meat industry—Indigenous communities whose lands (and, too often, lives) are stolen by ranchers and affiliated extractivist endeavors, and BIPOC workers who labor in harrowing conditions in slaughterhouses and meat processing plants. And, not least, there is the cruelty to billions of animals confined to short, tortured lives and early slaughter.

We track the history of these processes as well as the concepts and technologies that undergird them as they emerged in the context of the early modern Atlantic world and contemporary animal agriculture. We consider how meat production is predicated on the processes of alienation, extraction, dispossession, and commodification. These processes

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predate the capitalist political economy with which they are often conflated. However, the last two centuries are distinguished from the earlier period by certain signal developments in how meat is produced. These developments continued those earlier processes in more intensive forms—forms that have relied on both a more integrated global market in animal products and, at once, more intensive regulation of the bodies of both animals and humans who live and labor within the global meat system.

Alienation

For Marx, "alienation" signified the way that capitalist relationships estranged workers, their labor, and the goods they produced. In *Nature's Metropolis*, William Cronon extended its meaning to describe the "growing distance between the meat market and animals whose flesh it dealt" that "betokened a much deeper and subtler separation—the word 'alienation' is not too strong—from the act of killing and from nature itself."[3] The massive cruelty to those animals labeled as livestock, like the so-called environmental externalities above, is enabled, if not caused, by alienation.

The technology of the slaughterhouse suggests that alienation preceded industrial agriculture and even capitalism itself. In Spain, the slaughterhouse (*matadero*) emerged as a technology separate from the butcher at the turn of the fifteenth century. Before that time, the *carnicería* (butcher) was the site where skilled artisans killed cows and sheep, skinned and cut up animal bodies, and sold flesh, organs, fat, and skin directly to consumers or other tradespeople. The butcher already put people at a remove from the subjectivity of animals and the violence of their transformation into food and fiber. Yet, at the end of the medieval period, townspeople who consumed the corpses of animals increasingly demanded more distance from their killing and processing. In petitions to the monarchy, residents complained of "pernicious" filth emitted from butchers, of "the great noise" vocalized by cows, and "the bad smell of the blood."[4] City and town dwellers could no longer stomach hearing cows, pigs, and sheep bray in distress, feeling bloody mud that coursed through streets, or smelling the odors of death. The rulers listened. They decreed that *mataderos* were to be constructed outside towns walls, or at least out of their centers. The labor of a single butcher until this point was divided among at least four slaughterhouse workers.[5] The separation of the slaughterhouse and the butcher created temporal and spatial distance between those who managed living animals, those who killed them, and those who consumed their corpses.

To arrive at the modern slaughterhouse, meat production has followed a path interwoven with the technological transformations of industrial

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modernity and the globe-spanning reach of European empires. By the nineteenth century, agricultural peripheries supplied meat to burgeoning industrial workforces in metropoles. Steamships and railcars, refrigeration, and cheap overland gasoline-powered trucking permitted producers to sell meat to ever more distant consumers. This trend also propelled a disaggregation of breeding, birthing, fattening, slaughter, processing, and sales into discrete economic stages dominated by specialized actors. Meanwhile, global mobility permitted different communities to contribute efficiencies to meat production, with American pork and Australian sheep, for example, arriving in and then dominating European markets by the turn of the twentieth century. These changes in the meat trade accompanied ecological and economic transformations of agricultural peripheries. For example, on "finishing" farms in the American Midwest, cattle that had spent their early lives grazing on Western grasslands were fattened on cheap dent corn before making a final rail trip to the industrial abattoir in Chicago. *Nature's Metropolis* notes that the regimentation of space and time in Chicago's famed Union Stockyards relied on a network of fences, deeds, surveyors, grain silos, and rail lines that also permitted emerging global markets in fungible grain, meat, and dairy commodities.[6]

The industrial hog and chicken houses now euphemistically referred to as Confined Animal Feeding Operations (CAFOs) are an extreme horizon for trends already evident in both Chicago and its hinterlands, if not in early modern Europe. "Industrial animality," as the anthropologist Alexander Blanchette terms it, is broadly dispersed in the substance of daily life throughout the world.[7] However, pigs live and die in facilities most consumers never visit. Modern slaughterhouses still profoundly alienate both consumers and workers from the natural world, but their scale, scope, and outputs are on a different order. The twenty-seven-story abattoir in China's Hubei province will slaughter an estimated 1.2 million swine every year.[8] Facilities such as the one in Hubei use entire corpses, rendering what remains after meat cuts into lard and novel derivative ingredients that find their way into products as diverse as cosmetics, consumer electronics, and building materials.[9]

Dispossession

The establishment of animal agriculture in the Americas is connected to the most extreme forms of dispossession—enslavement, land expropriation, ecological destruction, and massacre.

To illustrate the connection between livestock expansion and Indigenous dispossession, let us consider the *baldío*. In Spain, *baldíos* were common

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lands, rather than private property, available to community members who wanted to collect firewood, forage for wild plants, and graze animals, particularly pigs.[10] In Iberia, the *baldio* was a land-use category that offered a degree of protection for peasants against other structural inequities. In the colonies, however, settlers repurposed it into a tool that expanded livestock husbandry and theft of Native land. In New Spain (Mexico), for instance, if settlers demonstrated that lands were not under cultivation, they could classify them as *baldíos* and convert them into private property to use for cattle and sheep grazing. The sequence was often reversed: Settlers permitted cows and sheep to occupy and destroy Indigenous crop fields, and then claimed that these lands were "vacant" *baldíos*. This process was the dominant reason that more than half of the arable and grazing lands in the Valley of Mexico was transferred from Indigenous to European hands in the first century of colonial rule.[11] The *baldío* was one of a number of legal constructs and technologies that turned livestock husbandry into a linchpin for the dispossession of Native land, labor, and, sometimes, life.[12]

These prefigured the forms of dispossession that continue into the present. Just as colonial pastoralism dispossessed Indigenous communities of their land, modern slaughterhouses depend upon a steady supply of livestock feed that has, in turn, spurred agro-expansion and dispossession.[13] But the dispossession facilitated by the Hubei facility in China is not (just) proximate to where the pigs will live and die; instead, expanding soy cultivation for animal feed is a major source of deforestation and Indigenous land dispossession in South America and other distant locations.[14]

Extractivism

It takes around thirty calories of energy input to produce a single consumable calorie of conventional beef. This is, in part, due to the intensive petrochemical-laden monocropping of corn and soy primarily for animal feed and, in part, because animal "food" is an indirect way, compared with plant food, to access the sun's energy. The unsustainability and resource intensitivity of modern beef exemplifies the extractive nature of animal husbandry. However, that extractivism has much deeper origins.

The *desjarretadera* epitomizes it in the cattle industry as it emerged during the early colonial era.[15] Cowboys in the Caribbean invented this new instrument to kill cows, one later exported to other cattle-producing regions in the Americas. Riding after (often feral) bovines, they used the tool (a lance topped by an iron blade) to slice the muscle of the animals' hamstring—to literally *desjarretar* (hamstring) the animal—without dismounting. The

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crumpled, disabled animal stayed in place, and the cowboy skinned their body and collected their hide. The accelerated destruction of cows and wasteful use of their bodies enabled by this instrument shocked Europeans accustomed to a political economy that made careful use of all parts of a bovine body, astounded that ranchers "only made use of their skins, leaving the Meat to the Wilderness, which is wasted and consumed by Wild Dogs" or became "food" for vultures.[16] The wanton waste and desecration of life—exemplified by cow flesh putrefying—was the underbelly of the transatlantic trade in hide commodities that enriched capitalists on both sides of the Atlantic, and it indicates how livestock husbandry transformed into an extractivist regime in American colonies.

Commodification

Late modern meat is predicated on a more complete commodification of livestock life processes and genetics, a shift in terms of changing regimes of breeding. To produce the billions of animal lives needed to sate humanity's appetite for meat, animals must be made to mate when and where the market demands. This has, in turn, increasingly located the profitable frontiers of animal agriculture within the bodies of the animals themselves, generating processes of genetic enclosure (and dispossession) as well as new forms of alienating labor and extractive flows. The intensification and disciplining of livestock reproduction has followed interlocking trajectories of spatial and temporal confinement.

Livestock breeding underwent a transition from extensive breeding, where reproductive labor is widely and diffusely distributed throughout a population, to intensive breeding, where reproductive labor is concentrated in a small subset of the total population.[17] Under the former, farmers tended to exert only minimal selection in breeding, mostly by castrating marginal males. More complex selection was incompatible with husbandry where cattle grazed on ranges and in common pastures and pigs feasted on acorns in the forest through *pannage*. Intensive breeding before the sixteenth and seventeenth centuries was primarily limited to warhorses and dogs, animals that held unique value to the European aristocracy.[18]

First in Europe and then later in colonial settings, animal mobility was increasingly inhibited by the fencing of pastures, ranges, and fields and the construction of permanent structures such as barns and sheds. These "improvements" helped to convert common and customarily accessed land, such as the *baldío*, into real property and subsequent agricultural intensification. In the Anglo-American tradition, enclosure established

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legal ownership of land and prevented roving animals from destroying crops, but it also reduced the costs associated with selecting which animals should reproduce.[19] This allowed farmers to more carefully segregate animals that were capable sexual laborers with favorable hereditary traits ("breeders") from animals that should be fattened for slaughter ("feeders") and prevented genetic admixture from wild animals. Enclosure also allowed breeders to arrange matings for animals with favored traits. By the eighteenth century, for example, British breeders mated their swine with Chinese breeds that were smaller but fattened more quickly.[20]

Spatial organization permits an ever more granular regulation of when and how livestock mate. The "location" of livestock sex has gone from open ranges and pastures, to fenced yards and closed barns and sheds, to breeding "crates" and "racks" that entirely immobilized animals during mating, and, finally, to *inside* the bodies of livestock. In fact, in the artificial insemination through which most commodity pigs, dairy cattle, and turkeys are now conceived, there is no contact between animals. Technological prostheses allow human actions to substitute for "natural" animal sex: breeding "guns" and semen catheters; artificial vaginas and prostate stimulators; pheromone sprays, hormonal treatments, and even tactile bodily manipulations administered to sows by human technicians—through these technologies, confined livestock are woven into global infrastructures of genetic governance and exchange.[21]

Animals are confined, but the *substances* of livestock reproduction move through global networks of exchange. Global livestock semen marketing permits breeders to impregnate tens of thousands of cows from the semen of a single bull, with effective semen cryopreservation adding the morbid twist that a bull may continue to sire long after it has died. Inexpensive genetic analysis and editing, cloning, statistical modeling of global animal agriculture value chains, and durable claims to "lively" intellectual property enable animal agriculture operations to splice in and out genes from a global population of breeders. Livestock, whether swine, cattle, sheep, or fowl, are the most routinely and extensively genetically engineered megafauna on Earth.[22]

This ever more granular exploitation of livestock bodies, reproduction, and genetics impels a comprehensive regime of human labor management. Gargantuan multinational meat corporations remake the social relations of their human workforces in the name of livestock. Individual pig lives, Alex Blanchette writes, have little value, but the enterprise depends on the future vitality of the "herd," an aggregation of pig life. In a striking example, a pork company prohibits romantic relationships between workers in

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different sectors of its facilities because of fears infectious pathogens might move from boars to sows by crossing a bridge of human embraces. Given that meat companies forced human workers back into animal agriculture facilities at the height of the COVID-19 epidemic, it appears that human labor productivity (to say nothing of basic welfare) is less important to current extractive processes than the collective vitality of the swine the same company slaughters and processes.[23]

Conclusion: After Modern Meat

That sick workers are a more tolerable liability than sick pigs lays bare the morbid endgames of meat's alienation. The processes of alienation that distance humans from nature also facilitated extraction and dispossession as well as the catastrophic outcomes this essay began with: billions of tortured animals, vast swaths of despoiled landscapes, and millions of people exploited and dispossessed. At best, CAFO apologists hope that the *human* pleasures of meat justify animal suffering, but will separating ourselves from nature, commodifying it through enclosure and dispossession, and extracting from it all that we can sell wall off humans from the nature we would dominate?[24]

We doubt it. Because humans are themselves as run through with nature as nature is with humanity, alienation, extractivism, dispossession, and commodification always seem to bend back, placing humans in the grips of the very domination some had thought to exert in the first place. This observation may appear bleak, but it also has within it the seeds of a possible productive solidarity with animals.[25] The workers in the barn may share more interests with the pigs they are paid to breed, feed, and slaughter than they yet realize, the barrier of species notwithstanding. In recognizing ourselves as ruled by modern meat, we may seek solidarity with creatures we are otherwise trained to regard as, at best, only pitiable victims. Untraining ourselves from seeing animals as mere victims and commodities may also happily entail creativity, play, and adventure, welcome ingredients in the shared struggle that forges solidarity. What particular forms this solidarity takes—whether directed political actions, electoral strategies, or even new dietary and consumer habits—is unwritten, but any escape from the ecological and political catastrophe of modern meat may well depend upon it.

Notes

1. Jonathan Foley, "Fixing Food's Big Climate Problem," July 10, 2024, https://drawdown.org/insights/fixing-foods-big-climate-problem.

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2. Hannah Ritchie and Max Roser, "Half of the World's Habitable Land Is Used for Agriculture," *Our World in Data*, February 21, 2024, https://ourworldindata.org/global-land-for-agriculture.

3. Karl Marx, "Economic and Philosophical Manuscripts of 1844," *The Marx-Engels Reader*, ed. Robert C. Tucker, 2nd ed. (W. W. Norton, 1978), 53–65; and William Cronon, *Nature's Metropolis: Chicago and the Great West* (W. W. Norton, 1991), 212–213.

4. Quoted in Marcy Norton, *The Tame and the Wild: People and Animals after 1492* (Harvard University Press, 2024), 56.

5. Norton, *Tame and the Wild*, 56–57.

6. Cronon, *Nature's Metropolis*.

7. Alexander Blanchette, *Porkopolis: American Animality, Standardized Life, and the Factory Farm* (Duke University Press, 2020), 20.

8. Guardian Staff, "China's 26-storey Pig Skyscraper Ready to Slaughter 1 Million Pigs a Year," *Guardian*, November 25, 2022.

9. Blanchette, *Porkopolis*; and Nicole Shukin, *Animal Capital: Rendering Life in Biopolitical Times* (University of Minnesota Press, 2009).

10. David E. Vassberg, "The 'Tierras Baldías': Community Property and Public Lands in 16th Century Castile," *Agricultural History* 48, no. 3 (1974): 383–401.

11. Elinor G. K. Melville, *A Plague of Sheep: Environmental Consequences of the Conquest of Mexico* (Cambridge University Press, 1994), 120–121; and Charles Gibson, *The Aztecs Under Spanish Rule: A History of the Indians of the Valley of Mexico, 1519–1810* (Stanford University Press, 1964), 274–277.

12. Norton, *Tame and the Wild*, 95–104.

13. Dom Phillips et al., "Revealed: Rampant Deforestation of Amazon Driven by Global Greed for Meat," *Guardian*, July 2, 2019; Rafael Moro, "Brazil Launches Biggest Operation Against Illegal Cattle Farms in Indigenous Amazon," *Guardian*, September 5, 2023; and Susanna B. Hecht and Alexander Cockburn, *The Fate of the Forest: Developers, Destroyers, and Defenders of the Amazon*, rev. ed. (University of Chicago Press, 2011).

14. Gustavo de L. T. Oliveira and Mindi Schneider, "The Politics of Flexing Soybeans: China, Brazil and Global Agroindustrial Restructuring," *The Journal of Peasant Studies* 43, no. 1 (2016): 167–194.

15. Norton, *Tame and the Wild*, 95.

16. Gonzalo Argote de Molina, *Libro de la montería* (Andrea Pescioni, 1582), 16.

17. Gabriel N. Rosenberg, "No Scrubs: Livestock Breeding, Eugenics, and the State in the Early Twentieth Century United States," *Journal of American History* 107, no. 2 (2020): 365, especially note 6.

18. Mackenzie Cooley, *The Perfection of Nature: Animals, Breeding, and Race in the Renaissance* (University of Chicago Press, 2022); and Jamie Kreiner, *Legions of Pigs in the Early Medieval West* (Yale University Press, 2020).

19. Virginia DeJohn Anderson, *Creatures of Empire: How Domestic Animals Transformed Early America* (Oxford University Press, 2006).

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20. See Rebecca Woods, *The Herds Shot Round the World: Native Breeds and the British Empire, 1800–1900* (UNC Press Books, 2017); Sam White, "From Globalized Pig Breeds to Capitalist Pigs: A Study in Animal Cultures and Evolutionary History," *Environmental History* 16, no. 1 (January 2011): 94–119; and Harriet Ritvo, *The Animal Estate: The English and Other Creatures in Victorian England* (Harvard University Press, 1989).

21. Blanchette, *Porkopolis*; and Gabriel N. Rosenberg, "How Meat Changed Sex: The Law of Interspecies Intimacy After Industrial Agriculture," *GLQ: A Journal of Lesbian and Gay Studies* 23, no. 4 (2017): 473–507.

22. Sarah Franklin, *Dolly Mixtures: The Remaking of Genealogy* (Duke University Press, 2008); and Blanchette, *Porkopolis*.

23. Blanchette, *Porkopolis*; and Michael Grabell, "The Plot to Keep Meatpacking Plants Open During COVID-19," *Propublica*, May 13, 2022, https://www.propublica.org/article/documents-covid-meatpacking-tyson-smithfield-trump.

24. Michael Grunwald, "Sorry, but This Is the Future of Food," *New York Times*, December 13, 2024, https://www.nytimes.com/2024/12/13/opinion/food-agriculture-factory-farms-climate-change.html.

25. Notably, this is the critical lesson we draw from Blanchette, *Porkopolis*.

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15

The Beautiful and the Damned: Historical Insect Perspectives on Climate Change

Whitney Barlow Robles and Kristoffer Whitney

Invertebrates are life-forms with deep natural histories that have represented both fragility and resilience, beauty and repugnance. Historians have told stories of charismatic megafauna from the Pleistocene to the present, whereas biologists look to the porous, sensitive amphibians as bellwethers of climate change.[1] And to the general public, a polar bear stuck on a floe of ice may well be the poster animal of global warming. Histories of invertebrates such as insects, on the other hand, can reveal *far*-from-human dimensions to environmental upheaval.

A small but mighty literature on insects has revealed their historical and economic importance as pests, model organisms, and curiosities.[2] Yet, the experience of insects in a melting world remains little explored. From a historical perspective, how and why does climate change matter for the least of us?

We present two opposing historical case studies—an insect point and counterpoint—to highlight arthropod experiences in the Anthropocene. The shimmering Xerces blue butterfly, which lived in a narrow slice of San Francisco and became extinct in the 1940s due, in part, to human-induced climate stress, has become a cautionary tale of extinction. Its story reveals how understanding long-term changes in climate or shorter-term effects of human activities such as habitat destruction and scientific collecting paint only a partial picture on their own. Fragility has many causes in our changing world. On the other hand, a loathed "pest" such as the cockroach shows that even successful and cosmopolitan species face challenges ahead and warrant human concern. Although roaches are hailed as survivors par excellence, their fates are also both historically and locally contingent. A roving multi-centuries history of cockroaches reveals themes resonant with climate change today: movement and migration, xenophobia, and heat.

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The Xerces Blue

Within the practice of natural history over the past few centuries, and also the history of conservation, Lepidoptera—butterflies and moths—loom large. The Xerces blue butterfly (*Glaucopsyche xerces*) is a case in point. The first scientific description of the Xerces blue is generally agreed to be by French lepidopterist Jean Baptiste Boisduval in his 1852 publication *Lépidoptères de la Californie*.[3] Boisduval's account briefly describes this blue-winged species, which he termed *Lycaena xerces*, as "remarkable" and "rare."

By the early twentieth century, the expansive growth of the city of San Francisco—the environs of which were the Xerces blue's only known habitat—led experts to believe that the butterfly was approaching extinction. In the pages of *The Lepidopterists' News*, for example, one collector noted: "At San Francisco, *Glaucopsyche xerces* was not taken although three trips were made. As has been suggested, it may have become nearly extinct of late."[4] As decades passed, lepidopterists came to a consensus that the last Xerces blue was likely collected in 1941, and the species went extinct shortly thereafter. In the 1950s, entomologist J. W. Tilden rued that "it had been the most characteristic butterfly of the coastal sand dune area known as the Sunset District, but complete settlement of the area left it no habitat to inhabit."[5]

Extinction was only the beginning, however. The Xerces blue, as it turned out, was more lauded and carefully studied *after* its extinction than before it. A 1956 article by John Downey and William Lange (who performed the infamous last collection in 1941), for example, provided the most extensive study of the Xerces blue to that point, relying on their work with live specimens decades prior as well as collected specimens. They described the butterfly's ecological relationships in the field: It fed on *Lotus glaber* (deerweed—a bushy member of the pea family), was dutifully tended by ants as larvae (a case of "facultative myrmecophiles," a relationship that can be mutually beneficial but not necessary for survival), and was parasitized by Hymenoptera (they may have had a love–hate relationship with ants and wasps). Downey and Lange also speculated on the insect's demise: "Expansion of the city of San Francisco has destroyed much natural habitat formerly available to insects in the area . . . The effect of a sudden shift in . . . narrow annual climatic oscillations might have been greater on *xerces* than on comparable numbers of another species."[6] That is, before climate change was part of scientific parlance, the Xerces blue was potentially a victim of changes in climate,

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exacerbated by habitat loss and possibly, according to the authors, even collecting pressure.

In the wake of the environmental movement of the 1960s and 1970s, and concurrent with the passage of landmark environmental legislation in the US such as the Endangered Species Act of 1973, the Xerces blue went from a footnote in the history of entomology to a symbol of conservation. Robert Michael Pyle founded the Xerces Society for Invertebrate Conservation in 1971, an "international nonprofit organization that protects the natural world through the conservation of invertebrates and their habitats." Pyle cited his experience with Lepidoptera conservation in Britain as inspiration to start the Xerces Society, and described how he self-consciously chose the recently extinct Xerces blue as a symbol of the cause.[7] Later scientists and conservation organizations, such as the International Union for Conservation of Nature, adopted and promoted the emblematic Xerces blue. As brothers Thomas and John Emmel wrote in 1993, it was "the first butterfly species in North America to become extinct through human interference," speculating that "in such small populations, a minor change in climate or other environmental factor could prove devastating. . . . While a live Xerces Blue will never be seen again on Earth, the species has served as a remarkably effective symbol for the fragility of nature among American citizens and conservationists around the world."[8]

In the last three decades, the Xerces blue has undergone its own genomic rediscovery. Researchers in 2014 nominated the butterfly as a potential "de-extinction" candidate, given its life history and relatively recent demise, the beloved Golden Gate Park being part of its former habitat, and the likely "wide and sustained public support" for such a revival thanks to its connection to conservation.[9] Most recently, the fate of the Xerces blue—through comparative genomic sequencing—has been linked, as suspected in the 1950s, with changes in climate. The authors of a 2024 study blame "a severe demographic decline for tens of thousands of years, likely associated with changing climatic factors" as the primary driver of the butterfly's extinction, with habitat destruction by humans likely dealing a "final blow."[10]

Glaucopsyche xerces and, by extension, all delicate-winged Lepidoptera are emblems of fragility—and have thus swiftly assumed the mantle of cautionary tale. But with recent murmurs of bringing the Xerces blue back, perhaps the question we should ask first is: What kind of world would we be bringing them back to? Should we proceed with caution with this cautionary tale? The history of the Xerces blue, tied up as it is with climate change, extinction, and the possibilities of reversing extinction, raises

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serious questions about environmental cautionary tales and the "lessons" of history more generally. Can a single animal bear the weight of being simultaneously a harbinger of climate doom and species salvation? What are scientists, historians, or the general public supposed to learn from the historical fate and imagined future of insects?

The Cockroaches

In contrast to delicate and beloved butterflies, the reviled cockroach has long been a model organism of survival. These insects can forgo food for a month, survive headless for a week, evolve in real time to resist chemical insecticides, and are, erroneously, thought capable of withstanding nuclear apocalypse. Two natural historical facets of cockroaches take on new meaning in the Anthropocene: their penchant for migration and their love of heat.

Nearly five thousand types of cockroaches scurry across our world. Only a comparative sliver—around thirty species—have risen to the level of maligned human pest. Lesser-known roaches, such as the domino cockroach of Indian and Sri Lankan leaf litter, often stay, like the Xerces blue, within bounded wild ranges (although the cuteness of this speckled species has catapulted them across the world through the international pet trade). But others, such as the infamous German cockroach, swarm every continent save for Antarctica and even rely on human habitations to thrive. In the early modern period, roaches infested ships, consumed their supplies, and hitched rides to new worlds. During Captain Cook's final voyage (1776–1780), they ravaged not only the journey's food stash but also valuable bird specimens and even the ink laid on paper. Naturalist Mark Catesby observed of these "troublesom and destructive Vermin" while stationed in the American South in the early eighteenth century: "They disappear in Winter, and appear most numerous in the hottest days in Summer. It is at night they commit their depredations, and bite people in their beds, especially childrens fingers that are greasy."[11]

Several of the more notorious roaches became entwined in name with geography—and hence movement—through the work of the Swedish taxonomist Carl Linnaeus. In the tenth edition of his *Systema Naturae*, published in 1758, Linnaeus described *Blatta orientalis*—commonly known as the oriental cockroach, although researchers now believe it hails from the Crimean peninsula. That edition also christened the American cockroach *Blatta americana* (now under the genus *Periplaneta*). But *it* actually came from tropical Africa, having, in addition to other routes,

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journeyed to the Americas on slave ships—opportunistically, in contrast to the Middle Passage's abused human victims.[12] In a subsequent edition of Linnaeus's work from 1767, the dreaded German cockroach received its spatial signifier, *germanica* (then under the genus *Blatta*, now *Blattella*). But *that* species probably originated in South Asia before stepping onto the European scene around the eighteenth century. Many cosmopolitan roach species found their global foothold in the early modern period, riding the wings of commerce and nascent capitalism.

Modern scientists claim that the German cockroach has "never been found in natural habitats, and consequently its native range is unknown."[13] Humans tend to regard roaches as matter out of place—in cupboards, in restaurant kitchens, in continents removed—but what exactly it would mean for a roach to be *in place* is far from obvious. In fact, scientists branded roaches of the genus *Ectobius* invaders when they appeared in the United States in 1951. It took until the 2010s for researchers to realize that some fossils sitting in the Smithsonian Institution's collections proved *Ectobius* once flourished in North America some forty-nine million years ago. It's thought that climate change, in the form of encroaching glaciers, may have prodded it toward Europe through some northern land route such as Beringia or Greenland.[14] Their historical trajectory has been more horse than starling; their "invasion" was, in fact, a homecoming.

As roaches traveled far and wide to cope with changing climates and shifting food opportunities, they became decoupled from their origins. Marginalized people have borne the brunt of their migration success, both from the perspective of health given differential access to clean and affordable housing and metaphorically. Climate refugees, asylum seekers, and other migrants struggling bravely to uproot have been branded "cockroaches" in the press in recent years—painted as swarming, swelling, invading. Dispossessed groups throughout history received the same label, with the "cockroach" slur surfacing in contexts as varied as anti-Catholic sentiment in 1930s Canada, to Nazi propaganda against Jews during the Holocaust, to the Rwandan genocide of the 1990s, to anti-Palestinian imagery and press during the war on Gaza. Itinerant roaches have proven a fertile conduit for human nativism and xenophobia.

In addition to movement, cockroaches have long been associated with heat, evident in Catesby's remarks in the eighteenth century. As interlopers who thrive in hot climes through a suite of adaptations, cockroaches are often hailed as candidates for thriving under global warming. See, for instance, a 2009 article in *New Scientist* titled "Cockroaches Future-Proofed Against Climate Change."[15] But heat has also been weaponized

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against cockroaches throughout history. Early modern pest management solutions included pouring boiling water on roaches. Still-ongoing efforts to kill cockroaches with radio waves, which generate lethal internal heat, have been underway for a century.

The Xerces blue has been asked to bear the burden of symbolizing extinction. The cockroach has become the symbolic burden of people under climate and other duress. The histories of both animals tie an impossible Gordian knot of culture and creature. Putting animal history and climate history in conversation asks us to think in intersecting temporal scales. But it also asks us to consider futures other than that of our own species when looking ahead. If the question facing a resurrected Xerces blue is "Where do they go?" in a world worn by climate change and habitat loss, cockroaches seem to beckon "Where won't they go?"

But even roaches have a limit. With more regular heat waves pushing some areas of the globe to reach 115°F, 120°F—temperatures that prove lethal for cockroaches in less than an hour—there will be some stretches of this Earth where even roaches dare not wander. The stories of both these insects challenge us to think seriously about the worlds we are making and remaking.

Notes

1. See, e.g., Sam White, "Animals, Climate Change, and History," *Environmental History* 19, no. 2 (April 2014): 319–328; and Jennifer A. Luedtke et al., "Ongoing Declines for the World's Amphibians in the Face of Emerging Threats," *Nature* 622 (2023): 308–314.

2. See Edward Melillo, *The Butterfly Effect: Insects and the Making of the Modern World* (Knopf Doubleday, 2020); and Hugh Raffles, *Insectopedia* (Vintage Books, 2010).

3. Jean Alphonse Boisduval, *Lépidoptères de la Californie* (Malteste, 1852), 24.

4. Lloyd M. Martin, "The Field Season Summary of North American Lepidoptera for 1950," *The Lepidopterists' News* 4, nos. 8–9 (1950): 86.

5. J. W. Tilden, "San Francisco's Vanishing Butterflies," *The Lepidopterists' News* 10, nos. 3–4 (1956): 113.

6. John Downey and William Lange, "Analysis of Variation in a Recently Extinct Polymorphic Lycaenid Butterfly, *Glaucopsyche xerces*," *Bulletin of the Southern California Academy of Sciences* 55, part 3 (1956): 158.

7. Robert Michael Pyle, "A History of Lepidoptera Conservation, with Special Reference to its Remingtonian Debt," *Journal of the Lepidopterists' Society* 49, no. 4 (1995): 397–411; and Xerces Society, "About the Xerces Society," accessed December 30, 2025, https://www.xerces.org/about-xerces.

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8. Thomas C. Emmel and John F. Emmel, "The Xerces Blue, *Glaucopsyche xerces* (Boisduval)," in *Conservation Biology of Lycaenidae (Butterflies)*, ed. T. R. New, Occasional Paper of the IUCN Species Survival Commission no. 8 (1993): 137–138.

9. Philip Seddon et al., "Reintroducing Resurrected Species: Selecting DeExtinction Candidates," *Trends in Ecology & Evolution (Amsterdam)* 29, no. 3 (2014): 140–147.

10. Toni de-Dios et al., "Whole-Genomes from the Extinct Xerces Blue Butterfly Can Help Identify Declining Insect Species," *eLife* 12: RP87928, https://doi.org/10.7554/eLife.87928.2.

11. Mark Catesby, *The Natural History of Carolina, Florida and the Bahama Islands* [. . .] (London, pub. By author, 1731–1743 [1729–1747]), Vol. 2, Appendix, 10.

12. Lindsay Garcia, "American Cockroaches, Racism, and the Ecology of the Slave Ship," Environment & Society Portal, *Arcadia* no. 29 (Autumn 2017), Rachel Carson Center for Environment and Society, https://doi.org/10.5282/rcc/8048.

13. Qian Tang et al., "Global Spread of the German Cockroach, *Blattella germanica*," *Biological Invasions* 21 (2019): 694.

14. P. Vršanský et al., "Native *Ectobius* (Blattaria: Ectobiidae) from the Early Eocene Green River Formation of Colorado and Its Reintroduction to North America 49 Million Years Later," *Annals of the Entomological Society of America* 107, no. 1 (2014): 28–36.

15. Shanta Barley, "Cockroaches Future-Proofed Against Climate Change," *New Scientist*, August 18, 2009, accessed December 30, 2025, https://www.newscientist.com/article/dn17626-cockroaches-future-proofed-against-climate-change/.

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16

Population and the Climate of Eugenics

Emily Merchant

In November 2019, more than 11,000 scientists from around the world declared "clearly and unequivocally that planet Earth is facing a climate emergency." As a necessary response, they urged that "world population must be stabilized—and, ideally, gradually reduced—within a framework that ensures social integrity."[1] To critics, this demand for stabilization of or reduction in the world's population recalled the racism and eugenics that permeated the conservationist and environmentalist movements across the twentieth century. Whereas environmentalists on the right have been eager to call for populationist solutions to climate change—solutions that locate the problem in the world's human bodies and seek to address it by changing the size or composition of the world's population—those on the left have been more hesitant, fearing the kind of critique leveled against the scientists making the 2019 declaration. But fear of climate change has recently overtaken fear of critique for some on the left. Even some historians and feminist science and technology studies scholars now contend that it is time to find non-eugenicist ways to achieve the presumably necessary goal of reducing the size of the world's population.[2]

This essay argues, however, that populationist approaches to climate change are inherently eugenicist because they devalue the lives of the world's most vulnerable people to protect the livelihoods of the world's most privileged. Addressing climate change requires reducing carbon emissions, which are produced by human activities, generally the activities of more privileged humans. Emissions are not a linear function of human numbers, which are currently increasing very slowly. Population control is therefore a bogus solution to the very real problem of climate change. The history of eugenics is, by now, quite well-known, as is the historical connection between eugenics and conservationism. The historiography of eugenics, however, is largely overdetermined by the Holocaust. As a result, historians and the public alike too often conflate eugenics with racism and

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genocide and assume incorrectly that eugenics disappeared after the Second World War. These misunderstandings make it difficult to recognize eugenics today, including in our response to climate change. This essay returns to the origins of eugenics to expand the concept and then demonstrates how eugenicists across the twentieth century and into our own day have created and perpetuated the false perception that reducing human numbers, rather than regulating human activities, is key to averting environmental catastrophe.

Eugenics, Population, and the Natural Environment

The word "eugenics" was coined in 1883 by the English polymath Francis Galton.[3] In Galton's time, the idea that biological differences underpinned the racial hierarchy of the British Empire was understood to be a matter of scientific fact. Galton theorized that biological differences also underpinned the socioeconomic hierarchy that characterized the metropole. For Galton, inherited differences in intelligence explained socioeconomic inequality within racially defined groups. Because he expected that racial groups had different distributions of intelligence (with Europeans having the highest average), inherited differences in intelligence also accounted for racial inequality in the British Empire. Galton proposed ameliorating social problems by encouraging reproduction at the higher end of the socioeconomic spectrum and discouraging reproduction at the lower end. At its most capacious, eugenics is an effort to naturalize social inequality and enhance the life chances of those at the top of the existing hierarchy (both within and between racial categories) while diminishing the life chances of those at the bottom.

The idea that population growth is detrimental to the natural environment began with the Reverend Thomas Robert Malthus in his 1798 *Essay on the Principle of Population*.[4] It was taken up by American eugenicists in the 1920s, as the US eugenics movement began to align with the movement to legalize birth control.[5] By then, eugenics had become more popular in the United States than it ever had been in the UK, with states beginning to pass eugenic sterilization laws in 1907. When Margaret Sanger failed in her efforts to promote birth control as a vehicle for worker liberation and female sexual autonomy, she changed tack, appealing to scientists and physicians for help by presenting birth control as a tool of eugenics that could operate on a larger scale than sterilization. The scientists she recruited to her cause justified birth control legalization by pointing to the soil erosion that would soon reach disastrous proportions,

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which they attributed to impending overpopulation in the United States. They recommended, however, that birth control be used only among the poor and that it be paired with immigration restriction. These arguments neglected the fact that soil erosion in the United States resulted from the overproduction of agriculture for export—at prices that undercut local production in other parts of the world—rather than to feed the country's growing population. Soil erosion was simply a convenient rationale for the eugenic cause, which sought to reduce the number of poor people and allow the wealthy to continue profiting from resource extraction.

During the Great Depression, as Europe lurched toward the Second World War, the American eugenics movement underwent a transformation that allowed it to escape the disapprobation that would later attach to the Holocaust. As a result, eugenics survived well into the postwar period in the United States. Although eugenics had previously been an explicitly racist and antidemocratic movement, as the United States began to mobilize for war against the fascist powers of Europe, the American Eugenics Society (AES) distanced its program from German and Italian eugenics and aligned it with democracy. In addition to jettisoning overt racism, the AES downplayed involuntary sterilization, instead embracing nominally voluntary birth control and the illusion of "freedom of parenthood": Parents could choose the size of their families, but the AES also lobbied for policies that would provide financial incentives to wealthy families to have more children and put financial pressure on poor families to have fewer. The AES simultaneously fostered the development of demography, the new social science of human population dynamics, in the hope that demographers could figure out how to get the "right" people to have more children and the "wrong" people to have fewer, without overt coercion.[6]

Postwar Population Control

After the war, demographers found that new public health measures were dramatically reducing mortality rates throughout the Global South, resulting in rapid population growth, since birth rates remained largely unchanged. In response, US-based philanthropies—and eventually the US government—worked to convince leaders of new postcolonial states that population control should headline their nation-building and economic development agendas. Demographers emphasized nominally voluntary family planning, extending the AES's "freedom of parenthood" concept to the international arena. They considered "noncoercive" anything short of directly telling people how many children they could have. Several

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prominent demographers remained on the board of directors of the AES well into the 1960s.[7] Although the postwar family planning programs distanced themselves from eugenic language and overt racism, they portrayed socioeconomic inequality—both within the countries of the Global North and between Global North and Global South—as the result of out-of-control reproduction among poor people rather than a structural feature of global capitalism.

The connection between population and the natural environment also took on global proportions after the Second World War, when American conservationists attributed increasingly visible environmental destruction to the growth of population in countries that exported raw materials, absolving the logics of capitalism that demanded these materials in ever larger quantities and externalized the environmental consequences of extraction.[8] These narratives directly inspired the biologists Paul Ehrlich and Garrett Hardin, who further popularized environmental arguments for population control at the end of the 1960s, leading to the establishment of Zero Population Growth (ZPG). ZPG aimed to protect the global environment while maintaining existing per-capita levels of production and consumption among wealthy Americans by reducing population growth, primarily in the Global South but also in the United States. Following the lead of interwar eugenicists, ZPG's leaders and other environmental populationists demanded the curtailment of reproduction among the world's poor to sustain the livelihoods and lifestyles of the world's wealthy.

Climate Change

Eugenics finally became disreputable in the Anglo-American world at the beginning of the 1970s. In subsequent decades, population control organizations based in the Global North reframed their goals in terms of "women's empowerment," but continued to promote the achievement of small families through the use of long-acting systemic contraceptives as the key to economic development in the Global South and environmental protection worldwide.[9] Birth rates began to fall in many parts of the world, and the United Nations currently estimates that global population will begin to decline by the end of the twenty-first century.[10] Nonetheless, environmentally motivated calls for population control became louder as the reality of climate change intensified. The concept of "anthropogenic climate change" and the designation of our current geological epoch as the "Anthropocene" generated further scientific support for population control through language that conflated human existence with human

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activities and that attributed the detrimental effects of economic and governmental practices to the number of people on the planet.[11]

Attributing climate change to human numbers—or suggesting that reducing human numbers would mitigate climate change—creates the illusion that humans passively emit greenhouse gases. It is well known, however, that individual carbon footprints correspond to wealth. Currently, the wealthiest 10 percent of North Americans are responsible for seventy-three tons of carbon equivalents per year per capita, whereas the poorest 50 percent of Sub-Saharan Africans are responsible for only half a ton of carbon equivalents per year per capita.[12] The wealthiest 1 percent of the world's population produces 16.8 percent of carbon emissions, whereas the poorest 50 percent produces only 12 percent of emissions. Populationist solutions target people with high fertility rates rather than those with high carbon emission rates, when the two are often inversely correlated. This is not to suggest that poverty is a solution to the climate crisis; we need to dramatically raise the living standards of the world's poorest people without increasing overall emissions. Again, carbon footprint figures obscure this possibility, hiding the fact that much of the carbon footprint of the average person is determined by those with the power to design the built environment and energy infrastructure in ways that can produce higher or lower emissions. The poorest 50 percent of Americans generate approximately the same per capita emissions as the middle 40 percent of Europeans, despite being approximately half as wealthy, because the fossil fuel industry has largely captured public policy in North America, creating a world where everyday activities produce more emissions than they might do otherwise. Focusing on population numbers diminishes the lives of those who are reproducing most quickly while detracting critical attention from those who are generating the most carbon and those who are profiting from the burning of fossil fuels.

Populationism is inherently eugenic because it misattributes the problem at hand (in this case, climate change) and assigns responsibility for solving the problem to the people suffering most from it (the world's poor, people of color, and women) rather than those who have the power to do something about it—the small number of elite and mostly white men who created and perpetuate the extractive and racist systems that have endangered the survival of our planet. As a result, populationism further devalues the lives of the world's most vulnerable and powerless people, who are also experiencing the worst effects of climate change. Through populationism, lives lost to climate change and its sequelae become ungrievable due to the perception that their very existence caused their suffering.[13] Although the

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focus here is on environmental populationism, economic populationism has the same eugenic consequences. Both naturalize the systemic inequalities at the root of the problems they purport to solve. Critiques of populationism typically focus on the *means* of population reduction as being eugenicist or racist. By revisiting the history of eugenics and environmental populationism, this essay has demonstrated that the formulation of population reduction as a solution to climate change and other global problems is, in and of itself, eugenicist, as is the now-prevalent promotion of pronatalism as a solution to population aging and the threat of global depopulation. Population itself is neither the problem nor the solution.

Notes

1. William J. Ripple et al., "World Scientists' Warning of a Climate Emergency," *BioScience* 70, no. 1 (2019): 8–12, 8, 11.

2. Adele Clarke and Donna Haraway, eds., *Making Kin, Not Population: Reconceiving Generations* (Prickly Paradigm Press, 2018).

3. Francis Galton first began to articulate the program he would later term "eugenics" in "Hereditary Talent and Character," *Macmillan's Magazine* 12 (1865): 157–166.

4. Thomas Robert Malthus, *An Essay on the Principle of Population, as it Affects the Future Improvement of Society with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and Other Writers* (London: J. Johnson, 1798).

5. The alliance between birth control advocacy and eugenics occurred first in the UK, which is where birth control activist Marie Stopes seems to have introduced Margaret Sanger to eugenic ideas, but the connection between birth control, eugenics, and the natural environment was first made in the United States. Jane Carey, "The Racial Imperatives of Sex: Birth Control and Eugenics in Britain, the United States and Australia in the Interwar Years," *Women's History Review* 21 (2012): 733–752.

6. Emily Klancher Merchant, *Building the Population Bomb* (Oxford University Press, 2021).

7. Edmund Ramsden, "Eugenics from the New Deal to the Great Society: Genetics, Demography and Population Quality," *Studies in History and Philosophy of Biological and Biomedical Sciences* 39 (2008): 391–406.

8. William Vogt, *Road to Survival* (W. Sloane Associates, 1948); and Henry Fairfield Osborn Jr., *Our Plundered Planet* (Little, Brown and Company, 1948).

9. Saul Halfon, *The Cairo Consensus: Demographic Surveys, Women's Empowerment, and Regime Change in Population Policy* (Lexington Books, 2007); Daniel Bendix et al., "Targets and Technologies: Sayana Press and Jadelle in Contemporary Population Policies," *Gender, Place, and Culture* 27, no. 3 (2020): 351–369; and Jade Sasser, *On Infertile Ground: Population Control and Women's Rights in the Era of Climate Change* (NYU Press, 2018).

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10. "Population," United Nations, accessed June 7, 2025, https://www.un.org/en/global-issues/population.

11. Nathan F. Sayre, "The Politics of the Anthropogenic," *Annual Review of Anthropology* 41 (2012): 57–70; and Janae Davis et al., "Anthropocene, Capitalocene, . . . Plantationocene?: A Manifesto for Ecological Justice in an Age of Global Crises," *Geography Compass* 13, no. 5 (2019): e12438.

12. All figures in this paragraph are from Lucas Chancel, *World Inequality Report* (World Inequality Lab, 2022), https://wir2022.wid.world/www-site/uploads/2023/03/D_FINAL_WIL_RIM_RAPPORT_2303.pdf.

13. For the concept of grievability, see Judith Butler, *Frames of War: When Is Life Grievable?* (Verso, 2009).

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17

Consumers: The Climate's Biggest Advocates or Most Fearsome Foes?

Kendra Smith-Howard

In 2019, the nonprofit organization Change Climate set out to reduce carbon emissions by steering consumers toward less carbon-intensive goods. Change Climate began by helping businesses alter their work processes so that they absorbed as much carbon as they emitted. Companies who achieved carbon neutrality could emblazon their products with the "climate neutral" label. By connecting businesses seeking to decarbonize with consumers eager to support them, Change Climate aimed to accelerate investment in renewable energy. By 2024, goods as varied as bass guitars to yoga mats bore the words "climate neutral."[1]

Change Climate's turn to consumers to propel social change drew upon a strategy familiar to me as an American historian writing in the US context. In no place has "the consumer" been accorded more power as an agent of change than in the United States. Some historians credit the very creation of an American nation to the rise of consumer consciousness, noting that shared resistance to taxes on British imports fomented the rebellion against British rule.[2] Consumer solidarity accelerated other social movements. Quaker abolitionists opened "free stores" to market sugar or coffee sourced from supply chains free of the taint of slavery.[3] In the post–Second World War era, the United States became, in historian Lizabeth Cohen's words, "a consumer republic" where citizens increasingly measured the nation's promise of democracy by how well it ensured access to consumer goods.[4] Change Climate taps into a long-standing tradition by viewing consumers as critical decision-makers.

Environmental advocates' perspective on consumption is more ambiguous. On one hand, commercial spaces, such as food cooperatives and catalogs, proved critical to helping environmental activists articulate and enact their environmental agendas.[5] Many of the environmental movement's strongest champions in the 1970s were Americans worried that pollution and deforestation might undermine the suburban way of life in

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which they had invested.[6] On the other hand, environmentalists have also issued grave warnings about the destructive effects of consumer society. As early as the 1920s, protectors of wild spaces bristled as campers carelessly littered the countryside with packaging of consumer goods.[7] By Earth Day 1970, many environmentalists accepted that the responsibility for the environmental crisis rested on their own shoulders—or, as the 1970 Walt Kelly cartoon character Pogo put it: "We have met the enemy, and he is us."[8] Rather than consider consumers as possible change agents, such rhetoric painted consumers as a key *contributor* to the climate crisis.

Are consumers the chief destroyers of the planet or the most critical force to save it? A historical perspective can help to address this pressing conundrum.

Messages depicting consumers as destroyers or saviors of the planet are more closely linked than you might think. Implicitly, the consumer-as-environmental-destructor narrative sends another message: *If consumers knew* of the environmental effects of their actions, they would use resources differently.[9] Thus, the tragic consumer consequence tale becomes recast as a fable for tomorrow through a reformed hero: the enlightened consumer. This virtuous green consumer, by purchasing electric cars, patronizing farmers' markets, or spurning plastic-packaged toiletries for toothpaste tabs and solid shampoo bars, leaves fewer burdens for future generations. With the help of guides such as the "climate neutral" label, the virtuous consumer can realize their environmental values at the cash register.

The ideal of the virtuous consumer resonates. In 2021, when surveyed about what actions they were taking to limit global warming, most Americans described consumer actions. More than half of those surveyed had deliberately purchased an energy-efficient appliance or purposefully avoided red meat. Far more Americans sought to arrest climate change with their wallets than with words. Only 8 percent of those surveyed reported having contacted their elected officials to urge them to take action to reduce global warming in the prior year. But more than 30 percent stated they had sought out goods from companies that took pledges to reduce global warming.[10]

Environmentalists are right to dwell on the role of consumers in environmental change. Decisions about where to live, who to live with, what and how to eat, how to keep a space warm or cool, and how to get from place to place carry massive implications for carbon emissions. But neither the consumer-as-destructor nor the consumer-as-savior narrative is sufficient or complete. History illuminates new pathways and narratives to provoke environmental change.

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The consumer-as-environmental-destructor narrative accords greater consideration of the cascading environmental consequences of each individual purchase than the cultural values, social norms, and economic contexts that shape consumers' actions. No person makes decisions about where to live or who to live with by considering environmental footprint alone: Economic means, social surroundings, ethnic and gender identity, stage of life, and moral commitments frame such decisions. Tracing the material consequences of consumer actions offers little help in explaining why and how people buy and use the products they do. Only by understanding the social and cultural dimensions of people's lives can we begin to nudge toward habits and practices for a viable world.

Examining the fate of one consumer good can help illustrate how and why greater attention to consumer motivations is merited. In the 1990s, environmentalists rallied to curb the sale of an increasingly ubiquitous product of family life: the disposable diaper. By 1990, eight out of every ten diapers that Americans changed were disposable ones. As landfills struggled to contain the growing waste stream that disposable products generated, environmental organizations sought to identify and publicize especially wasteful products. Environmental organizations targeted diapers, aiming to inspire parents and hospital maternity wards to shift to cloth diapers and minimize the pressure on systems of disposal.

The 1990 critique of the disposable diaper fixed on the solid-waste stream, not its contribution to climate change. By 1990, diapers had an ever widening carbon butt-print. In 1986, leading manufacturers introduced absorbent polyacrylate gel crystals into the diaper core to make them more absorbent. This gel, as well as the polyethylene fibers that constituted diapers' outer layer, both originated from hydrocarbon feedstocks. Disposable diapers created carbon emissions as they contained human ones.[11]

The 1990s efforts to curb disposable diaper use paid little attention to when, why, or how American families adopted them. In fact, American families' shift toward disposable diapers took off in the 1970s. Consumers became more receptive to disposable products in that decade as high inflation and economic strain drove more mothers to pursue paid labor. Whereas just 26 percent of mothers with children younger than three worked for wages in 1970, by 1980, 41.5 percent did.[12] As time at home dwindled, families streamlined household work. In short, parents purchased disposable diapers to buy time.

Analysis by 1990s environmentalists missed that limited time, not a surfeit of information, drove consumers to adopt disposable products. Work from feminist historians and economists, who study how and why

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people allocate their time to fulfill household responsibilities, might have helped environmentalists avoid this pitfall.[13] Their research shows that just as consumers' decisions about how to spend money have environmental externalities, individuals' decisions about how to spend time have spillover social effects. The person who cares for a disabled family member does not simply improve quality of life for the disabled individual but also reduces the amount society pays for the person's care. Teens and elders who provide care to others reap meager economic rewards but gain confidence and a sense of purpose that alleviates loneliness and improves mental health. By integrating analyses of how people spend time with how they spend money, climate activists might tap into a broader and more effective set of strategies to reduce carbon emissions.

What if what consumers need to make more sustainable choices is not more knowledge of the ill effects of their consumption but rather strategies to help them reorganize their time? Might solutions such as establishing daycare cooperatives, flexible thirty-hour workweeks, or faster trains that hasten commutes engender more sustainable use of material resources? By better understanding the policies, contexts, and life patterns that encourage and sustain excessive consumption, environmental advocates might be able to target and address these circumstances.

If the consumer-as-destroyer narrative skims over the cultural context of consumer decision-making, the consumer-as-change agent detaches consumers from potential allies along the commodity chain. The earliest efforts to make consumers more conscientious stemmed from *labor*, not environmental activism. The National Consumer League sought to enlist consumers to end practices of labor exploitation by affixing a "white label" to goods produced under just and fair working conditions. Much like today's climate activists, these reformers sought to steer consumers toward ethical manufacturers.[14] Some consumer-driven environmental campaigns effectively coupled workers' rights with environmental activism. In 1968, for instance, environmental activists opposed to the use of DDT teamed with labor unions worried about the effects of DDT on workers in the grape boycott.[15]

As environmental consumerism proliferated, the labels that once engendered cross-class coalitions increasingly have insulated consumers from the hazards that workers face. The Hazardous Household Chemical Act, for instance, established that the home ought to be protected from the most toxic and hazardous chemicals because it housed vulnerable household members. Such laws, however, provided greater measures to protect homes than workplaces, consumers than producers. Relying on

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"consumer protection" as a pathway for environmental reform built an environmental politics that guarded some more than others, and fostered a perception that environmentalism is for the rich.

Too often, enlightened consumerism offers only attenuated awareness of the stakes workers face in the climate crisis. The consumer deciding whether to order a veggie-topped salad or a steak confronts climate change with a very different sense of urgency than the farmworker toiling in relentless record-setting heat. Organizations such as the Coalition of Immokalee Workers fulfill a critical role to bridge this divide when they educate consumers about the kinds of worker protections, such as shade, that are necessary in an age of climate change. Such initiatives must be a part of environmental labeling efforts.

Neither the guilt-inducing environmental narratives that link environmental harms to consumer actions nor the consumers-as-agents of change narratives have proved wholly effective in unraveling or diminishing the resource use and carbon emissions associated with modern life. It's time to craft narratives about compassion, community, and citizenship to guide climate action.

Notes

1. As of 2025, Change Climate will require companies to dedicate a portion of their budget toward transitioning away from carbon, not simply making their business carbon neutral. Change Climate, "About Us" and "2019–20 Impact Report," accessed December 1, 2024, https://www.changeclimate.org/about.

2. T. H. Breen, *The Marketplace of Revolution: How Consumer Politics Shaped American Independence* (Oxford University Press, 2004).

3. Lawrence Glickman, *Buying Power: A History of Consumer Activism in America* (University of Chicago Press, 2009), 61–95.

4. Lizabeth Cohen, *A Consumer's Republic: The Politics of Mass Consumption in Postwar America* (Knopf, 2003), 11, 121–129.

5. Andrew Kirk, *Counterculture Green: The Whole Earth Catalog and American Environmentalism* (University Press of Kansas, 2007); Andrew Case, *The Organic Profit: Rodale and the Making of Marketplace Environmentalism* (University of Washington Press, 2018); and Rachel Gross, *Shopping All the Way to the Woods: How the Outdoor Industry Sold Nature to America* (Yale University Press, 2024), 35–37, 150–151.

6. Adam Rome, *Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge University Press, 2001), 5–6, 12, 87–152.

7. Paul Sutter, *Driven Wild: How the Fight Against Automobiles Launched the Modern Wilderness Movement* (University of Washington Press, 2002).

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8. Finis Dunaway, *Seeing Green: The Use and Abuse of American Environmental Images* (University of Chicago Press, 2015), 64–78.

9. Joseph Winters, "Who's Responsible for Waste?," *Grist*, November 27, 2024.

10. Anthony Leiserowitz et al., "Americans Actions to Limit and Prepare for Global Warming," March 2021, https://climatecommunication.yale.edu/wp-content/uploads/2021/08/americans-actions-to-limit-and-prepare-for-global-warming-march-2021b_v2.pdf.

11. Susan Frienkel, *Plastic: A Toxic Love Story* (Houghton-Mifflin, 2011), 60–62; and "Bringing Up Baby," *Nonwovens Industry* 32 (January 2001): 28.

12. Howard Hayghe, "Rise in Mothers' Labor Force Activity Includes Those with Infants," *Monthly Labor Review* (February 1, 1986), 45; and Susan Strasser, *Never Done: History of American Housework* (Pantheon, 1983), 301–303.

13. Nancy Folbre and Michael Bittman, eds., *Family Time: The Social Organization of Care* (Routledge, 2004), 12–16; and Ruth Schwarz Cowan, *More Work for Mother* (Basic Books, 1983).

14. Glickman, *Buying Power*, 177–180.

15. Robert Gordon, "Poisons in the Fields," *Pacific Historical Review* 68 (February 1999): 57–58.

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18

Borders, Empire, and Climate Catastrophe

Theodora Dryer and Ramya Swayamprakash

Amid incessant aerial bombings, civilian deaths, and destruction, including slain media and medical personnel—at least a hundred thousand tons of US-supplied bombs—the United Nations Secretary-General declared that the "living hell in Gaza" was now suffering from a human-made famine as well.[1] The Gaza strip is a narrow strip of land about twenty-five kilometers long and six to twelve kilometers wide and populated by about two million people.[2] The violent and visible erasure is an amplification of the long-term eco-genocide through dispossession, destruction, uprooting, and burning of Palestinian olive trees, desiccation of agricultural lands and water rights, and denial of fishing rights.[3] Weaponized humanitarian aid sits idly across a militarized border in this orchestrated famine.[4] The "toxic legacy" of this bombing will "last generations and extend beyond its borders."[5]

Like the bombs, Palestinians did not choose their boundaries, nor did many postcolonial nation-states. The technological ambitions haunting us today as well as planetary change connect border formations in Turtle Island to Palestine, Kashmir, and Aboriginal Australia. The world's dependency on oil and fossil fuels has occurred through material processes of settler state formations and imperial expansionism reliant on racialized economic systems, many that formed during early colonial expansion and slavery. Plainly put, slavery and wealth from slaveholding as well as extreme natural resource extraction drove Britain's Industrial Revolution.[6] Drawing upon Britain's model, American industrialization and development followed a similar script.[7] At its height, in 1914, before the Great War, European powers colonized about 84 percent of the world.[8] Some of the few parts of the world uncontrolled by European powers were the non-European parts of the Ottoman Empire, including historic Palestine.

At the end of the Great War, built on the twin imperatives of resource extraction and political expediency, Palestine's boundaries embodied

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stratifications of conflict, catastrophe, and loss. From British Mandate Palestine at the Great War to the Nakba (1948–2026) and the founding of the settler ethnostate of Israel at the end of the Second World War to the ongoing eco-genocide and famine, the continued obliteration of Palestinian lives and material realities is real and unceasing.[9] Until recently, however, the world outside the enclave seemed amnesiac. This willful denialism needs to be historicized as an outcome of military expansion, weapons trade, artificial intelligence (AI) development, mega-tech mining, and rampant land and water grabs that perpetuate the eradication of both truth tellers and truth telling, especially the more than 270 slain Palestinian journalists. Despite the live-streamed genocide, global consensus reinforced by impartial international organizations, nation-states continue to deny historical realities.

The humanitarian and environmental violence is indescribable, incalculable, and absolute. Yet, international legal frameworks governing multilateral conventions and definitions for eco-genocide, famine, and climate culpability require data for substantiation. Calculations overemphasize carbon costs, calling for new methods to calculate these costs without addressing the contexts of occupation.[10] Ahistorical categories and ineffective international legal frameworks fail to adequately challenge the forces perpetuating genocide and climate catastrophe.[11]

The struggle for Palestinian liberation is visible and reverberates through the contexts in which historians write, think, and teach across the world. Student- and staff-led protests have questioned "neutrality as a mechanism of erasure," calling instead for financial divestment from the military-industrial ecocide.[12] Educators write and teach in conditions of suppression, suspension, and threat of deportation that reinforce restrictive structures and sustain settler colonial violence.

Therefore, the question of how to write histories of borders and climate catastrophe requires us to historicize the intertwined legacies and material conditions of Western imperialism with academic knowledge production in the contexts that we work in. Institutional policies, disciplinary mandates, archives, and the legal and extralegal systems from which we generate information, document change, and write history live within and are an outcome of the material structures of knowledge production as well as physical borders. In this essay, we question writing about borders and climate catastrophe without relying on legal and historical frameworks and data-collection processes that do not account for lived experiences of borderlands regions and occupied places. To do so, we thematically and

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chronologically overlap subsections that explore historical connections before making pedagogical suggestions.

Rounding Out Reparations and Racial Capitalism

Borders consume space, time, and resources; they are functions of broader systems of racial capitalism, colonialism, and state violence.[13] Historians can build on the work of abolitionist geographers such as Ruth Wilson Gilmore alongside the long-standing Indigenous leadership in climate and environmental justice to recognize how historical processes and relational structures of racial capitalism and settler colonialism inform the function of borders vis-à-vis the nation-state in perpetuating climate catastrophe historically and today.[14] To this end, our historiography of borders and climate change considers three dimensions of interplay: resource extraction and land and water dispossession, legal and policy infrastructure, and epistemic and cultural domination.

Historicizing climate change effectively requires us to move away from an adherence to or preoccupation with its controversial origin stories to instead collaborate and interpret this heavy past in generative ways. We recognize the interplay of deep time with historical processes that have reinforced borders and obfuscated connections: the transatlantic slave trade, the Industrial Era, the Cold War / decolonization, and neoliberalism.[15]

European slavery shaped the modern world, forcing movement, migration, and monetary flows. Capitalism as we have inherited it can only bloom on inequality when watered by racism—that is, it has always been racial and relational.[16] Historically, the "discovery" of seemingly new places, people, and processes was driven by resource-extractivist ambitions under the legitimacy of religious virtuosity through world-exploring colonialism embodied by figures such as Christopher Columbus—who laid the politico-legal and economic frameworks and cultural precedents for dispossession.[17] The brutal forced migration enshrined racial hierarchies and entrenched material inequalities for generations to come.[18] The end goal was always profit; concentration and retention of power by the elite was inevitable. Climate change—incremental at first but catastrophic today—was just the untrodden and unfortunate path to this end.[19] The coloniality of climate change continues to subjugate and affect the recently decolonized world disproportionately.[20] Unless we are willing to historicize our paths to these catastrophes, arguments for reparations remain unreachable, as they do not connect the past with futures in meaningful ways.

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Borders as Settler State Formations

As material realities, borders are contingent and convenient historical outcomes. Borders function as part of mega-tech projects and terraformations, reified by colonial data and documentation. Steam, coal, oil, and large-damming technologies drove policy and practice ambitions and imperatives premised on Indigenous dispossession and displacement while formalizing economies reliant on indentured servitude, slavery, and dispossession.[21] In the US Empire, the Doctrine of Discovery is a legal practice and precedent undergirding the genocidal expansionism of manifest destiny and the creation and ongoing reification of its violent and unstable borders.[22] For instance, the 1882 Chinese Exclusion Act in the United States denied survival resources to Chinese laborers after the grueling and deadly development of the transcontinental railroad fueled by Gold Rush.[23] At the same time, the US 1887 Dawes Act or General Allotment Act broke up Native land into colonial partitions while settlers forced children into Indian Boarding Schools to be disciplined, beaten, and killed. The unstable creation of settler nation-states thereby formed through entrenching borders—bodily and structural—between people and places that became a tool of control and assimilation.[24]

Material extraction and profit pursuits drove territorial expansion, landscape destruction, and the regimes of forced labor, but not without the veil of legitimacy through science and technology.[25] The 1914 Panama Canal legitimized the global ambitions of American technological expertise and expansionism, overcoming geography and mosquitoes, to create an expandable waterway that conquered nature to move fresh water to two oceans through gravity-dependent locks. This, in turn, created the droughts that ravage Panama today and stall global trade. Inevitably, Panamanians, who did not choose the canal or its effects, are still paying for crises they did not create.[26]

Even as smoke in the imperial metropole of London killed vulnerable and poor populations, colonial bureaucracies enshrined bureaucratic regimes and legalese that embedded extractivism into the land and waterscapes.[27] Since the late nineteenth century, the Zionist Party's water-and-land occupation of Palestine and the Greater Levant region corresponded with colonial data infrastructure occupying archives, records, and the denial of institutional sovereignty.[28] Modern urban centers—from New York to Amsterdam to Madras—have long hedged their growth on the forced movement of enslaved bodies across waters and continents.[29] The warmth of fires burning across the world did more than power engines and

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human lives; it began melting the Arctic as early as the 1830s.[30] London's famous fogs through the nineteenth and twentieth centuries increased health-care costs, proving yet again that profit's price lived in the material realities of humans and more-than-humans.[31] Policy paralysis—then as now—was not about technological limitations but rather about capitalist extractivism and profiteering.[32]

Borders as Material Epistemes: Knowledge, Archives, and the University

The bordering technologies of control and colonialism wrought during the Progressive Era pushed an increasingly interconnected world into two global wars, with forced participation that exposed the underbelly of settler desires and imperial expansion. The global inequality scales and seeming policy paralysis that frame climate mitigation and inaction today are directly foregrounded by processes, politics, and poetics of the mid-twentieth century.[33] Withdrawing European imperial powers after the Second World War often hastily drew borders for nation-states that caused ecological devastation, permanent waste, and sacrifice zones. Embedded in these new cartographic conventions was an irreversible devotion to fossil fuels through the creation and categorization of developmentalism and growth economies.

Neoliberalism was seeded in the state programs of the early twentieth century as the material conditions of the two world wars substantiated the idea of the nation, neocolonial resource expansionism, and military economics encompassing the cultural fetishizations of optimization, efficiency, and the datafication of land and water.[34] These military architectures scaffolded the land for technofascism also called AI.[35] Incorporating these mechanisms, US university and knowledge structures substantiated from post–Civil War land grant colleges to the mid-century GI Bill as well as programs such as the Fulbright reinforced inequities and settler logics while moving forward policy formulations and infrastructural interventions.

Postwar economic realities hinged on the newly free world's adherence to environmentally detached, globalizing economic structures and agreements such as the Bretton Woods Agreement and the International Monetary Fund to receive monetary aid, implicit ideological lessons, and technological transfer. Even when they chose a third, nonaligned way, new nations aimed to catch up with industrialized economies by mimicking the latter. Unbridled rare earth mining and petroleum extraction, mega-infrastructural projects from dams and urban planning to desalination, and resultant social changes entrenched and accelerated climate catastrophes.

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Pushing already emaciated and impoverished (but free) postcolonial economies to the brink, these transactions further emboldened and enriched the US and Soviet economies and knowledge structures.[36] Postwar liberalism and socialism relied on these monetary flows to power the Green Revolution.[37] Both left lands oversaturated and unproductive in servile "developing" economies, as high-yielding crop varieties extinguished native species, especially rice.[38] Ecological changes and emerging catastrophes were incrementally built upon the explicit acknowledgment of the permanence and importance of Western political and economic traditions, knowledge systems, and structures.

Postwar industrial economies meanwhile were beginning to feel the effects of unbridled extraction. Questions about the state of the world drove a groundswell of protests in the industrialized world concerned about rivers catching fire.[39] Conscious of and frustrated by environmental collapse as well as militarism, in 1970, University of Michigan students began a multiday teach-in that catalyzed the first Earth Day.[40] What was meant to be a small event exploded to a global one, spawning environmental regulations to safeguard air, water, and land in the United States and abroad. This emerging regulatory infrastructure did not upend the economics of growth. For instance, deeply extractive and transactional ideas such as "sustainable development" reinforced older colonial flows under the garb of free market capitalism and liberalism.[41] Our inheritance of stratified technological and economic flows relies on these structures; borders reify and amplify climate catastrophes and reinforce divisions.

The purported end of the Cold War and the seeming victory of liberal capitalism came at the heels of massive economic, social, and environmental changes.[42] Keynesian economics made way for neoliberal reforms as liberal capitalism sought to reinvent itself, packaging resource extraction as sustainable development.[43] Economizing climate change through the Kyoto Protocol, for instance, brought monetary flows anew to emerging economies as long as they continued to be dump sites—bookending colonial extractive flows.[44] Despite the elaborate and multi-scalar repackaging of environmental governance, the base conditions of murder, pillage, plunder, and depletion remain the same. The stalemate of climate negotiations and the not-so-quiet indignation of emerging economies continue to expose the limitations of racial capitalism born in extractive and genocidal settler colonialism.[45]

Epistemic red lines and scholarly cages aside, Western imperialism violently suppresses, erases, and destroys data, information, and cultural memory about the realities of empire on planet Earth. Military archives,

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for example, do not substantiate information on the carbon impact of military production, a leading cause of climate change.[46] Palestinian scholar Karma Nabulsi coined the term "scholasticide" in 2009 to describe the systemic destruction of education, including institutions, archives, and cultural memory under Israeli blockade and bombardment.[47] Today, Palestinian scholars in Gaza struggle to write, think, and exist while "too weak to sit upright" from forced starvation.[48] As historians and educators, we can and must continue to link the past with the future. For instance, famine as a tool of genocide has a playbook.[49] In our classrooms and beyond, we must deeply and meaningfully engage with historical material conditions that continue to repeat in plain sight, draw out connections, and build communities so that we can confront catastrophes without cynicism but rather collaboratively.

Notes

1. Mohammed Sio, "Israel Dropped 100,000 Tons of Explosives over Gaza, Wiped out 2,200 Families: Media office," *Anadolu Agency*, May 8, 2025, https://www.aa.com.tr/en/middle-east/israel-dropped-100-000-tons-of-explosives-over-gaza-wiped-out-2-200-families-media-office/3561614; and "Secretary-General on Famine in Gaza," August 22, 2025, https://www.un.org/sg/en/content/sg/statement/2025-08-22/secretary-general-famine-gaza.

2. Aleks Phillips, "Gaza Strip's Size Compared to US Cities in Series of Maps," *Newsweek*, October 11, 2023.

3. Shourideh C. Molavi, *Environmental Warfare in Gaza: Colonial Violence and New Landscapes of Resistance* (Pluto Books, 2024).

4. World Health Organization, "Famine Confirmed for First Time in Gaza," August 22, 2025, https://www.who.int/news/item/22-08-2025-famine-confirmed-for-first-time-in-gaza.

5. Fadwa Hodali, Krishna Karra, Caroline Alexander, and Denise Lu, "An Environmental Crisis Haunts the Ruins of Gaza," *Bloomberg Green*, July 24, 2025, https://www.bloomberg.com/graphics/2025-gaza-war-environmental-disaster/?cmpid=072625_WKNDNL&embedded-checkout=true; and Lena Freij, "Climate Change and the Vulnerable Occupied Palestinian Territories," *Journal of Environmental Law* 39, no. 1 (2021).

6. S. Heblich, S.J. Redding, and H. Voth, "Slavery and the British Industrial Revolution," NBER Working Paper 30451, 2022.

7. Edward E. Baptist, *The Half Has Never Been Told: Slavery and the Making of American Capitalism* (Basic Books, 2014); Sven Beckert and Seth Rockman, eds., *Slavery's Capitalism: A New History of American Economic Development* (University of Pennsylvania Press, 2016); and Keron Niles, "Climate Change and Transatlantic Slavery: Uncomfortable Parallels, Uncertain Futures," *Pan-African Conversations* 1, no. 2 (2023): 64–90.

Downloaded from direct.mit.edu/books/book-pdf/2641078/book_9780262056311.pdf by guest on 26 November 2026

8. Philip T. Hoffman, *Why Did Europe Conquer the World?* (Princeton University Press, 2015); and Daniel Headrick, *The Tools of Empire: Technology and European Imperialism in the Ninetieth Century* (Oxford University Press, 1981).

9. Visualizing Palestine, "Gaza Stripped: The Colonial Isolation of Gaza," May 2025, https://visualizingpalestine.org/visual/gaza-stripped/.

10. Benjamin Neimark, Frederick Out-Larbi, Reuben Larbi, Patrick Bigger, Linsey Cottrell, Lennard de Klerk, and Mykola Shlapak, "War on the Climate: A Multitemporal Study of Greenhouse Gas Emissions of the Israel–Gaza Conflict," April 1, 2025, https://ssrn.com/abstract=5274707 or http://dx.doi.org/10.2139/ssrn.5274707.

11. Theodora Dryer, "Your Artificial Future Is Repulsive: On Climate Change, Data Tech, and Artifice," Just Tech, Social Science Research Council, May 8, 2024, https://doi.org/10.35650/JT.3069.d.2024.

12. R. Ziadah, "Genocide, Neutrality and the University Sector," *The Sociological Review* 73, no. 2 (2025): 241–248. https://doi.org/10.1177/00380261251321336.

13. Ruth Wilson Gilmore, *Golden Gulag: Prisons, Surplus, Crisis, and Opposition in Globalizing California* (University of California Press, 2007).

14. Kyle Whyte, "Indigenous Environmental Justice: Anti-Colonial Action Through Kinship" in *Environmental Justice: Key Issues*, ed. B. Coolsaet (Taylor & Francis, 2020), 266–278; and Miigis Curley, "Settler Colonialism Conspiring as Climate Change," *The Yale Global Health Review*, May 19, 2025, https://yaleglobalhealthreview.com/2025/05/19/settler-colonialism-conspiring-as-climate-change/#:~:text=Settler%20colonialism%20is%20evident%20in,are%20no%20longer%20a%20reality.

15. Heather Davis and Zoe Todd, "On the Importance of a Date, or, Decolonizing the Anthropocene," *ACME: An International Journal for Critical Geographies* 16, no. 4 (2017): 761–780; Tao Leigh Goffe, *Dark Laboratory: On Columbus, the Caribbean, and the Origins of the Climate Crisis* (Hamish Hamilton, 2025); P. Gooding, M.J. Lazenby, M.R. Frogley, C. Dai, and W. Su, "Documents, Reanalysis, and Global Circulation Models: A New Method for Reconstructing Historical Climate Focusing on Present-Day Inland Tanzania, 1856–1890," *Climate of the Past* 20 (2024): 2701–2718, https://doi.org/10.5194/cp-20-2701-2024; and Dagomar Degroot, "The Climate Chronicles," https://theclimatechronicles.com/episodes/.

16. L. Kofi Bright, N. Gabriel, C. O'Connor, and Olúfẹ́mi Táíwò, "On the Stability of Racial Capitalism," *Ergo an Open Access Journal of Philosophy* 12, no. 42 (2025), https://doi.org/10.3998/ergo.7965.

17. Goffe, *Dark Laboratory*.

18. Olúfẹ́mi Táíwò, *Reconsidering Reparations* (Oxford University Press, 2022).

19. Myles Lennon, "Postcarbon Amnesia: Toward a Recognition of Racial Grief in Renewable Energy Futures," *Science, Technology, & Human Values* 45, no. 5 (2020): 934–962; Mark Stoll, *Profit: An Environmental History* (Polity Press, 2023); and Corey Ross, *Ecology and Power in the Age of Empire: Europe and the Transformation of the Tropical World* (Oxford University Press, 2017).

Downloaded from direct.mit.edu/books/book-pdf/2641078/book_9780262056311.pdf by guest on 26 November 2026

20. Iva Peša, "Toxic Coloniality and the Legacies of Resource Extraction in Africa," *International Review of Environmental History* 9, no. 2 (2024): 33–50.

21. Manu Karuka, *Empire's Tracks: Indigenous Nations, Chinese Workers, and the Transcontinental Railroad* (University of California Press, 2019).

22. Harsha Walia, *Border and Rule: Global Migration, Capitalism, and the Rise of Racist Nationalism* (Haymarket Books, 2021); Nick Estes, *Our History is the Future: Standing Rock Versus the Dakota Access Pipeline, and the Long Tradition of Indigenous Resistance* (Verso Books, 2019); and The Red Nation, *The Red Deal: Indigenous Action to Save Our Earth* (Common Notions Press, 2021).

23. Erika Lee, "The Chinese Exclusion Example: Race, Immigration, and American Gatekeeping, 1881–1924," *Journal of American Ethnic History* 21, no. 3 (2002): 36–62.

24. Connie Yang, ed., *Nature Unfurled: Asian American Environmental Histories* (University of Washington Press, 2024).

25. Velayutham Saravanan, *Environmental History of Modern India: Land, Population, Technology and Development* (Bloomsbury, 2022); and Ashanti Shih, "The Most Perfect Natural Laboratory in the World: Making and Knowing Hawaii National Park," *History of Science* 57, no. 4 (2019): 493–517, https://doi.org/10.1177/0073275319848966.

26. Ashley Carse, *Beyond the Big Ditch: Politics, Ecology, and Infrastructure at the Panama Canal* (MIT Press, 2014); Ashley Carse, "An Infrastructural Event: Making Sense of Panama's Drought," *Water Alternatives* 10, no. 3 (2017): 888–909; and Karina Garcia, "The Panama Canal's Other Conflict: Water Security for the Population and the Global Economy," *The Conversation*, March 31, 2025, https://theconversation.com/the-panama-canals-other-conflict-water-security-for-the-population-and-the-global-economy-253100; For additional resources see: https//waterjustice-tech.org/

27. Utsa Patnaik, "Revisiting the 'Drain,' or Transfers from India to Britain in the Context of Global Diffusion of Capitalism," in *Agrarian and Other Histories: Essays for Binay Bhushan Chaudhuri*, ed. S. Chakrabarti and U. Patnaik (Tulika Books, 2017), 277–319.

28. Cristina Violante, "Liquidity: Water and Investment in Mandate Palestine," *Law & Social Inquiry* 47, no. 2 (2022): 535–57, https://doi.org/10.1017/lsi.2021.74; and Jabary Salamanca Omar, Mezna Qato, Kareem Rabie, and Sobhi Samour, "Past Is Present: Settler Colonialism in Palestine," *Settler Colonial Studies* 2, no. 1 (2012): 1–8, https://doi.org/10.1080/2201473X.2012.10648823.

29. Titas Chakraborty, "Slavery in the Indian Ocean World," in *The Palgrave Handbook of Global Slavery throughout History*, ed. Damian A. Pargas and Julien Schiel (Palgrave Macmillan, 2023), 339–357.

30. Nerilie Abram, Helen McGregor, Jessica Tierney, Michael Evans, Nicholas McKay, Darrell Kaufman, and PAGES 2k Consortium, "Early Onset of Industrial-Era Warming Across the Oceans and Continents," *Nature* 536 (2016): 411–418, https://doi.org/10.1038/nature19082.

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31. Walker Hanton, "London Fog: A Century of Pollution and Mortality, 1866–1965," *The Review of Economics and Statistics* 106, no. 4 (2024): 910–923.

32. Anders Fremstad and Mark Paul, "Neoliberalism and Climate Change: How the Free-Market Myth Has Prevented Climate Action," *Ecological Economics* 197 (2022): 107353, https://doi.org/10.1016/j.ecolecon.2022.107353.

33. Richard Tucker, Tait Keller, John R. McNeill, and Martin Schmid, eds., *Environmental Histories of the First World War* (Cambridge University Press, 2018); Timothy Mitchell, "Fixing the Economy," *Cultural Studies* 12, no. 1(1998): 82–101; Zachary Carter, *The Price of Peace: Money, Democracy, and Life of John Maynard Keynes* (Penguin Random House, 2021); and Ramya Swayamprakash, "Interpreting Rivers for Farms: Engineering Education, Economisation, Knowledge Creation and Indian Hydro-Engineers, 1860-1960," *Environment and History* 31, no. 4 (2025).

34. Theodora Dryer, "Settler Computing: Water Algorithms and the Doctrine of Equitable Apportionment on the Colorado River, 1950–1990," *Osiris* 38 (2023): 265–285.

35. Theodora Dryer, "No AI for the Colorado River," Water Justice & Technology Studio, 2023, https://waterjustice-tech.org/no-ai-colorado-river/.

36. Justine Buck Quijada, "Resource Sovereignty Beyond Socialism and Capitalism," *Anthropology News*, October 23, 2020, https://www.anthropology-news.org/articles/resource-sovereignty-beyond-socialism-and-capitalism/.

37. Aaron Eddens, *Seeding Empire: American Philanthrocapital and the Roots of the Green Revolution in Africa* (University of California Press, 2024).

38. Ann R. L. E. Nelson, Kavitha Ravichandran, and Usha Antony, "The Impact of the Green Revolution on Indigenous Crops of India," *Journal of Ethnic Foods* 6 (2019): 8, https://doi.org/10.1186/s42779-019-0011-9.

39. David Stradling and Richard Stradling, *Where the River Burned: Carl Stokes and the Struggle to Save Cleveland* (Cornell University Press, 2015).

40. Adam Rome, *The Genius of Earth Day: How a 1970 Teach-In Unexpectedly Made the First Green Generation* (Hill and Wang, 2014).

41. Faruque As Sunny, Aila Jeronen, and Juping Lan, "Influential Theories of Economics in Shaping Sustainable Development Concepts," *Administrative Sciences* 15, no. 1 (2025): 6, https://doi.org/10.3390/admsci15010006.

42. John R. McNeill and Corinna R. Unger, eds., *Environmental Histories of the Cold War* (Cambridge University Press, 2010).

43. Sunny et al., "Influential Theories of Economics."

44. Simone Müller, *The Toxic Ship: The Voyage of the Khian Sea and the Global Waste Trade* (University of Washington Press, 2023).

45. Farhana Sultana, "The Unbearable Heaviness of Climate Coloniality," *Political Geography* 99 (2022), https://doi.org/10.1016/j.polgeo.2022.102638.

46. Amitav Ghosh, *The Nutmeg's Curse: Parables for a Planet in Crisis* (University of Chicago Press, 2021).

Downloaded from direct.mit.edu/books/book-pdf/2641078/book_9780262056311.pdf by guest on 26 November 2026

47. Sundos Hammad, Donna Murch, Ahmad Shokr, and Abdel Razzag Takriti, "Palestinians' Fight Against Scholasticide Fuels the Struggle for Freedom," *Hammer & Hope*, Summer 2025, https://hammerandhope.org/article/gaza-palestine-scholasticide.

48. Ahmed Kamal Junina, "'Too Hungry to Think, Too Weak to Sit Upright. Concentration Slips Away': The Struggle to Stay Focused as an Academic in Gaza," *Guardian*, August 19, 2025, https://www.theguardian.com/global-development/2025/aug/19/too-hungry-to-think-too-weak-to-sit-upright-concentration-slips-away-the-struggle-to-stay-focussed-as-an-academic-in-gaza.

49. Brendan Ciarán Browne, "The Coloniality of Enforced Starvation: Reading Famine in Gaza Through *An Gorta Mór*," *Journal of Palestine Studies* 53, no. 2 (2024): 74–80, https://doi.org/10.1080/0377919X.2024.2379709; Mohan Dutta, "Opinion: The Immorality of Famine as a Colonial Tool: Gaza, Bengal, and the Echoes of Hunger," *Massey News*, 2025, https://www.massey.ac.nz/about/news/opinion-the-immorality-of-famine-as-a-colonial-tool-gaza-bengal-and-the-echoes-of-hunger/; and Senjuti Malik, "Colonial Biopolitics and the Great Bengal Famine of 1943," *GeoJournal* 88, no. 3 (2022): 3205–3221, https://doi.org/10.1007/s10708-022-10803-4.

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19

The Production of Vulnerability: Disability, Climate Change, and Environmental Injustice

Elaine LaFay and Mary E. Mendoza

Climate change is disabling. Extreme weather events such as hurricanes and fires increasingly cause debilitating injuries, displacement, and death. Fossil fuel extraction and use, a primary driver of climate change, leaches toxic substances into the air, soil, and water, exacerbating health risks. But beyond immediate physical impacts, climate change amplifies existing social and political inequalities, as populations who are already marginalized by race, class, disability, and sexuality are disproportionately affected by climate-related disaster and environmental degradation. The very systems that perpetuate these inequalities are entangled with the fossil fuel industry and our planetary emergency. In this way, how we respond to the mass disablement of the climate crisis will be contingent on our understanding of disability as an intersectional site of struggle and injustice. Disability history offers a vibrant analytical approach to understanding our planetary emergency because it foregrounds the ways in which vulnerability is produced through social inequality while also underscoring how climate change itself is an engine for producing new forms of disability.

Many environmentalists flatten disability as a warning of what awaits inaction. The earth is sick, as the metaphor goes; so too are we. The extent of this "sickness" is vast: The long history of environmental extractivism and degradation have wreaked havoc not just on our planet but also on our bodies. It has done so in ways that both create and exacerbate disabilities to such a degree that one scholar has suggested we rename our era the "Age of Disability."[1] A recent wave of scholars, activists, and writers with disabilities have challenged the stale trope of disability as a cautionary tale.[2] Instead, they have shown how disability is a dynamic site of vitality, care work, and labor of love and community. As we enter this Age of Disability, we must hold two truths at once: condemn the power structures that create vulnerable populations who are more susceptible to

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environmental violence, and celebrate disability as an adaptive, liberatory force in the struggle for climate justice.

This approach is a departure from past understandings of disabilities as individual deficiencies. The prevailing "medical model" of disability regards impairment as a defect to be fixed, equating "cure" with the ability to conform to capitalist norms and reducing disabled people to objects of pity and fear. Disability studies, a field shaped by people with disabilities, recognizes that disability is a complex social and cultural identity interlaced with intersectional structures of power. Advanced by disability rights activists in the 1970s and 1980s, the social model of disability shifts the focus from individual bodies to environmental, societal barriers. Impairment, in other words, is not inherently disabling; rather, it is society's failure to accommodate diverse bodies that creates disability. There is nothing inevitable in the mass deaths of people with disabilities during Hurricane Katrina, for example, or higher death rates of asthmatics in victims of police violence, or debilitation and death from exposure as migrants cross the US–Mexico border. As our climate crisis worsens, structural violence exacerbates these phenomena and creates vulnerability in some populations more than others. A disability history perspective demands that we turn a critical lens to how disabled populations are made vulnerable and marked as disposable in the onslaught of climatic catastrophe and the social consequences that follow.

An axiom of disaster studies is that there is no "natural" disaster; rather, people make disasters.[3] The disaster is one of preparedness, or lack thereof. Many disaster narratives lament the fates of vulnerable populations, including people with disabilities, yet reproduce ableist assumptions that disabled people are passive objects of suffering. They are not. Vulnerability is produced; it is not inherent. In August 2005, Marcie Roth, an activist for people with disabilities during disasters, was on the phone with Benilda "Benny" Caixeta, a quadriplegic woman in the Ninth District of New Orleans during Hurricane Katrina. As wind and rain lashed her apartment windows, Caixeta talked to Roth as she waited with mounting terror for aid that was already days late. Roth waited on the phone with her until Caixeta said, "with panic in her voice, 'The water is rushing in.' And then her phone went dead." Rescue workers found Caixeta's body five days later, floating near her wheelchair. Testifying before Congress in 2010, Roth stated flatly, "Benilda did not have to drown."[4]

Following the guidelines of the American Red Cross, many shelters during Hurricane Katrina barred entry to people with visible disabilities. As one Red Cross employee told Roth, "Our shelters are not for them . . . We

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can't hardly serve the *INTACT* people."[5] Some shelter employees directed applicants to "special needs shelters," but these were often understaffed, overcrowded, and without adequate resources.[6] General population shelters that did admit people with disabilities quickly built barriers to separate them, reifying ableist ideologies that disabled people are burdens and should be segregated.

People with disabilities were excluded from preparation and planning even before disaster struck, and as a result, disaster aid was largely inaccessible. Emergency messaging, hastily delivered, was without closed captioning and ASL. Shelters lacked ramps and accessible bathrooms. Sharing Benny's fate, a dearth of paratransit aid, the collapse of communication networks, and discriminatory emergency protocols trapped others with travel-limiting disabilities, including nursing home residents, in their homes. Many perished in their beds.

Environmental hazard often accompanies an uptick in police surveillance and violence. In the days following Hurricane Katrina, New Orleans police officers opened fire on a group of unarmed civilians searching for food and missing relatives.[7] One woman was so severely injured that she lost part of her arm. Firing shotguns and AK-47s, police officers killed two men, including forty-year-old Ronald Madison, a mentally impaired Black man who was shot in the back as he fled. Ableism and structural violence empower some populations over others.

But the production of vulnerability extends beyond seemingly contained disasters such as hurricanes and their aftermath. As disaster expert and disability activist Justice Shorter argues, when people navigate "chronic, slow-onset crises" such as toxic living conditions or the day-to-day struggle to access disability services, it becomes "harder to prepare for a hurricane on the horizon."[8] In areas exposed to toxic runoff and pollution from the nearby excavation and burning of fossil fuels, vulnerability is built into infrastructure.

When scholar Lydia Otero wrote about their childhood home, they remembered floodwaters, dirt, gravel pits, and environmental hazards. Otero grew up "in the shadow of the freeway," where environmental toxins permeated daily life. Between 1955 and 1973, freeway development destroyed most of the Mexican and Mexican American Kroeger Lane Barrio in Tucson, Arizona. The Latino neighborhood became a highway construction zone. Open gravel pits "the size of football fields" collected runoff water and sometimes swallowed children, including Otero's own brother, playing nearby.[9] Otero's home, with concrete floors, had furniture propped onto bricks because monsoon rains regularly brought oily water

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into their home from nearby roads. Environmental hazards permeated Otero's upbringing and took the lives of several beloved family members.

Segregated urban areas such as Otero's reveal the interconnectedness of systemic injustices and disability. Environmental racism, where marginalized communities are disproportionately exposed to pollution and toxic waste, collide with police brutality and climate change. Toxic waste sites cluster near these communities, increasing risk to an array of conditions—respiratory ailments, heart disease, fatigue, impaired cognition, cancers—that debilitate and cause early death. Majority Latino neighborhoods are often located close to freeways, industrial sites, or other areas in which toxicity seeps into the air and water with little to no regulation.[10] This environmental injustice, coupled with over-policing and overdevelopment in these communities, makes those with disabilities more vulnerable to police violence. Fossil fuel corporations often finance and partner with police groups in several major US cities to criminalize protest against pollution by industrial refineries in these neighborhoods.[11] When environmental injustice intersects with disability and social inequity, vulnerability is further compounded by the intersection of disability with other marginalized identities.

A third to a half of those murdered by police have disabilities, many of which are caused by toxic exposure.[12] On April 21, 2020, police brutally restrained and suffocated twenty-seven-year-old Carlos Ingram Lopez in a highly polluted Latino neighborhood in Tucson.[13] Responding to a call during a mental health crisis, police arrived at Lopez's house and immediately handcuffed him. They restrained his legs and torso, covered his head with a spit hood (a mesh covering), and held him down for twelve minutes. Increasingly agitated, Lopez repeated that he could not breathe before going into cardiac distress. The official cause of death was a heart attack. As of 2020, more than seventy people have died at the hands of police saying, "I can't breathe," many of whom also experience respiratory illnesses caused by pollutants.[14] Here, brutality is both place specific and racially and culturally coded. Echoing the experiences of those such as Ronald Madison, brutality against Latinos is woven into environmental and climatic conditions.[15]

Both neighborhood policing and border enforcement practices are deeply entangled with environmental disablement, which makes Latinos more vulnerable. The United Nations has recorded an average of 21.5 million people who are forcibly displaced by weather-related events, including storms, wildfires, droughts, floods, and extreme temperatures, each year between 2008 and 2016, and further estimates 1.2 billion climate refugees

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by 2050.[16] After traveling several days through areas that can reach up to 110°F with little to no shade, many migrants suffer heat exhaustion and dehydration, weakened further from lack of food, water, and overexertion.

It is in this state that Border Patrol agents confront migrants such as Carmelo Cruz Marcos, who are already debilitated, frequently unable to understand their interlocutors, and ultimately at greater risk of death if agents escalate encounters. In February 2022, an agent killed Marcos, a thirty-two-year-old Mexican migrant crossing the border in the rugged terrain of southern Arizona. Two agents chased Marcos down a narrow corridor known as "skeleton valley." One agent cornered Marcos and then claimed that the migrant threatened him with an oval-shaped rock. Seconds later, the agent fired multiple rounds, killing Marcos with four gunshot wounds.[17] Latinos encounter brutality from intersecting police regimes in the United States—one in their local neighborhoods and another along the US–Mexico border—and the warming climate only exacerbates these effects.

At the same time, migrant detention camps are built where crops no longer grow and water is scarce.[18] Confined in detention centers unprepared for climate disaster, disabled migrants face even greater risk. After fleeing a hurricane in 1998, Honduran climate migrant Argueta Anariba endured three back-to-back hurricanes in 2020 while detained in Central Louisiana. Water ran out during a five-day power outage. Inside, temperatures climbed to more than 100°F. Immigration and Customs Enforcement (ICE) agents deployed pepper spray to control panicked inmates, exacerbating Anariba's asthma. The smell of human feces from broken toilets made the air so potent that he "could not breathe."[19] Absent a plan for climate emergencies, disabled migrants who survive encounters with border agents are further made vulnerable by disabling conditions in ICE detention centers.

Like the border that Gloria Anzaldua calls "an open wound," human societies have deployed violent systems that produce vulnerability and disablement.[20] For Anzaldua, those systems have targeted racialized peoples to exclude them from the national fabric. Those same systems have also harmed disabled peoples, who have similarly been denied the full scope of citizenship. Policing these borders continues a long-standing historical trend that will only escalate as climate migration becomes more pervasive.

Vulnerability is not inevitable; it is made. Climate change looks different when we think of people as restricted by inaccessible environments and systemic inequities rather than the limitations of their bodies. Addressing the climate crisis requires a radical reimagining of our relationship with

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the environment and the systems of oppression that create vulnerability. As responses to climate change introduce new forms of precarity, the strategies of disability communities that have historically centered communal care, interdependency, and creative adaptation in the face of inaccessible environments are becoming increasingly urgent. People with disabilities have long adapted and refined survival strategies in a world that does not accommodate them. Yet, few policies related to climate change include people with disabilities. There is a need for creative thinking in the decades ahead, and centering disabled voices around questions of access, migration, and disaster preparedness will prevent needless loss of life. As sea levels rise and extreme weather becomes more frequent, disability becomes enmeshed with structural violence and inequality that denies the value and worth of disabled life. Surviving the climate catastrophe demands collective, creative adaptation in ways that center marginalized communities. Disability perspectives on the climate crisis, long maligned or ignored outright, force a recognition that who lives and dies during climatic catastrophes is not a product of inherent vulnerability but rather of power.

Notes

1. Sunaura Taylor, *Disabled Ecologies: Lessons from a Wounded Desert* (University of California Press, 2024), 29.

2. Eli Clare, *Brilliant Imperfection: Grappling with Cure* (Duke University Press, 2017).

3. Julia Watts Belser, "Disability and the Social Politics of 'Natural' Disaster: Toward a Jewish Feminist Ethics of Disaster Tales," *Worldviews* 19 (2015): 51–68.

4. Marcie Roth, "The Water Is Rushing In," in *Disability and Disaster: Explorations and Exchanges*, ed. Ilan Kelman and Laura M. Stough (Springer Press, 2015), 147–150.

5. National Council on Disability, "The Impact of Hurricanes Katrina and Rita on People with Disabilities: A Look Back and Remaining Challenges," August 3, 2006, 11 (emphasis in original).

6. National Council on Disability, "The Impact of Hurricanes Katrina and Rita," 11.

7. Campbell Robertson, "New Orleans Police Officers Plead Guilty in Shooting of Civilians," *New York Times*, April 20, 2016.

8. Justice Shorter and Julia Watts Belser, "Racial Justice and Disability Disaster Response—Justice Shorter in Conversation with Julia Watts Belser," Disability and Climate Change Public Archive Project, July 1, 2022.

9. Lydia Otero, *In the Shadows of the Freeway: Growing up Brown and Queer* (Planet Earth Press, 2019), 66.

Downloaded from direct.mit.edu/books/book-pdf/2641078/book_9780262056311.pdf by guest on 26 November 2026

10. Jayajit Chakraborty, "Unequal Proximity to Environmental Pollution: An Intersectional Analysis of People with Disabilities in Harris County, Texas," *The Professional Geographer* 72, no. 4 (2020): 521–534.

11. Alexandria Herr, "How the Fossil Fuel Industry Drives Climate Change and Police Brutality," *Grist*, July 28, 2020.

12. Ruderman Family Foundation, "Ruderman White Paper," March 8, 2016, https://rudermanfoundation.org/blog/in-the-media/media-missing-the-story-half-of-all-recent-high-profile-police-related-killings-are-people-with-disabilities.

13. Simon Romero et al., "Another Nightmare Video and the Police in the Defensive in Tucson," *New York Times*, June 25, 2020.

14. Mike Baker et al., "Three Words. 70 cases. The Tragic History of 'I Can't Breathe,'" *New York Times*, June 29, 2020.

15. Lindsey Dillon and Julie Sze, "Police Power and Particulate Matters: Environmental Justice and the Spatialities of In/securities in US Cities," *English Language Notes* 54, no. 2 (2016): 13–23.

16. Institute for Economics and Peace, "Over One Billion People at Threat of Being Displaced by 2050 due to Environmental Change, Conflict and Civil Unrest," September 9, 2020. https://www.economicsandpeace.org/wp-content/uploads/2020/09/Ecological-Threat-Register-Press-Release-27.08-FINAL.pdf, accessed on January 6, 2026.

17. Ryan Devereaux, "'This Is America, Mother-Fucker': Witnesses Describe Border Patrol Killing of Mexican Migrant," *The Intercept*, May 12, 2022.

18. Olúfẹ́mi O. Táíwò, "Climate Apartheid Is the Coming Police Violence Crisis," *Dissent*, August 12, 2020.

19. Alleen Brown, "Migrants Fleeing Hurricanes and Drought Face New Climate Disasters in ICE Detention," *The Intercept*, March 31, 2022.

20. Gloria Anzaldua, *Borderlands/La Frontera: The New Mestiza* (Aunt Lute Books, 1987); and Nirmala Erevelles, *Disability and Difference in Global Contexts: Enabling a Transformative Body Politic* (Palgrave, 2011).

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20

Climate Justice, Environmental Justice, and Black Places

An interview with Danielle Purifoy, October 8, 2024

Emily Pawley: Readers may be familiar with the idea that inequality leads to unequal harms from the climate crisis. But your work draws direct causal connections between the historical patterns that created inequality to the crisis. Could you help us see some of those connective lines?

Danielle Purifoy: Many geographers have a kind of place that feels foundational to their work. For me, that place is the plantation. I don't think of the formation of the plantation in the so-called New World as separate from the processes of colonization. They're mutually constitutive. If I start from this particular land relation, which seeks to impose a very particular kind of human domination over an ecosystem and, in doing so, also exercises dominion over African and Indigenous peoples of what became the Americas, then I end up with a kind of intersection between domination of land and domination of people who are thought of as inferior humans as part of this almost totalizing extractive project.

"Inequality" as a word—I struggle with it. "Extraction" is stronger. I think a lot about the word "evisceration." Because the plantation—that process—cannot help but be destructive for the future. It's difficult to envision a scenario where that continued practice of systematic extraction from land, generation after generation after generation, could have ever had another kind of outcome other than what we're seeing now.

The thing I would love to change about the plantation landscape narrative is the idea that the plantation died. I don't think it died. I think that what it did was evolve or disperse itself into various patterns and practices that impact the way we work, that impact agriculture, that impact ways that we live. There is a wonderful book by Kris Manjapra, *Black Ghost of Empire*, arguing that, actually, as slavery was ending in much of the West, the plantation was being exported across the world as a land relation and evolved into a lot of the multinational corporations that we know of today.

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Even mainstream second-, third-wave environmentalisms are defined at their core by dominion over land and ecosystems. It's about command and control regulation of pollutants—so you can discharge *x* amount of whatever kind of toxin into the waterways, into the soil, into the air. The industries that are producing these toxins impose their will on the legislation itself. Even in the attempt to dial back extractive harms, there is still a replication of this idea of dominion that reproduces itself on the backs of Black people.

So, that's the through line for me. It's the land relation at its core. It's defining what whiteness is as so deeply, per Cheryl Harris, tied to the idea of property and land and water and dominion. Defining the relations of the earth in that way could only lead us to a situation that's as untenable as this thing that we're calling climate change.

EP: In your essay "The Parable of Black Places," we were struck by the line "the climate change-causing greenhouse gases are incidental to the production of poisons that cut Black lives short." This seems like an essential inversion of a cliché. Could you help us understand the work that you're doing here?

DP: My work started out squarely in environmental justice [EJ] advocacy, environmental justice scholarship. Climate change as an arena of scholarship is not separate from that. But there have been a lot of attempts to separate them, to say that people who work on environmental justice, environmental racism, need to evolve toward climate change and climate justice. I've always thought that was nonsense.

It was one of the number one questions in the 2000s that people asked me. I was fresh out of college in 2006, just after Katrina happened—that was my initiation into this work. I worked in Louisiana for three years on environmental justice. Climate change was certainly a core part of the conversation—that was arguably one of the big moments that shifted public conversations about climate change. But when I arrived at Harvard Law in 2009, I was told that environmental justice belonged in the nineties, and that I needed to get with the program and start thinking more about climate change.

I thought that was the most absurd thing ever. If we think about climate change as emissions of greenhouse gasses—CO_2, methane, nitrous oxide—if we think about the top industries that produce those emissions, those are the industries that EJ organizers have been fighting forever because they also produce things that have had more acute impacts.

For instance, I'm from North Carolina, and I moved back to do my PhD and then stayed. The landmark environmental justice issue in North

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Carolina is Confined Animal Feeding Operations (CAFOs). For the longest time, before anyone was making connections to climate change, those industries have been poisoning people with *E. coli* and other bacteria and toxins. People's homes have been literally contaminated through the lagoon and spray field system with hog waste; there are acute respiratory issues, bacterial infections, all sorts of impacts of those industries that are also producing massive amounts of methane. And many climate scholars and organizers latch onto the methane and ignore the *E. coli*, the respiratory issues, the risk of staph infections to humans living near and working at these facilities. If people had listened to environmental justice organizers starting in the eighties, we would be in a very different place around climate change now.

These CAFOs in Eastern North Carolina are disproportionately located in floodplains, and historic Black communities like the ones I study are disproportionately located in floodplains. But the day-to-day experience of living near a CAFO and breathing in hog waste and getting sick is going to be a different experience than the once every five-, ten-year flood that comes through. Hurricane Floyd in 1999 washed out a lot of hog waste lagoons, drowned over a million hogs, and devastated that region. But people had been complaining about these CAFOs for a long time before that.

EP: Within Black places, you've paid particular attention to Black-founded towns. Can you tell us more about them? Where are they? When were most of them founded? What can we learn from them?

DP: So, "Black town" is kind of a nebulous term. The idea that a Black-founded place, where Black people own property, run their own government, have self-governance, are free, is not a thing that was intended when the transatlantic slave trade began. So, it's odd to talk about a Black town because the structures that typically apply to most towns in the US, which are white-founded towns, don't apply in the same ways in Black places. So, I struggle with the terminology "Black town."

I use it because I think it helps people get an entry point into the kind of geography that I'm talking about, which is a hyperlocal Black place. There are a bunch of scholars who write about these places, and we all have different ways that we define and approach them.

Where are they? They're everywhere. They are a deep North American phenomenon and, of course, in the Caribbean. But Black towns in North America have a distinction of existing as minoritized geographies.

When I say "to found a town," I mean two different things. If a Black place is trying to follow the trajectory of its white counterparts, they

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petition the state for a charter and form a local municipal government. There are plenty of Black towns incorporated in that manner, but the majority are unincorporated. There are places where people who had access to property settled and formed intentional communities.

This has happened continuously since Black people have been here. There is significant scholarship arguing that African peoples existed on this continent prior to European colonization, long before the 1619 date that is often quoted for the continental US. Certainly during the slave trade, during slavery, and emancipation, and Jim Crow, and after, Black folks have had this push to figure out how to create what the geographer, Ruth Wilson Gilmore, called "freedom as a place." Maroon communities of runaways did it in secret and then in open rebellion toward the eve of the Civil War and post emancipation. Arguably this was one of the biggest waves of Black town formation because Black people come into legal property ownership and start to create enclaves, a lot of them adjacent to white towns. During Reconstruction you start to see Black, male elected officials in places that have significant Black populations and the legal incorporation of some Black places that existed on former plantations. There are a lot of them in Oklahoma because there was a move to make all of Oklahoma a Black state. There's the Exoduster movement in places like Kansas and farther west, shaped, in part, by the Homestead Act, which did allow Black people to make land claims, though it was far more of a perilous process for them than their white counterparts. Much more recently, after the uprisings that followed the police murders of George Floyd and Breonna Taylor, a new place called Freedom, Georgia, was formed, where several families in a Black congregation uprooted themselves, bought some farmland, and basically created a town that wasn't incorporated as a public town but as a private town in 2021. So, different movements have created these places. They've not had as much scholarship as they might, in part because it's been hard to locate and define them. Most of them are unincorporated; they don't show up on anyone's map. A lot of them existed as clandestine places.

I think they have some commonalities that are important to pay attention to—particular relationships to land, particular ways of thinking about governance, the role of the church, lots of different things that are useful for thinking about the future of place if we're getting beyond the boom-and-bust cycles of towns that are formed for economic purposes and not for the purposes of "let's get to collective safety and try to figure out something here."

They have a different kind of purpose. And that means a different kind of governance and different imperatives that mean that even if they don't have any economic development, they still have serious longevity. These

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are places that people call dead but have been alive for decades to centuries. It's hard to account for that unless you understand that there were different imperatives that make them form versus white towns.

EP: Work that you've done with Louise Seamster on Black and white towns challenges some of our assumptions about environmental racism. Could you help us think, in particular, through your concept of creative extraction?

DP: Louise wrote an article called "The White City," and it's very much a parallel to the Black town. Its imperatives are really different. She and I talked a lot about the boom-and-bust cycles of white towns. They're not necessarily based on social cohesion or relation. They are centered around the buildup of property and industry for the purposes of accumulating wealth. Sometimes, they exist in very close physical proximity to Black towns. And what we noticed at the core was the deep relationality of those geographies.

Creative extraction—it's related to dependency theory—is this idea that the white geographies are fundamentally dependent on their ability to extract from these Black geographies, whether it's labor or literal resources or a displacement of land value.

The classic environmental racism case is the waste case, right? The term "environmental racism" and the beginning of the US Environmental Justice Movement comes out of a case in North Carolina with a toxic waste dump in Warren County on a former plantation landscape. But looking at the fuller geographic picture and impacts, we've realized "landfills actually are doing something productive for the communities that are doing the dumping." It's a displacement of land value. They don't have to dump their waste on their own land. Then they can use that land for some other thing, whereas if the land over there is dumped on, the future prospects of land valuation are going to be pretty low. If we think about it relationally, it's an extractive process.

EP: You make a point of connecting plantation landscapes, not only to landscapes of petroleum extraction but also to proposed climate solutions, particularly the wood pellet industry, now that the EU [European Union] has classed wood pellets as a form of renewable energy. Could you help us understand these links?

DP: So, my understanding of the current-day petroleum industry is that the US landscapes that much of it had grown onto were former plantation landscapes. So, Cancer Alley [a center of US oil refining] was also a sugar corridor in Louisiana. I think the serial extraction of those landscapes makes sense because the logics are reproduced. Nobody thinks of

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an oil refinery as a plantation, but it has very similar kinds of logics—"We can just drill deeper," "We will take the risk," "We can't do anything else." Even though we're no longer in plantation-based slavery, we're in another kind of hyper-extractive, death-dealing regime.

But even the proposed solutions commit to the same kinds of ideas of extraction. I didn't know anything about the [wood pellet] industry except through the annual Summit of the North Carolina Environmental Justice Network, which formed after Hurricane Floyd to fight environmental racism from waste industries and the hog industry (CAFOs). Through that network, I learned about the complaints that were coming from Northampton County about the wood pellet mills, which grind trees that are felled in the local area. It's rural Black, northeastern North Carolina, and the complaints, chiefly, are about the same kinds of things that CAFOs are about: respiratory illness because people are breathing in sawdust and debris from grinding these trees. People are having to power wash their homes once a month and wash their cars multiple times a week because the pollution is atmospheric basically.

So, before getting into anything climate related, people are like, "I would like this sawdust to stop. At my doorstep, I am breathing in sawdust. I have lived here for thirty, forty, fifty, sixty years, and now I can't hang my clothes out on the line. I can't have my family over for our family reunion because these are the last acres of land that we have in our family, and this is where the family comes together, and we can't any longer because we can't breathe here. And I can't sell because who is going to buy this land?" It was just stunning to me—that's a classic EJ issue.

If you pan out and look at the forested areas that are being cut down, these are either legacy forests that had been in these counties for hundreds of years or places that had already been cut down a long time ago and replaced with pine plantations. So, literally the model for getting ourselves out of reliance on oil is to cut down carbon-storing trees, some of the biggest ones, hardwoods, to grind them and burn them in a retrofitted coal-fired power plant, then to replace those trees with a monocrop—mostly loblolly pine, which could grow to be hundreds of years old but typically only live to forty to fifty years old—and then they argue that it's renewable technology because they keep planting trees.

As I was researching this, I was just like, "Oh, so now foresters are using the language of 'plantation forests.'" Even in the conceptualization of the solution to climate change, we fall back on the plantation—it's a thing that won't die. Even if it doesn't look like a traditional plantation, and these definitely do, I mean, the trees are planted in rows, and there's

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not much wildlife and understory and those things that make a forest distinctive. It's still a way of imposing this idea that we can control every element of nature so that we can continue living the life that we want to live.

EP: As you think about Black places heading into the climate emergency, what future developments do you most fear? And what do the futures you most hope for look like?

DP: I fear the kind of green capitalism taking hold in some of these places in their efforts to survive. I've seen it happen a couple of times. Places that I would have never imagined, embracing things like biomass. Not that they don't know its destructive tendencies, but maybe they feel forced to do something to preserve some part of their places. It's something that I am fearful of—the embeddedness within green capitalism of the idea that we can use the tools that have led to this destruction to get us out of it. And the ways that these industries prey on Black communities as well.

The features I most hope for—the hope and the fears coexist, right? But there are glimmers of things that are headed in a direction that I personally would like to see. There's a place called Princeville. Princeville is paradigmatic for me because it's one of the first incorporated Black municipalities in the country—a bona fide municipality in the legal sense. It was incorporated in 1885, twenty years after the end of the Civil War. It is located in a floodplain. It has catastrophically flooded at least seven times in its history, and the community continues to come back and rebuild. And it's faced various forms of environmental racism—not necessarily the classic dumping, but the denial of flood, water, and sewer infrastructure. They're another kind of creative extraction case; the white town of Tarboro is across the Tar River from them, and no real economy has ever been able to sprout up because so much of its resources and money and labor go into Tarboro and other neighboring white towns.

But in the last year or two, with a community development corporation called Freedom, there have been these really interesting ways of thinking about relating to place. One of them is this real embrace of and commitment to the floodplain and to not seeing the floodplain as a problem. "The floodplain is a floodplain. It is what it is. It's not wrong. But we do live here, and we have to figure it out in order to survive into the future, and not be displaced and not have the Federal Government, or Tarboro take this land and do whatever they want to it. We have to learn how to live in the floodplain." It's extraordinary, this work that they're doing to think about what it is to live with water.

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A similar thing is happening in New Orleans now, this idea of "We're not moving. To move is to move to another set of problems that actually probably look pretty similar to where we are now. We have a really long-standing relationship to this land, and it's time that we stop trying to control it in that same kind of way. The water is going to come. So, if we accept that the water is coming, what do we do to actually live with it?"

That's a different approach than I've seen in other places where they're just trying to build more retention walls. They're trying to do everything to stop the thing from happening. And it's going to happen. What did Toni Morrison say? All water is just trying to get back to its level. If you let it come, and you figure out what you are going to do to let it be, for me, it doesn't get any better than that. Because that is a fundamental shift away from a plantation relation.

To me, that looks like we're finally moving out of that particular kind of relation and turning to each other and to this land and saying, "Okay, how do we work together? How do we cultivate and support the kind of ecosystem that makes it possible for the water to come and for us to live here and to figure that out?" And this organization in Princeville / Edgecombe County—it's not the government. It's descendant communities who want to stay on that land for another 157 years. So, yeah, that makes me excited every time.

EP: I feel like you've started to answer this question, but what does work toward your hoped-for futures look like?

DP: So, my jam in this moment is all about how we shift out of what I might call plantation time. Plantation time demands a whole lot out of us. Its tendency is around domination and exhaustion, the exhaustion of the earth and also of every living being on the earth, including us. What would it mean for us to move out of plantation time? As another kind of time, I'm thinking of forest time. What it takes to actually cultivate a forest is hundreds and hundreds of years. Forest time is slow, but it's enriching and nourishing and reinforcing. It doesn't mean that there isn't conflict. It doesn't mean that there aren't problems and challenges and blights and death, but it's a different orientation to each other and our larger ecosystem—a folding back of ourselves into an ecosystem as opposed to kind of overlords of an ecosystem that we keep destroying and destroying ourselves in the process. I think whatever we can do to get to that is imperative. What needs to happen is a step back and a slowing down, a real intentional thinking about how we're going to relate to each other, building from practices that we think of as ancient.

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Resources Related to Part III

Alexandra Hui, Elaine LaFay, Samantha Muka, Emily Pawley, Sarah Pickman, and Anna Zeide

III.1 Brainstorming Exercise: Connecting Your Research or Teaching to the Climate Emergency

The central principle of this part of the book is that the climate emergency is linked to many more histories than we might conventionally expect. Here, we ask a necessarily incomplete series of questions about how the stories you work on might connect.

Links to causes:

How were my historical actors' lives shaped by their energy system? Did they depend on oil? Coal? Firewood? Animal dung? Did they rely on human and animal labor?

Does my historical story depend on particular kinds of physical energy infrastructure: trains, cars, horses, camels, electrical grids, and so forth?

Does my historical story connect to deforestation or grassland loss?

Does my historical story connect to changes in consumption rates or to how people in the past thought about or connected to goods?

Did my story drive growth or was it driven by growth? Or assumptions about growth?

Links to effects and damage:

How did my historical actors' way of life render them sensitive or insensitive to changing climate, patterns of rainfall, and weather? For example, did they depend on agricultural seasonality? Did they move with the seasons? Did they depend on heating or air conditioning to live where they lived? Did their food come from nearby or far away?

Did my historical story create or intensify forms of inequality that shaped later vulnerability to damage?

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Did my historical actors come to describe some people as less grievable or more disposable? Were they described that way themselves?

Did my story change the geography of where people lived and worked in ways that rendered them more vulnerable to disaster?

Links to solutions:

Does my historical story offer lessons about social movement building or community strength?

Did my historical actors have attitudes to the nonhuman world that offer alternatives to extractivism?

Did my historical actors think they were solving a problem? Were they?

III.2 Further Reading

We asked the contributors to this part of the book to share texts they found inspiring or provocative and added some ourselves. We encourage you to dig in!

Anderson, Virginia DeJohn. *Creatures of Empire: How Domestic Animals Transformed Early America*. Oxford University Press, 2004.

de Avilez Rocha, Gabriel. "The Pinzones and the Coup of the Acedares: Fishing and Colonization in the Fifteenth-Century Atlantic." *Colonial Latin American Review* 28, no. 4 (2019): 427–449.

Belser, Julia Watts. "Disability, Climate Change, and Environmental Violence: The Politics of Invisibility and the Horizon of Hope." *Disability Studies Quarterly* 40, no. 4 (2020).

Belser, Julia Watts. "Disabled People Cannot Be 'Expected Losses' in the Climate Crisis." *Truthout*, September 20, 2019.

Berne, Patty, and Vanessa Raditz. "To Survive Climate Catastrophe, Look to Queer and Disabled Folks." *Yes Magazine*, July 30, 2019.

Blakley, Christopher Michael. *Empire of Brutality: Enslaved People and Animals in the British Atlantic World*. LSU Press, 2023.

Buldrini, Fabrizio, Alessandro Alessandrini, Umberto Mossetti, et al. "Botanical Memory: Five Centuries of Floristic Changes Revealed by a Renaissance Herbarium (Ulisse Aldrovandi, 1551–1586)." *Royal Society Open Science* 10, no. 11 (2023): 1–16.

Butler, Judith. *Frames of War: When Is Life Grievable?* Verso, 2009.

Chevalier, Francois, Lesley Byrd Stimpson, and Alvin Eustis. *Land and Society in Colonial Mexico: The Great Hacienda*. University of California Press, 2023.

Clare, Eli. *Brilliant Imperfection: Grappling with Cure*. Duke University Press, 2017.

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Clarke, Adele, and Donna Haraway, eds. *Making Kin, Not Population: Reconceiving Generations*. Prickly Paradigm Press, 2018.

Deerinwater, Jen. "Colonial Forces of Environmental Violence on Deaf, Disabled, & Ill Indigenous People." *Disability Studies Quarterly* 41, no. 4 (2021).

Delbourgo, James, and Staffan Müller-Wille. "Introduction: Listmania. How Lists Can Open Up Fresh Possibilities for Research in the History of Science." *Isis* 103, no. 4 (2012): 710–715.

Dillon, Lindsey, and Julie Sze. "Police Power and Particulate Matters: Environmental Justice and the Spatialities of In/securities in US Cities." *English Language Notes* 54, no. 2 (2016): 13–23.

Franklin, Sarah. *Dolly Mixtures: The Remaking of Genealogy*. Duke University Press, 2007.

Hernández, Kelly Lytle. *Migra! A History of the US Border Patrol*. University of California Press, 2010.

Huber, Matthew. *Lifeblood: Oil, Freedom, and the Forces of Capital*. University of Minnesota Press, 2013.

Hultman, Martin, and Paul Pulé, eds. *Men, Masculinities, and Earth: Contending with the (m)Anthropocene*. Palgrave, 2021.

Hünniger, Dominik, Karina Lucas Silva-Brandão, Christian Reiß, and Xiaoya Zhan. "A Collection Ecologies Forum: Reevaluating Insects as Archives." *Isis* 115, no. 1 (2024): 157–163.

Kaiser, Katja, I. Heumann, T. Nadim, et al. "Promises of Mass Digitisation and the Colonial Realities of Natural History Collections." *Journal of Natural Science Collections* 11 (2023): 13–25.

Kukutai, Tahu, and Amanda Black. "CARE-ing for Indigenous Nonhuman Genomic Data—Rethinking Our Approach." *Science* 385, no. 6708 (2024).

Lui-Chivizhe, Leah, and Jude Philp. "Ways of Knowing a Former Insect." *Isis* 115, no. 1 (2024): 147–151.

Mabry, Makenzie E., Nuala Caomhanach, R. Shawn Abrahams, et al. "Building an Inclusive Botany: The 'Radicle' Dream." *Plants, People, Planet* 6, no. 3 (2023): 544–557.

Mendoza, Mary E. "Caging Out, Caging In: Building a Carceral State at the US–Mexico Divide." *Pacific Historical Review* 88, no. 1 (2019): 86–109.

Mendoza, Mary E., and Traci Voyles, eds. *Not Just Green, Not Just White: Race, Justice, and Environmental History*. University of Nebraska Press, 2025.

Merchant, Carolyn. *The Death of Nature: Women, Ecology, and the Scientific Revolution*. Harper & Row, 1980.

Mies, Maria, and Vandana Shiva. *Ecofeminism*. Fernwood, 1993.

Mitchell, Timothy. *Carbon Democracy: Political Power in the Age of Oil*. Verso Books, 2011.

Murphy, Michelle. *The Economization of Life*. Duke University Press, 2017.

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Oreskes, Naomi. "Eight Billion People in the World Is a Crisis, Not an Achievement." *Scientific American*, March 1, 2023.

Plumwood, Val. *Feminism and the Mastery of Nature*. Routledge, 1993.

Purifoy, Danielle M. "Remote-Control Plantations and Black Forest Relations in the Black Belt." *Environment and Society* 13, no. 1 (2022): 140–155.

Purifoy, Danielle M., and Louise Seamster. "Creative Extraction: Black Towns in White Space." *Environment and Planning D: Society and Space* 39, no. 1 (2021): 47–66.

Ray, Sarah Jaquette. *The Ecological Other: Environmental Exclusion in American Culture*. University of Arizona Press, 2013.

Ray, Sarah Jaquette, and J. C. Sibara, *Disability Studies and the Environmental Humanities: Toward an EcoCrip Theory*. University of Nebraska Press, 2017.

del Río Moreno, Justo Lucas. *Ganadería, plantaciones y comercio azucarero antillano: siglos XVI y XVII*. Academia Dominicana de la Historia, 2012.

Roane, J. T., Megan Femi-Cole, Preeti Nayak, and Eve Tuck. "'The Seeds of a Different World Are Already Alive in the Everyday Practices of Ordinary Black and Indigenous People': An Interview with J. T. Roane." *Curriculum Inquiry* 52, no. 2 (2022): 129–138.

Robles, Whitney Barlow. *Curious Species: How Animals Made Natural History*. Yale University Press, 2023.

Sanders, Nathan J., Natalie Cooper, Alison R. Davis Rabosky, and David J. Gibson. "Leveraging Natural History Collections to Understand the Impacts of Climate Change." *Journal of Animal Ecology* 92, no. 2 (2023): 232–236.

Sasser, Jade. *On Infertile Ground: Population Control and Women's Rights in the Era of Climate Change*. NYU Press, 2018.

Sins Invalid. "Into the Crip Universe: Cripping the Anthropocene." Podcast, 2020. https://sinsinprocess.squarespace.com/podcast/2020/10/16/episode-1-foundations-of-climate-justice-and-disability-justice?rq=Into%20the%20Crip%20Universe.

Smith, S. E. "When Disability Is a Toxic Legacy." *Catapult*, April 23, 2019.

Studnicki-Gizbert, Daviken. *The Three Deaths of Cerro de San Pedro: Four Centuries of Extractivism in a Small Mexican Mining Town*. University of North Carolina, 2022.

Sunder Rajan, Kaushik. *Biocapital: The Constitution of Postgenomic Life*. Duke University Press, 2006.

Svampa, Maristella. *Neo-Extractivism in Latin America: Socio-Environmental Conflicts, the Territorial Turn, and New Political Narratives*. Cambridge University Press, 2019.

Taylor, Sunaura. "Age of Disability: On Living Well with Impaired Landscapes," *Orion Magazine* 9 (Winter 2021).

Taylor, Sunaura. *Disabled Ecologies: Lessons from a Wounded Desert*. University of California Press, 2024.

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Trembath, Alex, and Vijaya Ramachandran. "The Malthusians Are Back." *The Atlantic*, March 22, 2023.

Waldby, Catherine, and Robert Mitchell. *Tissue Economies: Blood, Organs, and Cell Lines in Late Capitalism*. Duke University Press, 2006.

White, Sam. "Animals, Climate Change, and History." *Environmental History* 19, no. 2 (April 2014): 319–328.

Wong, Alice. "Episode 63: Climate Change." November 3, 2019. Disability Visibility Podcast. https://disabilityvisibilityproject.com/2019/11/03/ep-63-climate-change/.

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IV

Working with and for the Public

This part of the book encourages historians to think expansively about what working with the public might mean—encompassing powerful and familiar forms of public engagement such as museum displays and op-eds, as well as courtrooms, community organizing, and collaboration with journalists. A throughline in these pieces is the experience of each contributor: a moment of clarity when they realized the applicability of their historical skills and expertise to knotty, public-facing problems. They could help! And then they did!

In the first essay, Aislinn Pentecost-Farren and Sophie Hess explore how museums are already investigating the climate crisis and suggest new ways of doing so. Next, Katherine Arnold and Martha Fleming suggest how historians might work with museum colleagues to activate collections and catalogues created through imperial expansion to help populate the natural world of Tuvalu's proposed "digital twin." As some former colonies now consider managed retreat and emigration, museum specimens and data could animate lost culture and biodiversity. Leif Fredrickson, Christopher Sellers, and Jessica Varner describe the effective forms of "oppositional history" they developed through the Environmental Data and Governance Initiative during the first Trump administration's gutting of the Environmental Protection Agency, offering possibilities for the climate fight. Amy Woodson-Boulton and Troy Horton invite historians to consider bringing their expertise to the courtroom by contributing to the Climate Necessity Defense. An interview with Amy Westervelt, investigative climate journalist and podcaster, illuminates the broader structures of communicating with different publics and helps us imagine the different ways historians might contribute to the related work of investigative journalists. Finis Dunaway then describes how his work on the Arctic National Wildlife Refuge shifted when the issue of drilling reignited in 2017, and the Gwich'in community members he worked with

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called upon his expertise and pushed him to use his public voice. Finally, an interview with Jayson M. Porter encourages readers to think about what historians might bring to community organizing spaces and what they might want to remember as they begin.

In addition to further readings and web resources, our resource section offers lists of groups looking for historians' help, a brainstorming exercise for historians wanting to think through their own ability to contribute to community and public climate work, and advice for those embarking on oppositional history.

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21

Public History of the Climate Crisis: Untapped Potential at Museums and Parks

Aislinn Pentecost-Farren and Sophie Hess

Public history institutions have untapped potential to make climate change history visible. Although museums and parks across the United States increasingly address the climate crisis, material concerns over asset protection and sustainability often take priority over education about the problem's origins. Historical representations of the crisis, however, are critical to understanding it. Climate change is a problem of historic actions causing catastrophe in the present.[1] A just energy transition relies on the recognition and prioritization of those historically exploited by the fossil fuel economy. Public history institutions that steward the history of climate change are uniquely positioned to expand public knowledge about these issues.

Public institutions that preserve and interpret historic assets are heterogeneous, including museums, historic sites, parks, preservation nonprofits, and libraries that range from publicly funded networks to privately operated sites and small grassroots initiatives. Their audiences are equally diverse, including history buffs, tourists, and K–12 students. We use "interpretation" to describe the ways institutions speak to visitors, including exhibits, signage, tours, field trips, and public programming.

This essay will outline some of the challenges in interpreting the climate crisis at public history institutions in the United States. We provide an overview of what these institutions are saying about climate change and a blueprint for saying more.

Climate Crisis Public History: The State of the Field

Public history institutions have been slower to interpret the climate crisis than museums dedicated to science, natural history, art, and anthropology.[2] However, the effort is growing. So far, climate interpretation in public history falls into four categories: effects of climate change on historic resources, efforts of institutions to reduce their climate impact,

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encouraging visitors to engage in climate advocacy, and conveying the history of the crisis. The last category is rare, yet it represents a unique impact public history can have on the crisis.

The museum field has begun to advocate around climate change. Coalitions of museums have pledged to engage staff and visitors in climate education and mitigation. Examples include Canada's Coalition of Museums for Climate Justice, founded in 2016; Museums for Future, founded in Europe alongside Greta Thunberg's Fridays for Future movement in 2018; and the American Alliance of Museums' Environment and Climate Network.[3] A few new museums are wholly dedicated to climate change, including the Jockey Club Climate Museum of Hong Kong, founded in 2013, and the Climate Museum in New York City, which started programming in 2017.[4]

Mitigation concerns dominate the public history conversation around climate change, especially within heritage and preservation.[5] The Climate Heritage Network aims to mobilize the arts, culture, and heritage sectors "to help communities reduce greenhouse gas emissions and strengthen adaptive capacity."[6] The International Council on Monuments and Sites formed a Climate Action Working Group in 2016 and has launched multiple initiatives focused on safeguarding heritage from climate threats and promoting climate action.[7]

Public history institutions' engagements with the climate crisis are often predicated upon imminent threats of physical damage.[8] Climate change has increased flooding and erosion along the James River in Virginia, near Jamestown, the first English town in colonial America. The site's directors have proposed significant architectural and landscaping adaptations. In Houston, Texas, Olivewood Cemetery, the oldest Black burial ground in the city, repeatedly faces extensive damage from hurricanes worsened by global temperature rise.[9]

Both Jamestown's and Olivewood's climate vulnerabilities are entwined with long histories of racism. Jamestown played a pivotal role in the rise of global plantation agriculture, a process associated with devastating climate impacts such as biodiversity loss and increased greenhouse gas emissions. Olivewood's flood-prone location results from the racist urban planning seen throughout the United States, which relegates Black people to live in environmentally hazardous locations. Neither site currently interprets its connections to climate change or environmental racism for visitors. Including climate history interpretation would connect these topics and help visitors to understand the "slow violence" through which landscapes and people have been exploited over centuries, as well as to invest in their linked solutions.[10]

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Although few public history institutions currently present the origins of the climate crisis, what interpretation exists offers insight into how others might move forward. A recent article in *Smithsonian Magazine* previewed the Museum of American History's efforts to narrate climate change history in America through objects in the institutions' collections. A stereoscope photograph of loggers highlighted deforestation, whereas a kerosene lamp represented the rise of oil consumption.[11] Meanwhile, the Humanities Action Lab's Climates of Inequality project has taken a participatory approach, working with frontline communities to create exhibits that connect local environmental justice issues to global industrial histories. These projects demonstrate how climate change is a historical topic that resonates in artifacts and local places.

Some public history sites are beginning to account for their role in climate change's origins. Lowell National Historical Park has interpreted the local environmental effects of the Industrial Revolution's pollution for years. In 2023, they started testing ways of adding the climate impacts of industrialization, including changes to field trip curricula, tours, and teacher training. Whitney Plantation recently held a symposium connecting climate change, environmental racism, the petrochemical industry, and plantation history. However, most heritage sites do not include the history of climate change in their interpretation.

Interpreting Climate Change History: Challenges and Tools

Why aren't more public history institutions interpreting the climate crisis for public audiences? Given their history-oriented mission, why not especially climate crisis history? In her work with these institutions, Aislinn hears staff articulate a common set of challenges to climate interpretation. History institutions struggle to adopt a topic that is understood as scientific, with vastly distributed causality and effect, and want to avoid upsetting visitors with a subject that can catalyze negative emotions or that is perceived as politically controversial. However, these issues can be resolved through interpretive tools that the public history field already has at hand. This interpretive reorientation can be applied to how museums choose and label objects; how historic sites create tours, signage, and programs; and how founders of new historic sites plan their interpretation.

Climate change is perceived as a scientific issue, and public history institutions usually lack expertise in science education. They are reluctant to add a topic that seems off mission, or burden staff with scientific training and responsibilities. But even minimal inclusion of climate

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science information can help to link an institution's established expertise in social, economic, and technological histories to the climate crisis. Furthermore, the public is increasingly aware of the basic science of climate change from media sources. Public history institutions can do what they do best: offer historic context for a contemporary phenomenon.

Staff who understand how their institution's history connects to climate change can still believe that climate change is too abstract to include: They see a lack of concrete examples in historic materials to ground interpretation of a global-scale problem. However, the material culture of the climate crisis is already researched and preserved as industrial history, agricultural history, colonial history, and more. The materials preserved from these eras simply need to be reframed with what we now know about the impact those histories had on climate. At Lowell, Aislinn found that documenting the mills' growing use of coal during early atmospheric carbon accumulation helped staff see artifacts such as smokestacks and a steam engine not as secondary stories but rather as material examples for climate history education. In fact, the site specificity of history institutions can offer intimate and tangible opportunities to point out what is local and readily visible about the history of global climate crisis.

Another obstacle is concern about controversy from climate deniers. The depth of concern varies according to local and national political contexts and the site's experience with other topics. Some sites have the staff and budget for audience surveys, but in absence of systematic research, institutions' perceptions of their audiences are informed by the personal experience of staff and volunteers. A few experiences with negative feedback from a visitor can make a big impact, especially if staff are not prepared or supported properly. In these cases, the risk of climate controversy can be overestimated. For every visitor who vocally challenges climate as a topic for history museums, there are numerous silent others who accept or appreciate it.

It can be helpful to remember that climate is not inherently a political issue but rather has been intentionally politicized by interests with a financial stake in fossil fuel consumption. According to recent studies by the Pew Research Center and the Yale Center for Climate Communication, a majority of Americans understand that climate change is real, feel concerned, and support action on the issue. The National Park Service (NPS)'s Climate Change Response Program trains federal employees, who are barred by United States law from engaging in political activity at work, to speak about climate change at National Parks.[12] All public history institutions can be emboldened by the NPS's example. To paraphrase Whitney Plantation director Ashley Rogers, if audiences don't see climate

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history as relevant to a historic site, we need to do a better job showing them how crucial it is.

Finally, institutions fear negatively affecting their visitors' moods. Stories of climate destruction can trigger despair, which can be off-putting for visitors (and reduces engagement in climate action and solutions). Thankfully, there are robust public history practices to avoid this. A number of tools for public historians support engagement with "difficult histories"—slavery, colonialism, oppression, incarceration, and other histories that are emotionally upsetting. Staff can use similar strategies to interpret climate, such as the American Association for State and Local History's guide to "Interpreting Difficult Knowledge" by Julia Rose or the International Coalition on Sites of Conscience's dialogic method for historic tours. The NPS provides a free tool kit to help historic sites inspire action on climate through hopeful historical storytelling. In Aislinn's work with industrial-era historic sites, she emphasizes that the period's technological disruption and resulting changes in society have parallels to the renewable energy transition today. These histories can serve as hopeful examples of how energy transitions are achievable.

Conclusion

There are four ways public history institutions are starting to broach climate change with their audience: conveying the effects on historic assets, addressing the environmental sustainability of site operations, encouraging visitors to join in climate advocacy, and educating the public about the origins of the crisis. The fourth way is most uniquely suited to history institutions but is still the least common. Yet, climate crisis history interpretation can be grounded in historic resources and site expertise, and offer visitors a compelling experience with dramatic contemporary relevance.

Climate crisis history is a growing topic in the public sphere. Climate scientists use it to explain where the crisis came from. Energy technicians navigate it as they upgrade legacy fossil fuel infrastructure. Developing nations point to climate history when they demand industrialized countries pay for climate loss and damage. Museums and heritage sites have been largely absent from this dialogue. The expertise, historic examples, and cultural authority of the public history field is urgently needed to provide context for the crisis and develop understanding and support for a just transition.

Authors' note: This essay was written in spring 2024. At the time of final preparations for publication in fall 2025, all of the United States–based initiatives cited in this essay remain active, although their status may

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change due to actions by the second Trump administration. Regardless of their future status, they serve as examples for what is possible. Two international entities have closed: The Coalition of Museums for Climate Justice (due to funding loss) and Museums for Future (due to the professionalization of museum sustainability in Europe, reducing the need for this volunteer activist organization).

Notes

1. Liz Ševčenko, "Toxic Heritage and Reparations: Activating Memory for Environmental and Climate Justice," in *Toxic Heritage: Legacies, Futures, and Environmental Injustice* (Routledge, 2023), 306.

2. Jennifer Newell, "Talking Around Objects: Stories for Living with Climate Change," in *Curating the Future: Museums, Communities and Climate Change* (Routledge, 2017), 49.

3. "Coalition of Museums for Climate Justice," Coalition of Museums for Climate Justice, accessed October 14, 2021, https://cmcj.ca/; "Museums for Future," accessed December 11, 2021, http://museumsforfuture.org; and American Alliance of Museums, "AAM Environment and Climate Network," accessed October 14, 2021, https://www.aam-us.org/professional-networks/environment-and-climate-network/.

4. "Jockey Club Museum of Climate Change—賽馬會氣候變化博物館," accessed December 17, 2021, https://www.mocc.cuhk.edu.hk/en-gb/; and "Climate Museum," Climate Museum, accessed October 14, 2021, https://climatemuseum.org.

5. Elizabeth Brabec and Elizabeth Chilton, "Toward an Ecology of Cultural Heritage," *Change Over Time* 5, no. 2 (2015): 266–285, https://doi.org/10.1353/cot.2015.0021.

6. Climate Heritage Network, https://climateheritage.org/.

7. Climate Change and Cultural Heritage Working Group International, *The Future of Our Pasts: Engaging Cultural Heritage in Climate Action* (International Council on Monuments and Sites—ICOMOS, 2019), http://openarchive.icomos.org/id/eprint/2459/, 31.

8. Samantha de Leon, "A Closer Look at Seven '11 Most' Sites Affected by Climate Change," National Trust for Historic Preservation, October 19, 2022, https://savingplaces.org/stories/a-closer-look-at-six-11-most-sites-affected-by-climate-change.

9. The Descendants of Olivewood organization has advocated for increased public funding to manage the cemetery's environmental concerns, and recently won a $3 million grant from the National Park Service. Amal Ahmed, "Climate Change Is Threatening Historic African American Sites in the South," *Southerly Magazine*, September 25, 2019, https://southerlymag.org/2019/09/25/climate-change-is-threatening-historic-african-american-sites-in-the-south/; and Brooke Lewis, "Houston's First Black Cemetery Was Neglected for Decades. One Group Is Leading Its Rejuvenation," *Texas Monthly*, October 29, 2021, https://www.texasmonthly.com/being-texan/olivewood-cemetery-houston/.

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10. Rob Nixon, *Slow Violence and The Environmentalism of the Poor* (Harvard University Press, 2011).

11. Ellen Feingold et al., "These Objects Tell the Story of Human Driven Climate Change," *Smithsonian Magazine*, June 2023, https://www.smithsonianmag.com/smithsonian-institution/these-objects-tell-the-story-of-human-driven-climate-change-180982428/.

12. "Interpreting Climate Change Virtual Course," Presentation, National Park Service online course, April 18–19, 2023.

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22

Climate Change and Collection Ecologies: Biodiversity Lost and Found

Katherine Arnold and Martha Fleming, for the Collection Ecologies Collective

Natural history museums and their collections are deeply entangled in histories of colonial extraction, technological domination, and epistemic injustice. In some cases, it could be argued that the "collection" of nature over several hundred years has played a role in the loss of biodiversity globally. In others, the displacement of "the record" of environments from the Global South to the Global North in these collecting contexts contributed to the loss of local knowledge. And yet, these collections also hold keys to understanding the extent and mechanisms of changes to the earth's vitality, and our cultural connections across peoples, and to nature itself. Can such collections be a platform for reparative acts, both natural and cultural? This essay is a thought experiment investigating these possibilities.

In September 2023, the Prime Minister of Tuvalu, Kausea Natano, arrived in Hamburg to present a case to the International Tribunal of the Law of the Seas. He aimed to garner legal support for the people of several Pacific Island nations facing climate change. In recent years, the region's ocean levels have risen two to three times faster than the global average; the results have been so cataclysmic that, by the end of the century, the Pacific Ocean is predicted to wash over the atolls of Tuvalu. Tuvalu is expected to be one of the first countries in the world to be completely submerged before climate change can be slowed or stopped. Its surging waters also pose extreme risk to drinking water, food security, and energy supply in the present. Likewise, it seems that Tuvalu's financial and cultural impoverishment through European extractivism is now multiplied by their total natural dispossession. Natano stated at the 2023 Tribunal: "Just a few years—this is all we have before the ocean consumes everything my people built across centuries . . . If international law has nothing to say about an entire country going underwater . . . then what purpose does it serve?"[1]

Painfully aware of how desperate their situation is, Pacific Island nations are imagining radical solutions to the complex problems they face. Tuvalu

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has "groundbreaking plans [to] become the first wholly digitized nation existing in the metaverse."[2] Not simply trying to reclaim physical land, Tuvalu has formulated the Future Now Project, a set of three major initiatives designed to preserve its nationhood, governance, and culture: first, encouraging the international community to work together on implementing climate change solutions, embodying the Tuvaluan cultural values of *olaga fakafenua* (communal living systems), *kaitasi* (shared responsibility), and *fale-pili* (being a good neighbor); second, securing Tuvalu's statehood and maritime boundaries under international law in the event their land ceases to exist; and third, the development of a digital nation.[3] In theory, the third initiative allows Tuvaluans, who have a powerful physical and spiritual relationship to their land and oceans, to capture their world as it is today. The Tuvalu government is examining how to use augmented and virtual reality to allow displaced and future generations of Tuvaluans to continue to cohere as both a culture and a nation, complete with a digital record of ancestral knowledge, value systems, consular systems, and government.[4] Nonetheless, translation to the virtual world brings immense challenges. But as Farhana Sultana has argued, the "sense of despair, suffocation, stagnation, abandonment, and regression co-exist with that of revolutionary potentiality, alternative possibilities, collectivizing, worldmaking, and critical hope."[5] How might historians and natural history museums work to help Tuvaluans build a "digital twin" that is fully representative of their cultural *and* natural distinctiveness?[6]

Tuvalu's concept of a "digital twin" is, so far, a proposition and, in many ways, a "thought experiment" intended to challenge international *kaitasi*. One way of contributing to this is through shared knowledge of and access to historical natural history collections. As archives of nature, scientific collections of natural history held in botanic gardens and museums are essential tools in imagining and reconstructing past environments. They are indispensable data banks that can be used across research fields in the sciences, and they can be deployed in the humanities: We can interrogate their attendant archives to understand the political, cultural, epistemic, and environmental issues that both have formed science practice and are continuously produced by it. Museums and their collections are thus unique contexts in which interdisciplinary collaboration between the humanities and the sciences can now forge new methods to address problems arising from climate change and biodiversity loss. Articulating and demonstrating such collection-based methods is a key purpose of the Collection Ecologies Collective.[7] We are concerned with the contemporary challenges and opportunities that accompany questions of the historicization of collections,

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multidisciplinary cooperation, and digitization, so as to make sense of and best use the wealth of natural knowledge these collections hold.

How exactly could information from these collections inform Tuvalu's "digital nation" concept? An example from the nineteenth-century Museum Godeffroy can offer some generative answers. The Museum Godeffroy (1861–1885) was both a displayed collection open to the public and a sales counter for ethnographic and biological material. It was founded in Hamburg by Johann Cesar Godeffroy IV, a wealthy merchant of the J. C. Godeffroy & Sohn trading company. By the mid-nineteenth century, they expanded into the Pacific and South Seas, where they extracted goods such as copra, coconut oil, and pearls, only made possible through exploited Indigenous Pacific Island knowledge and labor. Alongside their trade in economically profitable commodity products, the company also benefited substantially from the natural history "duplicate trade."[8] Godeffroy employed staff stationed in Samoa, Papua New Guinea, Australia, and elsewhere in the South Pacific, requesting at least thirty specimens of each species—little matter which kingdom or family of nature.[9] Through its highly effective and standardized duplicate sales catalogues and logistical streamlining, it distributed and sold material across the globe, including sales made back to the very regions from which it collected in the South Seas.[10] Trading in duplicates could enhance a museum's standing, something that Godeffroy perhaps had in mind while building his commercial empire in the region. Over a few short years, nine thick catalogues containing a high degree of organized and standardized information were produced, and most ethnographic and natural history museums in Europe and the Americas made numerous purchases, which are still held in their collections today. Extrapolating Hans-Jörg Rheinberger's important work on the transformative preparation of scientific specimens that ultimately become representations of themselves, we can conceive of the widely distributed duplicates as collectively representing the pre–climate change environment of much of the Pacific region in the 1860s.[11] Thus, *a set of environments has become a set of collections*. On a grand scale, Godeffroy's Pacific collections could now, in some ways, represent the past environments from which they have been taken.[12]

With Tuvalu's impending catastrophe in mind, and repatriation therefore an impossibility, a valuable form of present-day reparations across the inequality divide and the gulf of colonial history might not be the return of actual physical specimens but rather the contributions to the restitution of environmental *habitat* and *habitus*. The "digital twin" is one way of imagining this. What is significant about Pacific Island natural history

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is that in a considerable number of cases, the islands are so small and their biological populations so unique that a reconstruction of nineteenth-century habitat through the computational analysis of the Museum Godeffroy catalogues could be reasonably effected. The catalogues include all the major families—birds, fish, mammals, amphibians, arachnids, insects, worms, crustaceans, gastropods, corals, and even protozoa—as well as the locations of collection. Once databased, overviews of the biodiversity of specific localities could be extrapolated. This could be even more accurate if the data from Godeffroy's nineteenth-century sale catalogues were linked to twenty-first century data on the vast numbers of duplicate specimens, purchased from the Museum Godeffroy at the time, that are held in a wide range of institutions worldwide.[13] Natural history specimens are of limited value to science without attendant data: Provenance and use information held in and across some 180 years of subsequent catalogues, analytical notes, diaries, and correspondence would be essential to make sense of the environment or conditions in which the materials were collected. Where they exist, they can tell us the place and date of the specimens' collection, notes on habitats and local names, uses of elements of Tuvaluan nature, and much more. Services such as AI, Zooniverse, Transkribus, and other crowdsourcing, text mining, and translation tools could rapidly identify and extract from the nine known Godeffroy catalogues those specimens that were transported from Tuvalu and traded to the rest of Europe's museums. These widely distributed duplicates could now potentially be reassembled to perform previously unimagined feats of both memory and re-worlding through three-dimensional scanning, visualizations, and metadata modeling, helping Tuvalu build their "digital twin" for the future—an entire world of natural life key to Tuvaluan culture.

Although natural history museums have been dangerously underfunded over the last fifty years, they are nonetheless critical infrastructure for understanding a natural world in rapid freefall. That infrastructure also includes—particularly in larger institutions—a wide range of visualization and digitization equipment such as three-dimensional and computed tomography scanners capable of producing high-definition photogrammetric images of specimens and all their complex qualities. London's Natural History Museum imaging department deploys "technologies [that] generate detailed 3D polygon meshes, with photorealistic visual texturing and sub-millimetre measurement accuracy."[14] Such CGI-ready imaging of Pacific Island collections could make a major contribution to Tuvalu's "digital twin." The Global Biodiversity Information Facility (which is

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already working toward a Digital Extended Specimen model) could work in tandem with museum professionals and humanities researchers to aggregate information on Tuvalu specimens purchased in the nineteenth century from Godeffroy.[15] These images and datasets from Global North museums could be conjoined with the vast wealth of local and traditional natural knowledge of Tuvaluans themselves, creating a rich hybrid of intercultural understandings that could underpin the "digital twin."

Looking closely and deeply at the highly distributed collection of nineteenth-century Pacific Island natural history means that we must address the historical conditions in which it was amassed before it was then redistributed for profit from Hamburg. These conditions include highly asymmetrical power relations that live on in the coloniality of the collection themselves and the very fact of their diasporic nature.[16] They also include the erroneous European assumption of a never-ending wealth of prodigious nature that was fused to the paradisiacal projection upon the place of Tuvalu and its racialized people. Collecting was extractive in nature but not necessarily comprehensive: This too reflects asymmetrical interests, and collections are likely to be only partially representative of the time and place. We must also recognize the conditions of epistemic violence that mean that little local or traditional knowledge of these species, or of the vanishing world of which they were a part, were noted or valued in any way during the process of collection. That they were collected concurrently and in the same way as other extractive capitalist ventures must be acknowledged to mean that their removal from Tuvalu is logically subject to any "loss and damage" policies that intend to compensate and mitigate the climate change effects and biodiversity loss experienced by frontline nations with little or no history of carbon pollution.[17]

A critical engagement with the historical context could be complemented by a similar approach to the technological apparatus. Digital restitution and hosting a "digital twin" also bring new problems: Digital imaging, rendering, and server storage have substantial energy and environmental costs. Thinking through such a process thus makes visible specific circularities of recursive colonialism; these are the kinds of contributions that humanities thinking can make to the development of sustainable methods and practices of both decolonial thought and biodiversity loss mitigation.[18] Humanities scholars and museum professionals working together are offering alternative methods for approaching contemporary problems through collections-based research. As interdisciplinary working spaces, museums and their collections are primed

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to be crucial hubs of creative thinking. With "approximately 1.5 billion specimens kept in European Natural History Collections," many with a colonial past, there is much to share and a lot to work with.[19]

Notes

1. Agence France-Presse, "Small Islands Take Ocean Protection Case to UN Court," *VOA News*, September 11, 2023, https://www.voanews.com/a/small-islands-take-ocean-protection-case-to-un-court/7263220.html.

2. Kalolaine Fainu, "Facing Extinction, Tuvalu Considers the Digital Clone of a Country," *Guardian*, June 27, 2023, https://www.theguardian.com/world/2023/jun/27/tuvalu-climate-crisis-rising-sea-levels-pacific-island-nation-country-digital-clone.

3. Fainu, "Facing Extinction."

4. For an overview of South Pacific cultural history, see Nicholas Thomas, *Voyagers: The Settlement of the Pacific* (Basic Books, 2021).

5. Farhana Sultana, "The Unbearable Heaviness of Climate Coloniality," *Political Geography* 99 (2022): 102638.

6. Joanna Dungate, "What Are Digital Twins and Why Do We Need Them?," *The Alan Turing Institute*, March 21, 2023, https://www.turing.ac.uk/blog/what-are-digital-twins-and-why-do-we-need-them.

7. For more on Collection Ecologies, see our website: https://collecte.hypotheses.org/.

8. Ina Heumann et al., "The Issue of Duplicates," *British Journal for the History of Science* 55, no. 3 (2022): 257–278.

9. Birgit Scheps, *Das verkaufte Museum: Die Südsee-Unternehmung des Handelshauses Joh. Ces. Godeffroy & Sohn, Hamburg und die Sammlungen "Museum Godeffroy"* (Abhandlungen des Naturwissenschaftlichen Vereins in Hamburg, N.F. 40, 2005).

10. Several of the catalogues are available on Biodiversity Heritage Library. For example: v. 4–6 (1869–1884), https://www.biodiversitylibrary.org/page/55284962#page/1/mode/1up; and v. 7 (1879), accessed August 18, 2024, https://www.biodiversitylibrary.org/item/266873#page/7/mode/1up.

11. Hans-Jörg Rheinberger, "Making Visible. Visualization in the Sciences—and in Exhibitions?," in *The Exhibition as Product and Generator of Scholarship*, Preprint 399, eds. Susanne Lehmann-Brauns, Christian Sichau, and Helmuth Trischler (Max Planck Institute für Wissenschaftsgeschichte, 2010), accessed January 14, 2026, https://www.mpiwg-berlin.mpg.de/sites/default/files/Preprints/P399.pdf.

12. One of the authors (Fleming) effected sustained research on the Godeffroy collections, catalogues, and specimen labels in 2019–2020 as Petra Kappert Research Fellow at the Centre for the Study of Manuscript Catalogues, University of Hamburg.

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13. A partial reconstruction of Godeffroy material in museums around the world was undertaken by Ole Herbold, "Die Reisen von Eduard Graeffe im Auftrag des Museums Godeffroy (1861–1885) zu den 'Viti Inseln' (Fiji): Eine sammlungshistorische Rekonstruktion ausgewählter faunistischer Funde" (Master's diss., Universität Hamburg, 2022).

14. Natural History Museum London, "3D Visualisation," accessed December 16, 2023, https://www.nhm.ac.uk/our-science/services/facilities/imaging-analysis/3dvisualisation.html.

15. See Alex R. Hardisty et al., "Digital Extended Specimens: Enabling an Extensible Network of Biodiversity Data Records as Integrated Digital Objects on the Internet," *BioScience* 72, no. 10 (2022): 978–987.

16. These epistemic issues relating to the ongoing coloniality of natural history collections are addressed more fully in Martha Fleming, "Afterward: What Goes Around, Comes Around," in *Mobile Museums: Collections in Circulation*, ed. Felix Driver, Mark Nesbitt, and Caroline Cornish (University College London Press, 2021), 328–342.

17. Elena Niehoff, "Tuvalu Rising Against the Tide: Sovereignty Through the Loss and Damage Fund?" (Master's diss., Wageningen University, 2023).

18. "The digitisation of collections, like any other technology, integrates assumptions and preferences—about people, capacities, values—that, if left unchecked, reproduce or reinforce inequities." Katja Kaiser et al., "Promises of Mass Digitisation and the Colonial Realities of Natural History Collections," *Journal of Natural Science Collections* 11 (2023): 13–25.

19. Louise Isager Ahl et al., "Digitisation of Natural History Collections: Criteria for Prioritisation," *Research Ideas and Outcomes* 9 (2023): e114548.

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23

Oppositional History: Pushing Back Against the Attack on the Environmental Protection Agency

Leif Fredrickson, Christopher Sellers, and Jessica Varner

On election night in November 2016, many Americans sat glued to their televisions in shock and dismay as swing state after swing state went for Donald Trump, sealing his victory over Hillary Clinton for the presidency. Among the most shocked and disoriented were academics who study the environment. As what happened began to sink in, many felt forced to set aside their customary, long-honed critiques of the Environmental Protection Agency (EPA) and its all-too-unprotective work. Faced with an incoming president who had declared climate change a "Chinese hoax" and had promised to shrink the EPA to only "a little bit," many of us found the customary repertoire of environmental academia—teaching and writing for professional journals, books, and colleagues, along with the occasional op-ed—inadequate to meet the moral difficulties of this moment.[1]

Later that same November, some environmental academics, including environmental historians, started emailing one another about possibilities for addressing the impending crisis through our collective action. Among the institutional fruits of this alarmed response to the Trump election was an Environmental Data and Governance Initiative (EDGI), including activist-minded academics from sociology, anthropology, geochemistry, applied physics, science and technology studies, and environmental historians, who carved out their distinctive niche within this group. We who joined this effort hope our recounting of our accomplishments can serve as a model for what we'll call "oppositional environmental history." By oppositional history, we mean confronting, as professional historians, the present-day forces that deny basic precepts of environmental or climate citizenship and seek to dismantle environmental governance that can and should protect ordinary citizens against private power and governmental environmental injustice.

EDGI's historians stepped beyond their classrooms and the usual audience of other academics and set aside the individualist bent that our

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history profession generally favors. Joining together *as* environmental historians, we sought to confront the ascent of politicians, parties, and other ruling institutions publicly dead set against environmental and climate citizenship. Whereas op-eds and other public writing have long been part of environmental historians' repertoire, we strove after something more: ongoing, collective research and writing projects that did not just reflect on past environmental politics but also steadily engaged with our political present. Our goal was to more effectively confront the anti-environmentalism and climate denialism that have become such powerful forces in the United States and elsewhere.

In retrospect, the Trump election helped open our eyes to far-reaching changes afoot across our environmental-political and media landscape over the last couple of decades, which have profoundly altered the contexts within which environmental historians work. When our field first matured into a bona fide historical specialty over the 1970s and 1980s, a consensus had existed between America's two major political parties about the value of our nation's recently crafted environmental agencies and laws. The push-back that quelled the attack of the early Reagan administration on these accomplishments only seemed to confirm this shared support. For many of us entering the "new" field of environmental history in the 1980s, it held out prospects whose politics were more subterranean: part of a "long march through the institutions," starting with the academy, that would remediate one disciplinary pillar of long-standing neglect of nature and the environment in American culture.[2] By exploring "the role and place of nature in human life," the profession of environmental history would change how we think about the human past in ways that would make our culture and society less prone to environmental destructiveness.[3] Although the shared sensibility of environmental historians at this time echoed that of political environmentalism, the professionalization of this field required the opening up of questions and terrain that had little to do with environmental politics or policy. And that was where, by the 2010s, most environmental historians had wound up. Our journals and conference sessions hardly ever foregrounded questions about elections or politicians; even histories of environmental laws and agencies drew dwindling attention.

The Trump victory accentuated a rising tide of conservative antienvironmentalism over the preceding decades that has helped make environmental history's assiduously honed independence from political questions and politics seem more untenable, at least for many of us. Not only did the incoming administration deride the need for many environmental protections and the value of public lands, it also regularly cast aspersions on scientific

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expertise, the anchorage for environmental historians' understanding of what nature is and was. The increasing fragmentation of the media landscape, enabled by the Internet and social media and cultivated by moneyed interests, had helped unleash conservative antienvironmental versions of the present framed by a past in which cherry-picked facts and anecdotal argument bolstered ideological fantasies. With conditions made plain by the 2016 election persisting and perhaps worsening, we explore here what our experiences of the late 2010s may suggest about how we, as environmental, climate, and other like-minded historians and related scholars, may continue to respond.

An Oral History of the EPA

From early November 2016, as the network of environmental scholars consolidated and became EDGI, its historians faced urgent questions about the skills and expertise we brought to our shared, interdisciplinary table.[4] Our skills in writing narratives enabled ease of engaging nonacademic audiences not shared by many scientific or social scientific confreres. Some who had been deeply involved in Science and Technology Studies took up a project for which EDGI first established its public reputation: a mass effort to download and "save" federal environmental data. Others seized on an increasingly common method for historians working on twentieth-century or more recent events: oral history.

Over late November and early December 2016, Chris Sellers (environmental historian) joined with Phil Brown (environmental sociologist) to set up a project interviewing employees of the EPA. The precedents were surprisingly few: a handful of interviews conducted by the EPA Alumni Association, mostly with former administrators and those covering recent years by environmental sociologists, several of whom—Jill Harrison, Alyssa Cordner, and Jennifer Ohayon—joined our team. Negotiating a hybrid of oral historical and social scientific methods, we quickly gained Institutional Review Board approval, garnered help from the Alumni Association to find former agency employees, and, in mid-December, began interviewing. Early on, Ruth Bell and others at the Woodrow Wilson International Center for Scholars in Washington, DC—where Sellers was spending the 2016–2017 academic year—also supported the project, with center interns undertaking some early interviews. Over the ensuing years, EDGI academic volunteers, including environmental historians Leif Fredrickson and Jessica Varner, would continue the interviewing and write-ups of this oral history project.[5]

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Initially, our questions concentrated on what employees remembered about the agency's transition from one presidency to another. Our early goal was a collection of memories that could better contextualize the transition we were watching mostly via journalist portraits and news headlines to provide perspectives from EPA career staff about just how unprecedented (or not) the ongoing takeover of this agency by Trump appointees was compared with earlier ones. To entice EPAers' participation, we worked up confidentiality options, extending to complete anonymity, where a person's name and contact info would only remain in the hands of a single interviewer. We made sure to store audio and transcripts in ways that would make them impervious to hacking and took up the end-to-end encryption of tools such as Signal to keep our communications with interviewees private. But by the first couple of months, our snowballing method of locating potential interviewees had also led to contact with those still employed inside the agency. Some career staff also proved willing and eager to continue speaking with us. And so, as the transition to the Trump administration proceeded, our interview team gained a growing—and, it turned out, unparalleled—vantage point on what was happening inside the agency on an ongoing basis, as well as how it compared with recollections of earlier transitions.

The EPA Under Siege

By spring 2017, we had accumulated interviews with at least forty former and current staff and felt ready and, more than that, compelled to get out the word on what we were finding. Over these months, the press confined its coverage mainly to those moves that EPA administrator Scott Pruitt and the Trump White House were legally required to make public, such as their intentions to supplant Obama-era rules for power plants and pesticides. The testimony we had gathered illuminated the many more fronts along which they were actively impeding the internal workings of this fifteen-thousand-person agency: overturning protective rules and guidance, shrinking or purging activities related to climate change, intimidating or sidelining staff who stood in the way. Given the EPA's established role as the nation's premier environmental regulator, we felt the historical perspective of both EPA staff and environmental historians could shine a light on what was happening inside this agency that no one else was providing. We weren't sure how exactly to get the word out. Still, we felt we had to try to reach not just journalists and groups of environmentalists but also those many others whose work and lives were likely to be touched by what

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was unfolding there, in those communities whose environments the EPA is charged with protecting. So, through the volunteered time and energy of those involved with our EPA oral history project as well as other volunteers who had lent their digital publishing expertise to EDGI, in mid-June, we put out EDGI's first white paper, inaugurating a series entitled "100 Days and Counting. . . ."[6]

The report, entitled "EPA Under Siege: Trump's Assault in History and Testimony," argued that "the unfolding approach to our environmental state under Trump has broken dramatically not just with Obama's policies but with those of many earlier administrations." The interviews enabled an at-once collective and personalized portrait of what had happened inside the agency through the first five months of Pruitt's tenure, including a compendium of anonymous quotes from our interviews. We sought to capture what Pruitt and other political appointees' "back to basics" approach meant for this vital agency's work as the atmosphere it stirred among agency staff: the plunging morale and sense of betrayal, the mixture of resignation and resistance. Their memories of how this transition compared with others they had experienced, intertwined with archives, historiography, and budget and staff data, led us to the conclusion the Trump administration posed "the greatest threat to the US Environmental Protection Agency . . . in its entire 47-year history."

This report gave EDGI its first experience breaking a vital news story. Through June into July, a wide array of journalists reached out to us in preparation for pieces on what was going on in this agency, and by early August, the story of turmoil inside the agency made *The New York Times* via a front-page article that mentioned and linked to our report.[7] Even though Pruitt himself would remain at the agency's helm for another year, we felt we had played a significant role in stirring that "public spotlight on the environmental and science-related actions of the Trump administration" for which our report had called, at least as a first step to slowing or halting the damage being wrought. As academics, we also sought more scholarly and peer-reviewed placement of our findings, and although that took longer, the peer review polished our evidence and arguments. Two articles based on this project appeared in the April 2018 *American Journal of Public Health*.[8] One situated the early Trump administration within the more extended history of presidential assaults on the EPA; the other framed the new administration's friendly relations with regulated industries as incipient regulatory capture, the first scholarly application of this concept to a federal agency under Trump.

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Enforcement Story

After the "EPA Under Siege" report, EDGI began an investigation of enforcement at the EPA, further illustrating the potential of oppositional history. Our knowledge of past assaults on the EPA, the Trump administration's rhetoric about deconstructing the "administrative state," and information from EPA sources all indicated that enforcement might be on the chopping block. Our investigation faced three challenges. One was that without any public window on the pressures on enforcement staff, we would have to rely heavily on confidential oral history interviews and other insider information from EPA staff. A second was a need to understand the profoundly complex legal processes and confusing (and often inconsistent) terminology and categorization related to enforcement. A third issue was the difficulty of navigating the EPA's byzantine and partially online enforcement datasets and digging up older data to put together a comprehensive and historically contextualized picture of enforcement under Trump.

These efforts came to fruition in November 2018 when we published "A Sheep in the Closet: The Erosion of Enforcement at the EPA."[9] The name was a reference to a famous quote by former EPA administrator William Ruckelshaus, who argued that the EPA needed to be a "gorilla in the closet," a credible enforcer, ready to take action against polluters when states (who do most of the actual enforcement) either could not or would not take action. Our data analysis showed that the dive in enforcement during the Trump administration was not just a minor dip in numbers or only valid for a few metrics. Instead, we established an across-the-board drop in enforcement numbers after 2016 to the lowest levels in decades.

Just as importantly, our interviews and contacts with the agency gave us a unique peek into what was going on in the agency and why enforcement was so weak. Leaked documents from the agency's internal review not only confirmed the drop in enforcement numbers but also suggested damning reasons for it that we also heard from our interviewees: the increased openness to industry requests and influence, suppressive interventions from headquarters on long-standard enforcement practices, the diminishment of resources, and the chilling effect on staff of the EPA leadership's rhetoric, tone, and policies. Combining long-term analysis of enforcement data with analysis of documents and testimony from the interviews allowed us to tell a deep and comprehensive story of enforcement decline under Trump.

The "Sheep in the Closet" report garnered attention from the media, Congress, the EPA, and other executive branch agencies. In late 2018 and early 2019, EDGI's analysis was discussed in numerous news outlets.[10] In

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January 2019, EDGI sent Leif Fredrickson to Washington, DC, to meet with congressional staffers. Given the interest in Trump's environmental approach at the time, many Democrats were eager to meet.

Later in January, the EPA released its annual enforcement report. As part of the report, it tried to tout aspects of its enforcement record, namely the "doubling" of its waste-reduction numbers between fiscal year 2017 and 2018. However, the development of our historical enforcement dataset allowed us to respond quickly to this boast. We wrote a blog post showing that the 2017 numbers were the worst on record (which went back to 2008), and the 2018 numbers, despite their doubling of 2017, were the second worst on record. Our blog post quickly made it into the press. It was highlighted in the House Energy and Commerce Committee's early February call for a hearing on EPA enforcement (at this time, the House was controlled by the Democrats). Around this time, committee staff also requested that an EDGI representative participate in a congressional hearing on EPA enforcement. On February 26, Chris Sellers represented EDGI in this hearing, showing the unprecedented assault on EPA enforcement under Trump and arguing, along with two other experts, that this decline in enforcement was "corroding the Federal commitment to protect health and the environment."[11]

Although it is hard to know exactly what effect our enforcement work had, we know, from both public statements and our contacts in the EPA, that we earned the ear and irritation of EPA's political leadership. This work and other news stories broken by EDGI may also have played a small but still significant role in the mounting political pressures that, in July 2018, forced Scott Pruitt to resign. Although his successor, Andrew Wheeler, continued much of what Pruitt had started, just more quietly, the EPA did reconsider some of its practices for recording and publicizing available enforcement data. EDGI's work on enforcement also continued through follow-up reports and an Environmental Enforcement Watch project, mirroring and analyzing EPA's enforcement data to make it more publicly accessible. We informed (inspired?) the Government Accountability Office in its analysis of enforcement at the EPA. And we continued to have active conversations with journalists, congressional staff, and activists concerned with EPA enforcement.[12]

Making a Public Archive

In 2020, EDGI members shifted priorities from collecting information and interviews about the US Environmental Protection Agency to making the

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research accessible through some enduring platform that could give voice to our oppositional history of this agency. With more than a hundred interviews with current and former agency employees and hundreds of pages of EPA primary documents, the larger question remains: how to put the resources out to a broader public while clarifying the complex agency workings. Books, reports, and peer-reviewed literature often speak to an isolated audience. In early brainstorming meetings, EDGI members discussed how to collaboratively turn the resources into something more—something available without paywalls or sign-ins, something facile, something clear, something more immediate. A resource that could expand and contract—a resource for the public, students, activists, and journalists to understand the Environmental Protection Agency's national and global role. The meetings were distilled toward one idea: to create a digital collection, a public history, and a counter-history of the EPA.

Over the following months in 2020, with a public history website in mind, EDGI cocurators Leif Fredrickson and Jessica Varner brought on the design team, Omnivore, to collaborate and create a flexible website that would grow over time. The website took cues from the EPA's historic 1970s rebranding to resonate with an era of agency power, contrasting with the EPA's Pruitt decline. Next, the team collaborated on what to name the new counter-history EPA archive—including a vast array of resources, from EDGI agency's interviews, findings, public resources, timelines, data analytics, compiled primary sources from crucial documents in the EPA's history, and more. The website's name, "A People's EPA," APE, offered a way to rethink the agency's role and purpose—an agency not born of industry and environmental harm but centered on people and the environment's health and well-being. It also offered a second meaning, a counter to what the agency had become: a bureaucratic entity with waning power and shrinking influence at a time when climate change, environmental injustice, and repair emanated from movements and communities across the US.

Launched fifty years after the founding of the EPA, "A People's EPA" went live in December 2020 with limited resources, including a handful of transcribed interviews, PDF transcripts, and corresponding audio.[13] Shortly after, the team published a weekly log of events around Biden's EPA happenings "to continue holding the EPA accountable." APE grew to include accessible stories and more interviews around essential agency histories. The website published several public history timelines on the EPA, "EPA and Climate Change," or "Budget and Enforcement," with partners and collaborators, such as University of Montana students, data visualization experts, and other environmental historians. It provided a portal

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to a Freedom of Information Act (FOIA) repository started by EDGI in collaboration with the Columbia University–based Toxic Docs as well as the Sierra Club and other green groups that, for the first time, made FOIA documents from the Trump era both publicly available *and* keyword searchable. And the resources continue to expand. The website is growing to include community-led FOIA work on the EPA and related agencies in Alaska and Texas. "A People's EPA" offers a cumulative resource to reach across institutional, educational, and public-focused histories, with an underlying message of action and accountability for what the EPA promised at its start, "designed to clean up the problems of the past, and to deal with emerging problems before they become critical."[14] The EPA's initial pursuit remains crucial and never so vital as it is now as the world deals with the lived experience of climate change. Our experiences are proof of concept and show just how much an oppositional environmental history can do to support these goals.

Notes

1. Edward Wong, "Trump Has Called Climate Change a Chinese Hoax. Beijing Says It Is Anything But," *New York Times*, November 18, 2016, https://www.nytimes.com/2016/11/19/world/asia/china-trump-climate-change.html; and Arthur Neslen, "Donald Trump 'Taking Steps to Abolish Environmental Protection Agency,'" *Guardian*, February 2, 2017, sec. US news, https://www.theguardian.com/us-news/2017/feb/02/donald-trump-plans-to-abolish-environmental-protection-agency. EDGI members and collaborators who contributed in many ways include (in alphabetical order) Chris Amoss, Praise Cano, Mark Chambers, Alissa Cordner, Lindsey Dillon, Leif Fredrickson, Steven Geofrey, Charles Halvorson, Jill Harrison, Katarzyna Kaczowka, Ellen Kohl, Katherine Kulik, Jennifer Ohayon, Emily Pawley, Christopher Sellers, Marianne Sullivan, James Morton Turner, Jessica Varner, Tyler Wedrosky, and Jaime Zwaschka; APE website design by Omnivore Inc.; APE website development by Alfredo Gonzalez and Osvaldo Pulido.

2. Timothy Shenk and Michael Kazin, "Was the Long March a Dead End? An Exchange on Radicals and the University," *Dissent Magazine*, accessed December 29, 2023, https://www.dissentmagazine.org/article/was-the-long-march-a-dead-end-an-exchange-on-radicals-and-the-university/.

3. Donald Worster, "Transformations of the Earth: Toward an Agroecological Perspective in History," *Journal of American History* 76, no. 4 (March 1990): 1089.

4. Lourdes A. Vera et al., "Data Resistance: A Social Movement Organizational Autoethnography of the Environmental Data and Governance Initiative," *Mobilization: An International Quarterly* 23, no. 4 (2018): 511–529, https://doi.org/10.17813/1086-671X-24-4-511.

5. See note 1.

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6. Christopher Sellers et al., "The EPA Under Siege," Environmental Data and Governance Initiative, 2017, https://100days.envirodatagov.org/epa-under-siege/.

7. Coral Davenport and Eric Lipton, "Scott Pruitt Is Carrying Out His E.P.A. Agenda in Secret, Critics Say," *New York Times*, August 11, 2017, https://www.nytimes.com/2017/08/11/us/politics/scott-pruitt-epa.html.

8. Leif Fredrickson et al., "History of US Presidential Assaults on Modern Environmental Health Protection," *American Journal of Public Health* 108, no. S2 (2018): S95–103, https://doi.org/10.2105/AJPH.2018.304396; and Lindsey Dillon et al., "The Environmental Protection Agency in the Early Trump Administration: Prelude to Regulatory Capture," *American Journal of Public Health* 108, no. S2 (2018): S89–94, https://doi.org/10.2105/AJPH.2018.304360.

9. Leif Fredrickson et al., "A Sheep in the Closet: The Erosion of Enforcement at the EPA," Environmental Data and Governance Initiative, May 31, 2019, https://envirodatagov.org/publication/a-sheep-in-the-closet-the-erosion-of-enforcement-at-the-epa/.

10. Among others: *E&E News*, *Inside EPA*, *High Country News*, *The American Prospect*, and *The Christian Science Monitor.*

11. Leif Fredrickson, "Pollution and Hazardous Waste Reduction Is the Lowest on Record Under Trump's EPA," February 1, 2019, archived version available at https://web.archive.org/web/20221210054951/https://envirodatagov.org/pollution-and-hazardous-waste-reduction-is-the-lowest-on-record-under-trumps-epa/; House Committee on Energy and Commerce, "E&C Democratic Leaders Reiterate Demand for Information on EPA Enforcement Actions," February 4, 2019, archived version available at https://web.archive.org/web/20221117132735/https://energycommerce.house.gov/newsroom/press-releases/ec-democratic-leaders-reiterate-demand-for-information-on-epa-enforcement; and "EPA's Enforcement Program: Taking the Environmental Cop Off the Beat: Hearing Before the Subcommittee on Oversight and Investigations of the Committee on Energy and Commerce, House of Representatives," 116th Congress, February 26, 2019.

12. Sara Wylie et al., "Democratizing Data: Environmental Enforcement Watch's Report Cards for Congressional Oversight of the EPA," Environmental Data and Governance Initiative, October 22, 2020, https://envirodatagov.org/publication/democratizing-data-environmental-enforcement-watchs-report-cards-for-congressional-oversight-of-the-epa/.

13. Leif Fredrickson et al., https://www.apeoplesepa.org.

14. Richard Nixon, "Special Message to the Congress Outlining the 1972 Environmental Program." February 8, 1972, speech, US Presidential Records.

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24

Historians and Climate Necessity Defense

Amy Woodson-Boulton and Troy Horton

Although multiple groups, governments, and individuals are working to curb planet-warming emissions through legislation, the courts are one of the most powerful levers for addressing climate change. One legal strategy in particular, Climate Necessity Defense (CND), has great potential to support climate activists engaging in nonviolent civil disobedience. CND can facilitate mass participation in nonviolent climate activism, educate the public and the judiciary, and set new legal precedents that acknowledge the threat of climate change. Historians can play a vital role in this defense by serving as expert witnesses for climate activists facing trial for nonviolent protests.

Historians are especially important for the necessity defense because they can give juries the broader context that is critical in CND cases, showing courts the interactions between humans and the natural world (or among humans and nonhumans). This is particularly crucial for CND, which requires showing the court why an act of civil disobedience was justified. Historians can provide the bigger picture about environmental history, civil disobedience, and democracy.

What Is CND?

Necessity defense is a long-standing legal strategy for defendants who believe, as William Quigley has written, "that even though they broke a minor law, their actions were justified because they tried to prevent a more serious harm."[1] Going back to English common law since the 1550s, the strategy allows the defendant to argue that "necessity" drove them and that, given the larger context, they should avoid legal punishment.[2] Although early cases were often around specific emergencies—for example, destroying property to save lives at sea or in a fire—the strategy took on renewed

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use and meaning during political protests in the twentieth- and twenty-first centuries, notably against the US wars in Vietnam and Iraq.[3]

Climate Necessity Defense builds on this history, arguing that any damage caused by nonviolent climate protest is far less than the catastrophic effects of climate change itself. Activists and their legal teams first used the necessity defense in a climate case in the United Kingdom in 2008, and recently it has been used in multiple other countries. It has been used in at least thirty-one cases in the US, in other common-law areas (Australia and Canada), and increasingly in continental Europe (France and Germany, with notable success in Switzerland).[4] CND depends on the judge allowing it, and even when the defense is permitted, such cases are often dismissed or end in a hung jury. However, every time there is a successful climate case, it creates a legal precedent and puts more political pressure on governments to rein in climate-changing emissions. It is also a crucial form of public education, allowing defendants to explain to the judge, jury, and (through media coverage) the broader public the need for rapid action on climate change. Activists whose cases get dismissed or who are found not guilty can continue to spur change, and their success makes others more likely to engage in protest.[5]

A real-life US example comes from retired socially responsible investment adviser Troy Horton, coauthor of this essay. In May 2022 and March 2023, Troy chained himself to a Wells Fargo bank branch in Tempe, AZ.[6] He did this to bring attention to the bank's financing of fossil fuel projects, leading to the imminent and future harm we are facing from climate breakdown. Troy knew he was breaking a law, but he knew the harm he caused was much less than the harm he was trying to prevent. As expected, his action resulted in his arrest, which led to press coverage and a CND trial that helped publicize the financial industry's continued investment in fossil fuels.

How Can Historians Support CND?

Although specific elements vary from state to state, legal teams using the necessity defense need to prove the following fundamental points:

1. That the harm the defendant caused was less than the harm that they were trying to prevent. (Was the harm caused by trespassing less than the harm that the company is doing to the environment?)
2. That the harm they were trying to prevent was imminent. (Is there immediate damage that is occurring as our climate is warming? Are we

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seeing that harm in increased weather events, fires, droughts, and so forth?)

3. That they had tried other reasonable alternatives that had not worked. (Has going to marches, calling elected officials, writing letters, signing petitions, and taking similar actions been ineffective in stopping the crisis?)

Testimony from expert witnesses is critical to CND's success. Historians can give crucial context for the defendant's actions, explaining how civil disobedience has been effective in making change with testimony about social movements (for example, civil rights, labor, anticolonial, and women's suffrage movements, among many others). Historians' testimony can also provide crucial perspective on the harm the activist was trying to prevent. Environmental and climate historians can testify about human interactions with the natural world. This might mean the broad sweep of modern industrialization and resource extraction, or it might mean providing context about specific locations, industries, or ecosystems. Climate scientists can testify that we are, in fact, in imminent danger, caused by burning fossil fuels, which will increase if we continue to keep burning fossil fuels.

If you can serve as an expert witness, the defense's legal team will train and prepare you for your testimony. While it is natural to be nervous about being in a courtroom, people who have become expert witnesses have felt very positive about the process and appreciated the importance of supporting those who are willing to risk arrest. It is time for all people who understand the truth of what we are doing to the planet to speak out. Being an expert witness is a powerful way to use your knowledge and your humanity to make a meaningful step to affect our future.

Not all historians will be easily able to contribute to a CND case as an expert witness. The other author of this essay, Amy Woodson-Boulton, works on British cultural history and the history of museums, so her testimony is unlikely to be useful in a US CND case. Instead, motivated by her deep anxiety about the future, Amy has been working to engage historians and other academics in the climate movement. CND offers her (and you!) a fantastic opportunity for building academic activism: Even if you do not participate in a CND case yourself, anyone reading this can reach out to colleagues to educate them about necessity defense and why, along with the other strategies outlined in this book, it is a vital contribution to the climate movement. Historians have a special ability to put what is happening now into a longer context; serving as an expert witness in a CND case is a climate action uniquely suited to our professional training and skillset.

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Even if you cannot yourself serve as an expert witness, you can work with climate activists and your professional networks to expand the pool of experts and speak out publicly about climate change, activism, and CND.

Educating the broader climate movement about this type of legal strategy can help activists think about their goals and the meaning of their acts of civil disobedience. Connecting activists and experts is a key element here: Necessity defense can both encourage wider participation in climate activism and help activists more effectively choose how, where, and why to protest. Whether or not you are ready to chain yourself to a bank to protest funding for fossil fuels, you can be someone who uses your expertise to help courts—both judges and juries—and the media understand what is at stake in our current moment.

The climate movement needs to be as broad as possible to succeed in equitably bringing emissions down to prevent more than a 1.5°C temperature increase. For this to happen (and as the rest of this book shows), we need people working across as many fields and in as many ways as possible. Networks across different disciplines, areas of expertise, and economic sectors can help amplify public understanding of the problem, establish precedents and useful models, and broaden the pool of engaged people finding ways to contribute. Troy's cases helped do this: Even though like many CND cases his were ultimately dismissed, the hearings resulted in press coverage, training for his expert witnesses, and educating the court about climate change and necessity defense.

Participating in Climate Necessity Defense can amplify your voice and those of the activists who are willing to risk arrest. If you are interested in this important work, please reach out to the Climate Defense Project and/or Scientist Rebellion. Troy knows how important it was having the help of expert witnesses supporting his action. Without that support, the charges would not have been dismissed. Historians' participation in CND can help give future generations a chance of a livable world. Please consider becoming an expert witness!

FAQs About Serving as an Expert Witness

Will I be required to travel? If so, will those expenses be paid for?
Our goal is to train and have experts across the United States. This will reduce travel expenses that climate activists need to cover. In general, you can expect to have travel and lodging expenses paid for, but not be paid for your time. You will be helping those who are willing to risk arrest and help them know that they will be supported in their actions.

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What will getting trained as an expert witness involve?
This will typically be done virtually, providing you with resources and information about how the trial is likely to proceed, what sort of questions would likely be asked, and a practice session(s). Scientists and academics who have done this have ended up feeling empowered by the process and appreciated the opportunity to use their knowledge to help.

How can I get involved?
The Climate Defense Project is actively working on CND cases, keeps a running list of cases and resources for activists, and can add you to their list of potential experts.

Some other organizations that might need volunteer historians are listed in the resource section to part IV.

Notes

1. William P. Quigley, "The Necessity Defense in Civil Disobedience Cases: Bring in the Jury," *New England Law Review* 38, no. 1 (2003): 3–72, 3.
2. Quigley, "Necessity Defense," 6.
3. Quigley, "Necessity Defense," 3.
4. Paolo Mazzotti, "The Necessity Defence in (the Swiss) Climate Protest Cases: Democratic Contestation in the Age of Climate Activism," *European Law Journal* 29, no. 3–6 (2023): 393–421, https://doi.org/10.1111/eulj.12497. See also Climate Defense Project, "Climate Necessity Defense Case Guide," 2021, https://climatedefenseproject.org/wp-content/uploads/2022/07/CDP-Climate-Necessity-Defense-Case-Guide-Aug-12-2021.pdf.
5. Mazzotti, "Necessity Defence," 397.
6. Zayna Syed, "A Grandfather Politely Ties Himself to a Bank Door to Protest Fossil Fuel Investments," *The Arizona Republic*, May 20, 2022, https://www.azcentral.com/story/news/local/arizona-environment/2022/05/20/protester-ties-himself-wells-fargo-door-protest-investments/9847823002/.

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25

The Fierce Urgency of History: Public Outreach and the Struggle Against Arctic Refuge Drilling

Finis Dunaway

I kept waking up in the middle of the night, thinking "it's going to pass." After decades of environmental and Indigenous advocates fighting to protect the Arctic National Wildlife Refuge from oil and gas development, I feared that drilling proponents might finally prevail.

In these moments, I often thought about the people I'd interviewed, including Faith Gemmill, a Neets'aii Gwich'in from Arctic Village, Alaska. Faith and I had met for breakfast in Anchorage a couple months earlier in August 2017. We talked about how the Gwich'in Nation transformed the Arctic Refuge debate from a traditional wilderness battle into a fight for Indigenous rights and environmental justice. The Gwich'in live in communities dotted across northeastern Alaska and northwestern Canada. For them, the refuge struggle encompasses culture, identity, and relations of responsibility with the Porcupine caribou herd—thousands and thousands of caribou that migrate every year to the Arctic Coastal Plain to have their young.

Gemmill wanted me to understand the challenges in building alliances with environmentalists. She recalled advice a Gwich'in elder once gave to her. Speaking about environmentalists, he said, "We'll work with them; we'll have respect for each other. But in the ultimate end, we might end up standing alone." "So I always remember that," she continued, "because they're not invested. They don't live here. It's not their children that will be impacted. So, for them, they could walk away tomorrow, and jump on some other issue . . . and leave us hanging."[1]

I didn't come to Alaska as an environmental advocate but rather as a historian trying to understand the long struggle to protect the Arctic Refuge. Still, Gemmill's comments made me reflect on my responsibilities as a scholar to this place and, especially, to the people whose lifeways would be devastated if it ever became an industrialized oil field.

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In 2014, when I began researching this history, I had no idea that I would later try to engage in public outreach. At the time, the hotly contested debates over the Arctic Refuge slumbered in a rare period of political dormancy. Like other Republican presidents before him, George W. Bush had aggressively pushed to hand over the refuge's coastal plain to the oil and gas industry. But those efforts came to naught, as a series of razor-thin votes in Congress had protected this Alaskan land from fossil fuel development. The debate remained in relative quiescence through both terms of Barack Obama's presidency but then, in 2017, suddenly returned with a vengeance.

By the time Donald J. Trump came into office, my research had taken an unexpected turn into microhistory. The more I delved into this history, the more I realized how much a conventional, Beltway-focused account would miss. I was struck by the surprising impact of grassroots organizing and by the unlikely alliances forged between Indigenous peoples and environmental activists. The microhistory I was piecing together helped me understand this struggle from a different perspective and inspired my modest efforts at public outreach. Both emerged out of a sense of responsibility to the people and place I was researching—and out of a sense of urgency as the Arctic drilling plan rapidly advanced through Congress.

Even with Trump installed in the White House and Republicans boasting majorities in both houses of Congress, Arctic drilling proponents knew that a stand-alone development bill would not survive the sixty-vote threshold needed in the Senate. So, they took a different tack, attaching it to a filibuster-proof budget bill called the Tax Cuts and Jobs Act of 2017. As part of a sweeping tax code overhaul that would slash taxes (especially for the wealthy and corporations) to the tune of 1.5 *trillion* dollars, the Arctic Refuge lease sale was cynically touted as a revenue-generating measure to bring in 1 *billion* dollars to the federal coffers.

One evening, as the tax bill was winding its way through Congress, I had a long phone conversation with Norma Kassi, a citizen of the Vuntut Gwitchin First Nation, longtime defender of the Arctic Refuge, and someone I'd interviewed a couple times in the Yukon. Kassi emphasized that she and others had entrusted me with their stories and knowledge—and now the Arctic Refuge, a place that was sacred to their people, that was essential to their food security and cultural survival, was under threat. I needed, she said, to see myself as part of the story, as someone who could use my research to support this struggle. It was incumbent upon me to find some way, no matter how small, to contribute to the fight. Kassi insisted that, as a historian, I had connections and forms of privilege that could be useful to

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her community. Too often, we as academics see ourselves as basically powerless and completely irrelevant to contemporary struggles. Kassi helped me understand otherwise.

As we talked, something powerful and unexpected happened: It was as if the line between past and present suddenly disappeared. People such as Kassi, whom I was researching and writing about historically, were now people with whom I began collaborating on the current issue. The following week, we wrote an op-ed together, which appeared in Canada's *Globe and Mail* newspaper. It was the first time I published a piece that used historical research to comment directly on current politics. Kassi and I wrote the article with a Canadian audience in mind, hoping that it might encourage Prime Minister Justin Trudeau to take a more proactive stance in fighting a Trump policy that would have potentially catastrophic impacts upon Indigenous communities in the Yukon and Northwest Territories.[2]

Around that time, I also began working with Subhankar Banerjee, an Arctic photographer and activist whom I'd interviewed. Banerjee had played a crucial role in the refuge campaign during the George W. Bush years—a time when the issue frequently received front-page coverage. In contrast, we were both dismayed to see how little attention the new drilling plan was receiving. It seemed like the proposal was going to sail through Congress while remaining completely out of the media spotlight. We pitched op-ed ideas to various US newspapers but to no avail. Out of a sense of desperation, we decided to launch an open letter campaign to Congress, soliciting support from scholars across the United States and Canada.

Congress, though, soon passed the tax bill, which Trump signed on December 22, 2017. Never before in the long history of the Arctic Refuge fight had both Congress and the president approved a drilling plan. During the next couple years, as the Trump administration conducted the Environmental Impact Statement process, Banerjee and I organized open letters to the Bureau of Land Management in the hopes of creating a robust record of opposition.[3]

I have no idea whether such letter campaigns have any direct political impact, but collaborating with Banerjee and others helped me overcome my doubts about venturing into current debates and trying to write about the present. It also gave me the chance to witness history in action, including attending and testifying at a 2018 Bureau of Land Management public hearing. I was impressed by the range of refuge defenders who spoke and how they connected the drilling debate to broad, systemic issues—especially to biodiversity, climate change, and Indigenous rights. I later wrote an

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article, based primarily on their testimony, to share their voices and document history as it was unfolding. I gradually became more comfortable with writing advocacy-driven pieces directed toward a specific news item or event. I tried to incorporate a historical perspective in these articles, even if the main focus was a call to action: Congress, add a provision to the climate bill to cancel the Arctic Refuge drilling program; President Biden, while you work to protect the refuge, don't sacrifice the Western Arctic to fossil fuel development by ConocoPhillips and the Willow Project.[4]

I know this type of writing is not for everyone—nor should it be. I also believe that historians can make more lasting contributions to public dialogue in other ways. It took me a long time to figure this out, but we can strive to share our research in smaller chunks with readers who would not usually stumble across our scholarship. The key, for many media outlets, is to try to connect something happening in the present with particular strands from our research. With the ongoing refuge fight, I found that I could latch onto a news hook or historical anniversary and use that as an opening to address a broader historical theme: The first-ever lease sale of the Arctic Refuge provided a timely moment to discuss the history of Gwich'in advocacy; the twentieth anniversary of a controversial Smithsonian exhibit, the chance to reflect on the role of non-iconic images in building grassroots movements; and the release of a revised Environmental Impact Statement, the opportunity to trace the ways that science has been weaponized and distorted throughout the entire history of the Arctic drilling debate. From these experiences, I learned how I might share my research with readers who would never pick up my book.[5]

When I began researching the Arctic Refuge, I assumed that the debate fell into the familiar grooves of the wilderness ideal, with environmentalists upholding this place as a sequestered realm, completely cut off from human society and systemic environmental problems. From a distance, it seemed that the refuge campaign worked to reinforce the nature–culture dualism and to distract from long-term, escalating environmental crises.[6] The research opened a portal to a surprising story in which certain environmentalists were willing to listen to and learn from Indigenous peoples and, in turn, work together to build larger coalitions. The strangeness of the past, even the recent past, can provide us with empowering models for present action.

Viewing this history from the perspective of the grassroots also gave me a deeper appreciation for contingency, for the tense times and pivotal moments when the outcome could have gone either way. Even though refuge defenders lost a major battle in December 2017, the first-ever lease

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sale in 2021 turned out to be a bust. No major oil companies placed bids, and most leases were bought by an Alaskan state-run corporation that does not even own drilling equipment. Nevertheless, the Tax Cuts and Jobs Act of 2017 radically redefined the statutory purpose of the Arctic Refuge to include fossil fuel development. It is still the law of the land, so the future of this place remains uncertain.

The outreach efforts that I have described here grew out of particular relationships with particular people related to the history of a particular place. Although I hesitate to offer any general lessons or conclusions from experiences so grounded in specificity, I would emphasize the importance of listening to and learning from communities before you dive into public advocacy work. You might also try to build relationships with activists and staff members of grassroots organizations to find out how your research and public writing might be useful to contemporary struggles. Being involved in these networks can give you insight into the rhythms of campaigns and when, for example, an op-ed might be best timed to advance a particular issue.

Arctic Refuge defenders made me rethink the aims and purposes of writing history. They also made me grapple with the responsibilities we have, as scholars and educators, to the peoples and places we study. Most of all, this experience made me understand the fierce urgency of history and the importance of infusing our writing and teaching with a sense of contingency and possibility. The future, after all, remains unwritten.

Notes

1. Faith Gemmill, interview with author, Anchorage, Alaska, August 6, 2017.

2. Finis Dunaway and Norma Kassi, "An Irreplaceable Ecological Treasure Is About to Be Auctioned Off for Oil. Will Canada Step Up?," *Globe and Mail*, November 4, 2017, https://www.theglobeandmail.com/opinion/an-irreplaceable-ecological-treasure-is-about-to-be-auctioned-off-for-oil-will-canada-step-up/article36835552/.

3. In total, we wrote three open letters, the last of which was coauthored and co-organized with Rosemary Ahtuangaruak (Iñupiaq) and Norma Kassi (Vuntut Gwitchin). See https://www.commondreams.org/views/2019/02/11/arctic-refuge-protectors-open-letter-teachers-and-scholars.

4. On testimony at the Bureau of Land Management public hearing, see Finis Dunaway, "Arctic Drilling Is 'Ecocide on an Incredible Diversity of Wildlife,'" *Truthout*, November 29, 2018, https://truthout.org/articles/arctic-drilling-is-ecocide-on-an-incredible-diversity-of-wildlife/. The other pieces described here include "It's Congress' Turn to Stop Arctic Refuge Oil Drilling," *The Hill*, June 12, 2021, https://thehill.com/opinion/energy-environment/558129-its-congress-turn

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-to-stop-arctic-refuge-oil-drilling/; "Trump Sold Off the Arctic Refuge—Congress Must End This Risky Boondoggle," *The Hill*, January 24, 2022, https://thehill.com/blogs/congress-blog/energy-environment/591004-trump-sold-off-the-arctic-refuge-congress-must-end/; and "Big Oil Wants to Refreeze Alaska Permafrost—So It Can Keep Drilling There," *Truthout*, August 25, 2022, https://truthout.org/articles/big-oil-wants-to-refreeze-alaska-permafrost-so-it-can-keep-drilling-there/.

5. Finis Dunaway, "Indigenous Advocacy Transformed the Fight over Oil Drilling in the Arctic Refuge," *Washington Post*, March 14, 2021, https://www.washingtonpost.com/outlook/2021/03/14/indigenous-advocacy-transformed-fight-over-oil-drilling-arctic-refuge/; "Did One Photograph Change the Fate of the Arctic Wildlife Refuge?" *Washington Post*, March 3, 2023, https://www.washingtonpost.com/made-by-history/2023/03/03/arctic-wildlife-refuge/; and "The Arctic Refuge Has Always Been a Case Study in Weaponizing—or Worse—Science for Oil," *TIME*, February 8, 2024, https://time.com/6332304/arctic-refuge-drilling-distortions/. The book is Finis Dunaway, *Defending the Arctic Refuge: A Photographer, an Indigenous Nation, and a Fight for Environmental Justice* (University of North Carolina Press, 2021), which has a companion public history website at https://defendingthearcticrefuge.com.

6. For an influential critique of the wilderness ideal, see William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," in *Uncommon Ground: Toward Reinventing Nature*, ed. William Cronon (W. W. Norton, 1995), 69–90.

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What Do Journalists Need from Historians?

An interview with Amy Westervelt, March 12, 2024

Emily Pawley: What are some things that historians need to understand about how climate journalists work?

Amy Westervelt: Let's see. Even if you're on staff at a publication, you still have to convince your editor to let you write a story. It's as important to figure out who the editor is and what their deal is as it is to build a relationship with a particular journalist. The editor is the person deciding not just what does and doesn't get covered but also how it gets covered. If you're trying to get a staff journalist to talk to you, you have to think in terms of "how am I gonna get this past this person's editor?"

US editors in particular are allergic to history. I don't know when that started happening. Whenever I put something out on my own that is all history, people fucking love it. People are like,"Oh, this is so interesting—I had no idea that there was this shared history between the oil industry and *The New York Times*," for example. Every time I try to pitch that stuff to an editor, they're like, "But what's the news hook? Why is it important today?" It's not enough to say, "Well, you would never end up with *The New York Times* brand studio today if you didn't have Herb Schmertz inventing the advertorial in 1970." That's a thing for history folks to have in mind—how do I frame this as a current story?

Even though most publications are online now, they have shorter word counts than ever. They're all convinced that no one will read more than 900–1,200 words. There's currently a huge obsession in the climate space with data; anything that you can peg to new numbers is automatically gonna be more appealing.

Oh, there's a whole trend, in climate journalism in particular, being driven mostly by the climate foundations. Their biggest fear in funding journalism is that they're investing in something that they can't control that's hard to measure the impact of. Their way around that has been to fund these quasi-journalistic research organizations—groups like the Energy and Policy Institute, Documented, DeSmog, Aria. They hire what

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they call "investigators," often journalists who've been laid off, to do investigative work, and then they hand that work over to a reporter at *The New York Times* or *The Washington Post*.

The reason they do this is manifold. They get to gatekeep the primary documents so that they control when and how the public sees them. Once they give [the story] to the journalist, they end up exerting a lot of influence over that journalist—connecting them with particular sources, pointing them in the direction of some archives, steering them away from others. They get to make it so that a front page *New York Times* story comes out as they're launching a campaign or as a policy is coming up for a vote. A lot of them are connected to climate litigation.

I understand the benefit for an advocacy organization. However, it is making it easy for outlets to get rid of all but one or two investigative reporters, which I don't think ultimately serves what these foundations want. It certainly is not good for democracy, public awareness, or the information ecosystem. And the reporters that remain are very pliable—you're teaching them to be spoon-fed scoops.

Another concerning trend impacting climate journalism is the reverse engineering of news coverage for optioning material to TV and film. Podcasts started the problem—TV and film studios realized that they could option podcasts more cheaply and easily than they could books or treatments. Podcasts were a good pilot because it's like, "Oh, this already has a huge audience. People really liked how this story worked." That's what drove the true crime explosion in the podcast space: the desire to sell to TV and film.

A similar thing is happening in climate now—there's a bunch of money in Hollywood that's very interested in climate stories. All the big newspapers have a person whose entire job is to look out for stories that they can option as "material" to TV and film studios. In a way, this could lead to meatier climate stories because the thing that the studios are interested in is more narrative, more investigative.

Nonetheless, it's all being driven by capital. It's gross. We're working on a big investigation now showing how a good chunk of that money is oil money that has a very particular type of climate story that they're open to seeing.

EP: I'm sure you've imagined a better climate journalism. What would that look like?

AW: More collaborative research and production. On a small scale, we've been testing this out with *Drilled*. I now have reporters in multiple places,

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all digging into the same question at the same time, so that we can share information back and forth. In most cases, it's one stream of reporting or research that is going into the chatty talk show, the investigative podcast, the op-ed piece, the essay, the investigative piece that we copublish with someone else, the social media post. That's what you need to do to reach people. We have found that there are totally different audiences for all of those things.

With the layoffs and places shutting down, if there was one consolidated climate desk that helped other outlets have good climate content, that would be good. I'm on the steering committee for Covering Climate Now (https://coveringclimatenow.org/about/), and they're into this idea that you don't need to be an expert to be a climate journalist. That's sort of true, but it helps if you have one editor on staff who is an expert. I get asked all the time by younger journalists, "Where do you go to find information on *x*?" And I'm always like, "I can tell you where I go, but it's not gonna help you if you don't know what you're looking for, and you don't understand it once you've found it." The reason that the minutes of Exxon's analyst call are useful to me is that I've looked at them for so many years that I know what a weird sentence is. That's just something you learn over time. So, how do you centralize that and make it available?

EP: For historians, the idea that you're gonna need to spend a lot of time with the sources to understand what is going on will definitely resonate.

AW: Talking about collaboration, this is something I've done before with Melissa Oranche at Rutgers and a couple of the social scientists at Brown and also Geoffrey Supran and Naomi Oreskes: I'm like, "I'm going to this archive, and I found a bunch of stuff that I know is gonna be interesting to you guys. Do you want me to send you the link to my Dropbox folder so you can look at it?" And they're like, "Yes, thank you." For me, there's no competition there. Academic publishing and journalism are on different schedules and are geared toward different things. So, why aren't we all working together?

EP: What could historians do that would be useful to journalists?

AW: Well, loads of journalists really want to learn how to do archival research. I feel like pairing journalists with academics who can bring that lens to it—it's helpful for training the journalists and also could lay the groundwork for relationships where people who are looking into things in the same realm can be in closer contact.

Nobody is getting any training on the job as a journalist anymore. I'm forty-five—when I started out, there was a clear pathway. You start as a

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fact-checker or in the research department, and it's a great way to learn how to do careful reporting because you're going through someone else's reporting and flagging every possible thing that could be questioned. Then, you graduate to being a beat reporter, a lead reporter. Then, if you're gonna become an investigative journalist, you get some training. That's not on offer anymore.

So, you end up with these cohorts of young journalists—they don't learn how to go to an archive, do research, file a FOIA [Freedom of Information Act request], find and cultivate whistleblower sources. No one is teaching reporters that in newsrooms anymore.

Training journalists in archival research is something that history folks could do. And potentially, some of those people would go on to be editors who would have an appreciation for why history matters.

EP: Historians spend a lot of time agonizing about their writing, but we are not sure what would make it more useful outside the academic community. Does historical writing seem useful to you in its current state? Could it be more accessible?

AW: I don't think it's the writing style so much as that most people don't know where to access it—where do they find it? I guess surfacing it to journalists in some way is a key thing. Nobody is being taught anything about academic publishing outside of academia, so people don't know how to read it, how to find it, how to vet it. People just aren't aware of it.

EP: So, how could historians communicate that their research exists? What would feel like a surface to you?

AW: Maybe a newsletter about things that just came out? We do a newsletter every week, and the whole point is, here are the five climate stories you should read this week—I always include at least two studies in there because I'm trying to encourage people to think about those as part of their reading diet.

EP: Does anything about how historians work seem weird or unexpected or frustrating?

AW: Something—this is not unique to historians but applies to academics in general—is that there are oftentimes when someone will interview you for a significant amount of time, and it will absolutely shape how they understand the issue, and they still won't quote you in the story—very irritating. Nine times out of ten, that's their editor and not them. I don't wanna encourage people to prep sound bites before they do interviews, but if you can frame something in a way that's very quotable, that does

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increase your chances of actually being quoted. And when journalists talk to you, they'll link to your research.

EP: That's really helpful—a practical thing that we can think about—speaking quotably! One thing I worry about in history is that when there's a story about research done in science, the scientist may not be mentioned, but it's "a study has shown." But when it's history, it's just "in the past, this thing happened." The research part goes away. As historians, we ask, "When are we the researcher? When does the historian appear? When does the archivist appear?" But also, we know about editors because our editors also make us cut the parts where we say, "As so-and-so has shown."

AW: I know. Very annoying. Journalists get around by just linking to the study. I imagine you guys put it in a bibliography.

EP: In addition to your print journalism work, you've created this podcast universe, Critical Frequency. Do podcasts shift how you tell stories and what stories you can tell?

AW: I spend a lot more time documenting everything we say in the podcast than even I do when I'm writing a piece for *The Guardian* or *The Intercept*. There's this idea that podcasts are somehow less researched and more casual—we have to counteract that.

In terms of the types of stories—it doesn't totally make sense—primary documents are compelling to people, but when they're in print, they don't look at them. There might be a screenshot of a document, but it doesn't sink in. For some reason, *hearing* someone read from a document or, in the Exxon case, for example, hearing directly from those scientists just made it sink in to people more. It lets you get into the weeds in a way that print doesn't, which seems totally counterintuitive.

Trying to figure out a narrative structure for those stories is helpful. When *Drilled* first launched, we framed it as a true crime story, in part because there was a true crime boom but also because I was like, "Oh, people find climate stories to be complicated. So, I'm gonna put them in a narrative structure that people are familiar with, that is not considered highbrow or too sciencey because that will help people understand what's actually at play here, which is a basic story of fairness and power imbalance." But at the end of the day, it's kinda just good guys versus bad guys, powerful people versus people with no power.

EP: So, what climate stories need more historical attention?

AW: Actually, I'm working on a book right now. You know, I was very interested in the origins of climate denial. And then, after a while, I was

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like, of course, [denial's] gonna work. 'Cause you're basically pitting "don't change a thing" against "change everything." So, it's automatically gonna work.

Then, I was like, "What made people so open to the idea that there's this cabal of highly paid climate scientists that are trying to mess with the economy?" So, I got obsessed with corporate propaganda and the PR [public relations] industry. But the more that I've looked at that, the more I'm like, "Oh, it's this whole enabler ecosystem, and the thing that all these entities are doing—the management consultancies, and the university research, and the lawyers and the private equity firms and all these investment banks—what they're all doing is warping the information ecosystem to get around democracy."

So, I'm interested in that enabling ecosystem. For example, the entire reason for management consultancies to exist is to connect corporations with other centers of power. Shell has McKinsey doing the most basic accounting stuff because McKinsey also works for every government entity and can tell them what's going on inside the EPAs [Environmental Protection Agencies] of every government, can connect them to anyone they need to speak with. To me, climate denial is a tactic, but it's not the strategy. It'd be great to have it placed in this larger context.

And then I've been really obsessed with oil colonialism over the years. So, for example, when I was doing the PR research, I went to this guy's archive at the University of Wisconsin, Madison. There's this guy named Earl Newsom, who was a PR guy. This is a great archive. It's like every single memo he ever wrote, and it's perfectly preserved. It's just miles and miles of boxes. And so interesting because he was the PR guy for Standard Oil of New Jersey from the 1940s to 1969, also for Procter and Gamble, for GM, Campbell soup—like, every big American company. He was almost a consigliere of CEOs. His files are fucking fascinating. This guy was very involved in a lot of geopolitical stuff—one of the things that Standard sent him to deal with was the Red Line Agreement, where all the oil companies in the world drew a literal red line around the Arabian Peninsula and divvied it up. This guy got sent to Venezuela to do a whole bunch of shady shit for Standard Oil in the 1940. And all this media work he was doing, and meeting with different politicians down there, my God, this is exactly what they're doing today in Guyana or in various parts of Africa. Especially, this last wave of oil colonialism, it's like this weird musical chairs moment—they're all trying to be the one holding the least reserves at the end of the game—the whole approach is exactly what they were doing in the 1920s.

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The story that I'm obsessed with now, that no one will let me write about because everybody thinks it's too boring, is the investor–state dispute system stuff. Oh, my God, it blows my mind.

So, at the end of the Second World War, they create this whole system where, if you are an investor or company and want to build a factory in another country, you need to have assurances that the state isn't gonna take your factory, or that if it does, you have some recourse.

So, this quasi-legal system emerges run through the WTO [World Trade Organization] and governed by clauses in trade agreements and contracts. If Exxon Mobil, for example, has a contract with the government of Guyana, there's a clause that ties them both to international arbitration. So, if the government of Guyana passes a law that Exxon feels materially harms its investment in the country, they can file an arbitrary complaint. Then, that complaint is heard by a panel of three corporate attorneys. One is selected by the company; it's held behind closed doors, and these three people decide whether this government owes this company money.

In Ecuador, Chevron won an arbitrary complaint against Ecuador. They said Ecuador should not have allowed a case to move forward in their courts and alleged corruption among the judges. So now, the government of Ecuador owes Chevron a billion dollars, even though Chevron—well, Texaco—dumped a bunch of oil in the Amazon in Ecuador. So, not only have they not cleaned up the mess, but they've managed to get a billion dollars out of the government of Ecuador, which is not insignificant to their GDP. This has eroded the sovereignty of governments.

EP: Are there other archives or sets of primary sources that you wish historians would spend some time with?

AW: I would love it if someone would look at the history of how the media has dealt with climate. We talk all the time about this strategy of climate denial, and false equivalence, that made the media do this and do that, but it'd be really interesting to see if there's a way to plot that.

I feel like the media needs to own up to its role in all of this. *The New York Times* really did play an outsize role in normalizing the idea that the minority of scientists who don't agree with all of the rest of the climate scientists are valid sources. I wrote a story for *The Washington Post*, five or six years ago, about the oil industry's role in pushing false equivalency, and they surgically removed anything that they had also been complicit in. I don't think it was intentional or conscious—I think it was just resistance to grappling with it. But how are we gonna do better if you

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won't even admit that you were wrong? I have been thinking about an empirical study that forces them to admit how that actually influenced policy or broader conversations.

There is this study that gets cited a lot that Mobil did itself showing how effective its *New York Times* advertorials were at changing the way *The New York Times* itself covered different things. *The New York Times* always gets very defensive about this, and is like, "Well, these are PR people, of course, they're gonna claim that they've had this influence on us." And I'm like, "Yeah, but you're missing the point—that was obviously the goal of the program. And that's what you sold them."

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Environmental Literacy, Climate Archives, and Community Work

An interview with Jayson M. Porter, October 10, 2024

Emily Pawley: When we talked about what part of this volume you wanted to be in, you said the part "Working with and for the Public." We were curious—who do you consider your publics to be?

Jayson M. Porter: It depends on whether or not we're talking about research or if we're talking about life work. Many of us live lives that are directly impacted or indirectly impacted by the racialization of landscape, climate crisis, and the many adversities that come with being of color, being Black in particular. Just working in academia, it's a difficult space to be in. In order to do that work, I need to recover or recuperate just so I can make it through the semesters.

So, my scholarship publics include my peers in the US, Mexico, and Latin America. As an editor, someone working on interdisciplinary journals, it broadens to things like plant humanities, Black ecologies, and Black environmental history, then also political engagement and solidarity work in Latin America.

In terms of life work, sometimes the work is working with funders. Sometimes it's working with frontline workers, with educators, with young people, with public school teachers, with scientists. Sometimes it's working with politicians. Always working with different groups, you have different capacities.

I'm lucky to be in community with so many different folks here in Maryland where I was technically born (they wouldn't claim me) and where my ancestors have worked for centuries as enslaved and free people. Just this week, I just had the honor of doing consultation between the University of Maryland Center of Environmental Sciences and University of Maryland, Eastern Shore. They're trying to build a place-based curriculum, and both are just down the road from where my family has lived for centuries, on a highway dedicated to Harriet Tubman, who is from a town not that far from where my family is, on the Eastern Shore. My uncle is a

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city council member in Snow Hill, a city established in 1686, that still has a Black cemetery, that has a plot where I get to take care of my ancestors. The first one, Charles A. Spencer, was born in 1856. So, I'm very lucky to be here in Maryland and have that public be so clear for me. I hope that gives some sense of where I'm coming from.

EP: You are doing a lot of different things at once—the Black Climate Action Atlas, the Just Climate Archives project, the Soil as Archive of Race and Injustice project with the Max Planck Institute of the History of Science, multiple curriculum design projects, and the Environmental Justice Freedom School with the Chicago Teachers' Union. Could you give a quick sense of what a few of these projects are? Do you think of them as circling a central core?

JMP: Environmental literacy really runs through a lot of these projects. Climate literacy as well. How can we read climate injustice and justice, through political education and through landscapes, particularly of folks and communities that have different archival trails than in traditional archives? How do we read race and environment and landscape? How can we read what we've had and what we have and what we want through landscape?

I'm currently a Black and Indigenous climate faculty fellow at the Harriet Tubman Department for Women Gender and Sexuality Studies here at the University of Maryland, College Park, where I get to work with an incredible Indigenous philosopher, Shelbi Nahwilet Meissner. My work resonates with hers along the lines of environmental literacy—creating new metrics and new language. There is a developing environmental literacy curriculum here at the University of Maryland.

The Chicago Teachers Union reached out to me on how we can make their general freedom school model around political education for teachers and students tied to environmental justice work. They're fighting for green schools across Chicago. I think the average school in the United States is around forty-two years old, whereas the average school in Chicago is eighty-four years old. When we take students to meet the official in charge of doing half a billion dollars' worth of repairs in Chicago every year, he tells the students straight up: "When I go into a room in any Chicago public school, I assume that there's asbestos there and lead in the pipes before I test." The Chicago Teachers Union has been fighting for a long, long time against the violent way that schools were treated in Chicago, which is really a microcosm of public education in the United States.

The Chicago Teachers Union wants to make sure that student and teacher perspectives are part of the work initiatives that they're doing

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toward green schools. So, how we are having fun outdoors, being critical outdoors, meeting environmental justice leaders, going to spaces of toxicity that are adjacent to our communities, and supporting our students to make pitches to the mayor and to the Chicago Public Schools president. The goal is political education, political impact; we just got EPA [Environmental Protection Agency] funding for that.

The Black Ecologies Lab in Rutgers does something similar—they're building Black and Indigenous field schools in the US South. But it's more working across the realm of Black climate leaders and justice throughout the South so we can create a guide of what works and doesn't work, be it in Mississippi, North Carolina, New Orleans, Tappahannock, Virginia.

A lot of my work is bringing climate action workers together. I was in Tanzania last week to help facilitate conversations with 170 people at a gender and climate summit, to put together a statement for COP30 in Brazil next year. Why it didn't happen is a whole other conversation. But the work is all very similar. It's about how do we read common struggles together? How do we read distinctions through environmental ways of thinking? The environment and its differences can serve as a language for us to work through these things.

A lot of the projects are about building a language with people and with soil, with ground. How do we build language to connect with each other across these divides—linguistic, geographic, political, class, racial, all of that. How can we speak through soil? There was a really powerful metaphor from Johannes Lehmann. At Cornell, he has this "Soil Factory" which combines art and community with deep soil science. He spent a lot of his career proving that humus doesn't exist and argues that this notion that humus is something that's out there to be "found" and "protected" and "conserved" fits old colonial logics of creating national parks and displacing Indigenous people, calling Indigenous folks poachers, and thinking that Western science has the particular way of conserving it. Organic matter is something that doesn't take conserving and protecting. It's something that takes collaboration and care. That is what this type of language building is—it's not creating an environmental language of the "pristine" and the "need to protect," it's the care work of making organic matter together.

EP: You do both environmental justice and climate justice work. Are there places where toxic legacies and changing climate overlap in your work?

JMP: You know, I've done a lot of work on arsenic and its relation to mining and plantation landscapes in the Americas. And working with paleoclimatologists and having spent time with evolutionary biologists

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and biogeochemists, it's made me think about the way that arsenic wasn't always a life-denying thing. Before the Great Oxidation Event, it was actually something that affirmed life. Still, in many anaerobic environments, like the seafloor, you have places where organisms *breathe* arsenic. Arsenic contamination is both naturally occurring and anthropogenic. That adds a really exciting way to look at arsenic—as a proxy for understanding climatic change.

The paleoclimatologists inspiring my thinking here, Lina Pérez-Ángel and Intan Suci Nurhati, use archives outside the realm of history—paleoclimatologists use the term "archive" when they're talking about a tree ring or ice core or pollen sample. But a lot of our climate archives, they're produced in the "high-latitude countries" and their temperate environments. A tree ring don't exist as readily in the tropics because a tree ring is a scarification caused by winter. Without that scarification, that archive doesn't exist—that's something that's rooted in temperate reality. So, it can't necessarily help us understand how climate change is happening where it is happening at the fastest rate: in the tropical regions.

Working in the tropics, there are archives that just take a different science. So, Dr. Lina Pérez-Ángel has won big grants studying bacterial lipids in lake-bed cores in Colombia—you can study the rings of fat cells around these bacteria as a way of seeing how that climate has changed over thousands of years. Professor Nurhati is looking at climate change in the twentieth century through microplastics and pharmaceutical residues throughout Southeast Asia. And to me that was like "boom." Okay, so arsenic. Not only do you have arsenic that has the "anthropogenic signature," as Dr. Nurhati would call it, of being from a mine or from a plantation in the colonial period or even modern-day plantations, but it's usually interacting with naturally occurring arsenic, which could provide another added layer. That's something I want to investigate further with scientists: How can arsenic serve as an anthropogenic signature, creating a new archive for toxicity and for understanding climate change over the twentieth century?

EP: Do these lines of thinking about alternative archives and proxies connect to your current book project?

JMP: For the book project, I focus on Guerrero, Mexico, and all the different textures and rhythms there. It's the region with the highest concentration of people of African descent in Mexico. It's been the largest producer of cotton, sesame, and coconut; and it's currently a large producer of marijuana and opium. All five of those plants are oilseeds and

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have been central to long histories of biofuels, vegetable oil–processing products, and soaps. In lieu of records that speak to Afro-Indigenous and Black experience in Mexico, I've used oilseeds as a proxy because its proximity to Blackness on a host of different levels allows me to speak to some structural experiences in these plantation landscapes. I also can talk about how oilseed crops were really important in *marronage* and Black place making. In lieu of archives that speak directly to people of Black African descent, I've analyzed oilseeds to do some of that work.

EP: A lot of these projects involve cross-disciplinary collaboration. We were curious—does it feel cross-disciplinary? Do you feel like you're bringing particular things to these collaborations as a historian?

JMP: It definitely feels cross-disciplinary, interdisciplinary, transdisciplinary, working with so many different types of people with so many different types of perspectives toward similar goals. Part of what we need to do when thinking about interdisciplinarity is to move with humility and move with others. I can't become a paleoclimatologist—they do things I am woefully unable to do, and it wouldn't be in anyone's interest for me to try them. You don't have to do everything. It's really important to find our niche within a division of labor.

One thing historians are really good at is, we organize perspectives to put together a greater story. We all work in multiple archives. Within those archives, we work in different registers, in different sources. Oftentimes in a chapter, a historian is bringing dozens of different perspectives to tell one thing.

We should never speak first. We have so little to share first, but we have so much to share last. I just heard on a sports show, "You can't win a game in the first half, but you can lose one." I think we can lose the audience in the first half if we speak too much, and I think we can lose our value.

This is why I've done a lot of facilitation work. Because we can sit back, we can see how perspectives are based on perspectives and rooted in varied contexts and contingencies. That's what we have to offer—a really great sounding board: critical, thoughtful, historically sound, rooted in intimate handling of contingencies and ruptures and continuities. I think we can sit back and say, "Okay, I'm hearing this, that, and the third here, and XYZ over here, which is connecting with what I'm hearing over here for this reason. I'm seeing a little something I don't understand particularly here. If this group has a little bit more time to share what they're thinking here, maybe we can revisit. . . ." That's what a humble, discerning, and powerful historical perspective can provide.

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EP: Could you elaborate a little bit on the process of developing and carrying out collaborative community projects? We're curious about what your favorite parts are and what's especially tricky.

JMP: Nothing about historical training prepares you to do this type of work. I got very lucky going to college and high school in Mississippi, and getting deep into community art and food justice work. I developed a food program that won an international humanitarian award when I was twenty. I got a job working and running a food warehouse, distributing food across the South at twenty-one. I was also building installations with communities in the US and in Paris and working at a children's museum writing curriculum for young people as a young person. I developed programs for high school and elementary school teachers fifteen years ago. These things informed how I got into history and what refined my historical perspective and practice. I think it might behoove historians to reach back to what got them into history too. You have to lean into where you come from to bring your own seat to a table.

And, you can't just go into a space expecting that you have something to offer. Your chair might not fit. I think listening first is paramount in any type of collaboration. Politically, I come from the perspective of the Student Nonviolent Coordinating Committee: When you go into a space, you assume that people are already working toward what they want. They're already working toward their goals. They might not have all the resources and access that they need. But you go in there thinking that you can listen first because there are people already working toward things. My favorite thing is just meeting other people and helping see their visions through.

I think you realize when you do this work, woof, there are gonna be people that you build with who annoy the heck out of you sometimes. It's just tough. Sometimes, you just really have to check your ego. You got to take breaths. You gotta take care of yourself as you're going through it because things are going to be frustrating. People who you love will be frustrating. You will be frustrated with yourself sometimes. You just have to be patient with yourself and others because the intramural difficulties that come to light when you're working with people you love and admire and have fought with don't go away, and they don't get easier. This stuff is tough.

EP: Let's talk about what the world would look like that pays right for this kind of work.

JMP: No, I don't do ifs and shoulds. I don't go into what we should have because we just don't have that. That's another world.

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My late grandmother said "Shoulds and ifs don't exist; you do with what you have." We have these wastelands, and we have to work with them. That's what we and our ancestors have been doing for a minute. So, that is what I think is so exciting; we have to build a road while walking. The metrics we need are ours to make because the metrics that we have for progress and modernity and sustainability are all shaped by things that we do not really want to replicate.

I think it's super easy for academics to talk about what should be, and I don't even know why. Particularly as historians, we should know deeply and intimately that shoulds and ifs don't exist.

But there's hope there too. I can't remember who said it, but they talk about moving toward the future conditional, moving toward "What would a world without white supremacy or without racial capitalism look like? What would have needed to happen for that to take place?" And you could say something as simple as a conversation like this or the book that you're writing.

You're never gonna really know if what you did or said mattered. And it shouldn't matter to you. You don't need to know. In January, I was in Jackson, MS, and someone came up to me and was like, "Bro. You worked with my second grade class, like twelve years ago," and I was like, "That's wild." But that's happened one time, and I've talked to hundreds of second graders in Jackson. I think that working toward that future condition—"What would a world without [racism or capitalism] require"—really boils down to the everyday acts of resistance that a lot of Black feminist scholars are highlighting these days and have been for a long time.

EP: When we mentioned maybe being in the sustainable academia part of this volume, you pushed back—can you say why?

JMP: I don't think it's my job to make academia a better place. I think academia is rooted in a lot of different types of violence, and I think it reinforces class hierarchies largely in landscapes and in society. And also, this line you hear all the time: "I'm trying to redistribute resources from the university." I don't come with a mindset that the university has resources to share to my community. If anything, my community has resources to share to the university. I think that's what people talk about with the abundance mindset: We got what we need. So, I don't come with a mindset "I'm trying to steal from the rich and give to the poor"—my people *rich*.

Really, it's pretty audacious for universities to think that they can go around helping other communities. They need to do a lot of soul-searching before they can go out and talk about other communities. They

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need to do the work of seeing *themselves* as communities, and they're gonna have to pay me extra to do that type of work with them.

I'm not in the business of humbling people 'cause I don't really think that's my job either. I don't think I'm particularly good at it. But I do think if you're not ready to be humbled, you're not ready to do this work for real. It's brutal. It's tough. It's unaccommodating. But it's also so joyful—and necessary and healing. So, I'm not trying to say there's a warning sign at the door. It's a welcome sign for sure.

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Resources Related to Part IV

Alexandra Hui, Elaine LaFay, Samantha Muka, Emily Pawley, Sarah Pickman, and Anna Zeide

IV.1 Online Resources for Interpreting the History of Climate Change at Public-Facing History Institutions

Climate and Race Seminar. Whitney Plantation, September 4, 2022. https://www.youtube.com/watch?v=AujH1LuuLVY.

Council on Library and Information Resources. Climate Resiliency Action Series. https://climate-resiliency.clir.org/.

History and Hope. Interpreting the Roots of Our Climate Crisis and Inspiring Action. National Park Service & Donna Graves, 2024. https://www.nps.gov/subjects/climatechange/historyhope.htm.

International Coalition of Sites of Conscience. Sites of Conscience Dialogue Facilitation and Resources. https://www.sitesofconscience.org/wp-content/uploads/2020/01/Sites-of-Conscience-Dialogue-Facilitation-and-Resources.pdf.

Glaser, Leah S. *Interpreting Energy at Museums and Historic Sites*. American Association for State and Local History, 2023.

Reid, Debra A., and David D. Vail. *Interpreting the Environment at Museums and Historic Sites*. American Association for State and Local History, 2019.

Rose, Julia. *Interpreting Difficult History at Museums and Historic Sites*. American Association for State and Local History, 2016, http://interpretingdifficulthistory.com/.

IV.2 Organizations That Might Need Volunteer Historians

Climate Defense Project (includes their Climate Necessity Defense Case Guide)
Climate Change Litigation Database
Environmental Data and Governance Initiative (EDGI)
Civil Liberties Defense Center
Environmental Law Alliance Worldwide
Scientist Rebellion

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Third Act
Oceans Past Initiative
Data Rescue: Archives and Weather
Sabin Center for Climate Change Law

IV.3 Brainstorming Exercise: Path-Making and Reflection

Avoiding climate breakdown will require cathedral thinking. We must lay the foundation while we may not know exactly how to build the ceiling.
—Greta Thunberg, 2019

In this part of the book, in the climate crisis and in life in general, there are more things that need doing than can be done by one person, and few that can be done in one day. If you're starting to feel dizzy, take a breath. This book is not your individual to-do list. Below are some questions you might want to think through as you think about climate crisis work.

Which of the climate crisis actions I've seen here seem most important to me?
What skills might I bring to each of these actions?
What skills might I need to develop for each of these actions? How might I develop or practice those skills?
Who could I connect with to start listening and collaborating?
What actions am I ready for now?
What step might I be able to take today toward this work?
What step might I be able to take this month toward this work?
How might I imagine this work a year out?
What actions might work better later in my life?
How might I grow into the kind of person who can participate in these actions?
Who do I know who can be brought into this work to join me?

IV.4 How to Do Oppositional History: Points and (Oppositional) Paths Forward

As we—Chris Sellers, Leif Fredrickson, and Jessica Varner—sat down together to write our contribution, we discussed some of the takeaways from the Environmental Protection Agency (EPA) project and the possibilities and processes around history and historians' responsibility to

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respond to contemporary crises, such as the Trump administration's attack on the EPA. Our response and conclusion take the form of a list:

IV.4.1 Undiscipline Yourself

For all involved, the Environmental Data and Governance Initiative (EDGI) was a process of muddling through. We were muddling through an unprecedented presidential administration and muddling through what was, for all of us, a new approach to doing research, writing, and activism. Perhaps the most important lesson was simply flexibility and adaptability. Also, the willingness to do things in a way we had not done before, had not been trained to do, and had even been told not to do based on our disciplinary boundaries—between environmental and other kinds of history, between history and other fields, from sociology to data analysis to policy studies to journalism. We learned to work more cross-disciplinarily, to become more interdisciplinary ourselves, and generally to "undiscipline" ourselves while maintaining our disciplinary training or methods. Beyond breaching disciplinary norms, there are real concerns about stepping too quickly into research areas, methods, and sources in which one is not fully conversant. We did make mistakes, sometimes caught later rather than sooner. One lesson we soon drew was how collaborative vetting—a less formal version of peer review—could enable swift correctives. Another was that even if opposing interests may nitpick about a minor detail, for all the talk about post-truth politics, robustly evidence-based arguments can still retain a powerful and enduring influence on public discourse. Environmental historians turning "oppositional" should not be paralyzed by the fear of making mistakes or stepping beyond the confines of their historical specialty.

IV.4.2 The Power of Oral Histories and Trust Building

When doing oppositional history, historians may look for oral history interviews with people who are also being sought for journalistic interviews. But in our experience with the EPA oral history project, especially in the early months, journalists weren't reaching out to EPA staff at all but instead to official pronouncements, along with Trump-appointed public spokespeople, to glean the agency's story. We dug out stories from "below," but in a different sense of "below" than oral historians usually mean: among the career staff that those in the Trump White House vaguely maligned as a "deep state." Our interviewing helped call journalists' attention to other neglected stories, which cast political appointees' self-serving rhetoric in a different light.

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The experience suggests some advantages oral histories offer over journalistic approaches to interviewing. Oral historians approach interviewing as a co-creation of knowledge by the interviewer and interviewee. This fact means that the interview process is explicitly open to and encourages interviewees to tell the stories *they* want to tell (not just answering what the interviewee wants to ask) and is sensitive to stories and topics interviewees do *not like* to discuss. That accords us oral historians with both more significant curiosity and a potential communicative role that diverges from that of journalistic interviewing, which only seeks to "get" specific information that can feel extractive to interviewees (and can potentially endanger them). One benefit of oral history co-creation is that approaching interviews with patience and carving out substantial time for discussion often yields important insights and stories that would not otherwise emerge. A full story provides details and nuances versus clips and sound bites. In addition, because historians are not on a deadline schedule like journalists are, they can be less rushed in setting up interviews and accommodating people who might otherwise be missed.

Furthermore, an open, non-extractive approach builds trust. This trust building is reinforced by other aspects of oral history, including informed consent and the provision of wide-ranging options for confidentiality. Finally, co-creating an interview that will be preserved and made accessible for the public and other researchers often increases interviewee investment and makes the interview seem less extractive. In our project, we found that the oral history approach built trust and investment, yielded essential stories that otherwise would have been missed, and led to repeat interviews and interviewees sharing names of other potential interviewees. In addition, trusting relationships built through oral histories had different benefits. Interviewees often gave us essential tips on what to look more into and, as noted, passed us an internal document that was crucial to framing and bolstering our enforcement report.

IV.4.3 Institution Building

It is unlikely you will be able to do oppositional history alone. You will need help, collaborators, and probably an organization, even if it is loose. Organizations matter, which is precisely why the Trump administration sought to throw a wrench into the organizational effectiveness of the EPA. Look to bring in other eager historians, including early career scholars and graduate students. Look to bring in different types of scholars and other professionals, such as experts in data and technology and experts in media relations and political activism. A larger organization will likely need the

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help of competent administrators. In addition to disciplinary and professional diversity, look to include people of diverse social backgrounds: gender, race, and class. All of these considerations are both ethical considerations about whom we should be including and consideration of what makes an organization effective. Building and maintaining organizations is a lot of work. It is challenging and frustrating. It takes constant effort to keep a group operational and cohesive. A larger organization will benefit from paying at least some people to do critical tasks (due to garnering some large grants, EDGI was able to do some of this). And any organization will benefit from conscious attempts to build a culture of support and solidarity. Finally, external relationships will likely be necessary in addition to creating your organization from within. Look to develop connections with other organizations concerned with similar things, whether those organizations take the same approach as your own regarding research and methodology (in other words, undiscipline your relationships!).

IV.4.4 Develop Shared and Shareable Resources and Tools

A crucial part of making EDGI effective was the development of resources, tools, and processes that facilitated collaboration. If you want to build an oppositional history organization, consider developing resources that make it easier for the group to produce blogs, op-eds, reports, and information for journalists or hearings. Although historians and researchers can work at a somewhat different pace than journalists, which is one of their strengths, you will still need to tap into news and political cycles. (See, for example, our response to the EPA's claims about reducing hazardous waste.) At EDGI, we developed datasets, glossaries, one-pagers (brief policy papers), and other resources we could share in addition to our oral history collection. We also sought to create these to communicate with people outside of our organization. We held training sessions to help inform journalists and activists about how to research and analyze what was going on at the EPA.

IV.4.5 History Is Powerful—Use It Wisely

Virtually every political move or policy is rooted in some historical justification. This makes history powerful. It is easily and often abused. But this also gives trained historians the power to wade into critical political issues. Even professional historians can be liable to use history poorly or ineffectively. Like a professional athlete, sometimes we need to remember the basics. History is complicated; it changes. What happened in the past helps us understand the present—as an origin story, as an analogy—but the

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past cannot fully explain the present or serve as a way to predict the future easily. Context and events in the past may have similarities to the present, but they are not the same as the present. For example, the Gorsuch administration was similar to the Pruitt administration. However, the political and cultural contexts were also very different in meaningful ways. Political polarization and bipartisan support for the EPA have drastically changed since the 1980s, and so has bipartisan support for science-based policy. When Gorsuch resigned, Reagan sought to reestablish the legitimacy of the EPA by appointing the first EPA administrator, William Ruckelshaus. When Pruitt was on his way out after the scandal, some people, including historians, thought someone might replace him with more legitimacy. But that did not happen, and the changing context helps explain why that was the case.

IV.5 Further Readings Related to Community-Based Research, Citizen Science, and Citizen History

Arsenault, Kerri. *Mill Town: Reckoning with What Remains*. St. Martin's Press, 2020.

Lee, Debbie, and Kathryn Newfont, eds. *The Land Speaks: New Voices at the Intersection of Oral and Environmental History*. Oxford University Press, 2017.

Quivik, Fredric. "Of Tailings, Superfund Litigation, and Historians as Experts: *US v. Asarco*, et al. (the Bunker Hill case in Idaho)." *The Public Historian* 26, no. 1 (2004): 81–104.

Ridge, Mia. "Citizen History and Its Discontents." IHR Digital History Seminar, Institute for Historical Research, London, November 18, 2014.

Trower, Shelley, ed. *Place, Writing, and Voice in Oral History*. Palgrave Macmillan, 2011.

Weaver, Stewart, Tatyana Bakhmetyeva, and Daniel Wayne Rinn. "Climate Witness: Oral Environmental History and Community-Based Research—A Case Study from Trans-Himalayan India." *The Oral History Revi*ew 49, no. 1 (2022): 56–76.

Wylie, Sara Ann. *Fractivism: Corporate Bodies and Chemical Bonds*. Duke University Press, 2018.

IV.6 Asset Mapping for Shoestring Projects

Even as we all deal with cuts, it's worth noticing what kinds of resources, if any, you already have access to. We did this project without any grants because we thought that grant writing would slow us down and that the book was urgently needed. We used Emily's institutional Zoom account,

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paid our contingent authors with honoraria we had received for speaking, met mostly online and also with cheap meals at conferences that handbook participants were already going to. We had our writing retreat in the woods Emily lives in full time. If we hadn't gotten a deal with the MIT Press or another university press, we were considering self-publishing options. These capabilities definitely depended on our particular circumstances. Others will have more or fewer options. However, it's worth asking yourself a few questions:

1. What resources do I already have? Room access? Connections at the public library or local historical society? A photocopier? A personal website?
2. Who do I know with relevant resources and skills? This could be people or organizations.
3. Who might I get to know with relevant resources and skills?
4. What small-scale resources might help and how might I get them?

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V

A Sustainable Academy

A wealth of literature challenges the idea that sustainability requires only individual work on individual carbon footprints, an acceptance of individual blame that fossil fuel companies have understandably encouraged. As historians, however, we are usually embedded in institutions, often high-emitting ones. These are often funded, as Cyrus Mody shows us, by fossil fuel companies, and sometimes spread information shaped by that funding. "Academia" is a field for action beyond the individual frame. Changing academic institutions must be part of any response to the climate emergency.

At the same time, historians themselves are embodied. Especially in this historical moment in the US and Europe, they need support in the face of collapsing, assaulted, and often internally destructive education systems. Contributions to this part of the book invite readers to think expansively about institutional change and about building institutions that promote change. They ask what kinds of change can sustain and be sustained by the lives of historians themselves. They start in a place of feeling stuck and then point toward possibility.

In an extended email exchange, Yulia Frumer reflects on what it's like to be embedded in an academic institution and the structures that make change hard to conceive of. Matt Henry, via interview, describes his move away from a contingent position in the academy and toward energy transition work. Harun Küçük and Alix Hui examine what can and can't be done at the level of academic societies. Paul Nauert, Sarah Pickman, and Andrew Stuhl help us think about how stepping back from high-carbon travel-heavy academic meeting and research practices might help build a stronger and more inclusive academic community. Cyrus Mody then shows how fossil fuels have become embedded in the academy in a different way, as a funding source central to multiple institutions. An interview with activist and journalist Bill McKibben describing the ongoing fossil fuel divestment movement, which he helped found, helps us think about

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how these connections could be unwound. Finally, Cathy Gere describes how her experience as a historian shaped her work pushing for the decarbonization of the University of California campuses, which, put together, emit more CO_2 than Barbados or Somalia.[1] Institutional change in these stories stretched beyond institutions—the divestment movement kick-started nationwide conversations about fossil fuels—the transformation of the University of California will motivate and support broader institutional shifts.

The resources for this part of the book link to related materials for those who want to dig into these questions. Contributors offer suggestions for self-maintenance, and we include a brainstorming list for readers to think through their own institutional positions and the types of power that come with those positions, with a list of possible forms of intervention keyed to different stages or positions. Finally, remembering a comment made by Jayson M. Porter in this volume that not everything in academia should be sustained, we ask readers to reflect on what in their institutions should be sustained and what should be dismantled.

Note

1. "CO2 Emissions by Country," Worldometer, accessed July 2, 2025, http://www.worldometers.info/co2-emissions/co2-emissions-by-country/.

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Marking Time and Making Time

An e-interview with Yulia Frumer

A primal scream about structural stuckness. Abridged version, for reasons related to word count.

August 22, 2023

. . .

So, my gut reaction to the request to contribute to this volume was "oh no, I don't have *time*." In a sense, it is true: I have recently assumed the department chair position, and particular departmental circumstances made the already demanding job even more time-consuming, costing me months I could have dedicated to my own research. By June 2023 (while still, theoretically on a sabbatical, and before officially becoming the chair), it was clear that if I wanted to make any progress on my book manuscript, I could not take on any additional writing projects.

I am not even talking about work–life balance but work–work balance. Work dedicated to administrative tasks versus work on my own research. We academics tend to conflate our research with our life, but the truth is that I don't have time for life at all. By a certain point in the day, I get exhausted and just can't do anything anymore. Not work, not household chores, not hobbies, not even reading fiction. The only thing I can do is to veg out.

Yulia

August 27, 2023

Dear Yulia,

Emily and I both groaned at the insightful work–work balance point. I write this email from my campus office on a Sunday, having demanded my partner watch our children all weekend so that I could finally catch up on a month's worth of emails and smallish admin tasks.

Your description of decision fatigue is especially compelling. The upper limit of our brains' decision-making mechanisms (thus our morality, our civic-mindedness, our tolerance for heat, etc.) seems to be a defining concern of our times. And when daily domestic and work life requires too many decisions, they crowd out the time and space to think about, say, broader existential threats. When I'm feeling cynical, I presume my institution's

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ever-increasing number of required webforms is busywork designed to keep me from causing actual trouble for them. . . .

Anyway, your thoughts also got us thinking about how decision fatigue plays into climate action and inaction. Some days all you can do is wash out the yogurt cups and set them in the bin to be (maybe) recycled. Emily and I were wondering what you thought was needed to ponder, and I suppose make some decisions, about existential threats? Time and space? Solitude? Community? . . . Anyway, our question for you, that I suspect we will return is: What do you need versus what do you have, to consider and make decisions about the climate crisis?

warmly, because Mississippi,

Alix (and Emily who is not in a Mississippi heat wave)

P.S. We discovered, with both of our children, that when offered a choice, they would always choose the second option, probably just because they couldn't pay attention long enough to hold both options in their heads. We now use this to our advantage ("Do you want to lie here screaming on the floor or do you want to put your shoes on?"), offering false choices.

August 31, 2023

Alix and Emily,

. . .

All this goes back to the work–life or work–work balance. Not only that we (at least I) tend to default thinking that "my" work is part of "life" (because I am doing this for myself), but I also discount tons of work that I am doing for others because it is not officially enumerated as "work." I used to get really pissed at a distant relative who enjoyed saying that professors only teach *x* hours a week and have winters and summers off. But I am ashamed to admit that I, too, tend to only count things as work if they rise to a category that may create a line on the CV. So I am taking on more and more, thinking "that's doable," and only start saying no when I am physically crashing.

Happy to switch gears and talk about things that fill me with joy and energy—like the feline who is snuggling between my arms right now as I am typing.

Yulia

September 19, 2023

Yulia!

. . .

Actually, speaking of the maintenance of domestic spaces, it occurs to me that these last few weeks (childcare has resumed, workers have completed

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their projects on the house), our household has finally fallen into a routine that allows me to have alone time at home. Since the pandemic, I very much prefer working at home in an empty house. It is a pleasure.

This supernova of a collaborative *Handbook* project notwithstanding, most historians' work is very solitary, no? Time in the archives, reading, writing; all of this is usually done alone. Even coauthored or coedited projects are usually completed at separate sites, thanks to the convenience of email, cloud computing, and Zoom. Emily and I were wondering if this disciplinary convention makes it easier to collapse one's "research time" with "life time." One feels the need to defend research time like one defends self-care, potentially (and perversely, since research likely drew you to the field) replacing your self with your work.

Marx had something to say about laborers' alienation from the objects they produced . . . it occurs to me now that *all* of my hobby time has been replaced by carving out little tidbits of time and space to do my research. Because our research is always skittering away from us and being set on back burners to address more pressing issues, are we alienated from it and therefore, because our identities are so bound up with these solitary projects, alienated from ourselves?

Or put in a slightly different way, because our work is so solitary and conflated with our self-identity, do we feel . . . selfish, even dilettantish for working on it? I do sometimes. Like, it feels indulgent to ignore my inbox for two hours to work through a folder of primary sources. Perhaps the chatter of politicians calling for the elimination of useless majors is starting to stick in my head.

. . .

Alix

September 21, 2023

So yes, I agree: I wish academics were a little more alienated from their labor.

But I also wonder if we have unconsciously bought into the old academic ethos of "life of mind" and "passion for knowledge." A couple of years ago, as a Director of Graduate Studies, I was tasked with revising the graduate handbook. In the old version, was the sentence "If you are not passionate about research, maybe you don't belong in grad school"—or something along these lines. I deleted that sentence. It was guilt-shaming. It sent a message that research is a calling, in Protestant sense, and that being a "true" academic meant identifying oneself with work. So, since we are already getting Marx on his head, I am asking: Are we the true lumpenproletariat who do not have the consciousness of what is good for them and identify with the wrong cause?

Hobbies, families, pets all are good reminders of the parts of us that are not work. That we can feel joy, satisfaction, and fulfillment outside of work. And that work ≠ us.

But no, I did not do anything indulgent in the past couple of days. Except for going on a run, which may backfire, health-wise.

Y.

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September 28, 2023

Hey guys,
I am finishing a conclusion for something I started long ago (a coauthored book), and the topic naturally evolved into a discussion of degrowth. I am degrowth-curious, even though I know very little about the topic, and certainly don't understand the nuances between different shades of degrowthers. While much discussion centers on economics and sustainability, it also deeply resonates personally—why the hell did I agree to this hell job of department chair? Why do I need all this stress to grow the department? Why do I insist on finishing the goddamn manuscript (which I really like and want to see published, but still . . .). Funny how I don't follow anything I want to preach . . .

Y.

October 17, 2023

. . .
I will now ramble about the methodological turn I've coined and then kicked about by myself that I'm calling "sllllloooooooowwww history." It admittedly comes from a place of privilege beyond the tenure clock or at least a situation where job security doesn't require speedy production. The general idea spins off of my position that historians need to think more carefully about the sensory perceptual experiences of their historical subjects. FURTHER (and I think we've talked about this before), we as historians can gain insight into these past sensory perceptual experiences by training our bodies into past sensoriums. So if we're training our bodies to past sensations of smell or sound or whatever, what about time? How might we understand the daily rhythms of our scientists? How would our archival work shift if we only read and analyzed one lab notebook entry per day? Can we slip into past temporalities?

Which is all to say, what would de-growth look and *feel* like in academia? Can we all agree to stop working so hard or is academia like capitalism? The bitter mumbling not-joke is that academia *is* capitalism. It must accelerate and expand and limit collective bargaining at all costs.

To us your recent diagnosis also highlighted the impossibility of the sustainable self. The well-balanced academic is no more isolated than, it turns out, our bodies during an airborne pandemic. If the alternative to getting all your work done but feeling miserable and like an intellectual husk is to have fulfilling hobbies but a frustrated and painful life of the mind, well, what do we do with this? Must we reconceive the self? Reconceive labor? You study robots with calluses on their hands: Must we reconceive technoscientific solutionism?

But to bring it back to humans and their bodies, how can we be more gentle with ourselves? Lowering expectations and demands isn't actually going to reduce stress all that much for most academics is it? Can we trick ourselves with sssslllllooooooooow history methods? Can we develop

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research methods that prioritize the experiences of the historian in the present over the experiences of historical actors of the past?

Alix (and Emily)

January 2, 2024

Hi Yulia!
I hope you got all the warmth and rest you deserved this winter holiday. Happy New Year!

I'm attempting to jumpstart our conversation with a couple of rather bleak thoughts:

1. Does self-care/sustainability stand in direct conflict with institutional sustainability, in the case of academia specifically? Are there older or untried newer models that approach survival through mutual aid rather than zero-sum tooth-and-claw?

2. Does grief fit into this conversation somewhere? Climate grief but maybe also a generalized grief for the future? I looked into whether there was a highly specific German word for the latter and the best I could find was *Weltschmerz*, which is more like world-weariness. There is also *Kummerspeck*, which refers to the weight you gain from comfort eating but directly translates to "grief bacon," neither of which applies to what I'm talking about but I find hilarious. Is the battle for time in academia a microcosm of our battle for time on the climate emergency? Where does fending off feelings of resignation or futility belong?

Low-pressure ball (as in no rush to return it, not as in too deflated to bounce) is back in your court!

Alix!

January 15, 2024

Snow! SNOOOOOWWWW! Though not enough to go sledding or anything. Still, it makes the wintery landscape look prettier and calmer.

Is self-care and institutional functioning a zero-sum game? It all comes down to simple math. If you take care of yourself by drawing firm boundaries around your time and energy resources, then tasks that don't benefit you aren't going to get done. There is just too much, and if you prioritize your own interests and tasks that require immediate attention (e.g., teaching, or reviewing graduate student applications), then things like "help the new administrator figure out how to get started" or "make sure candidates who didn't make the cut get notified" simply keep dropping to the bottom of the to-do list.

Getting long COVID, and basically finding myself chronically sick and disabled, opened my eyes to just how many things I was doing "in my spare hours." My PT reminded me of something I taught my undergrads—the spoon theory. "You have to count your spoons every morning, and plan ahead on how you are going to spend them," she said. True. It is easy for me to drop balls left and right now, since I have an excuse—the excuse being,

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"I am physically unable to get out of the bed; I am dizzy; I have a migraine; I have a total brain fog." But deciding NOT to do certain things and saying no highlights how many spoons I was giving away when I thought that my spoon reservoir was bottomless.

But I don't think that institutions are hurt by an individual setting boundaries. It is other individuals who suffer: the rejected candidates, the editors who need authors for their volumes, the graduate students, and the colleagues who will have to figure things out on their own . . . And then *they* will be burned out and sick, and the cycle continues.

An alternative? I don't know, maybe we unionize or if our promotions weren't just about scholarship . . .

Grief: Grief takes weird forms. But it is not unusual for grieving people to feel angry. Maybe we should be more angry.

Hope you both stay warm and do your favorite winter activity!

Yulia

February 28, 2024

Happy Birthday! Are you getting more snow today!?

This conversation has been so helpful for my thinking about my own spoon supply. It seems like especially these days, which are scheduled so tightly, and suddenly full of talking to folks all day, I have zero spoons by about 3 P.M. each day. So my poor kids get way less patience and silliness from me than they should. . . .

It occurred to me that you are struggling with scaled calamities right now. Your own body, the impossible job of your job, national politics, regional violence, and global climate change. For me at least, also struggling with similar scales, I find that I am constantly toggling away from one grief and anger to another and then nothing is resolved. You say maybe we should be more angry. Maybe we should and in a more sustained, focused way. Do you feel like from your perch as department chair that you have better insight into where points of intervention at your institution might be? Or does institutional change seem even more futile from your vantage point?

You offer that tying promotion to something other than scholarship might be an alternative to the academic burnout cycle. Or perhaps expanding what we consider to be scholarship? Emily and I were just talking about historians as expert witnesses and how nobody will call us to testify about nineteenth-century sheep aphrodisiacs or an Austrian psycho-acoustician's efforts to trace accommodation to the middle ear. But after this book is out perhaps folks will want us to talk about how humanists can and already are involved in the study of climate change. Or how sending lots and lots of chipper emails and organizing breakfasts at diners before annual conferences or trawling various online roundtables for contributors is—we hope—building a scholarly community that will have lasting effects on how individuals think and maybe also nudge the field in a new, more collaborative direction. Which is to say, I've decided that my greatest academic skill is a high tolerance for the project-management chaos of herding cats

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(and also getting them to sit down and talk to one another and create something new) and I guess I want something like credit for that.

Alix

March 2, 2024

It's an interesting question whether I learned something from the vantage point of being the department chair . . . I am not sure we have a word for the kind of labor that the department chair does. This is not emotional labor, because it is not about managing others' emotions (though, sometimes it is), it is also not mental labor (because it is not only about keeping all the things in mind, although a lot of is), and it is not managerial, because there are so many things I cannot offload onto others. It is a labor of just making shit happen: sending emails to move things along, writing inquiries, certifying things, following up, organizing, budgeting, making plans. . . . And there is also this nagging sense of responsibility. My therapist asks why don't I just start dropping balls. After all, nobody will fire me if some stupid report is not filed, if graduate student admissions are processed late, or if I just ignore this or that mentoring initiative. But it is this nagging sense of responsibility—if I don't do *x* in time, then my administrator would need to do twice the amount of work; if I drop the ball on admissions, then foreign students' visas won't be processed in time; if I don't spend time mentoring, then I let people flail like I am flailing now.

But . . . the thing is that we are so dependent on a little help from others. Not having an administrator for the first six months of my chairship, and with most of my senior colleagues retired, I was left to figure out on my own every tiny thing this job required. The other day Sharon Kingsland (who retired years ago) stopped by campus and helped me prepare for a budget meeting. I almost cried. It is really amazing how a little advice here and there, a little "let me do this for you because I can do it in a second," a little "here is how things work," and "there is really no need to stress about it because this report is inconsequential"—how all these things can make your life easier. So, how can you refuse to do it for others?

One form of sustainable academia is the selfish path that many academics take: don't engage, only take graduate students for your vanity and then let them sink or swim, skip committees, wait until somebody else writes that report, just focus on publishing, apply for flashy grants and fellowships, and get outside offers for raises and promotions. When I was a graduate student and a young assistant professor, I despised this kind of academic. Now I am tempted to become one. Sure, departments and universities won't survive if we all took this path, but should we really sacrifice our well-being for these institutions?

I don't know what would be the alternative. Trying to account for all kinds of labor in promotion? Honestly, that sounds like a sci-fi scenario to me. All this labor is not quantifiable and hence won't get traction. Hoping that all labor will be distributed equitably is a utopian dream. Or, maybe we should give up our cherished "flexible" schedules that force us to work evenings and weekends, and, instead, go to a nine-to-five schedule: zero work after five and on weekends (and no conferences on weekends!) Or maybe the

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critics are right, and the whole academia thing is passé. The current model of academic promotion is based on post-war realities when the number of professors was small, number of students was large, nobody cared about equity, diversity, Title IX, or, god forbid, mental health. Oh, and nobody expected professors to also be caregivers. We are living in a different reality.

I don't know. I am rambling again, and I don't think all this verbiage is getting us anywhere. I am only sending it because I've started this email three times and three times deleted everything. I am now not at all sure it should be published. Just another mid-career academic life crisis.

Yulia

December 10, 2024

I'm going to attempt now, nearly a year after our first missives, to draw this conversation to a close. In editing this correspondence down, I wanted to preserve your beloved cat as well as the glimpses of our personal frustrations and struggles. Part of the creative part of this exercise was trusting each other and the readers of this book with our vulnerabilities. Circle up, everyone, for a group hug.

Looking back over our exchange now, I think we landed on something in our discussion of the scale of daily and lifetime tasks and responsibilities (to self, to family, to job, to colleagues, to field, to planet, to future, and so on). And we shared dismay at the trickle-down burden of prioritizing the time of one scale over the other. And then we shared the associated grief of making choices in a zero-sum system over and over and over again.

Maybe time is not the right measure. You just threw this out there in one of your earliest emails. I initially chuckled at this thought, two historians giving up on time. It occurs to me now, that one of our historian superpowers is the ability to toggle between timescales and stretch time and—like this months-long correspondence reduced to a few pages—collapse time. Recently my friend Roland Wittje, playing on Simon Schaffer's article title, "Astronomers Mark Time," and I think also your first book, *Making Time*, said to me: I do not have time but I can make time. This was in response to my proposal that we wander around Oslo and look at gulls and brutalist architecture. Historians mark time and they can also make time. You note that the astronomers in your book were "making" time by building the calendars that everyone would use to organize their lives. They were also "making" time because they embedded their newly evolved concepts of time into systems they produced, such as central-meridian-based maps, changing the ways other people perceived time as well. So yes, if we want sustainable academia, we need to start reclaiming our time (as a wise Congresswoman once said) and also change how others perceive time. Can we use this to get out of our heads to address the injustice of work-work-work-life-climate change balance? Does this bring us the necessary calm to approach wicked problems of the past and present with deliberateness and care? We have no time but we can make time.

Hugs,

Alix

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Academic Contingency and Transitioning Away from the Academy

An interview with Matthew S. Henry, August 20, 2024
Updated: August 29, 2025

Emily Pawley: Can you trace out the arc of how you ended up where you are now for us?

Matt Henry: I did my undergraduate and master's at the University of Montana in English literature. I took a few years off for my spouse to pursue her graduate degree, and then went into a PhD Program at Arizona State University.

In 2014–2015, I was working on my comps list while the drought in the Western US was particularly severe. I was struck by the ways in which the conversation around the drought excluded voices that weren't people who are interested in urban development or agriculture. A lot of Indigenous voices were missing—even the recommended reading lists that faculty gave me or the articles in the *Arizona Republic* or the *LA Times* were very white and settler and didn't acknowledge the colonial past around water development and land theft in the Western US.

So, I developed my project around the role of narrative in water justice and environmental justice movements around the United States. I was interested in public narratives, and how people think about crises in ways that might silence or exclude certain voices. I used a chapter on water contamination and anti-coal and anti-fracking activism in Appalachia for a job talk at the University of Wyoming. They hired a more senior person but created a two-year postdoc, then I took a teaching faculty position in the honors college for two and a half years.

That's really where my energy humanities work came to bear on community engagement—Wyoming is facing a lot of challenges around the energy transition. So, I was working on my book but also with youth on youth-out migration and climate change, doing policy analysis, working with interdisciplinary teams. I became comfortable being one of the only people with a humanities background in the room because I was in the

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School of Energy Resources. I think that's how I ended up where I am now at the National Renewable Energy Lab [NREL].

EP: Could you give us a sense of your working conditions as contingent faculty at the University of Wyoming? How did they affect your ability to do the kind of work you thought was needed?

MH: The roles I had there had different challenges. The first role was this postdoctoral fellowship. They cobbled money together for me to uproot my family from Arizona to Wyoming, a "half-time" salary to work on my book and teach a class a year. The challenge there was that the administrators who put this opportunity together for me left after the first semester, which coincided with the pandemic. There was an interim dean and an interim director and a hiring freeze. There was no money to go to conferences. I didn't have an academic community yet, and so it was a year and a half of mostly isolation. I had to finish my book because I knew I needed to go back on the academic job market. At the same time, I thought that maybe if I did enough good work, I could find a permanent good-paying position at the University of Wyoming. So, the pressure was on to produce during a time when I didn't have much support or community.

My spouse worked as an urgent-care physician assistant during COVID-19, which meant she was putting herself at risk every day so that we could keep benefits, and she was pregnant with our son. There was no opportunity to get out of that—we didn't have health insurance if my spouse decided to take a part-time role.

It became clear that I could renew my postdoc, which was generous, but there were no benefits and no likelihood of a tenure track position because of hiring freezes. So, I ended up taking a teaching faculty position in the honors college, which came with benefits but also a pay cut. The teaching load was 3–3 along with pretty significant service and mentorship requirements. I taught five semesters in that department, and three included at least one new prep.

During that time, I kept trying to make my way into a tenure track job. So, I did research evenings, weekends, mornings. I designed my courses to allow me to read things I hadn't, so they could double as research opportunities. And for a time, I thought that might be okay.

But then some more opportunities started rolling in. I taught a class on climate change and colonialism and posted the syllabus online, and it got a lot of attention. An agent reached out to me about writing a book at a major firm in New York. Folks were reaching out about writing a book on teaching climate change. My book was about to come out. I

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was getting invited to talks, starting to have success, like an early career scholar might.

All these opportunities didn't count for anything within my position. That became clear when I did my annual review after my first year as teaching faculty. I sat down with my dean, and he saw publications and interviews and book proposals and progress. And he said, "This is great. You're doing the work of a tenure track assistant professor. But what we'd really appreciate seeing more is for you to attend more extracurricular events for the honors college—that would help us recruit students."

And at that moment, I realized that this was not going to work. On the one hand, I had opportunities and burgeoning collaborations; on the other hand, I had five years to be promoted, I was making less money than I was before. Until I'd mentioned I published my book, nobody knew, and there was not even an email saying, "Congrats your book's out." I was doing good work, and it wasn't recognized, and there was no path to do it. And so I started looking to leave the University of Wyoming and later to leave academia.

EP: What was it like teaching climate and colonialism in Wyoming?

MH: To my dean's credit, when I proposed the class, he said, "Go for it," which surprised me.

I designed the course without any reservations, though I knew backlash was possible. It went great. But it became clear that I was one problematic student away from real trouble, particularly because the state legislature and the board of trustees had turned toward claims about leftist indoctrination and anti-trans rhetoric and things like that. At one point, there was an op-ed in the state's only seven-day newspaper from the father of a student in the honors college about our courses being too "woke." And so, yeah, I did get nervous.

My dean said, "We've got your back if someone comes after you." But I don't know if that would have been the case, given how I've seen other things unfold. The administration has now totally dismantled and defunded all DEI activities at the University of Wyoming. There's a lot of climate denialists in the state legislature, and obviously colonialism is a hot button topic, and I had a unit on Israel Palestine. We weren't in a situation where they were reviewing syllabi yet, and I still don't think the University of Wyoming is doing that. I think it would be different in Florida.

My colleagues would say things like, "Wow, you're brave. How do you do that?" Well, I don't know. I feel it's important to teach these things, regardless of the political atmosphere. I can't say I'm super confident that

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I would have had support from admin. I might not have been fired; it might have been a situation where the course just disappears. So, that was another data point that maybe higher ed, in its current state, was not conducive to this work. I had similar challenges doing research on just energy transitions. During one of the legislative session in 2021 or 2022, a state representative stated that the word "transition" indicated surrender when defending Wyoming's fossil fuel economy. Some of the conversation around energy transitions was foreclosed around campus, not overtly, but reflected in the types of hires the university was making and the types of projects that were being supported. Overall, it felt like it was not a friendly place to do my work.

EP: I'm wondering what advice you have for people working within the limitations of contingency and what kinds of strategies became helpful. Would you recommend them? Do you feel like ultimately they were destructive to you?

MH: I'd say my early strategy was just to do the work, regardless of what it meant for my physical or mental well-being. Because every new publication or decent CV line would pay off down the line. But I started realizing that some of the activities were for a goal that I didn't think I necessarily wanted anymore. I think my early strategy was just overwork, and I don't recommend that.

I did learn to be strategic about the opportunities I said yes to, to use those opportunities for more than one goal. I was starting to think, okay, if I'm interested in this research project or this type of community engagement, I'm gonna join this committee or start talking to these people or designing a course in a certain way. I knew I wanted to do more impactful work. So, I started tailoring some of the opportunities I had toward those ends.

I stopped expecting perfection in some areas—it's hard to write an article or contribute to a policy brief or apply for funding and also do a good job teaching or play a central role on every committee. So, toward the end of my time in academia, I started being, I don't wanna say mercenary, but I wasn't gonna do anything that didn't pay off. I recognized that long term in the academy, that would be selfish because you're off-loading labor onto other people. But I knew I was going to leave, and I needed to make sure that I was taking the steps to set that up. I thought, if I give 110 percent on every activity, there's never going to be a transition out of the academy.

One more thing: I made a conscious effort to network. At Wyoming, I didn't have a lot of people in my area. I had to make an effort to reach out, to schedule thirty-minute conversations with people I didn't know. I

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didn't always treat it as transactional. Just let's get to know more people in the space—see what we can do together.

EP: What are some things that tenure track faculty who don't yet have tenure or administrative roles can do to help their contingent colleagues?

MH: One thing that really stuck out to me is that nontenure track faculty are at a disadvantage when we're competing for resources. For example, I was reviewing proposals for NEH (National Endowment for the Humanities) fellowships. There were proposals from tenure track or tenured faculty—we'd know many of their names. And there were proposals from contingent people, which were also brilliant. But the senior people had used sabbaticals to develop their project far more than any of the contingent faculty could. It frustrated me—these people had awards, they already had institutional resources. What really got me was the fact that they were applying for these opportunities at all. I don't think that's right. I'd say that tenured faculty with relatively more institutional support (I say "relatively" because nobody has enough) might take a step back.

Also I would get questions a lot of the time like, "How can you do all of this? Wow, don't burn out!" And I wish people actually listened to the answers, which were, "I *am* tired. I *am* burned out. I don't know how I'm doing all of this."

I know there are so few resources to go around, and a lot of us are struggling. And it's really hard for even senior faculty to have any energy to do anything for anyone else. But I think more explicit advocacy and listening would be a big part of it. Of course, not crossing picket lines and supporting contingent faculty strikes and labor organizing is the huge elephant in the room. But again, that comes out of listening and recognizing and empathizing with the plight of contingent faculty in general.

EP: Are there macro changes you'd like to see? Sometimes, people talk about eliminating contingent faculty positions and pushing for a re-expansion of the tenure track system. Should faculty push for protections for all instructors?

MH: Every faculty member should have a measure of protection that allows them to pursue work in a way that doesn't lead to harassment. Obviously, one-semester contracts or one-course contracts are bad. Everyone should have benefits. People shouldn't get their teaching contracts the day before the semester starts. But I'd rather see a tenure system that's expanded and recognizes different skill sets and strengths. One of my issues, even with the tenure track system, was how does this institution define meaningful work? It's important to make that expansive if we care about climate change.

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EP: We're very excited about your new position as National Renewable Energy Lab senior energy transition social science researcher. What has changed about your work?

MH: The National Renewable Energy Laboratory is a federal contractor. The work we do is project based, so we are constantly applying for funding from the Department of Energy or the EPA (Environmental Protection Agency) or other programs, which expanded vastly after the Inflation Reduction Act was passed. We do research, development, demonstration, and deployment around renewable energy.

It's almost all scientists and engineers. When I joined, I quickly found a contingent of people with humanities and social science backgrounds actively organizing around the need for more recognition of the value of that type of expertise. A lot of the programs that we're administering provide technical assistance for communities looking to decarbonize: coal transition communities or urban communities looking at solar or energy efficiency. But this is community engagement work that NREL doesn't have expertise in. So, they're starting to hire more people in the social sciences and humanities. It's an exciting time to help steer the lab toward thinking about what technical changes look like in communities in the real world.

It is challenging because we're trying to teach a bunch of people in STEM the value of slowing down and asking tough questions about what their technology does to people. They're not used to doing that. So, not every day is easy, but at least for now, we have the support to do that work.

Some of the work that I'm doing here feels like work I was trying to do in academia. Some days, I feel dumb because I have no expertise on, for example, modeling the employment benefits of advanced geothermal technology retrofitted to a coal-fired power plant. But I'm learning a lot, and it feels like my work is making more of an impact.

EP: If we were deliberately training people in the humanities to prepare for this kind of career transition, what would that look like?

MH: Especially in the humanities, we're not good at articulating how our research or skills can map on to these projects. We say, "Oh, I wrote a dissertation. So I have project management skills." And that's partially true. But that's not the same as building a research team, managing a budget, thinking big picture about deliverables, and all that stuff. There could be more opportunities in the humanities to prepare people for this work—that might look like revising what it takes to get a PhD. In some social sciences and in STEM, students get hired to be part of multiyear projects where they're playing a smaller role and then maybe evolving

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into a larger role. So, revising the idea of the dissertation to be more collaborative could make a big difference.

Another difference would be thinking differently about the value of our work beyond the academy. Writing for different audiences or getting small grants to work with young people really helped prepare me to do different types of community engagement. But my academic training didn't do that—it would be nice if some of those opportunities were embedded. We shouldn't only have these conversations after graduate school when people are trying to pay their bills.

EP: I think a lot about Erin Bartram's essay "Why Everybody Loses when Someone Leaves Academe." What is academia losing from transitions like yours?

MH: I think higher education is losing a lot of scholars who have the knowledge and skills to change the world in material ways. A growing chorus of scholars have recognized the "cognitive-practice" gap—the gulf between research and implementation of that research—preventing universities from adequately addressing the climate crisis. Business-as-usual benchmarks for career advancement in the academy are not conducive to the types of change necessary to move the needle on climate. I left academia not just because I wasn't afforded the types of support that tenure-track scholars are but also because the type of work I wanted to do in the humanities—community engagement and capacity building, for example—were not supported. When higher education institutions lose the types of scholars that want to both think and *do*, that means students miss out too. The result is institutions that are ill-equipped to play a meaningful role in a rapidly changing world.

EP: Where beyond the academy are historical stories needed in the climate emergency?

MH: Historical stories are sorely needed everywhere climate solutions are being researched, designed, and implemented. There's an assumption that if a technology can meaningfully reduce carbon emissions, it is a net good for everyone. But we lack the expertise and processes to understand how different communities have wildly different experiences with emergent technologies. Historical work can help us better understand the cultural politics of energy in different contexts and, by doing so, meaningfully engage with communities to coproduce energy transition scenarios that are responsive to community concerns. Without historical work, climate solutions are unlikely to be durable. They will be designed to only respond to the technical or economic challenges of the climate crisis.

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Update One Year Later

EP: So Matt! What's changed since the Trump administration took over in 2025?

MH: When Trump entered office for the second time, we experienced pretty much immediate chaos at NREL. The DOE (Department of Energy), EPA, and other agencies that fund and support our work issued stop work orders or paused disbursement of funding for some projects. As DOGE (Department of Government Efficiency) targeted USAID (United States Agency for International Development), people at the lab who did international work, often in tandem with USAID, were left with diminished work portfolios. Trump's day-one executive order eliminating DEI programs in the federal government was interpreted by NREL leadership to include DOE-funded contractors like the national laboratories. DEI-related work was abruptly cancelled, including employee resource groups that served as critical spaces for underrepresented lab employees to collaborate and commiserate. The DOE demanded that we end any work related to energy justice or community benefits plans and revise project scopes of work—including those that had been in place for months or years—for research projects and technical assistance programs. Many people found themselves without projects to work on and increasingly reliant on charging their time to overhead or scrambling to find work. Uncertainty ruled, especially as the federal workforce was diminished through layoffs or (compulsory) early retirement packages. Some federal partners just stopped answering the phones. It became unclear whether much of our work would remain funded or for how long, which programs would be eliminated, and whether the lab would even remain a viable institution in the long term. In May, 114 NREL employees were laid off, with whispers of more on the way.

During this time, it became apparent that doing the work I'd hoped to do at NREL when I joined a year before would be increasingly untenable. During Republican administrations in the past, the lab has typically reverted to focusing more on basic science and less on technical assistance, community engagement, and other types of work where humanities and social science expertise is valuable. But the combination of the rapid defunding of scientific research writ large in the United States, the administration's hostility toward renewable energy, and the wholesale dismantling of programs to support anything related to social justice convinced me that it was time to test the waters and see what other career

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options were possible. This decision was reinforced by the unfortunate reality that those at the upper echelons of NREL leadership seemed more interested in adapting to serve the DOE's pro–fossil fuel, climate-denialist agenda in the name of institutional self-preservation. In practice, this meant a shift toward work on AI (artificial intelligence) and data centers, for example, which we know are actively killing the planet. A palpable sense of unease permeated our work; what had happened to the laboratory's mission to support an equitable clean energy transition? Even during my time in academia, I'd adhered to the idea that the work—to fight climate change and a just transition—transcends institutions, and when an institution's mission shifts and becomes antithetical to that work, then it is imperative to seek alternative venues to do that work.

It became clear pretty early on in the new Trump administration that the most important opportunities for climate and energy transition work would reside at the state and local levels, so that's where I focused. After exploring casually and interviewing for a few different roles, I was fortunate enough to land a role at Gridworks, a nonprofit consulting firm that specializes in facilitation and stakeholder convening to solve energy and grid challenges in the Western US. I am now a director, coleading our work in the Interior West, particularly in rural and red states, to support equitable solutions to issues like grid modernization and resilience, energy affordability, and interstate transmission planning. At the core, this role is focused on building relationships, bridging divides, bringing people together, and ensuring the right people are in the room and have an equal say in energy decision-making amid an accelerating climate crisis. Personally, it feels like an opportunity to advance procedural justice in a region that hasn't always prioritized community engagement and meaningful participation.

This kind of meso-scale work not only offers the opportunity to secure climate and energy transition wins under a hostile administration, but it is also work that is not really possible in higher education or federal government settings. Our organization is small and nimble, funded by private foundations or state energy offices. We specialize in a unique combination of regulatory and policy expertise and cultural competency across a range of settings (what, in academia, you might call applied interdisciplinarity). I was sad to leave NREL—my colleagues were wonderful, and many find themselves as conflicted as I was about mission drift.

One of the brightest spots during my time at NREL was the collaborative atmosphere; instead of competing over scarce resources as one

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often does in academia, we were largely concerned with doing good and impactful work. The same can be said about my role with Gridworks too; the goal is good, collaborative work that solves real-world problems. Some of this is made possible by our funding structure, to be sure. But it is also made possible by how success is defined and the types of incentives that exist, both of which rest on relationship and capacity building, comfort with ambiguity, and recognition that the complexity of climate and energy work can't be done alone. Higher education could learn from this.

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What Should Academic Societies Save?

Harun Küçük and Alexandra Hui

Can you save the world via academic service? Maybe.

Perhaps we first need to consider what "saving" and "the world" mean in the case of academic societies. To save the world of academia implies an act of preservation. The humanities especially, but academia generally, is, even in wealthy nations, currently being actively undermined and openly overthrown by public and private operators. But before we push our academic societies to save higher education from this onslaught of budget cuts, congressional subpoenas, neglect, administrative bloat, and contempt, shall we pause and consider what exactly should be saved?

What has historically been the role of an academic society? For the sake of specificity, we'll look more closely at the History of Science Society (HSS), which both authors have been members of for nearly two decades and held elected positions on the HSS Council or ex-officio positions on the HSS Executive Committee. We've also held governance positions in other academic societies, but we're focusing on HSS here. Originally, HSS was an intellectual community, most certainly with the trappings of an elite old boy network, closed off to most classes, genders, and skin colors. It was collegial, a site of intellectual exchange and support, but also functioned as a gatekeeper of the field. Let's not save this world.

Since the come-lately cultural turn in the field of history of science, HSS has expanded both the content and practitioners of its study. What counts as history of science and who counts as a historian of science have grown—in fits and starts, to be sure—as academia has become more inclusive. This has been motored by active efforts by leadership, by the development of graduate programs in history of science or STS at public institutions, and by shifting demographics. This has meant that anyone who is interested in the history of science, technology, or medicine finds a warm welcome in the History of Science Society, but this is not without

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caveats. Like most academic societies, the kept gates were broken by professionalism. Professionalism, especially after the economic crisis of 2008 and the recovery that would never come, has replaced demographic barriers with monetary barriers, as we discuss below.

What does an academic society like HSS *do*? It seems to function in two, perhaps three, major ways. Most prominently, it organizes the big annual conference and hosts the flagship scholarly journal and related publications. It also dispenses honors, awards, and recognition to its members. HSS, like most academic societies to some degree, also functions as what we might call "labor union adjacent." It provides information on the academic job market, informal mentoring, access to ombudsmen, workshops to provide feedback on job applications, scholarly publishing, grant proposal writing, and so on. More recently, as larger organizations such as the American Council of Learned Societies, the Organization of American Historians, and the American Historical Association have taken up advocacy as part of their mission, smaller academic societies similarly have become more politically engaged. Briefly, from approximately 2019 to 2021, the HSS Council put quite a bit of energy into issuing statements about various political developments both in the US and globally. This has slackened due to either fatigue by Council members or perceived futility—or both.

The current moment of economic fragility in higher education, political brittleness generally, and climate change precipice threatens to roll back gains in diversity of ideas and people for the field, and to once again throw up barriers to inclusion and to political engagement. Monetary contraction, like contraction of any other resource, is not necessarily a death sentence for communities but rather stokes competitive behavior: jobs become scarce, the distance between the haves and the have-nots increases, fights ensue over who is going to take the hit. And societies such as HSS make decisions about what, and sometimes whom, to cut. The logic of American society, where a winner-take-all approach is already dominant, is such that those who are punished by the market, such as the jobless, the precarious, or the without-research-funds, can be left behind without further reflection. Today and increasingly in the future, this is the most significant battlefront. Already in the last decade, we have witnessed an increasingly precarious faculty and decreasingly supported students (financially, intellectually, and emotionally). Let's not backslide into the dusty fossils of our past. Let's *do* something. Our predecessors tried to think and act outside of the logic of the old boy network to shore us up on professionalism. Our challenge is different: How can we think and, more importantly, act outside the logic of the market? For what it's worth, the old boy network has a logic that is

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different from the market and remains a living, false messiah. Where does genuine salvation lie?

Combatting US higher education structures and values feels like neoliberal whack-a-mole. Many kinds of radical behavior are already rewarded by the neoliberal system to foreclose other kinds of radical behavior. And academic societies are, in part due to their governance structures, ossified and not nimble. It is also useful to keep in mind that these societies themselves function within the same social structures. And, as collectives, they need to abide by sanctioned forms of performative radicalism that do not move them an inch above the neoliberal market. What's more, members are often divided along generational lines due to a lack of shared understanding of the nature of the past and the present that is additionally exacerbated by a lack of curiosity about the stakes of the present. Jaded cynicism and misplaced responsibility also divide members along contours of career stage, type of institution, and future trajectory (parlaying a faculty position into an administrative position, for example).

The combined infrastructural and cultural nature of the problem, at the academic society level, hints at a way through. We are historians of science! Our ability to document and critique the power and bias built into intellectual supply chains, products, and institutions is applicable here. Cutting through the presentations of toxic positivity and unhelpful self-help, as well as feedback loops of doom, we might help our younger generation of scholars especially by pointing out that there is also a reality and it is comprehensible.

Resource scarcity is more a problem of redistribution than of social or planetary capabilities. As universities are looking to cut costs on teaching and research while boosting their real estate portfolio, as universities are looking to Wall Street and private equity for leadership rather than to scholars with a genuine calling, as governments and states prioritize their relationship with the superrich over serving their communities, it behooves us as historians of science to show not only the tragic consequences for individuals but also how the production of scientific knowledge is altered. A society that invests in research and education is not at all like a society that prefers to concentrate its wealth in business and finance. Although white supremacist notions of Western culture lead to the mistaken notion of science as birthright, we historians know that science represents a long-term accumulation that is easy to spend down. Expertise is eroding everywhere, not only in the humanities but also in the sciences.

It is actionable. The day job is never the reason to do this job. Activism and speaking the truth that we see are the reasons to do this job. And

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academic societies give us elevated platforms where we can observe at a higher altitude and speak without the urgency of the street. As intellectuals, we also serve as vanguards. Although none of us can see the future, it also behooves us to act on our predictions about what will need to be voiced not only for today but also for the future. If the past year has taught us anything, it is that critical experts such as historians of science have immense power in generating, moderating, and leading dialogue—this is why critique is what authoritarian figures shut down first and with the greatest vehemence. Although public reason is not as strong as it used to be, a good argument still has stopping power. We have also learned that entire fields of expertise can evaporate in the hands of a handful of rich and powerful political actors. This has happened during the conflict between Israel and Palestine; climate change expertise is likely next. We may be looking at a future where we cannot even speak of climate change, let alone do something about it.

But let us not also unwittingly support "market forces" like EdTech or the increasing dominance of engineering and business when we are seeking greater democracy and a more equitable redistribution of resources. We all know that teaching online courses for aspiring engineers, probing the profit-maximizing potential of actor-network-theory or endorsing the cannibalization of the university by patent moguls, Massive Open Online Course boosters, and artificial intelligence entrepreneurs who are confident they can instantly do what many of us at universities have been doing for decades "better and cheaper" is not the future that we want. The market is not a democratizing force.

How, then, might a desirable future look, in concrete and specific terms? It all starts with self-knowledge. What is our society in its most inclusive form and who are our members? What do they share and how do we align our academic societies, not with some *a priori* definition of history of science but rather with a sense of why our members do what they do? We also need to remain mindful that our societies are not monolithic entities, with monolithic politics to match, but rather umbrellas that can enable, nourish, and shield smaller enclaves. Local and regional communities, especially after COVID-19, stand in dire need of kindling. This is where it all starts, and this is what needs money, space and time, including our enhanced ability to bridge physical distances. There are already institutions, such as the Consortium for the History of Science, Technology and Medicine, that run any number of working groups in the online space. In all cases, patience, thoughtfulness, and deliberate engagement are a must.

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When we locate and begin to tear down the structures that only perpetuate ambivalence and paralysis in the field, we intervene in the present as we have in the past. And then we build up again. We explicitly and enthusiastically build up not only local community support of ideas but also bodies and souls. We create the infrastructure necessary to foster a community of care. Academic societies can be fun. And they can be kind. We can be grateful to each other for interesting questions, and we can be grateful to each other for each other.

Let us turn now from existential job grief to existential climate grief. Just as the stuffy, wood-paneled academia that was never going to be welcoming anyway is in the past, so is the bucolic Holocene. As we imagine a future for our field that is built on our knowledge of its past and actively intervenes to disrupt portents of collapse, let us also imagine how we might scale up such a pivot. First save the field, then save the world. To return to our first consideration, perhaps saving is achieved not through preservation but rather through revolution. Perhaps we only wiggle out of this climate change catastrophe, like save the *actual world*, by applying our skills of critique and analysis to overhaul the infrastructures accelerating climate change and build a softer future of multispecies mutual aid.

We note that climate change is different in some ways from former crises in its capacity for physical disruption and similar in other ways in its capacity to create economic pressure. We can already see some of what is going to come, but we realize that some of it will be almost entirely novel. Although we believe we need to resist monetary contraction by causing a big stink if necessary, we also think it's wise to do our work in less resource-intensive ways. A modest step in this direction may be to consider the give-and-take of the annual meeting. For example, we applaud the local and thematic focus of the 2024 HSS meeting in Mérida. The society showed that it can offer recognition and credit to those who are often excluded (the Global South comes to mind). And it can also, by choosing such meeting locations, nudge scholars with resources to travel to places where scholars may have less. And again, with acknowledgment that online and hybrid meetings also use resources, we might consider a new conference form that unfolds throughout the year, where folks can gather in person to Zoom in. At any rate, taking the annual meeting off autopilot toward Boston or Chicago and onto a more deliberate path is desirable.

Societies should also devote their time and resources to advocating for their members rather than the other way around. For example, HSS can run a campaign on how history of science is for everyone and that

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it deserves to be taught to all undergraduates, who, in the twenty-first century, need a working and critical understanding of science and technology. We also believe that academic societies should also lean deeper into questions of employment, which is where both the current crisis and the possible salvation lie. This may include employment and pay surveys, bargaining support, and even setting up pay and workload standards for institutions wishing to post their ads on society webpages and LISTSERVs. Although these tactics may not ultimately make academic fields more sustainable in terms of energy consumption, they will certainly help academic life be more sustainable for their members on a warmer planet.

Many people today believe that academics are a pernicious or even a parasitic group, perhaps deserving extinction on that account. But just as there are good and bad bacteria in the human gut, we believe that academics are the good kind of bacteria for social guts riddled with exploitative tapeworms. It is our job to get societies to not only digest knowledge and information in the way that is most beneficial to them but also change our societies in ways that cultivate the individual desire for good, wholesome knowledge in order to ensure health and longevity for humankind as a whole. Finally, we note that the alarm bells that we sound here are too late for our many colleagues who have already left their respective professions and are pursuing their calling outside of the academy. For others, contingent labor, unsatisfying careers, and disappointments galore beckon. We point our readers to the conversation between Emily Pawley and Matt Henry for further personal reflection on a more hopeful note and promising paths forward.

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31

Decarbonizing Toward Justice: Sustaining Academic Community and Research in More Diverse Ways

Paul G. Nauert, Sarah Pickman, and Andrew Stuhl

For many historians, travel for archival research or academic events is key to intellectual community, professionalization, and producing scholarship. Yet, the climate crisis and COVID-19 pandemic have underscored long-standing calls to critically reimagine the assumption of frequent air travel, the greatest source of emissions for most academics. Recent studies have demonstrated the urgency of this issue. For example, academic travel in the last few years from just one R1 US university generated annual emissions equivalent to a small city in the Philippines, and travel to a single academic conference in 2019 equaled the annual emissions of Edinburgh, UK.[1]

Academia's emphasis on frequent travel incurs other burdens as well, especially for scholars at under-resourced universities or in rural areas, those working outside of the academy, and colleagues with caregiving responsibilities, mobility constraints, or neurodivergent conditions.[2] However, *not* traveling, especially to conferences where networking happens, can exact a high professional toll, particularly for graduate students, early career scholars, precariously employed academics, scholars at non-elite institutions, and those based in the Global South.

Perhaps you are already nodding your head in agreement, fired up to rethink academic travel. In that case, skip ahead to the bullets, where we describe examples of academic conferences, organizations, and informal networks that are already doing just that.

If you are on the fence, keep reading. Allow us to make the case that decarbonizing academic travel should be embraced as part of a larger project of building more inclusive, equitable, and accessible academic communities. A growing body of research has documented the climate impacts of scholarly gatherings. This research demonstrates that not only is decarbonization of conferences possible, but it is also not an either/or scenario of fully in person or fully remote.[3] A range of alternative formats

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Table 31.1
Carbon emissions of five selected conference formats

Conference Format	Carbon Emissions (kg CO_2 per capita)	Carbon Emissions *as a percentage of Fully In-Person Conferences*
Fully in person	840	100%
Hybrid—2 locations, 100% in-person participation	682	81.2%
Hybrid—3 locations, 100% in-person participation	568	67.6%
Hybrid—2 locations, 50% in-person / 50% virtual participation	280	33.3%
Fully virtual	54.8	6.5%

Note: Data based on Yanqiu Tao et al. (2021).[4]

exists, each with a unique reduction of carbon emissions when compared against the traditional conference (see table 31.1).

Emphatically, we are not calling for flight shaming or attempting to shift the blame to individual choice (as fossil fuel companies would like us to do). We need systemic, infrastructural change in how societies produce energy and power transport globally. We are calling for all of us to contribute by imagining and enacting systemic change where we can—in our professional culture and infrastructure—not arguing that individual choice is a panacea.[5] Nor do we deny that community building happens during in-person gatherings, or that some research materials can only be accessed in person. However, not only do we believe genuine connections and work can happen on digital platforms—this essay was written via a series of conversations on Zoom, after all!—we also believe in thinking more purposefully about when, how, and why we choose to gather in person.

Nearly a decade of experimenting with alternative gatherings has shown that these events can replicate in-person exchange and catalyze rethinking the activities and audiences defining a scholarly community. This approach also invites more scholars working outside of the academy to continue to participate in research and networking, which is critical to the lifeblood of our intellectual communities as the academic job market continues to shrink. Here are some of the many powerful examples we found:

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- The Nearly Carbon Neutral Conference (NCN) model: One of the most comprehensive resources freely available, this guide, spearheaded by environmental humanities professor Ken Hiltner at the University of California, Santa Barbara, provides a road map for reducing emission impacts for conferences by up to a factor of a hundred while vastly increasing accessibility, especially to scholars based in the Global South. This model has been followed successfully many times since 2016. After its NCN pilot conference, 73 percent of speakers felt they made a meaningful connection with conference attendees in an entirely online *and* asynchronous conference[6] (https://hiltner.english.ucsb.edu/index.php/ncnc-guide/#details).
- Since 2016, the model of born-online conferences has spread, facilitating dynamic bridging of academics with wider communities. Launched online before the pandemic, the Virtual Islands Conference (https://www.islandinnovation.co/cases/the-virtual-island-summit/) has sustained a global forum for scholars, advocates, policymakers, and nongovernmental organizations focused on some of the most vulnerable frontline communities facing rising sea levels from the Pacific to the Arctic to the Caribbean. Terror Camp (https://www.terror.camp/) brings together fans of a popular TV series who have been inspired by the show to undertake historical and other humanities-based research alongside university-based scholars of polar regions. Attendees and presenters—including English professor Hester Blum, who said the style of the conference "could save the humanities"—connect through Zoom talks that invite academics to show as much passion for their research as fans, an artists' alley, digital poster display, conversation on Discord, and multisensory learning, such as classes on nineteenth-century textile mending and bookbinding.[7]
- Hybrid conferences have become laboratories for creatively reimagining scholarly community as pandemic lockdowns and subsequent reopenings compelled professional associations to reexamine long-held assumptions about travel and togetherness. Like many flagship conferences, the American Society for Environmental History (ASEH) shifted online early in the pandemic and returned to in-person conferencing in 2022. ASEH, however, has retained an online conference that precedes the in-person conference, allowing scholars to participate via Zoom panels when teaching, care work, financial constraints, or carbon ethics commitments make in-person travel difficult. The conference is complemented by Environmental History Week that runs all of April, with public history and community-focused online and

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in-person events happening across the world. Communities formed during in-person conferences (such as the Queer@EH network that originated at ASEH 2022 in Eugene, OR; https://aseh.org/queer-at-eh) continue to grow globally beyond ASEH through virtual gatherings on Zoom while meeting for social hours at in-person conferences.

- Often involving hybrid components, multi-hub conferences—distributing conference events across several regional sites—form a promising area of innovation for reducing emissions while boosting equity. Major scientific conferences documented significant increases in geographic diversity of participants and emission reductions by a factor of two to four, with strategic siting of hubs as a key takeaway for conference planners.[8] For example, the Sustainability Transitions Research Network (https://www.transitionsnetwork.org/), made up of three thousand scholars, held its 2022 global conference over a six-day period online and at sites in South Africa, Australia, and the US.[9]

Although carbon-intensive travel remains central to our fields, these inspiring models demonstrate a revolution is well underway. What are steps that would help scale up equity-focused decarbonization and accelerate the revolution?

- Equalizing professional incentives for online and hybrid conference engagement, from hiring committee interviews to tenure review.
- Celebrating models of decarbonization in high-profile spaces, paralleling efforts such as the *American Historical Review*'s emphasis on pedagogy and historical work beyond R1 academics through the #AHRSyllabus project (https://www.historians.org/news-publications/american-historical-review/ahrsyllabus/).
- Materially rewarding approaches to decarbonization that enhance collaborative, inclusive scholarship, such as grants to researchers who coordinate across archives on different continents and pool photos of findings, using community-built tools such as Sourcery (https://sourceryapp.org/). Such efforts reduce aviation and cloud-computing climate impacts while facilitating forms of transnational scholarship many of us have long championed.
- Aligning conferencing schedules with major archival hubs. Many scholars, especially those from institutions with limited resources, strive to align their travel schedules with research opportunities. Some organizations, such as the Society for Historians of American Foreign Relations, have recognized this advantage, holding its conference every other year in the Washington, DC, area near the US national archives.

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Ultimately, we believe we will be most successful when we look at decarbonization of academic work as a channel for collaboration, innovation, and even playfulness rather than a burden. To do this, we must treat decarbonization as an opportunity to sustain community in more diverse ways.

Notes

1. These data points reference the University of California, Santa Barbara, in the mid-2010s and the American Geophysical Union global conference in December 2019. See Ken Hiltner, "A Nearly Carbon Neutral Conference: Overview / Practical Guide," n.d., https://hiltner.english.ucsb.edu/index.php/ncnc-guide/#details; and Milan Klöwer et al., "An Analysis of Ways to Decarbonize Conference Travel After COVID," *Nature* 583 (2020): 357, https://www.ecolsoc.org.au/wp-content/uploads/Klower-2020.pdf.

2. Ayana Elizabeth Johnson and Katharine Wilkinson, *All We Can Save: Truth, Courage, and Solutions for the Climate Crisis* (Random House, 2021).

3. We focus on academic travel in this chapter, since this likely forms the largest single source of emissions related directly to knowledge production. For a sampling of recent research, see this paper, especially the references in the "Social Media Summary" section: Rob Raven et al., "Transitioning to Sustainable Academic Conferences Needs More Experimentation and Reflection," *Global Sustainability* 6 (2023): e16, https://doi.org/10.1017/sus.2023.15. See also Sami El Geneidy et al., "The Carbon Footprint of a Knowledge Organization and Emission Scenarios for a Post-COVID-19 World," *Environmental Impact Assessment Review* 91 (2012): 106645, https://doi.org/10.1016/j.eiar.2021.106645; and Joachim Ciers et al., "Carbon Footprint of Academic Air Travel: A Case Study in Switzerland," *Sustainability* 11, no. 1 (2019), https://doi.org/10.3390/su11010080. Other sources of emissions related to academic work—and opportunities for reduction through creative reimagining—must not be discounted, particularly with the proliferation of energy-intensive cloud computing and machine learning tools increasingly deployed in the humanities. See Steven Gonzalez Monserrate, "The Staggering Ecological Impacts of Computation and the Cloud," *The MIT Press Reader*, February 14, 2022, https://thereader.mitpress.mit.edu/the-staggering-ecological-impacts-of-computation-and-the-cloud/; and Karen Hao, "Training a Single AI Model Can Emit as Much Carbon as Five Cars in Their Lifetimes," *MIT Technology Review*, June 6, 2019, https://www.technologyreview.com/2019/06/06/239031/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/.

4. Data based on Yanqiu Tao et al., "Trend Towards Virtual and Hybrid Conferences May Be an Effective Climate Change Mitigation Strategy," *Nature Communications* 12 (2021): 7324, https://doi.org/10.1038/s41467-021-27251-2.

5. For example, see Rebecca Solnit, "Big Oil Coined 'Carbon Footprints' to Blame Us for Their Greed. Keep Them on the Hook," *Guardian*, August 23, 2021, https://www.theguardian.com/commentisfree/2021/aug/23/big-oil-coined-carbon-footprints-to-blame-us-for-their-greed-keep-them-on-the-hook.

6. Hiltner, "A Nearly Carbon Neutral Conference."

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7. Elizabeth Minkel, "'Terror Camp' Could Be a Glimpse of the Future of Fandom and Scholarship," *Atlas Obscura*, January 30, 2024, https://www.atlasobscura.com/articles/the-terror-amc-camp-fandom.

8. Stefanie Kremser et al., "Decarbonizing Conference Travel: Testing a Multi-Hub Approach," *Bulletin of the American Meteorological Society* 105, no. 1 (2024): E21–E31, https://doi.org/10.1175/BAMS-D-23-0160.1.

9. Raven et al., "Transitioning to Sustainable Academic Conferences." See also Klöwer et al., "An Analysis of Ways."

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Tracing Oil Money in the Academy

Cyrus C. M. Mody

In public debates, historians often supply historical context or analogies relating past and present. I'll even do so in this essay. But historians should also historicize the debate itself by showing that change over time matters to our ethical calculus. Things were different before, what was right then isn't now and vice versa, and things will be different again someday.

We should even historicize the ethics of oil money in the academy. Universities' oil ties weren't innocent in the past, but they were more defensible than in the present. True, many well-meaning academics argue that only by working with oil companies today can universities assist a future green transition. So, let's debate that question, armed with an understanding of how oil money passes through universities, with what results, for whose benefit.[1]

Admittedly, my argument that oil ties were once defensible is self-serving: My career owes much to oil. Yours too, probably! To illustrate, let's review the institutions I've been associated with, starting with Cornell's Science and Technology Studies (STS) department. Franklin Long, that department's "chief architect," was on Exxon's board of directors from 1969 to 1980.[2] Long was also an influential adviser to the Aspen Institute when that organization was run, and funded, by current and former oil executives.[3] While I was at Cornell, the STS department was housed in *Rockefeller* Hall. One of my PhD advisers, Ron Kline, was Bovay Professor in History and Ethics of Engineering; Harry Bovay was a petrochemical plant designer with Humble Oil and Bovay Engineers.[4] After my PhD, I became the Gordon Cain Fellow at the Chemical Heritage Foundation (CHF); Cain was a Conoco vice president and founder of Petro-Tex Chemical Corporation.[5] More generally, CHF—its museum, fellows program, art collection, archives—and the historical research it hosted benefited enormously from ties to the oil and petrochemical industries. Then, I moved to Rice University in Houston. Rice's scientists and engineers were naturally immersed in

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oil; but even my department, history, owned a natural gas well![6] Finally, I relocated to Maastricht University's Science, Technology, and Society Studies program, where, again, some of my science colleagues are funded by Shell, Saudi Aramco, and other oil companies.[7] As at Cornell, though, the first STS research in Maastricht—at the International Federation of Institutes for Advanced Study in the late 1980s—was funded by Shell, Atlantic Richfield, Exxon, and DSM.[8]

This personal detour underscores two points. First, research organizations worldwide are awash in oil; I've encountered it at every step, and I'm hardly exceptional. Second, oil money has fostered good research, including *historical* research unconnected to, or even critical of, the oil industry.[9] In the past, oil firms also sponsored surprisingly "green" research. The oil executives who ran the Aspen Institute, for instance, employed the prominent climate scientist Walter Orr Roberts to promote climate issues at the United Nations and within the oil industry. Likewise, the 2019 Nobel Prize in Chemistry was awarded partly for battery research—essential for adoption of wind and solar energy—conducted at Exxon and Schlumberger in the 1970s and 1980s; and Exxon's world-leading climate forecasts from the late 1970s remain accurate even today, despite that company's later climate denialism.[10] The 1970s also saw oil industry projects in solar, nuclear, and geothermal energy, sometimes in collaboration with universities or academic start-ups.[11] Publicly, Big Oil CEOs circa 1980 universally agreed that fossil fuels would be significantly replaced by hydropower and geothermal and conventional nuclear energy before 2000 and by solar and exotic nuclear power in the twenty-first century.[12]

In the 1980s, though, hostile takeovers and falling profits led most oil firms to abandon climate and alternative energy research and to focus instead on fossil fuels.[13] Left without long-range solutions to climate change, oil firms now claimed climate change wasn't a problem. Scholarly and journalistic accounts have documented the industry's turn to denialism, for which they relied on *academic* proxies such as William Nierenberg at the University of California, San Diego (see Erik Conway's essay in this volume) who were paid to generate op-eds, media quotes, and journal articles undermining mainstream climate science.[14]

Documenting oil firms' historical sponsorship of academic research contributes to this volume's aims in at least three ways: (1) to show how climate denialists co-opt academic research institutions and practices such as peer review; (2) to show that oil firms promoted alternative energy and environmental research until the early 1980s and then *decided*, despite knowing the consequences, to pursue denialism instead; and (3) to highlight oil's

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ubiquity in the global research system, past and present, and the obstacles to decarbonization that that raises.

Regarding the third point, high-quality oil-sponsored academic research is as much an obstacle to decarbonization as climate denialist misinformation. That's partly because of "greenwashing," whereby oil firms enhance their environmental reputations by sponsoring research on green technologies with no intention of actually using those technologies to reduce carbon emissions. As implied by my narrative above, however, historians should be cautious in ascribing greenwashing: Not all past oil industry sponsorship of alternative energy or climate research was insincere. Yet, this just means we can historicize greenwashing and show how the strategy emerged and evolved.

Historians can also illuminate how oil industry sponsorship of high-quality research hinders decarbonization beyond greenwashing. For instance, when researchers prioritize topics set by oil firms, they necessarily de-emphasize other subjects. Intentionally or not, oil funding therefore contributes to "undone science."[15] Sponsoring high-quality research also bolsters oil firms' credibility, which enhances the plausibility of the low-quality denialist "research" that they sponsor alongside. Additionally, oil firms' sponsorship of academic research lets them influence university curricula and recruit promising graduates.[16]

Finally, universities' oil ties mean that if our energy system becomes less carbon intensive, an oil industry–sized hole will grow in our research system. That is, we have to adopt an energy mix to which fossil fuels contribute far less; academic research across all disciplines can aid that shift. But universities are already suffering financial precarity, which they relieve partly through donations from, and collaborations with, fossil fuel companies—making them vulnerable to funding shortfalls as the fossil economy withers. Universities are, in effect, resting on the so-called carbon bubble—that is, through their oil ties, the value of universities' assets have been inflated by the value of the hydrocarbons currently in the ground. That value would collapse if a binding decision were made to leave those hydrocarbons where they are.[17] This might explain the dismissive opposition from University of California officials that Cathy Gere recounts in this volume!

As those officials inadvertently illustrate, bubbles are hard to resist, right up until they burst. Indeed, universities have faced this problem before. Historically, enslaved people were forced to perform many of the tasks that machines fueled by oil perform today. Every day brings to light new evidence that many universities benefited from slavery until the value

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of enslaved "assets"—human beings—collapsed with abolition.[18] Similarly, the global oil trade today extends many of the inequalities previously associated with colonialism. Indeed, Kairn Klieman argues that almost every national "oil curse" was originally a colonial curse.[19] Again, many universities depended on money derived from colonial exploitation. Quite a few universities were explicitly founded to facilitate colonial resource extraction.[20] In teaching about the climate crisis, we should draw on these historical episodes. Slavery and colonialism are not just good analogies for explaining universities' current predicament but also, in fact, genealogically related to today's academic entanglements with oil.

Another clarifying historical genealogy/analogy is the mid-1960s to early 1970s debate over what kinds of military-funded research US universities should host. That episode also featured a bubble. Many US universities became almost existentially dependent on rapidly growing military funding after the Second World War and especially after Sputnik. Deep cuts in Pentagon R&D spending in the late 1960s therefore left recent graduates jobless and academic researchers unable to fund their investigations.

As with oil in the academy today, the postwar US university–military relationship also featured an evolving ethical dimension. University–military collaboration was far easier to defend during the Second World War than during the Vietnam War. Yet, as with oil today, not everyone agreed that the ethics of defense research changed in the 1960s. Indeed, many never changed their minds, and some changed back and forth. Thus—much less than with slavery or colonialism—the debate about academic dependence on the military can't be depicted as a linear before-and-after tale of progress. That debate thus offers a warning against Whiggish views on oil and alternative energy today. Antiwar activists did make notable gains in the 1960s and early 1970s—for example, bans on classified dissertations and the divesting of university research centers working on nuclear missile guidance and counterinsurgency warfare.[21] Yet, the divested organizations simply continued doing military-funded research, and campus opposition to military sponsorship of academic research waned with the end of conscription. Moreover, the alternative to military funding that emerged was the neoliberal university beholden to corporate, and especially oil, interests—an arrangement with its own moral failings.[22] Whatever academic funding regime comes after oil-sponsored neoliberalism will be similarly susceptible to critique. The Solar Age will be no more a utopia than the Age of Oil.

Notably, some influential climate denialists—such as Nierenberg—transformed into hired-gun "merchants of doubt" partly out of disgust with

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US universities' acceptance of Vietnam-era curbs on defense research.[23] Most scientists, though, took no visible position on the question. Even so, criticism of military funding, plus a decline in that funding, encouraged ambivalent, and even some staunchly pro-war, scientists to (perhaps temporarily) unwind their military ties and focus on research relevant to civil society.[24] Similarly, today, we should expect most academic researchers to remain ambivalent toward funding from oil companies—neither strongly for nor against. But if the 1970s are any model, public opinion, political will, and the presence of alternative funding sources can incentivize many to change course. Naturally, there will be holdouts who (like their predecessors) invoke academic freedom or argue that refusing oil money will do more harm than good. And maybe permanent or universal proscription of oil funding isn't the right solution. Many activists during the Vietnam War didn't advocate total bans on academic defense research either. In my view, though, current collaboration with fossil fuel companies can only be defended if those companies make concrete plans (with swift, certain deadlines and penalties) to reduce their carbon emissions.

Finally, during the Vietnam War, one of the more effective tactics of opponents of military-funded research on US campuses was simply to make that research visible.[25] And that's proving effective for anti-oil activists today as well. Here in the Netherlands, for instance, activists from a coalition of groups have filed the equivalent of Freedom of Information Act requests, requiring Dutch universities to declare their oil-funded projects. The results of those requests are available at https://mappingfossilties.org/index.html. Similar efforts are underway in other countries.[26] This is very much work in progress. Both individual researchers and their institutions are understandably reluctant to declare their oil ties, universities are ill-prepared to surface that information anyway, and the fossil fuel regime is so large, complex, and pervasive that many oil ties are hardly recognizable as such. But these campaigns are an important first step and are already yielding results.

So, let that work continue, but it won't be a panacea. Knowing where the funding for academic research comes from tells us something, but that knowledge has to be interpreted. As I've argued above, oil money isn't an automatic moral sink, not least because, at certain times and places, a few oil firms have funded research that could help dismantle their own industry. Tracing oil money in the academy also isn't an end unto itself. It should be followed by dialogue leading to near-term changes in university policies on external funding and collaborations, and longer-term strategic changes that will help universities to survive decarbonization.

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More fundamentally, we should seize the opportunity provided by decarbonization to create entirely new kinds of (quasi-)academic organizations. After all, each earlier energy system was coproduced with a new way of organizing teaching and research. Medieval universities were predicated on light and warmth from biofuels. Early modern academies and scientific societies ran, in part, on profits and knowledge coerced from enslaved labor. The Humboldtian research university would not have globalized in the nineteenth century without coal-fired trains and ships. The corporate laboratory of the early twentieth century leveraged the diesel engine, steam turbine, and especially the hydroelectric dam. The Cold War think tank would have been unthinkable without the promise of nuclear power and the reality of multilane highways and ocean-crossing passenger jets. And as I've argued above, the neoliberal university was partly an outcome of the 1970s and 1980s oil shocks and countershocks. We don't yet know if there will be an Age of Solar, Wind, or Fusion, and I can't predict what the distinctive research organization of that era would be. But we can say that universities of our own era have been saturated with oil, for better and—certainly today—for worse.

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Notes

1. Chris Garrard, "Taking the Logos Down: From Oil Sponsorship to a Fossil-Free Culture," in *Reimagining Museums for Climate Action*, ed. Rodney Harrison and Colin Sterling (Museums for Climate Action, 2021), 52–59; Douglas Rogers, "Energopolitical Russia: Corporation, State, and the Rise of Social and Cultural Projects," *Anthropology Quarterly* 87, no. 2 (2014): 431–451; and Riley E. Dunlap and Aaron M. McCright, "Organized Climate Change Denial," in *The Oxford Handbook of Climate Change and Society*, ed. John S. Dryzek, Richard B. Norgaard, and David Schlossberg (Oxford University Press, 2011), 144–160.

2. Long is described as the chief architect of Cornell STS in Sheila Jasanoff, "The Floating Ampersand: STS Past and STS to Come," *Engaging Science, Technology, and Society* 2 (2016): 227–237. Dates of Long's directorship are from Standard Oil of New Jersey / Exxon annual reports.

3. Joseph Slater, "1974 Scholars-, Artists-, and Special Guests-in-Residence in Aspen," April 1, 1974, in Folder 18, "Aspen Institute Board of Trustees, 1973-3,"

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Box 151, Martin Meyerson Papers (UPT 50 M613M), University Archives and Records Center, University of Pennsylvania; letter from F. A. Long to Walter Orr Roberts (cc'd to M. Black and J. Slater), October 2, 1973, in Folder "Aspen Institute, Program in Science, Technology & Humanism, 1973-1977-3," Box 21, Walter Orr Roberts papers (COU: 1356), Rare and Distinctive Collections, University of Colorado Boulder Libraries. The Institute had numerous oil ties in this era; in particular (but not exclusively), its president, Joseph Slater, was a former Creole Petroleum executive, and the chair of its board was Robert O. Anderson, founder of Atlantic Richfield.

4. Ronald R. Kline, "Harry E. Bovay Jr.," *Memorial Tributes: National Academy of Engineering*, vol. 18 (National Academies Press, 2014), 30–33.

5. Gordon Cain, *Everybody Wins! A Life in Free Enterprise* (Chemical Heritage Foundation, 1997).

6. Cyrus C. M. Mody, "Tools for Making Materials: Introduction to Part III," in *Between Making and Knowing: Tools in the History of Materials Research*, ed. Joseph D. Martin and Cyrus C. M. Mody (World Scientific, 2020), 241–256.

7. See https://mappingfossilties.org/.

8. Nils K. Ståhle et al., *From Vision to Action: Science and Global Development, 1971–1986* (International Federation of Institutes for Advanced Study, 1986).

9. E.g., "Exxon: The Challenge to Innovate," *FAS Reports*, February 1982.

10. Nobel Foundation, "M. Stanley Whittingham: Facts," *The Nobel Prize*, https://www.nobelprize.org/prizes/chemistry/2019/whittingham/facts/; and Geoffrey Supran et al., "Assessing ExxonMobil's Global Warming Projections," *Science* 379, no. 6628 (2023): https://doi.org/10.1126/science.abk0063.

11. Michiel Bron, "Oil's Nuclear Frames: The Oil Industry Shaping the Environment with 'Innovative' Nuclear Technologies since the 1970s," *Journal of Energy History* 12 (2025): 1h–15h; Jelena Stankovic, "History of Oil and Solar Relationships: Makeups and Breakups," *Journal of Energy History* 12 (2025): 1g–21g; and Odinn Melsted, "Geoscience Spillover: Gunnar Böðvarsson and the Adoption of Petroleum Technologies in Iceland's Geothermal Industry, 1940s–1970s," *History and Technology* 40, no. 3 (2024): 218–249.

12. E.g., Rawleigh Warner [chair of Mobil], "U.S. Energy: To Have and To Have Not?," speech to the World Affairs Council of Philadelphia, November 6, 1980, in binder HD9569.M62.Z99; or C. C. Garvin Jr. [chair of Exxon], "The Energy Outlook: Near and Long-Term," speech to University Club, New York, November 14, 1980, in binder HD9569.E99.Z99; both at Baker Library, Harvard Business School.

13. Cyrus C. M. Mody, "Surveying the Landscape: The Oil Industry and Alternative Energy in the 1970s," in *Electrical Conquest: New Approaches to the History of Electrification*, ed. Erik Conway and W. Bernard Carlson (Springer, 2024), 51–79.

14. Alexander Beunder, "Hoe Frits Böttcher met steun van tientallen bedrijven de basis legde voor de klimaatscepsis in Nederland," *Volkskrant*, February 22, 2020; Benjamin Franta, "Early Oil Industry Disinformation on Global Warming,"

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Environmental Politics 30, no. 4 (2021): 663–668; Christophe Bonneuil et al., "Early Warnings and Emerging Accountability: Total's Responses to Global Warming, 1971–2021," *Global Environmental Change* 71 (2021): https://doi.org/10.1016/j.gloenvcha.2021.102386; and Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (Bloomsbury, 2010).

15. David J. Hess, *Undone Science: Social Movements, Mobilized Publics, and Industrial Transitions* (MIT Press, 2016).

16. Jelmer Mommers, "Als de fossiele industrie de onderzoeksagenda op je universiteit bepaalt," *De Correspondent*, May 16, 2017, https://decorrespondent.nl/6724/als-de-fossiele-industrie-de-onderzoeksagenda-op-je-universiteit-bepaalt/.

17. Bill McKibben, "Global Warming's Terrifying New Math," *Rolling Stone*, August 2, 2012.

18. Leslie M. Harris et al., *Slavery and the University: Histories and Legacies* (University of Georgia Press, 2019).

19. Kairn Klieman, "From Kerosene to Avgas: International Oil Companies and Their Expansion in Sub-Saharan Africa, 1890s–1945," in *Environment and Economics in Nigeria*, ed. Toyin Falola and Adam Paddock (Routledge, 2011), 21–54.

20. Caitlin Harvey, "Gold Rushes, Universities, and Globalization, 1840–1910," *Past & Present* 261, no. 1 (2023): 118–157.

21. Sarah Bridger, *Scientists at War: The Ethics of Cold War Research* (Harvard University Press, 2015); Kelly Moore, *Disrupting Science: Social Movements, American Scientists, and the Politics of the Military, 1945–1975* (Princeton University Press, 2013); and Stuart W. Leslie, *The Cold War and American Science: The Military–Industrial–Academic Complex and MIT and Stanford* (Columbia University Press, 1993).

22. Cyrus C. M. Mody, "Taking the Marks to the Market: The Oil Industry and the Entrepreneurial Turn," in *Greedy Science: Creating Knowledge, Making Money, and Being Famous in the 1980s*, ed. Michael D. Gordin and W. Patrick McCray (Johns Hopkins, 2025), 19–44.

23. Naomi Oreskes and Erik Conway, "Challenging Knowledge: How Climate Science Became a Victim of the Cold War," in *Agnotology: The Making and Unmaking of Ignorance*, ed. Robert N. Proctor and Londa Schiebinger (Stanford University Press, 2008), 108–148.

24. Cyrus C. M. Mody, *The Squares: US Physical and Engineering Scientists in the Long 1970s* (MIT Press, 2022).

25. Stanton A. Glantz, "Stanford and the Pentagon," *Change* 4, no. 7 (September 1972): 17–19.

26. E.g., Data for Progress' Accountable Allies project for the US, https://www.dataforprogress.org/memos/accountable-allies-the-undue-influence-of-fossil-fuel-money-in-academia; and open Democracy's similar survey for the UK, https://www.opendemocracy.net/en/dark-money-investigations/british-universities-slammed-for-taking-90m-from-oil-companies-in-four-years/.

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A Brief Oral History of Fossil Fuel Divestment

An interview with Bill McKibben

We cannot overstate the significance of journalist and environmental activist Bill McKibben to the fight against the climate crisis. McKibben's book *The End of Nature* (1989), the first publicly facing book on the crisis, appeared just as climate change began to emerge as an issue in US politics. Twenty subsequent books, along with influential articles in venues such as *The New Yorker* and *Rolling Stone*, have propelled climate change into the public view. He serves as the Schumann Distinguished Scholar in Environmental Studies at Middlebury College, where with his students he founded 350.org, a climate action group that was instrumental in coordinating a global upsurge of climate protests. These included the successful civil disobedience campaign against the Keystone XL Pipeline Project in the US and the New York People's Climate March (2014), which helped push for greater ambition in the Paris Agreement. His current projects include Third Act, a group he helped found, which organizes climate action among people over the age of sixty, and a Substack newsletter, "The Crucial Years."

As we considered oil money and the sustainable academy for this volume, we asked him to help us think about another important initiative: the fossil fuel divestment campaign, which he launched on college campuses starting in 2011. (Full disclosure: It was his visit to Dickinson College in 2012, as Rose-Walters Prize winner, that recruited one of our coeditors to climate work.) Since 2011, according to the Global Fossil Fuel Commitments Database, institutions with investments totaling $40.76 trillion have divested from fossil fuels. More than $6 trillion of that comes from educational institutions.

Emily Pawley: Could you start by giving us a quick sense of what the climate movement looked like to you and your students at Middlebury, just before the divestment movement started? What prompted the turn to a divestment campaign as a strategy?

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Bill McKibben: We were on a bit of a roll, with the successful first part of the campaign against the Keystone Pipeline the summer before.

Both Naomi Klein and I had read a small report by the London group Carbon Tracker, and realized that it put the fossil fuel industry in a new light—their business plan literally called for digging up five times more carbon than scientists said was compatible with a livable climate. Viewed in this light, it was a rogue industry, and both of us flashed back to our college-age divestment fights against apartheid. I tried the idea out in a story in *Rolling Stone*, which went unexpectedly viral, and so we organized a series of two dozen mass meetings across America that fall (Naomi got pregnant, which limited her to just a few of them). They were wildly successful—sold-out crowds in three-thousand-seat venues night after night. By the time they were done, there were hundreds of divestment campaigns underway, at first mostly on college campuses (and we had our first win, Unity College in Maine).

EP: I heard you speak early in the divestment campaign, and you said that the divestment movement was about moving money and changing ideas. Could you talk about this—whose money and whose ideas were you targeting early on? What is it about academic institutions that made them receptive to this type of campaign?

BM: Originally, when this was very small and when we didn't know if it would grow to the point where it would have a deep practical effect, we said that our first target was the "social license" of the fossil fuel companies.

My thought was most people don't have a coal mine or an oil well in the backyard, so the fight against Big Oil was somewhat abstract. But everyone is near a pot of money—church fund, pension fund, college endowment. Therefore, the climate fight could play out in ten thousand places, and in each one, we could lay out the logic, over and over, of why we had to bring this industry under control and keep its reserves in the ground. This, I think, was undeniably successful. And then, as it grew and grew, it started to crimp the flow of capital, first to coal and then to oil and fracked gas.

Universities were an obvious target, if only because half the prominent people in America sit on some college board of trustees, and this was a great way to keep this topic in their faces. They are also very hard targets because those people on the boards come overwhelmingly from finance, and they were not keen on seeing money in moral terms—hence, say, Harvard's ten-year resistance to divesting.

EP: What did it accomplish beyond what you expected? What were the false starts or things that remain to be done?

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BM: First of all, it got much larger than we ever expected. People have called it the largest anti-corporate campaign ever, measuring the size of endowments and portfolios that have signed on—roughly $40 trillion.

But our biggest hope was that it would be a way to have the climate fight in a thousand places at once, and man, did that prove out. A lot of it was on college campuses, and there—when kids graduated after four years—they kept on fighting. The Sunrise Movement was, at first, almost all veterans of the divestment fight. I'd met Varshini Prakash, its great founding executive director, when she was running the UMass Amherst divestment campaign. And they, of course, brought us the Green New Deal, which begat the IRA—so, you never know how things are going to end up.

Much remains undone—two of our white whales have been the CA pension fund, which we need to follow New York, and the Yale endowment, which is just about the last of the Ivies.

EP: As historians teach the history of climate, what would you want them to emphasize about the divestment movement? And maybe about the climate movement (or movements) in general?

BM:

1. It took the climate fight to a lot of new places—in truth, it gave it a geography that went beyond the coal fields and oil patches. Suddenly, anywhere with a pot of money was in the game.

2. It highlighted, kind of early on, the role of money as a key part of the fight—that we could cut off not just pipelines but pipelines of money.

3. It drove home the argument that we needed to keep carbon in the ground—that is, it called out the business plans of Big Oil for the unscientific farce that they were. Exxon et al. became, increasingly, rogue companies.

4. It trained an ungodly number of amazing leaders.

5. Because so many of these universities, foundations, etcetera had prominent people on their boards, it forced them repeatedly to deal with this most pressing of issues, which otherwise would not have been in their faces so regularly.

6. It cut off a lot of the supply of easy capital to the coal industry, and some of it to Big Oil.

7. It drove the bad guys crazy, and took a lot of their energy to fight.

EP: For those of us planning our own activism within and outside higher ed, what lessons should historians draw from the divestment movement?

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BM: I think one lesson is: Trust that people are able to do remarkable things. There have been divestment campaigns in several thousand places. We've been able to supply resources to some extent, but mostly people have figured out the local lay of the land and gone to work. NGOs (non-governmental organizations) sometimes try to hang too tightly to campaigns; if you can, instigate, inspire, help—but also leave lots of room for people to do their own things.

And if you message clearly—these are rogue companies that threaten the Earth—then people will be able to take on even fairly complicated fights.

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The Five Stages of Institutional Transformation

Cathy Gere

In October 2023, *Frontiers in Education* published an opinion piece titled "No Research on a Dead Planet." Authored by four British academics, the article pointed to a glaring contradiction. Most institutions of higher education have officially acknowledged the climate crisis as an "emergency," and yet those same institutions fail to act to mitigate the problem.[1]

Universities continue to invest in fossil fuel companies. They use fossil fuel banks. Their metrics of faculty success incentivize eye-watering quantities of academic aviation. They conduct research on fossil fuel reserves for the industry. Their industry-funded climate experts work diligently to obfuscate the problem and delay the energy transition. Their energy systems directly add millions of tons of greenhouse gasses to the atmosphere.

This piece summarizes a five-year effort to confront the climate contradiction at the University of California (UC). Although the campaign has tackled all of the issues listed above, this discussion will focus on university energy systems. Scientific research is extraordinarily energy intensive—all those freezers, servers, supercomputers, and autoclaves, running twenty-four hours a day, add up to an enormous demand. Taken together, the ten campuses of the University of California directly emit more than a million metric tons of CO_2 every year, three-quarters of which is generated by the natural gas that is used to make electricity on site.

Although natural gas emits less CO_2 than coal and oil when burned, it is nonetheless a highly polluting fossil fuel and an environmental and human health disaster. Natural gas is methane. In the short term, it is a far more potent greenhouse gas than CO_2. Leaks during production, transportation, and use are a major contributor to global warming. Its extraction by hydraulic fracturing contaminates the soil, air, and water and shortens the lifespan of fenceline communities. Taking the whole cycle into account, it is only marginally less polluting than coal.

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The authors of "No Research on a Dead Planet" talk of "a process of socially organized denial" that leads academics to experience "a state of 'double reality.'"[2] In the case of the University of California, double reality was couched in doublespeak. In 2013, the then–UC president Janet Napolitano launched the "Carbon Neutrality Initiative." She promised that by 2025, the whole UC system would reach "net zero" greenhouse gas emissions.[3] A phalanx of engineers, climate wonks, and campus operations people studied the challenge and decided that the best—that is, the cheapest—way to achieve net zero was to continue to burn fracked methane to power the campuses and neutralize the resulting enormous emissions with "carbon offsets."[4]

Carbon-offset schemes funnel money to projects that *absorb* carbon in order to "neutralize" the environmental impact of institutions that *emit* it. Sounds okay on the face of it, but if you boil it down to its basic logic, the carbon-offset market lies somewhere between fairytale and protection racket. The classic carbon offset involves trees. If, for example, someone can spin a story about how a forest in Ecuador will be destroyed if payments are not made to middlemen, the middlemen make money. Then, the forest burns anyway because . . . climate change.[5]

In 2019, neuroscientist turned climate-activist Adam Aron founded the Green New Deal (GND) at UC San Diego.[6] In 2020, taking advantage of pandemic Zoom, I helped expand the organization to the whole ten-campus system.[7] As one of our many campaigns, we challenged the university to abandon the fiction of offsets, and retire its fossil fuel infrastructure on a schedule dictated by science. In 2020, we circulated a petition demanding that the UC campuses draw up plans for electrification of their energy systems, a necessary step toward real decarbonization.[8] Three and a half thousand signatures got us into meetings with the executive vice president of the whole UC system, as well as the chancellors of three of the campuses. They were politely dismissive. Some chuckled incredulously at the whole idea.

In the aftermath of that discouraging meeting, I reflected on the ways that being a historian of science informs my approach to environmental issues.[9] The natural sciences break down environmental impacts into constituent pieces, imposing grids on landscapes, ignoring humans, abolishing the arrow of time, and simplifying entangled ecologies. History of science and technology, by contrast, understands landscapes and infrastructures as layered historical artifacts composed of material-semiotic objects. Without history of science and technology, we will never

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understand how we got into this complicated mess. And if we don't know how we got here, it's going to be harder to find our way out.

Offsets are pure financialization gilded with the sheen of science. They are worse than useless when it comes to tackling climate change. In 2020, one of the UC campuses—UC Merced—announced that it had achieved carbon neutrality ahead of the 2025 deadline. When we asked them about the carbon offsets they had purchased for this purpose, they refused to release the details. Increasingly surreal emails flew back and forth, including one not meant for my eyes calling me a "bug." We had to do a public records request to get the information.

Public records showed that the UC invested in at least 326,275 tons of carbon offsets starting in 2014, all of the same type: "Landfill Gas: Capture/Combustion." Here's how it works. When waste decomposes in a landfill, it produces biomethane. When methane is burned, it produces CO_2. Since methane is an even more potent greenhouse gas than CO_2, burning it to convert it to CO_2 supposedly reduces the burden of greenhouse gas emissions.

In California, every landfill legally has to *capture* its biomethane gas. In lower-regulation states, landfills can sell offsets by simply *flaring* it. Because this most basic of mitigation measures is not otherwise mandated by law, Louisiana landfills can sell offsets for the CO_2 they generate by setting fire to their methane. The UC bought them at the risibly low price of $1.35 a ton. Ultimately, the purchase of these certificates amounts to less than nothing: The University of California claims to "neutralize" the damage it causes when it burns methane and emits CO_2 by paying landfills in low-regulation states to burn methane and emit CO_2.

We published a piece on these findings in the *Sacramento Bee*.[10] A group of student filmmakers made a documentary.[11] We staged demonstrations and inserted student speakers into fancy events.[12] Meanwhile, we were also working through the university's version of Athenian democracy, the Academic Senate. In 2019, the aforementioned faculty founder of the GND pushed through the creation of a standing committee of the UC San Diego Academic Senate on "Campus Climate Change."

In 2022, the climate change committee put decarbonization to a systemwide vote. Every campus had to separately cast their ballot. It passed by a large majority. Of the faculty who voted, 84.6 percent supported our resolution to "petition the Regents to invest in infrastructure that would reduce on-campus fossil fuel combustion by 60% by 2030 and 95% by 2035."[13] Such statements are exercises in futility unless they are backed

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by a lot of additional advocacy. In this case, we had colleagues who carried our energy campaign to the real seat of power, the Office of the UC President. Eventually, having initially resisted our demands, Michael Drake, the UC president, responded to their urging by convening a task force on a fossil-free UC. Over the course of a year, the task force whittled down the university's offsets policy and replaced it with a commitment to actually decarbonize campus operations. They also extracted $13 million from the university's operating budget for decarbonization plans for the whole UC system, using the Academic Senate memorial as the guiding instruction.

The *MIT Technology Review* recently published a piece on the UC's change of policy from carbon neutral to fossil free. The same people who bitterly opposed us for years are now taking credit for having identified the problems with carbon-offset schemes. A long political fight *against* them has been recast by them as a sober scientific assessment conducted *by* them.[14] It got me thinking about the stages of institutional transformation: first, they laugh; then, they get angry; then, they get punitive; then, they sulk. And then, it was their idea all along.

Each of the ten campuses engaged in the planning process in its own fashion. Now, the decarbonization studies are complete, and the campuses have to make plans for implementation.[15] Now, in other words, the real work is upon us. Only two UC campuses—Davis and Berkeley—already have implementation plans in place for their decarbonization. At UC San Diego, arguing for real solutions to be undertaken at the right pace will be a monumental challenge. Haunting all of these negotiations, of course, is the question of funding. Electrification will cost hundreds of millions of dollars in capital costs and tens of millions in running costs. To summon the political will, we will have to braid real decarbonization into the very DNA of the institution. To that end, we have been working to align with the educational mission of the university by making each campus a living laboratory for the energy transition. It takes a lot of patience, and there is no such thing as victory, but there is satisfaction and purpose to be found in activating the academy to behave as if the future mattered.

Notes

1. Aaron Thierry et al., "'No Research on a Dead Planet': Preserving the Socio-Ecological Conditions for Academia," *Frontiers in Education* 8 (2023), https://doi.org/10.3389/feduc.2023.1237076.

2. Thierry et al., "'No Research on a Dead Planet,'" 3.

3. University of California Sustainability Office, "Fact Sheet: UC Carbon Neutrality Initiative," 09/14, accessed June 10, 2024, https://www.ucop.edu/sustainability/_files/UC_Carbon_Neutrality.pdf.

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4. Alan Meier et al., "University of California Strategies for Decarbonization: Replacing Natural Gas," UC TomKat Carbon Neutrality Project, https://doi.org/10.17605/OSF.IO/HNPUJ.

5. Lisa Song and Paula Maura, "An Even More Inconvenient Truth: Why Carbon Credits for Forest Preservation May Be Worse than Nothing," *ProPublica*, May 22, 2019. https://features.propublica.org/brazil-carbon-offsets/inconvenient-truth-carbon-credits-dont-work-deforestation-redd-acre-cambodia/.

6. See https://ucsdgreennewdeal.net/. See also the Green New Deal archive at UCSD Library: https://library.ucsd.edu/dc/collection/bb3459953q.

7. UC Green New Deal Coalition: https://ucgreennewdealcoalition.net/.

8. See the "Electrify UC" website, created and maintained by Adam Aron with contributions from myself and other members of UCSD Green New Deal: https://electrifyuc.org/. Having succeeded in the aims of the campaign, it is now more of an archive than a live site. See also Monica Nelson et al., "The Wins of the Grassroots Climate Movement in the University of California," *Frontiers in Education* 10 (2025), https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2025.1491439.

9. Cathy Gere, "'Shovel Ready': The Commons and the Climate Crisis," *Historical Studies in the Natural Sciences* 51, no. 4 (2021): 542–552.

10. Cathy Gere and Adam Aron, "UC Says It'll Meet 2025 Carbon Neutral Goal, Yet Remains a Massive California Polluter," *Sacramento Bee*, June 19, 2021.

11. "Coming Clean: A Demand for a Fossil Free UC," Green New Deal Films, dir. Andre Salehian and Carolina Montejo, accessed June 10, 2024, https://www.youtube.com/watch?v=1N_dq9J7mDY&t=2s.

12. See "A Conversation with Author Kim Stanley Robinson," centered on his cli-fi masterpiece *The Ministry for the Future*, in which we had students playing the parts of UC San Diego Ministers for Atmosphere, Health, Finance and Energy: https://www.ucsd.tv/shows/A-Conversation-with-Author-Kim-Stanley-Robinson-38733.

13. Here is the text of the resolution on the UC San Diego Academic Senate website: https://senate.universityofcalifornia.edu/_files/reports/rh-md-senate-memorial-on-reducing-fossil-fuel-combustion.pdf.

14. James Temple, "The UC Has All but Dropped Carbon Offsets—and Thinks You Should Too," *MIT Technology Review*, November 2023, https://www.technologyreview.com/2023/11/30/1084104/the-university-of-california-has-all-but-dropped-carbon-offsets-and-thinks-you-should-too/.

15. A link to UCSD's decarbonization study is to be found on the university's sustainability page: https://sustainability.ucsd.edu/focus/climate.html.

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Resources Related to Part V

Alexandra Hui, Elaine LaFay, Samantha Muka, Emily Pawley, Sarah Pickman, and Anna Zeide

V.1 A List of Resources for Making Academia More Sustainable

Campus greening:

- Where do you stand in the star ratings for the Association for the Advancement of Sustainability in Higher Education?: https://stars.aashe.org/
- Are your campus buildings LEED Certified by the Green Building Council?: https://www.usgbc.org/leed
- Net Zero on Campus Tool Kit: https://www.unsdsn.org/our-work/net-zero-on-campus/

Decarbonizing travel:

- FlyingLess—tools and strategies for scientists interested in "successful research, less flying": https://flyingless.de/en/
- Stay Grounded campaign—two hundred member organizations, including local airport opposition and climate justice groups, nongovernmental organizations, trade unions, initiatives fostering alternatives to aviation, and groups fighting offset projects or biofuel plantations

Divestment:

- Check your institution on the divestment tracker: https://divestmentdatabase.org/
- See if your retirement funds (if you have them) are invested in fossil fuels at Fossil Free Funds: https://fossilfreefunds.org/
- Fight fossil fuel investments in US academic retirement funds at TIAA Divest: https://tiaa-divest.org/

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Power and Community Building:

- For unionization resources, check out Higher Ed Labor United: https://higheredlaborunited.org/about/members/
- As a model for centering different voices in higher education (and a source of great material), check out Environmental History Now: https://envhistnow.com/

V.2 Ways That Faculty at Various Stages in Their Careers Can Push for Change at Their Institutions

Senior faculty (see also everything listed under junior faculty):

- Don't lament institutional features you have the power to change without acting on them
- Board of trustees/economic work
- Push for divestment
- Decouple tenure / advancement requirements in your department from carbon-heavy activities (international travel)
- Loudly assert the prestige of public-facing work
- Push for increased security and pay for contingent faculty and support their research
- Help other people make time for their work by reducing meetings, cutting hoops that need jumping through, and fighting only when you need to fight
- Unionize and support unionization

Junior faculty:

- Run for faculty leadership positions
- If you can, develop courses that focus on climate change history
- If you can, develop courses that document and teach your institution's labor history ("strike pedagogy")
- Participate in student-led climate activities
- Support divestment
- Understand your university's climate impact and ask about it
- Learn about your institution's landscaping practices and consider advocating for more native / seasonally appropriate / water gardens
- Learn about and support your institution's recycling initiatives
- Learn about and support your institution's food waste initiatives

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- Learn about and support your institution's rideshare / public transportation options
- Unionize

Adjunct and contingent faculty:

- If it is a part of your position, sit on committees and say what you can there
- If you can, design courses about climate change history or integrate climate conversation into your courses (see resources for part II)
- Build networks and make stuff (know that the network Historians for Future, which inspired us here, was almost all student and contingent)
- Consider contributing a piece to *Contingent Magazine*
- Unionize

Graduate students:

- If applicable, run for council positions in your academic societies
- Join groups working for change and see what they do
- If possible, sit on committees
- Blurt fake naive questions—make people explain why things are the way they are
- Mention climate a lot
- Unionize

V.3 Some Self-Maintenance Practices

Some of these require money, some require time, some require power. Readers will have different amounts of money, time, and power at different points in their lives. Some of these strategies don't work when you are personally in crisis. Nevertheless, consider:

Take a break:

- Some possible email auto-reply phrases:

  "I am unable to reply quickly right now."
  "Everybody deserves a break—I will reply to your email soon."
  "There will be delays. I am taking a break right now."

- If you start to hate all people, go look at some art, don't think about climate for two hours, pet domesticated animals, go for a hike, do crafts, make human connections.

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- Remove social media apps from your phone.
- Curate your different social media platforms so that some have a lot of climate content and some have mostly knitting and kittens (or whatever your cozy preferences are), so you can choose, depending on your headspace.
- Run the dishwasher twice—that is, it's okay to sometimes do what you need to do to get the dishes clean.

Prioritize:

- Throw out a task or decide to do it badly.
- Don't substitute tiny consumer scale guilt for thinking about and enabling big change.
- Sometimes, what is needed is not a hero but a supporting role.
- Following Jenny Price: If you have to choose something to respond to, choose a big problem not a little one. Local doesn't mean small.

Reframe:

- Distinguish between *your* choices and the choices of those who made the structures around you.
- Notice that single acts and moments have multiple consequences—don't only notice the negative ones (as historians, we know that lived realities can be multiple).

Find inspiration / find community:

- Join communities *outside the academy*.
- Add natural history communities to your social media.
- Add people doing cool climate work to your social media feeds.
- Do not, do not, do not reinvent the wheel (find the folks already working on all the things).
- Don't be alone unless you need to be alone to rest.
- Add to your "to-read" pile / dismantle your "to-read" pile.

Mess with time:

- Is the four-day workweek right or somehow possible for you? Or seasons of intensity followed by periods of rest?
- Consider using an app that helps you maintain personal time separate from work time.
- Silence email and work app notifications at 5 P.M. and on weekends.

Look for tangible opportunities within reach:

- Find climate organizing work within your institutions.

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- Set up new monthly donations to nonprofit organizations (local, Global South, etc.).
- Give yourself permission to scaffold your climate knowledge and action.
- Learn about your place: local wildlife, local groups, local plants, local weather.
- Choose your battles, but don't immediately assume you know what battles are losing.
- Note how other justice work is also climate work—support it, and if you're in the middle of it, keep going!
- Don't hyper-fixate on individual lifestyle choices; rather, choose one change at a time that already supports other goals of yours—for example, composting, bike commuting, and so forth.

V.4 Brainstorming Exercise: Make Your Own List of What Should or Should Not Be Sustained in Academia

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VI

Preparing for Change and Imagining Futures

The past is the historian's object of inquiry, but the worst horrors of the climate crisis, as well as the most dramatic responses to it, lie in the onrushing future. In this last part of the book, we think about how historians might intervene in proposed futures: by finding the histories of planned "solutions," by disrupting expectations of inevitability, by writing the histories of those who are working to create *new* futures, and by using the past to think in different ways about grief and possibility and to imagine how, following Olúfẹ́mi Táíwò, we might act as ancestors to the people and worlds to come.[1]

In the first essay, Emily Pawley argues that we should focus as much critical attention on our prophecies of doom as we do on our Pollyannaish hopes for renewal. Kate Brown follows this with a meditation on her shift of attention from the global circuits of radioactive isotopes from nuclear disaster toward forms of research that can nourish what Christof Mauch has called "slow hope." James Morton Turner and Gustave Lester show how historians can prepare for the energy transition by emphasizing the ways that critical mineral mining is already replicating historical extractivism and by tracing and supporting Indigenous sovereignty and resistance. An interview with Laura Martin outlines the century-long history of ecological restoration to help us think concretely about "rewilding" and "nature-based climate solutions." Laura Stark asks how historians can work with allies in the tech industry to disrupt the narratives of inevitability that are clearing the way for catastrophic forms of artificial intelligence. Claire E. Campbell, Melanie A. Kiechle, and Kara Murphy Schlichting push readers to consider how cities might be adapted to climate resilience. They show how existing cities have already been drastically reshaped by planners in ways that made them safer in the present and more vulnerable heading into the future. Next, Samantha Muka and Anna Guasco argue that knowing marine histories, and expanding

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our sense of archives to include forms of marine life, can help prepare us for the rising tides of a watery world. Taking perhaps the quintessential historian's approach to considering the future, Elizabeth Blum and Ellen Griffith Spears trace the histories of youth climate activists who have profoundly changed what futures are planned and by whom. Finally, Gabriela Soto-Laveaga meditates on how hunger stones, water treaties, and Aztec gods illuminate what care for the future might look like.

Resources for this part of the book include another brainstorming exercise for readers to articulate their history skills (the "Historian's Climate Emergency Go Bag" assignment from part II), a list of places where the future is being discussed where historians might want to intervene, and one last round of recommended reading.

Note

1. Olúfẹ́mi Táiwò, *Reconsidering Reparations* (Oxford University Press, 2022), 201.

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35

Despair as Analytical Failure

Emily Pawley

What do I mean when I say that despair can be an analytical failure? Not that despair is unreasonable or stupid. The harm of climate change has moved past projection into reality, tallied in grieving family members, homes washed away or burned, and livelihoods shattered. Here in the US, the Trump administration is destroying climate policies built up over decades of organizing, gutting federal agencies and handing them back to fossil fuel interests. The Loss and Damage Fund promised to the Global South in United Nations (UN) climate negotiations lies essentially empty after yet another UN Conference of the Parties held in a petrostate.

Given these truths, this essay is not an exhortation to a ghastly grinned positivity. There are plenty of valid critiques of positivity—the distortions of Pollyannaish hope, the naivete that "every little bit counts", the toxic positivity that won't let people express their suffering or that sanitizes unpleasant elements of "encouraging" stories; the narratives of inevitable progress that encourage us to sit back and let the arc of history bend toward justice while we wait. I don't want to hunt for silver linings in the deaths of others or to serve as an uncritical booster for flimsy or self-serving "solutions."

To be honest, though, I do not find positivity particularly tempting. I find it tiring and sometimes embarrassing. At this moment, I would like to give up and take a nap, resting in the knowledge that nothing I do matters.[1] I would also enjoy the cultural cachet that comes with cynicism. Here, I want to challenge the assumption that I most struggle with: that appalled despair is automatically an intellectually honest position, a cold reality, free of the myths and distortions that plague hope, and the only proper end of analysis.

Of course, concerns about despair's effect on motivation already animate a lot of climate discourse. Since the early 2000s, endless debates have circled around pushing the public to be just afraid enough to act. "When we cannot panic appropriately, we cannot take fittingly radical action," warns

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Andreas Malm, typically.[2] In recent years, many climate activists and writers have pushed in the opposite direction. One school points to research in psychology suggesting the greater motivating power of hope.[3] Another marks the allure and the ethical bankruptcy of the people Mary Annaïse Heglar calls "Doomer Dudes," ever present on social media to assure us that all efforts are useless.[4] "For those of us whose lives are already easy," Rebecca Solnit writes, "giving up means making life even easier, at least in terms of effort. For the directly impacted, it means surrendering to devastation. Giving up on their behalf is not solidarity."[5]

Increasingly, I have been trying to pay attention to the ways that doomerism is not just an ethical trap, not just a failure of will or energy, not just a demotivating force, but also a failure of analysis. In public climate science, evidence-based attacks on the doomer position are now common. As the possibility of limiting warming to 1.5°C slips away, phrases like "game over for the climate" that were popular in the 2000s and 2010s (and which helped to create the doomer position in the first place) have given way to a gritty incrementalism—a determination to fight each fraction of a degree of warming.[6] But climate scientists' declarations about the possibilities of beating back incipient disaster depend on their understanding of social and political change. That seems like the cue for us as historians.

As historians, what can we see of the distortions and fallacies that a despairing mode introduces? What kind of processes does it make invisible? What theories of social change does it unquestioningly presume? What limits does it accept and naturalize? How might historians better lay those distortions, fallacies, and invisibilities bare? Further, what kind of scholarship doesn't find its stopping point in numb acceptance of the worst aspects of the status quo?

This shouldn't be as hard for me as it is. My own subfield, environmental history, was founded on a critique of "declensionism"—a narrative mode describing all human-driven environmental change as damage and all landscapes as moving faster and farther from a golden, more natural past.[7] In the face of climate instability unfolding at a scale unmatched in historical experience, we need narratives of decline. But as efforts to "rewild" ecosystems roll out, bankrolled by states and corporations, critiques of declensionism remain vital. Historians like Diana K. Davis have shown, for example, how colonial experts interpreted deserts or savannas as evidence of deforestation by colonial populations, justifying crackdowns, surveillance, the seizure of territory, and the loss of use rights.[8]

Even outside my subfield, as a historian, I should be well placed to notice the aspects of common expressions of climate despair that are

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fundamentally anti-historical. As historians, we certainly can challenge the assumption that particular cultural formations—from political platforms, to diets, to gender identities, to practices of consumption and production—are actually universal, permanent human tendencies or perhaps expressions of some kind of national character (e.g., "the American Love of the Car"). Likewise, the idea that the shape of the future is fixed and inevitable rather than contingent and branching runs counter to the most basic training we receive.

Researchers have also traced myth in some of the narratives of social collapse that have long since hardened into clichés, painstakingly demonstrating the historical origins of expectations of the madness of crowds or elite expectations of working-class panic or Malthusian-inflected myths about the behavior of rats in boxes or colonized peoples in droughts.[9] We can see the imprint of biblical apocalypse stories in throwaway comments about a world on fire that add drama while sapping any social capacity to act.[10] Archaeologists and historians have primed us to ask questions when we start to run into the often-racist stories of "collapse" that inflect our understandings of the Romans, the Maya, and the people of Rapa Nui.[11]

Some despairing distortions come also from the direction we point our professional gaze—frankly, we are better at narrating negative change than positive change, so we leave significant phenomena undescribed. Thus, for example, we have an increasingly rich and important literature explaining the emergence of mechanisms of denial in the US, but we have no clear history explaining how it came to be that, despite these mechanisms, the majority of Americans have acknowledged the reality of human-caused climate change for decades. This contributes to the hard-to-eradicate myth that deniers are the majority.[12] Who did that communicative work? What institutions were crucial? What forms of communication worked? We don't have a systematic understanding. Telling such a story shouldn't lead us to relax—our actual political barriers have perhaps clogged a functioning climate politics nearly as effectively as majority denial might have. But acknowledging the work that has been done to weaken denial of the science in the US might help us imagine the task before us differently.

In failing to narrate stories of positive change, we have perhaps contributed to another despairing myth: the persistent belief in total climate inaction rather than insufficient ongoing action. This hides the emergence of climate movements, the contest between different kinds of policies, the interposition of barriers, and the attempts made to surmount them. Activists themselves have worked to fill this gap—recent works on hope often include an emerging popular historiography of positive change. Often,

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this is built around well-known historical narratives about the New Deal, the Civil Rights Movement, and the abolition of the Transatlantic Slave Trade. Climate activists' timelines of "Earth Wins" chronicle significant developments that I struggle to find scholarship on.[13]

When we leave positive accounts out of our own historical work, we get another source of despair: painfully thin and thus unconvincing accounts of social change. Some are dependent on great man history, hiding the quotidian organizing work that historians of social movements know well and encouraging potential activists to wait for leaders. Others depend on the expectation that positive change follows "society coming together" around a single galvanizing moment, a single message, and a generally agreed upon plan as opposed to being pushed forward haltingly by a disparate, usually disunited, and conflicted coalition.

Better use of historians' work could help us to forgive processes that get messy when they get democratic. We could trace multigenerational and multicentered projects and follow out the lines of continuity between different phases of protest and the sprawling intersections and sometimes mutually reinforcing consequences of solutions work.[14] I think here of the Keystone XL Pipeline fight in the US, which stopped its target pipeline and then also helped build new coalitions, welded Democrats imperfectly to the promise of climate action, and created strategies to keep fossil fuels in the ground that are still unfolding.

God forbid I should advocate here an exclusive attention to happy stories from the past. We need our studies of past and present horrors to help us identify what changes are needed, and to keep us from nibbling at the edges of problems without tackling their cores. Indeed, as elaborate schemes to combat our fear of apocalypse proliferate, we are already finding them to be inflected by colonialism and racial capitalism. In every flavor of hope, there is a lingering tang of horror and corruption.

Here the analytic failure, it seems to me, is stopping at the observation of horror. Two moments have changed my thinking about this. The first is the sharp voices of Olúfẹ́mi Táíwò and Shuchi Talati hitting back against critics who lament that solar geoengineering will inevitably derive from and strengthen global inequality. "These Global North–based researchers, without any disclosed consultation with Global South organizations or researchers, pronounced the Global South's interests from a microphone based in the North," they write. They demand instead more work on "a non-military alternative research program that helps fund and build capacity of Global South Researchers and policy makers" and "a collective framework to make collective decisions."[15] The second is Sara Ann

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Wylie's conception of "constructive STS" in *Fractivism*. Upon uncovering the information asymmetries and intentional obfuscation of the oil and gas industry in the fracking landscape, Wylie formed a research group of artists and programmers to develop participatory online tools, among them a rating system to expose fraudulent landsmen and a system for sharing symptoms among distributed groups with poisoned water.[16] Such examples help us see where our critique might intervene beyond the peer reviewed literature—in, for example, legal challenges against fossil fuel companies, or in support for assertions of sovereignty by Indigenous people, or in repeated public commemoration of the broken promises of development agencies, corporations, and global negotiators to assist those demanding better.

What can historical work offer us as we turn away from the distortions and seductions of despair? Reassurance that things will be fine? Obviously not. As historians, we know that hope and despair are claims about a future that is not yet fixed. What we can do is add our hands to the work, do research designed to help those people attempting to turn that unfixed future away from disaster, and chip away at the ramparts of the despairing myths that confine them and us.

Notes

1. To be clear, naps are great and help with not giving up.

2. Andreas Malm, *The Progress of this Storm: Nature and Society in a Warming World* (Verso, 2018), 189. For meditations on hope and despair by environmental historians, see Graeme Wynn, "Framing an Ecology of Hope," *Environmental History* 25, no. 1 (2020): 2–34; and Esther van 't Veen, "Fearing the Subject of Study: The Climate Crisis and the Environmental Historian," Environmental History Now, April 17, 2024, https://envhistnow.com/2024/04/17/fearing-the-subject-of-study-the-climate-crisis-and-the-environmental-historian/.

3. Maria Ojala, "Hope and Climate-Change Engagement from a Psychological Perspective," *Current Opinion in Psychology* 49 (February 1, 2023): 101514.

4. Mary Annaïse Heglar, "Home Is Always Worth It," Medium, September 17, 2019, https://medium.com/@maryheglar/home-is-always-worth-it-d2821634dcd9.

5. Rebecca Solnit, "Why Climate Despair Is a Luxury," *New Statesman*, July 17, 2023.

6. E.g., James Hansen, "Game Over for the Climate," *New York Times*, May 9, 2012, https://www.nytimes.com/2012/05/10/opinion/game-over-for-the-climate.html; and Graham Readfearn and Adam Morton, "'Every Choice Matters': Can We Cling to Hope of Avoiding 1.5C Heating?" *Guardian*, April 2, 2021.

7. William Cronon, "A Place for Stories: Nature, History, and Narrative," *Journal of American History* 78, no. 4 (1992): 1347–1376.

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8. Diana K. Davis, *The Arid Lands: History, Power, Knowledge* (MIT Press, 2016).

9. Lee Clarke and Caron Chess, "Elites and Panic: More to Fear than Fear Itself," *Social Forces* 87, no. 2 (2008): 993–1014; and Jon Adams, *Rat City: Overcrowding and Urban Derangement in the Rodent Universes of John B. Calhoun* (Melville House, 2024).

10. Timothy Grieve-Carlson, *American Aurora: Environment and Apocalypse in the Life of Johannes Kelpius* (Oxford University Press, 2024).

11. Guy D. Middleton, *Understanding Collapse: Ancient History and Modern Myths* (Cambridge University Press, 2017).

12. Gregg Sparkman et al., "Americans Experience a False Social Reality by Underestimating Popular Climate Policy Support by Nearly Half," *Nature Communications* 13, no.1 (August 23, 2022): 4779.

13. Zahra Biabani, *Climate Optimism: Celebrating Systemic Change Around the World* (Mango, 2023), 71–102; and Rebecca Solnit and Thelma Young Lutunatabua, *Not Too Late: Changing the Climate Story from Despair to Possibility* (Haymarket Books, 2023).

14. Olúfẹmi O. Táíwò, *Reconsidering Reparations* (Oxford University Press, 2022).

15. Olúfẹ́mi O. Táíwò and Shuchi Talati, "Who Are the Engineers? Solar Geoengineering Research and Justice," *Global Environmental Politics* 22, no. 1 (February 4, 2021): 12–18.

16. Sara Ann Wylie, *Fractivism: Corporate Bodies and Chemical Bonds* (Duke University Press, 2018).

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36

On My Way to the Anthropocene: On a Possible Future for Writing About the Past

Kate Brown

The women and children came and went on bikes and on foot, disappearing into the forest's dappled light, swiftly moving through the understory. There was a democracy to the forest when it comes to blueberries. Anyone could pick, anywhere. A person willing to do the hard work of stooping ten hours a day and heaving forty-pound boxes of fruit to the road earned good money picking berries in the forests of northern Ukraine in 2016.

I was working on a history of the aftermath of the Chernobyl accident. I noticed the activity while driving through the area. My colleague, Olha Martynuyk, and I got curious about the pickers. We equipped ourselves with baskets and followed them into the woods to go undercover berry picking. The pickers spoke to us briefly but then went back to work. They foraged with quick, efficient motions, the forest silent except for the brushing sound of their scoops and the pinball roll of berries hitting plastic buckets. When they filled their baskets, the pickers sold their berries to buyers waiting in vans on the road.

The pickers knew the woods ancestrally. Their reliance on the forest for a living was not new. In this territory, Polesia, of mineral-poor soils, traditional farming had never thrived. For centuries, people in the swampy stretches of northern Ukraine subsisted on game, fish, berries, herbs, and mushrooms, while making their tools and homes from stone, wood, and clay. What was new in 2016 was the industrial scale of berry harvesting. Each roadside berry buyer purchased about two tons of blueberries a day in season, and there were hundreds of buyers. But these were not just any berries. They grew in radioactive soils.

We followed the berry buyers to a wholesaler in a nearby town. The wholesaler met the buyers, waving a wand that measured gamma rays over each box of berries. I ask how many of the berries are radioactive. The wholesaler replied, "All the berries are radioactive, but some are really radioactive!"

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She purchased berries indiscriminately—those under but also those over the permissible threshold of 450 becquerels a kilogram. Evidently, the wholesaler mixed cleaner with dirtier berries to get to the European Union threshold of 1,250 becquerels a kilogram. In 2016, Ukraine was one of biggest exporters of blueberries to the EU.

While writing and lecturing about the medical and environmental effects of the 1986 Chernobyl accident, I would use the specter of radioactive berries spreading through global food markets to haunt the (your!) breakfast table as a way to get audiences to understand that the national borders we rely on to feel safe mean very little when it comes to human-engineered toxins that circulate atmospheric and oceanic currents, run through vascular systems of plants and animals, and drop in the form of food from global markets into our bodies.

Although I could figure out where the berries went, it was more difficult to determine where exactly the berries' radioactivity came from.

Chernobyl fallout would, of course, be the most obvious answer, but I found that Soviet monitors first recorded the widespread radioactive contamination of the vast Pripyat Marshes in the mid-1960s, a decade before the Chernobyl plant was built. The marshes were already radioactive because of global fallout from testing nuclear weapons and from earlier nuclear accidents in the USSR, the UK, and the US in the fifties and sixties. The providence of the berries' radioactivity could also have come from forest fires that, in the 2010s, tore through northern Ukraine in the drier, hotter summers, brought about by changes in the climate.

During the period of the most vigorous atmospheric testing from 1945 to 1963, radioactivity traveled fluidly around the globe and became an astoundingly sharp signal of anthropogenic activity. Cold War scientists following the isotopes came to understand interconnected "ecosystems," whereas twenty-first-century geologists searching for synchronous and universal markers to date the Anthropocene found that no matter where they looked—a bog in Ukraine, an ice core in the Arctic, a desert in Africa—the most consistent signal was radioactive cesium. Following the counts of cesium-137, cobalt-60, and strontium-90, biologists came to learn that, despite centuries in which they carefully built Linnean taxonomies, there is no isolated, biological individual on earth, no individuated species, nothing as discrete, even, as a solitary human endowed with independent free will. Radioactivity taught scientists what Indigenous scholars had long asserted: that everything is connected, all beings in kinship, that trees in a forests, fungi underground, plants in a field, animals roving among them, microbes

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sewn throughout are all in each other's business, making it impossible to distinguish where one individual ends and the other begins.

Following berries sharpened my focus on plants—not only how they can serve as harbingers of human-engineered damage but also how they are incredibly dynamic organisms that shape human society. For centuries, Polesians of northern Ukraine cultivated Pripyat forests to encourage the propagation of berries and other forest products. They used the forest as a commons, governed by social conventions and rules prescribing how to use natural resources. In 2014, Ukraine came to a new trade agreement with the European Union, and berry picking in Polesia went viral. Watching how this new demand for berries drove pickers to use illegal metal rakes to harvest more and faster at the expense of damaging the bushes was like a lesson from William Cronon's *Changes in the Land*.[1] The infinity of capitalist markets brought Polesians to a classic "tragedy of the commons" scenario.

More generally, thinking about how fruitful human–plant relationships can be, I started to rethink what I do as a historian—how I approach history and the methods I use.

As an environmental historian, I had in previous books told declensionist stories of societies despoiling their ecologies by plugging in technologies that promised to solve a multitude of problems. Like other scholars and journalists, I worked to get the public to understand the significance of radioactive contamination, climate change, and other human-inspired ecological misfortunes. But maybe we did this job too well. Now the scale of planetary environmental problems looms so large that many people feel too paralyzed to take action.

Drawing on Christof Mauch's understanding of "slow hope," an alternative to narratives of environmental crisis and despair, I went looking for alternative horizons and sustainable possibilities overlooked in the past.[2] What if the scale of the histories I told were downsized to the community level? After all, people relate differently to friends, family, and neighbors whom they know directly compared with abstract people living in some nation or counted in the billions on the planet. With millions of others, I started reading books focused on the symbiotic properties of forests, plants, and fungi, which have become surprising bestsellers in the last decade. The sum of this work is that the long-standing narrative of competition, self-interest, and survival of the fittest is only half the story—that mutualism, altruism, and cooperative networks also describe the working of forests, reefs, wetlands, prairies, and human societies and bodies. These insights change other categories of thought. Darwin and his

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followers drew metaphors from economics and philosophy of their day. Social Darwinists and economists applied Darwin's lessons on evolution to conjure laws for the market, law, and society. With new insights from biology, many are now calling for a reconceptualization of the past and present to incorporate an understanding of a shared flourishing in human and more-than-human history.

Inspired by these insights from the plant turn, I revisited urban, working-class history. I sought to find out how working-class people used small, green spaces in cities to sustain themselves with garden produce and small animals. I found it impressively difficult to recover the historical record of garden-variety plants that emerged for half a year and then submerged back into organic matter. Working on top-secret nuclear histories was easy in comparison.

Slowly, I tracked how, in the very bellies of market capitalism, working people managed to balance between wage labor and an alternative, market-shy network by recreating commons and regenerating wastes in urban landscapes. Making alliances with the microbial, vegetal, and animal kingdoms, working-class gardeners constructed green shanty towns in cities in Europe and North America. They did not depend on troubling features of urban democracies—on hierarchies, inequity, and exclusions by race or nation. Instead, they elected self-governing councils and organized collectives to manage insurance, childcare, arbitration, and consumer cooperatives. They knocked together cafes, dance platforms, parks, playgrounds, and tiny gardens. Working-class gardeners managed to mobilize a great deal of labor when they needed it, without the creation of a class of workers and a class of overseers. Rather than rank up in hierarchies, gardeners made no great distinctions among themselves. They divided land in allotments in almost exactly equal proportions. The gardeners produced a flexible and varied range of food, which they shared among each other and which tided them over in periods of war, economic crisis, or periodic downturns. Urban gardeners did not run through their local resources or live beyond their ecological means. They gathered up the river of organic nutrients (food waste, human and animal manure, organic, industrial byproducts) to create human-produced soils that generated some of the most productive agricultural yields in recorded human history.[3] By enhancing the vitality of their surroundings, gardeners created green spaces in crowded cities where human and nonhuman species could alight, pause, and engage in a collective subsistence.

I found this story fascinating to piece together. I started working on this project during the COVID-19 quarantine. My first field site was

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located across the street from our DC row house in an empty lot that my friend and I turned into an edible landscape. As I spent a lot of time on the street digging, I came to know neighbors I had never met before: James, the perennial porch sitter, who had grown up on the street; Anders, who lived with his partner Steve and their dog Lacy in a two-door coup parked on our street; and Nina and Jose, who cultivated a garden in Rock Creek Park until the park police put a stop to it. In the past, I picked what I thought were optimal, research sites, and I would parachute into distant locations and work quickly so as to return home to family and job responsibilities. With this project, I realized I could research in any urban location where I happened to be. I worked slowly, volunteering on projects and getting to know people and places before I asked questions. I came to know the kinds of solidarities that working with other people and plants builds. My research no longer felt extractive or stressful as it had in the past. Working in tiny gardens, absorbing knowledge from companions while pulling weeds over a bed, guided me on a path to my Anthropocene research future. I hope never to look back.

Notes

1. William Cronon, *Changes in the Land: Indians, Colonists, and the Ecology of New England* (Hill and Wang, 1983).

2. Christof Mauch, "Slow Hope: Rethinking Ecologies of Crisis and Fear," *RCC Perspectives: Transformations in Environment and Society*, no.1 (2019): 1–43.

3. For a historic reconstruction of French urban farmers' productivity and yield, see G. Stanhill, "An Urban Agro-Ecosystem: The Example of Nineteenth-Century Paris," *Agro-Ecosystems* 3 (1977): 269–284.

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37

A Short History of Extractivism and Opposition to Critical Minerals Extraction

James Morton Turner and Gustave Lester

Phasing out fossil fuels and scaling up a clean energy transition at the pace needed to avoid the worst consequences of climate change has far-reaching implications for frontline communities. It requires increasing the production of raw materials needed to manufacture solar panels, wind turbines, electric vehicles, and other technologies. In 2021, the International Energy Agency predicted that keeping the world on a path to hold global warming to 2°C will require expanding critical minerals production sixfold to forty-three million tons per year by 2040.[1] Materials needed for clean energy technologies, such as lithium, nickel, cobalt, and copper, often occur in ore grades measuring less than 1 percent.[2] That means for every ton of finished material, hundreds of tons of ore will have to be mined and processed, with potential ill consequences for local environments and communities.

Mining projects needed to supply energy transition minerals and metals can compound historical injustices. For instance, a large percentage of active or projected mining projects for energy transition minerals and metals are located on or near Indigenous peoples and their territories.[3] Perhaps for this reason, Indigenous peoples, among the most adamant advocates for taking action to address the climate crisis, are also among the most outspoken opponents of such mining projects. Responding to a proposed lithium mine on the traditional territory of the Shoshone and Paiute people, one tribal member explained that their local water supply was already contaminated with mercury and her people sick from the "last mine." She asked, "[Isn't] there a better way that we could get clean energy?"[4]

For many frontline communities, the clean energy transition appears not so much as the harbinger of a modern era of sustainability as yet another front in a long history of extractivism: putting the interests of outsiders and their claims on land and resources ahead of those of local and Indigenous peoples. In this moment, when efforts to scale up a clean energy transition globally are accelerating, historians can play a key role in considering the

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potential costs of this transition, amplifying voices past and present that speak to the implications of a boom in extractive industries for climate justice and advancing policies needed to ensure a more socially just and inclusive energy transition.

Reckoning with the potential consequences of sourcing the raw materials needed for renewable energy technologies requires an understanding of the history of extractivism. Scholars have used the concept of extractivism to highlight the inequities of commodity frontiers around the world: from colonial patterns of resource appropriation and export in Latin America to the global sourcing of fossil fuels. It has also been extended to include aspects of the green economy that rely on the promise of an energy transition to justify green sacrifice zones. This is one reason why the idea of "energy transitions" itself, central to global climate policy, has drawn scrutiny from historians who caution against the idea that energy technologies follow sequential patterns of succession or substitution. Instead, the global history of energy transitions reveals an uneven and contested history of energy aggregations and accretions, each with distinctive local impacts and legacies. Understanding how different energy regimes overlap and conflict at different scales, places, and times, and making those concerns relevant to a broader public, promises to offer crucial insights into the contemporary dilemmas of the green economy and green extractivism.

The clean energy transition requires many different materials. Considering one—nickel—and its entanglements with Indigenous communities in North America and Siberia reveals some of the grave risks and new assertions of sovereignty at stake. Historically, the primary driver for nickel has been the stainless steel industry. But in the past decade, the fastest growing demand for nickel has been for lithium-ion batteries. Adding nickel to lithium-ion batteries allows them to store more energy per unit weight and improves their stability. Those qualities can improve electrical vehicle performance, but they come at a cost to nickel-producing regions around the world.

Anishinaabewaki—the traditional territories of the Anishinaabeg in the Great Lakes region of North America—has long been subject to the pressures of extractivism.[5] In the nineteenth century, the United States expropriated Anishinaabe land (parts of present-day Michigan, Wisconsin, and Minnesota) to acquire copper, iron, timber, and other resources. Some of this land became one of the earliest and largest sources of mined copper for an industrializing United States, a metal consumed especially in railroad locomotive and electrical industries. To satisfy the raw material imperatives of a shifting energy regime, US political leaders deployed an assortment of strategies over several decades—including economic

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pressures and attempts at violent expulsion—to coerce cessions of copper-rich land from the Anishinaabeg.[6]

More recently, the region's unmined nickel has attracted the attention of mining corporations. For instance, Talon Metals, a mining company based in the British Virgin Islands, in a joint venture with the British-Australian mining company Rio Tinto, has proposed a nickel-sulfide mine in rural northern Minnesota near the homes of the Mille Lacs Band of Ojibwe. In 2022, Talon Metals received federal funding from green energy policies passed under President Biden to increase domestic manufacturing of electric vehicle batteries and entered an agreement to supply seventy-five thousand metric tons of nickel concentrate to Tesla. Although positioned as a "green nickel mine," the proposal extracts metal from sulfide ore—a process with a track record of contaminating local water supplies. The placement of this mine threatens the health of nearby tribal members and downstream lakes, streams, and wetlands where culturally significant wild rice (manoomin) grows, a staple crop already threatened by the climate crisis. This is one reason why the mine is opposed by the Mille Lacs Band of Ojibwe, who, like other Anishinaabe nations, continue to steward their traditional territories and uphold their treaty rights to hunt, fish, and gather on ceded lands.[7]

Other nickel-mining proposals have presented similarly urgent challenges for Anishinaabe nations and allied organizations. In 2023, the US Army Corps of Engineers revoked a federal permit for a $1 billion open-pit nickel mine in northern Minnesota proposed by NewRange Copper Nickel (formerly PolyMet Mining), a joint venture between Glencore (Switzerland) and Teck Resources (Canada). In doing so, they sided with the Fond du Lac Band of Lake Superior Ojibwe, whose reservation lies downstream and whose long-standing opposition to the project made clear that its pollution would violate the tribe's water-quality requirements.[8] At the same time, nickel-mining proposals are part of larger and longer struggles against extractivism in the region. In 2011, Gogebic Taconite proposed the world's largest open-pit mine in the Penokee-Gogebic Range at the headwaters of the Bad River in Wisconsin to extract low-grade iron ore (taconite), a process involving the removal of hundreds of meters of overlying rock ("overburden") containing pyrites and sulfide ores. Because acid mine drainage threatened ecologically sensitive wetlands and culturally significant wild rice beds downstream, several Anishinaabe nations joined in opposition to the mine. After years of legal challenges and bad press, Gogebic Taconite abandoned the project.[9]

In the case of Siberia, nickel extraction and its impact on the local community have a similarly long history. But, in recent years, the pressure to

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source materials for a clean energy transition sustainably and justly gave the Indigenous community new leverage in its efforts to secure recognition and compensation for a long-standing history of extractivism. Although Siberia was claimed by Russia in the sixteenth century, large-scale mining operations only started in the early twentieth century. In the 1930s, the Russian state invested in mines at Norilsk, deep in the Siberian Arctic on the Taymyr Peninsula. The mines, built by political convicts, tapped into the Siberian Traps, a geologic deposit of sulfide veins rich in nickel, copper, platinum, and other minerals. In 1970, the industrial operations expanded further, with the completion of the Nadezhda smelting plant. In the following decades, Norilsk became the largest producer of nickel globally. In 2010, Norilsk accounted for 2 percent of Russia's economy and nearly 5 percent of Russian exports.[10] And in the 2010s, it was one of the most important producers globally of the high-quality nickel needed for electric vehicle batteries.

Although activities inside Norilsk may have been guarded carefully—it was and remains a "closed" city—due to its strategic and economic importance, the consequences of mining and smelting spilled over into the surrounding environment. Air pollution stemming from metals processing left behind a wasteland scorched by sulfur pollution. The Blacksmith Institute, an environmental watchdog organization, estimated that Norilsk's refining activities had devastated two thousand square miles of surrounding forests. Norislk was described as one of the most polluted cities in the world.[11]

In 2020, Indigenous peoples leveraged the growing demand for nickel for electric vehicles, and the growing attention to the supply chains needed to support them, to draw attention to their efforts to pressure Nornickel to clean up its operations and provide compensation for damages. Despite a history of Indigenous activism that dated to the 1990s, and the passage of laws between 1999 and 2001 that mandated compensation for Indigenous groups, a United Nations committee determined that the smelting operations had had "a devastating effect on the traditional territories of the Nenets, Enets and Dolgan indigenous peoples." In exchange, the mining operations, "contribution to the Indigenous population's socio-economic development has been virtually non-existent."[12]

A confluence of events propelled the impacts of Norilsk and nickel mining for Indigenous peoples to international attention in 2020. A fuel spill near Norilsk polluted the Ambaryana River, turning it red for six miles downstream. In response, a small group of Indigenous activists associated with Aborigen Forum appealed directly to Elon Musk, the CEO of Tesla: "We are respectfully requesting that you DO NOT BUY nickel, copper, and other products from the Russian mining company Nornickel" until the company

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took steps to assess the damage, compensate the Indigenous community, and align their corporate policies with the United Nations Declaration on the Rights of Indigenous Peoples.[13] Their direct appeal was complemented by a social media campaign featuring Indigenous activists posting to Facebook and other platforms, fists raised in a show of determination, using hashtags such as "#AnswerUsElonMusk" and "#NOnickelfromNornickel."[14] In September 2020, mining interests entered into a five-year agreement to provide $25.6 million in support for the Indigenous community and convened a team of Indigenous-led experts to draft an engagement strategy for the mining interests and the Indigenous community.[15]

Historians can help recast clean energy transitions in terms not only technical—reductions in greenhouse gas emissions or increasing megawatts of solar power—but also social, including expanding access to energy, redistributing power (literally and figuratively), and fostering energy democracy. Scholars envisioning the energy transition as a moment of opportunity must consider the implications for environments and communities disproportionately affected by transitions past and present. In the case of Indigenous communities, mining raw materials for renewables will advance the goals of climate justice and energy democracy only insofar as such projects are held accountable to historical and ongoing movements for Indigenous power and liberation. As Anishinaabe scholar Kyle Whyte explains, "Indigenous peoples are not just seeking to mitigate the risks of mining and other large infrastructure in the areas where their communities live. They are working to grow their leadership nationally and internationally so that they can influence the decisions about energy and infrastructure that are made by non-Indigenous governments, industry, and scientific institutions."[16] At a moment when a globally just clean energy transition must accelerate, historians can help us understand how energy regimes shift and restructure, and the importance of policies that require transparency along supply chains and center the concerns, priorities, and values of frontline communities. All of those steps are essential in enfranchising those for whom the consequences of a clean energy transition are both deep rooted and immediate.

Notes

1. International Energy Agency, "The Role of Critical Minerals in Clean Energy Transitions," May 2021, 9, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions.

2. Nedal T. Nassar et al., "Rock-to-Metal Ratio: A Foundational Metric for Understanding Mine Wastes," *Environmental Science & Technology* 56, no. 10 (2022): 6710–6721.

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3. John R. Owen et al., "Energy Transition Minerals and Their Intersection with Land-Connected Peoples," *Nature Sustainability* 6, no. 2 (December 2022): 203–211; and Arnim Scheidel et al., "Global Impacts of Extractive and Industrial Development Projects on Indigenous Peoples' Lifeways, Lands, and Rights," *Science Advances* 9, no. 23 (June 2023): eade9557.

4. Takayla Antonio, comments before Council on Environmental Quality, transcript of public meeting, October 21, 2021, https://www.regulations.gov/document/CEQ-2021-0002-13552.

5. *Anishinaabe* refers to Indigenous peoples who also identify as *Ojibweg*, *Odawaag*, and *Boodewaadamiig*.

6. Gustave Lester, "Land, Fur, and Copper: The Union of Settler Colonialism and Industrial Capitalism in the Great Lakes Region, 1815–1842," *Early American Studies* 21, no. 1 (Winter 2023): 122–165.

7. Karina Atkins, "Dirty Water and Dead Rice: The Cost of the Clean Energy Transition in Rural Minnesota," *Inside Climate News*, November 21, 2023, https://insideclimatenews.org/news/21112023/talon-metals-tamarack-minnesota-copper-nickel-mining-wild-rice-water/; and Joseph Mogul, "Indigenous and Rural Organizers in Minnesota Prioritize Clean Water Over 'Green' Nickel Mine," *Prism*, March 3, 2025, https://prismreports.org/2025/03/03/minnesota-mine-ojibwe-manoomin/.

8. Steve Karnowski, "US Army Corps Revokes Permit for Minnesota Mine, Cites Threat to Downstream Tribe's Water Standards," *AP News*, June 7, 2023, https://apnews.com/article/new-range-mine-tribe-water-pollution-minnesota-075463042956fa4e89d576c5cae8f663.

9. Nancy Langston, "The Wisconsin Experiment," *Places Journal*, April 2017, https://placesjournal.org/article/the-wisconsin-experiment/.

10. Marlene Laruelle and Sophie Hohmann, "Biography of a Polar City: Population Flows and Urban Identity in Norilsk," *Polar Geography* 40, no. 4 (2017): 306–323.

11. Blacksmith Institute, *The World's Worst Polluted Places: The Top Ten* (Blacksmith Institute, October 2006).

12. Johannes Rohr, *Indigenous Peoples in the Russian Federation* (International Work Group for Indigenous Affairs, 2014), 41–42.

13. Gennady Schukin, "An Appeal of Aborigen-Forum Network to Elon Musk, the Head of the Tesla Company," *iRussia*, August 6, 2020.

14. Viktor Sulyandziga, "#AnswerUsElonMusk: Russia's Indigenous Peoples Campaign Against Arctic Pollution—Batani," October 17, 2020, https://batani.org/archives/1222.

15. Nornickel, "Nornickel Revamps Engagement Strategy with Indigenous Communities," accessed January 17, 2024, https://nornickel.com.

16. Kyle Whyte, "Indigenous Environmental Justice, Renewable Energy Transition, and the Infrastructure of Sovereignty," in *Environmental Justice in North America*, ed. Paul C. Rosier (Routledge, 2023), 308.

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Histories of Restoration for the Future

An interview with Laura Martin, July 18, 2024

Emily Pawley: Your work gives a sense of the history of ecological restoration as a third strand running alongside better-known histories of environmental preservation and conservation. Could you give us a quick periodization of that history? Where do we see that emerge? What are some of the big shifts that you see?

Laura J. Martin: Ecological restoration was preceded by the game restoration movement, in which a group of largely white rich male naturalists, most of whom were involved in the eugenics movement, established game reservations in order to subvert hunting laws. Their argument was that the government did not need to further restrict hunting if it was possible for game restorationists to breed large mammals in captivity and release them into the environment.

I'm interested in how restoration became scientific and ecological. That happened a little bit later, in the 1910s and 1920s, with a loosely coordinated group of people who were interested in distinguishing scientific ecology from forestry and other federally oriented sciences. These ecologists collaborated with landscape architects who were interested in bringing more naturalistic designs into their practice. This is a timeline that challenges the idea that ecological restoration was dreamed up by Aldo Leopold and then no one did anything with it until the 1980s, when a group of ecologists founded the Society for Ecological Restoration.

I'm writing against two different histories: this internalist history that's been told within restoration ecology and also the narrative in environmental history that there were only two important strands of American environmentalism in the early twentieth century—preservationism and conservationism. I argue that restorationists from at least the early twentieth century were positioning themselves against these better studied movements.

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EP: Where might our readers have seen the physical consequences of the practices and organizations you describe? What around us has been ecologically restored? Can you see different styles and theories of restoration?

LJM: Anybody who has seen a peregrine falcon, or a bison, or a lady slipper orchid, or a dogwood, or countless other species has seen the results of restoration practice. Anyone who has been to a state park or national park or wildlife refuge—or, increasingly, the side of a highway—has seen a site that has been restored.

We can see, over the arc of the twentieth century, a shift in restoration practice, from single species restoration to the restoration of entire groups of species or what we today call "ecosystems."

Restoration is now an international endeavor and has come to be at the center of recent environmental negotiations. In 2022, the UN (United Nations) Convention on Biological Diversity passed the Kunming-Montreal Global Biodiversity Framework, which encourages member states to restore 30 percent of their lands and waters by 2030. Various nations are now implementing this. The United States is not a signatory, but the Biden administration released the America the Beautiful Plan, which essentially sets out this goal. In June 2024, the European Union passed a restoration law requiring 20 percent restoration in countries' borders by 2030. So, we are about to see massive governmental and private investments in restoration.

Restoration encompasses a broad suite of practices, including breeding species in captivity and then rereleasing them, removing invasive species, removing dams, creating wetlands, and planting trees for carbon sequestration. The evidence of these practices is becoming more and more apparent on the landscape—if you know what to look for.

EP: As your work shows, ecological restoration sometimes contains a theory of historical time, sometimes aiming at a particular or an imagined historical moment. How should the historians who read this be thinking about this? Do historians and restoration ecologists think about the past differently?

LJM: In a lot of ways, this is the question that got me into my research and current work and convinced me to retrain as a historian. I began my career as a wetland ecologist, and I was working on management of non-native wetland plants and collaborating with people who very much believed in historically based restoration. They viewed 1492 as a historical baseline for distinguishing "natural" ecosystems from "unnatural" ecosystems.

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Now, any reader of this book is going to know that, for decades, historians, anthropologists, and Indigenous studies scholars have been pointing out the racism at the heart of the claim that ecosystems prior to 1492 were "unmanaged" or "uninhabited." I encountered these humanistic critiques of baseline-based restoration at the same time that ecologists were beginning to question historical baselines because of climate change.

This epistemological crisis was emerging in ecology over whether anthropogenic change rendered place-based restoration and conservation obsolete. The idea that it was impossible to turn back the clock or re-create a historical ecosystem in a way that would remain static into the future. So, historically informed and historically based practices seemed central to me when I began researching the history and the politics of ecological restoration.

I therefore was surprised to realize that prior to the 1980s, restoration was not about re-creating particular historical assemblages of species. Historical baselines only emerged in the 1960s with Starker Leopold's report for the US Fish and Wildlife Service and other work around the Wilderness Act, where these groups of experts suggested to the Department of the Interior that they manage their lands specifically to re-create a white settler gaze.

Throughout history, restorationists have had a lot of different goals. Their politics were not necessarily more virtuous than those in the 1960s looking to do this kind of settler restoration. But their restoration encompassed a lot of different visions of the present and the future, and a lot of different relationships to the past. Some restorationists wanted to restore a general impression of a historical landscape or an experience of a historical landscape. Some cared very much about the continuation of particular species and didn't much care where they occurred. Some people cared about retaining scientific access to particular groups of species. So, there are a lot of different relationships to historical information and data baked into those practices.

I think there's an endless number of interesting things to consider about the relationship between environmental history and historical ecology. We can go back to some of the most cited work in the field, like Cronon's *Changes in the Land*, and think about how dependent it is upon paleoecological research, some of which has now been overturned. And it really gets to interesting questions about method, and how to write about environmental change, while also recognizing that the science of environmental change is itself always changing.

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EP: Could we say that ecological restoration is a form of applied history? And does that help us think about the role of historians in the present, collaborating on plans for the future?

LJM: Oh, yes. In the broadest sense, all restoration work is applied history because all restoration work seeks to undo the harms that particular people and institutions have done in the past.

Here is where I think ecological restoration has a lot to learn from historians thinking about historical reparations—I haven't really seen crossover conversations in these areas before. In *Wild by Design*, I rather bluntly state that, often, ecological restoration attempts to undo the ecological harms of ongoing injustices without undoing the social and political harms of those injustices. And I think there's real opportunity for restoration ecologists and historians to work together to identify and redress the causes of environmental harm. Because restoration that happens in a vacuum without addressing the root causes of harm is just a Band-Aid or, at worst, permission to continue to harm or pollute.

More narrowly, I'd say that some restoration projects are certainly applied history and paleoecology specifically, where the goal of those particular projects is to re-create a historical scene, or historical processes, or historical communities of species. There, too, I think there's a lot of possibility for collaboration and bringing together methods from the humanities and the sciences.

EP: Your research (and your last answer) show how concepts of restoration and eventually the discipline of restoration ecology emerge from periods of drastic damage like the near destruction of the bison, the scouring of forests for wildflowers, the Dust Bowl, the aftermath of nuclear test blasts, and the destruction caused by resort building and development. Do you see particular concepts and practices of restoration emerging from the specific damages of the climate crisis?

LJM: Absolutely! Assisted migration and assisted evolution are the two emerging restoration proposals in response to the climate crisis that have gotten the most media attention. Assisted migration is when people intentionally move species from a known historical range to a new place expected to be more suitable for that species in the future. Assisted evolution is when people attempt to use genetic technologies to select for or create genotypes of species that are better able to survive in changed climates. For example, seeking coral that do better in acidic ocean waters. Both assisted migration and assisted evolution have been incredibly

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controversial. They've pitted environmentalists against environmentalists, ecologists against ecologists. This controversy really gets at the heart of the stakes of ecological restoration and the tension that I see running throughout the history of restoration between a desire to cultivate wildness and desire to design or intervene in nature.

Forestry-based carbon offsetting is the other policy response to climate change which is dramatically reshaping restoration practices. Tree planting in particular is gaining enormous traction among international environmental negotiators as well as among philanthropists and multinational corporations seeking to appear green.

As historians well know, tree plantation projects have a centuries-old history of displacing and violently dispossessing local and Indigenous people. I worry that under the banner of the climate crisis, we are seeing a form of neocolonialism enacted through tree planting and carbon offsetting. Here again, historians have a role to play in pointing out that restoration and other modes of environmental management are not mere technical practices. They are also fundamentally political and social practices.

EP: One clear climate connection we see in your work is this link between off-site mitigation that emerged in the 1990s and today's carbon-offset markets. Could you help us understand the connections between these two phenomena and their consequences?

LJM: Off-site mitigation is the practice of compensating for damage at one site with care at a geographically separate site. This is a very common practice today. But it is not inevitable or an obvious thing to do. Off-site mitigation depends upon the idea that ecosystems or places are fungible, which nests into a much broader history of economic thought.

Understanding the history of off-site mitigation is necessary for understanding today's carbon-offset market. In *Wild by Design*, I argue that wetlands mitigation regulations in the United States, which emerged in the 1980s, paved the way for today's carbon-offset market.

Under the Clean Water Act, developers are required to attempt to avoid impacts to wetlands and, if they deem that not plausible, then to mitigate for those impacts. It's up to the US Army Corps of Engineers and the US EPA (Environmental Protection Agency) to decide what counts as mitigation.

In the first decades of implementing the Clean Water Act, it was common practice for developers who were destroying wetlands at a site to then construct wetlands on that same site. Nobody was happy with this.

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It cost developers money, so developers didn't like it. Ecologists didn't like it because constructed wetlands were often of lesser habitat quality than the ones that were destroyed and there was no enforcement or monitoring.

Through a series of backroom conversations in the 1980s, environmental nonprofits, federal agencies, and developers put forward the idea of off-site mitigation; developers would be allowed to develop a site if they paid a third party to do wetlands restoration or construction at a separate site. This severed the site of damage from the site of care and led to the development of wetlands mitigation banks. Today, a compensation wetland could be hundreds of miles away from a destroyed wetland. This practice redistributed wetlands at a national scale. There's very little research done on which communities have lost wetlands and which communities have gained wetlands. I think it's a really important question.

The same actors who developed off-site wetlands mitigation then attended UN conferences and shaped development programs like REDD++ and what we now know as forestry-based carbon offsetting. The idea that a polluter in the Global North can pay to offset their greenhouse gas emissions by enabling another entity, often in the Global South, to plant trees to sequester carbon—this is reconfiguring the distribution of trees at a global scale. The Global South is being fashioned as a kind of reservoir for continuing business as usual in the Global North.

EP: What are some other questions that the history of ecological restoration can help us to raise about these projects?

LJM: Who is empowered to make decisions about where restoration occurs and what is restored? What modes of expertise are considered relevant to these decisions?

The recovery of the American bison is often celebrated as an environmental success story. But the history of ecological restoration shows us that the first bison restoration sites in the United States were established on Native American reservation lands that the federal government was systematically dismantling under the Dawes Act. The National Wildlife Refuge System was built upon stolen Indigenous land, just as the National Park System was built upon stolen Indigenous land.

History should force us to stop and ask: Who owns the lands upon which restoration projects today are being planned and enacted? And how can we do ecological restoration in a way that is socially just?

EP: That last point takes us to our last question. We were struck that you don't want people to *stop* ecological restoration, despite having found these oppressive structures within it. What are your hopes for how

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understanding these histories might help people do ecological restoration better?

LJM: I think it's essential to understand the history of ecological restoration in order to shape a more just and hopeful future. Over the twentieth century, restoration morphed from the work of a loosely organized network of volunteers to a consolidated and privatized endeavor. I think there's a real danger to a top-down approach for restoration—megaprojects have the real capacity to dispossess people of land and livelihood.

The history of restoration also teaches us that restoration work is difficult, intimate, and skilled labor. I would like to see a future in which restoration is not only the domain of volunteers but also civic work, paid for by governments. We had the Civilian Conservation Corps of the 1930s. You could imagine a Restoration Corps of the 2030s—one implementing the restoration visions of local communities.

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The Movement for Green AI

Laura Stark

Artificial Intelligence Is Part of the Climate Emergency

Can artificial intelligence (AI) "supercharge climate action"? On July 18, 2023, the leader of the United Nations (UN), António Guterres, rallied a hall of experts with the proposal that AI just might save us from planetary collapse. The group was assembled in New York City to debate the promises and pitfalls of AI. Meanwhile, in Phoenix, AZ, meteorologists announced on the same day that the city had set a new heat record: for the number of consecutive days with temperatures above 110°F. Ultimately, the city would lift above 110°F for thirty-one days in a row. Residents fried eggs on sidewalks.[1] In New York, Guterres continued, "We need a race to develop AI for good."[2]

By that point, the AI industry was already sprinting to capture the market potential of the climate emergency. From tech giants to scrappy start-ups, firms capitalized on climate disaster.[3]

In 2023, Google (the parent company of DeepMind, a top AI firm) rolled out its Green Light Project, which used AI to coordinate traffic lights and reduce vehicle emissions from drivers idling at stop lights.[4] Like many industry efforts, Google may well be addressing climate concerns with the aid of AI technologies. But many such efforts, including Google's Green Light Project, leave in place—and extend—the underlying growth economy that is driving the climate crisis. In this case, Google reduced drivers' idling time but did nothing to cut the number of cars on the road through structural changes such as support for public transportation. Unsustainable, extractive, and unequally experienced, the growth economy also allows AI to be commercialized largely by private industry rather than to be held as a public resource—sidestepping public input and accountability for climate action.[5] Shifting the focus from how AI tools are *used* to how AI systems are *designed* in the first place

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deepens an understanding of when, how, and where AI impacts climates and communities.

AI Will Both Mitigate and Extend the Climate Emergency

There is no doubt that AI is helping climate researchers and usefully guiding informed climate action. The paradox is that AI itself exacts enormous environmental costs.

The process of developing AI tools requires a large and ever-expanding amount of energy, water, land, and other ecological resources. Since 2017, technologists have developed algorithms that have shown stunning improvements in accuracy and capabilities.[6] But these improvements have required magnificent amounts of computational power and that, in turn, has demanded enormous amounts of global supply of water and energy—generated from fossil fuels as well as renewable sources.[7]

To be sure, all human activities have an effect on the environment. AI systems are distinctive, however, because an exponential use of resources is designed into the systems. To develop generative AI tools, algorithms train on large amounts of existing data. In this process, a system takes in data (such as texts, in the case of large language models) and then creates a vector, or mathematical space, where it maps the statistical relationships and features of the data. This mapping then allows the algorithm to make statistical predictions, such as an appropriate response to a verbal prompt or the next move in a videogame.[8] For AI developers, the trick is to make an algorithm as accurate and robust as possible, so it gives the best response, such as a helpful reply or a winning move.[9] The more data it receives, the more specifications emerge for what to pay attention to while training, and the more accurate the algorithm becomes. To understand this change in scale, consider that GPT-2 had 1.5 billion parameters, GPT-3 leapt an order of magnitude to 175 billion parameters, and GPT-4 continued the trend with 1.8 trillion parameters. To complete training, for state-of-the-art large language models, supercomputers must run for days (depending on the hardware used), expending energy, water, and resources from data collection, storage, and use. Other developers then use foundation models to develop additional domain-specific tools. The resource use compounds.

Environmental impacts are most intense at the time when a model is being trained and in the places known as "data centers." In terms of model development, training a single first-generation large language model emits carbon equivalent to five cars in their lifetime.[10] AI systems are soon expected to use as much energy and water as some nations.[11] Training

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GPT-3 used seven hundred thousand liters of drinkable water in US data centers alone. To think about AI infrastructure, data centers are the locus of harm. They are the physical locations of the processing units (e.g., GPUs and TPUs) that power AI. These facilities demand an enormous amount of energy and other resources to power, run, and maintain by way of cooling, lighting, and powering the servers, support systems, and distribution—and the power supply for data centers is often carbon intensive.[12] Already in 2021, cloud infrastructure accounted for 3.9 percent of global greenhouse gas emissions.[13] At a local level, the impacts are keenly felt: Many communities are suing tech companies for polluting the air and sucking down too much municipal water to support their data centers. Model deployment—basically, people's use of AI once a tool is developed—extends these ecological impacts.[14]

The AI–Climate Nexus Needs Historians

The field of history documents the past in order to address the future. Although the field is often glossed as the study of the past, a closer look at what history does—and the task of the historian—shows that history is about time. This notion of history as an analysis of relationships (among people, things, environments, systems, and concepts) situated in time means that history addresses the present and future, not only the past. This also means that how time is understood to work—which is to say, your theory of history—is important because it implies whether (or not) human action matters. Much maligned "Whig histories" refer to stories of progress and improvement over time; there may be swerves and slowdowns, but history has a directionality and the drumbeat of a steady march from this perspective. Declension stories flip the trajectory. The decline of civilizations or groups, moralities or ecologies, is imagined as a natural process, like erosion. Despite their differences, both theories of history—the Whiggish and declensionist—embed a sense of historical inevitability.

As a result, both views have underwritten great harms because they deflect accountability away from powerful institutions and underwrite political apathy. If the outcome is written in the stars of history, there is no reason to act for change—to make efforts that are modest, provisional, but nonetheless powerful.

There is no doubt that individual people rarely alter history by themselves. Rather than justify apathy, however, this insight offers courage for people to act collectively.[15] There is nothing inevitable in the course of history; it has no inherent directionality. People working together, as well

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as with environments and institutions, have been agents of change over time—and will be again. This third theory of "historical contingency" knows that there are inflection points and catalytic moments, in which people's (in)actions have pushed the course of history toward greater freedom and safety—or toward oppression and harm. It seems apparent that we are at a critical moment of contingency in the AI–climate nexus.

The key intervention of the historian at the AI–climate nexus is to notice and open up conversations about people's vernacular theories of history and climate determinism—where do these historical framings come from, what are counterexamples of collective agency, and whose interests are served through the apathy sown with the false assumption of historical inevitability? No need to have all the answers; the skill of asking good questions is often needed most.

(Some) Technologists Are Allies

AI's impact on the environment is far from inevitable. Since the mid-2010s, a loose collection of technologists has mobilized to stem the effects of AI on the global climate. Operating under the banner of green AI, they have insisted that the technology being sold to solve the problem of ecological collapse is, in fact, exacerbating it. Rather than retire from the "race to develop AI for good," as the UN Secretary-General framed it, they are altering the paradigm of engagement—away from competition and toward collective action, focusing on good design of systems not only good uses, all with climate responsibility as a core value.[16] Since 2015, the number of articles published on green AI has increased exponentially.[17] In 2021, more than half (56 percent) of computer scientists reported being moderately or very concerned about the environmental impacts of AI when asked in a survey from the Association for Computing Machinery. (Eleven percent said they were "not concerned at all.")[18]

The movement for green AI is working to make models and hardware more efficient and also, importantly, strategically restructuring the field of AI toward a green norm—by standardizing practices and changing institutions to prioritize global environmental justice. For example, at a major international professional conference, technologists created a research track for studies on computing efficiency, where research on sustainable design can be presented and eventually published. This effort to change an institution—their professional association—had the broader impact of letting other members share knowledge on energy efficiency, identify like-minded researchers, publicize (and therefore legitimate) green priorities, and

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ensure researchers receive symbolic credit, like any other topic of research, for work on reducing environmental impacts of AI. In a similar spirit, in 2022, a team of members launched a "badge" system for the annual meeting of the North American Association for Computational Linguistics. The badges marked research papers that supported energy efficiency through open models. Sharing code and models saves researchers and designers from using environmental resources to re-create work already done.[19] And efforts to cut climate impacts of computing align with other justice issues, like increasing equitable access to resources and labor justice.[20]

No doubt, the movement for green AI has its share of struggles and contradictions. One key issue is the divergence over how to operationalize "green-ness." Most work uses energy efficiency as the metric. This choice makes sense because information on the energy use of hardware and facilities is readily available, making "efficiency" easy to calculate over a given time or task. And there is virtue in simplicity if the goal is to encourage people to adopt a new practice, like calculating, and thus thinking about, environmental impacts of AI. Yet, energy efficiency as a metric sidesteps the issue of energy source. Whereas some AI systems pull from coal-fired power plants, others run on renewables.[21]

As an alternative, many green-AI technologists use carbon footprint as the metric of choice, calculating energy used over a given time by the "carbon intensity" of the energy source (be it fossil fuel, renewable, or a mix). In the field of machine learning, two tools are especially good at calculating the carbon footprint of a computing task: CodeCarbon and ML CO2 Impact (there are others, such as the experiment-impact-tracker).[22] Still, a smaller carbon footprint can be achieved in many ways. Some AI firms buy carbon offsets to balance their eco-ledgers, reducing the appearance of climate impact while still remaining responsible for enormous carbon emissions. One concern is that the metric fails to differentiate between types of non–fossil fuel sources—which is important, since the environmental impacts of energy sources beyond fossil fuels, such as nuclear energy, are up for strong debate.

Regardless of the source, energy is just one environmental impact of AI.[23] A third way technologists measure environmental impacts of AI is through the broader metric of ecological footprint. Water is essential for technologies that are data intensive and scalable like AI.[24] Data centers are notoriously hot because hardware for computation generates heat when running, making water essential to cool the facilities. Lithium and cobalt are mined to make batteries, wiring, and other electronic components of AI technology.[25] Mineral extraction causes soil erosion, deforestation, water

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pollution and scarcity, and an increase in greenhouse gas emissions, in addition to the impacts on human health and communities. This broader vision of ecological impact brings into focus the ways that water, land, and other resources are involved in the full AI pipeline of manufacture, transportation, and disposal of components.

Change the Temperature—Of Conversations, Connections, and Climate

Authors Meghan Kallman and Josephine Ferorelli offer a tool kit, from their own experience and research, for moving feelings (such as climate grief) to social connection and, when needed, to collective action for institutional change. "Even within large associations," Kallman and Ferorelli explained, "small groups are the unit of transformation. A group of two to five is little enough for shy people to feel comfortable, and for conversations to have a real give and take." To connect with new people and create little clusters of climate allies, the opportunities are nearby. They can just feel distant by virtue of organizational charts or social networks. These connections and clusters are, nonetheless, key to building collective power for institutional change. "We bridge our individual experiences with those of the bigger group through these clusters," they wrote.[26]

The movement for green AI points at an opening for historians to connect with technologists over climate concern. Alas, there is a long and unhelpful tradition of stereotyping scientists as morally ignorant technophiles. Humanists, for their part, have often been painted as techno-reactionaries, the lingering stain of C. P. Snow's outmoded "two cultures" thesis.[27] These caricatures misrepresent our much more varied and interesting fields—and also do a disservice to efforts to build collective power.

To start building new climate connections, Kallman and Ferorelli invite us to ask: What groups am I already a part of? What institutions do I already have a relationship with? Where do I go regularly? The institutions might be an employer, civic group, school, or spiritual community. They reassure that "it can be enough just to come together and recognize our connection." By getting together with data scientists, engineers, IT workers, or other tech-forward folks within these institutions (a coffee, a conversation), it becomes possible to imagine needs, wants, and values around tech and environment—and, when the time is ripe, to brainstorm modest makeshift points of intervention in your shared institution. "A first meeting doesn't need to end with a ten-step plan to contain the entire climate crisis," they wrote. "Rather, it is an act of faith that getting together will help us understand what we need, and how we can meet that need."

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Future History of the AI–Climate Nexus

There is no position of innocence in efforts to safeguard the climate, and AI will be an enduring part of planetary history.[28] Yet, the future history of AI's expanding negative impact on the global climate is far from determined. Recognizing our collective agency—within limits and unevenly distributed—historians can change how the story of AI emerges. In solidarity with the movement for green AI, it is possible to design climate responsibility into AI systems and into any institution. Whereas an individual person acting alone can rarely affect change that is meaningful and just, historians know that collective action has—and can—shape our future's past.

Notes

1. Phoenix broke the record on July 18, although the extreme heat continued until July 30, setting the new record at thirty-one consecutive days above 110°F. People did fry eggs on the sidewalk, but it was unclear whether they were cooked well enough for human consumption after an hour. Janice Harayda, "A Beloved Journalism Cliché Lives: The Photo of an Egg Frying on a Sidewalk in a Heat Wave," Everything Shortform, August 24, 2023, https://medium.com/everything-shortform/a-beloved-journalism-clich%C3%A9-lives-the-photo-of-an-egg-frying-on-a-sidewalk-in-a-heat-wave-11a047976a87.

2. UN Press, "Secretary-General Urges Security Council to Ensure Transparency, Accountability, Oversight, in First Debate on Artificial Intelligence," July 18, 2023, https://press.un.org/en/2023/sgsm21880.doc.htm. With his remarks on AI, the Secretary-General had the climate crisis in mind, continuing that AI "has the potential to turbocharge global development, from monitoring the climate crisis to breakthroughs in medical research." This UN effort links to the United Nation's AI4ClimateAction Initiative.

3. Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism*, 1st ed. (Metropolitan Books, 2007); and Antony Loewenstein, *Disaster Capitalism: Making a Killing Out of Catastrophe* (Verso, 2015). Klein specifically argues that the US government practice of awarding contracts to private companies to carry out public responsibilities, such as schooling in the wake of Hurricane Katrina, is both a symptom and a fuel source of a capitalist economy that is under-regulated, treats the ecological environment as a market externality, and exploits socioeconomic inequality, which it also exacerbates.

4. Paresh Dave, "Google's AI Is Making Traffic Lights More Efficient and Less Annoying," *Wired*, October 10, 2023; and "Harnessing AI for Better Urban Mobility: A Deep Dive into Google's Project Green Light," *Medium*, October 18, 2023.

5. In addition, it is well known that Silicon Valley firms tend to invest in carbon offsets that fail to reduce greenhouse gas emissions. Meredith Broussard uses the term "technochauvinism" to describe "the belief that technology is always the solution." This approach to social and climate problems short-circuits accountability, equity, and diversity. Les Levidow and Sujatha Raman, "Sociotechnical

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Imaginaries of Low-Carbon Waste-Energy Futures: UK Techno-Market Fixes Displacing Public Accountability," *Social Studies of Science* 50, no. 4 (2020): 609–641, https://doi.org/10.1177/0306312720905084; Andrew D. Selbst et al., "Fairness and Abstraction in Sociotechnical Systems," in *Proceedings of the Conference on Fairness, Accountability, and Transparency*, FAT* '19 (Association for Computing Machinery, 2019), 59–68, https://doi.org/10.1145/3287560.3287598; Sean Johnson, *Techno-Fixers: Origins And Implications Of Technological Faith*, 1st ed. (McGill-Queen's University Press, 2020), https://dokumen.pub/techno-fixers-origins-and-implications-of-technological-faith-1st-edition-0228001323-9780228001324-0228002044-9780228002048-0228002052-9780228002055.html; and Meredith Broussard, *Artificial Unintelligence: How Computers Misunderstand the World* (MIT Press, 2018).

6. One of the fundamental findings that spawned the current era of generative AI is the importance of "attention," or weights in the training process. Ashish Vaswani et al., "Attention Is All You Need," *arXiv*, December 5, 2017, https://doi.org/10.48550/arXiv.1706.03762.

7. International Energy Agency, "Energy and AI," 2025, https://www.iea.org/reports/energy-and-ai/executive-summary.

8. Mary Phuong and Marcus Hutter, "Formal Algorithms for Transformers," *arXiv*, July 19, 2022, https://doi.org/10.48550/arXiv.2207.09238; and Lewis Tunstall et al., *Natural Language Processing with Transformers*, rev. ed. (O'Reilly Media, 2022).

9. Note here that generative AI is trained to predict the best response, not the most likely response, in an effort to make the application appear and sound more human like. Because the large language models are trained in an unsupervised manner, largely on unstructured data, to get natural language process (NLP) applications such as ChatGPT or BART to sound more humanlike in their responses, human intervention and labor, by way of tuning with labeled data and prompt engineering, are necessary steps of the training process—continually creating additional layers of data and resource consumption.

10. Karen Hao, "Training a Single AI Model Can Emit as Much Carbon as Five Cars in Their Lifetimes," *MIT Technology Review*, June 6, 2019, https://www.technologyreview.com/2019/06/06/239031/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/.

11. Kate Crawford, "Generative AI's Environmental Costs Are Soaring—and Mostly Secret," *Nature* 626, no. 8000 (February 20, 2024): 693–693, https://doi.org/10.1038/d41586-024-00478-x; and Pengfei Li et al., "Making AI Less 'Thirsty': Uncovering and Addressing the Secret Water Footprint of AI Models," *arXiv*, March 26, 2025, https://doi.org/10.48550/arXiv.2304.03271.

12. Steven Gonzalez Monserrate, "The Cloud Is Material: On the Environmental Impacts of Computation and Data Storage," *MIT Case Studies in Social and Ethical Responsibilities of Computing* (Winter 2022), https://doi.org/10.21428/2c646de5.031d4553; Dustin Edwards et al., "The Making of Critical Data Center Studies," *Convergence*, January 23, 2024, 13548565231224157, https://doi.org/10.1177/13548565231224157; and Brad Plumer and Nadja Popovich, "A

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New Surge in Power Use Is Threatening U.S. Climate Goals," *New York Times*, March 14, 2024, sec. Climate, https://www.nytimes.com/interactive/2024/03/13/climate/electric-power-climate-change.html.

13. Charlotte Freitag et al., "The Real Climate and Transformative Impact of ICT: A Critique of Estimates, Trends, and Regulations," *Patterns* 2, no. 9 (September 2021), https://doi.org/10.1016/j.patter.2021.100340.

14. Kate Crawford, *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence* (Yale University Press, 2021).

15. The theory of historical contingency is also a reminder that political agency—the capacity to affect change—is unevenly distributed. Power is a privilege. Political power depends on a person's social status, access to material resources (like money), geopolitical location, identity within contexts of family, community, policy, and much more. It is encouragement for people with at least a glimmer of political power—for example, those with access to books and the globally dominant English language—to use it for collective good.

16. E.g., Marcos Treviso et al., "Efficient Methods for Natural Language Processing: A Survey," *Transactions of the Association for Computational Linguistics* 11 (July 12, 2023): 826–860, https://doi.org/10.1162/tacl_a_00577.

17. Roberto Verdecchia et al., "A Systematic Review of Green AI," *arXiv*, May 5, 2023, https://doi.org/10.48550/arXiv.2301.11047.

18. Ji-Ung Lee et al., "Surveying (Dis)Parities and Concerns of Compute Hungry NLP Research," *arXiv*, November 9, 2023, https://doi.org/10.48550/arXiv.2306.16900.

19. The Association for Computing Machinery writes "well-formed and documented artifacts allow others to build directly upon the previous work through reuse and repurposing." Artifact Review and Badging—Version 1.1—August 24, 2020, AMC Publications Policies and Procedures, https://www.acm.org/publications/policies/artifact-review-and-badging-current.

20. Julian Togelius and Georgios N. Yannakakis, "Choose Your Weapon: Survival Strategies for Depressed AI Academics," *arXiv*, March 31, 2023, https://doi.org/10.48550/arXiv.2304.06035. Beyond academia, the labor impacts of AI track environmental impacts: more just labor arrangements also tend to be better environmental approaches. Tamara Kneese, "Climate Justice and Labor Rights," SSRN Scholarly Paper, Rochester, NY, August 2, 2023, https://doi.org/10.2139/ssrn.4533853; and Paola Tubaro et al., "The Trainer, the Verifier, the Imitator: Three Ways in Which Human Platform Workers Support Artificial Intelligence," *Big Data & Society* 7, no. 1 (January 1, 2020): 2053951720919776, https://doi.org/10.1177/2053951720919776.

21. Kasper Groes Albin Ludvigsen, "How to Estimate and Reduce the Carbon Footprint of Machine Learning Models," Medium, December 6, 2022, https://towardsdatascience.com/how-to-estimate-and-reduce-the-carbon-footprint-of-machine-learning-models-49f24510880.c.

22. Ludvigsen, "How to Estimate and Reduce the Carbon Footprint." See also the Critical Carbon Computing Collective, https://criticalcarboncomputing.github.io/.

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23. OECD, "Measuring the Environmental Impacts of Artificial Intelligence Compute and Applications: The AI Footprint" (OECD, November 15, 2022), https://doi.org/10.1787/7babf571-en.; and Kneese, "Climate Justice and Labor Rights."

24. Monserrate, "The Cloud Is Material"; Edwards et al., "The Making of Critical Data Center Studies"; and Theodora Dryer, "Settler Computing: Water Algorithms and the Equitable Apportionment Doctrine on the Colorado River, 1950–1990," *Osiris* 38 (2023): 265–285, https://doi.org/10.1086/725187.

25. Thea Riofrancos, "The Security–Sustainability Nexus: Lithium Onshoring in the Global North," *Global Environmental Politics* 23, no. 1 (2023): 20–41; and James Morton Turner, *Charged: A History of Batteries and Lessons for a Clean Energy Future*, reprint (University of Washington Press, 2022).

26. Meghan Elizabeth Kallman and Josephine Ferorelli, *The Conceivable Future: Planning Families and Taking Action in the Age of Climate Change* (Rowman & Littlefield, 2024). The book offers substantial historical context and additional tools to connect in new ways over climate concern with people we already know, in addition to new people. They also offer questions to help identify new climate connections, including: What am I in charge of (however small)? Who do I influence and who influences me? Who shares my skills and whose skills complement mine? Who do I have fun with?

27. Max Weber et al., *The Vocation Lectures: Science as a Vocation, Politics as a Vocation* (Hackett, 2004); and C. P. Snow and Stefan Collini, *The Two Cultures* (Cambridge University Press, 1993).

28. Matthew L. Jones, "AI in History," *The American Historical Review* 128, no. 3 (2023): 1360–1367, https://doi.org/10.1093/ahr/rhad361.

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The Promise of Urban Resilience

Claire E. Campbell, Melanie A. Kiechle, and Kara Murphy Schlichting

An insurance map. A panoramic view. A photograph. These sources show the urban paradox: Humans build cities intended as permanent when neither a city nor its environmental context are fixed. Cities seem immutable with their tons of stone, asphalt, and concrete. Yet, every time a root or underground stream cracks the pavement, we are reminded that cities are built on dynamic ecologies and human relationships. Knowing the past environments of our cities can help guide contemporary urban planning.

Urbanites reconfigured their neighborhoods in response to daunting environmental challenges. Many of these interventions improved the quality of urban life. Many, though, have not always improved urban resilience. Three examples show how communities with different resources and constraints responded in varying ways and on different scales according to capacity, ecological circumstance, and will. In the fishing port of St. John's, Newfoundland, residents aimed to prevent fire. Between two industrializing suburbs of Boston, they buried a river. In New York City, they paved an island. Although we have inherited these compromised cityscapes, we also see that the city *can* be rebuilt with equity and environment in mind.

Today's extremes of the climate crisis are without precedent. Climate change is raising global temperatures and making heat waves hotter, more frequent, and of longer duration. It is increasing the frequency of flooding-producing storms, raising sea levels, and threatening to submerge constructed waterfronts. Cities of all sizes face environmental calamities in this new climate era.

Like twenty-first-century cities confronting climate change, industrializing cities of the nineteenth and twentieth centuries sought greater security and protection from environmental forces. Previous generations learned to respond to environmental changes, to build against vulnerability, and to articulate plans for the greater good. Their legacy is both the

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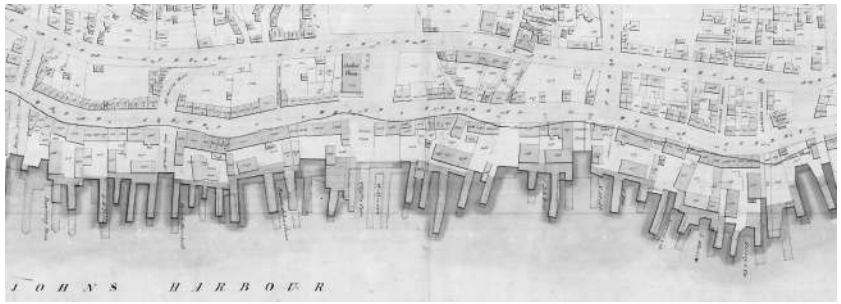

Figure 40.1
Frederick Page, *Map of St. John's, Newfoundland, shewing all the buildings erected since the fire of the 9th of June 1846 from actual survey* (1849/1882), detail. Source: The Rooms Provincial Archives Division, MG 50.2.

physical landscape of modern cities and a tradition of creating, undoing, and rebuilding urban forms.

Page's original map tracked the progress of reconstruction of buildings and warehouses in the commercial core. The line showing the approximate location of the shoreline circa 1800 was added in 1882 by Harbor Master George Robinson to show how much the waterfront now extended into the harbor and complicated navigation for ships. Both men, though, were primarily concerned with measuring and facilitating commercial growth.

Hugging the eastern edge of Newfoundland in the North Atlantic, St. John's evolved within entwined vulnerabilities. The town was a dense jumble of wooden stages and storehouses, with vats of fish and seal oil (and later, other combustibles, from kerosene to lard) that could light sheets of flame across the harbor: "a mass of insecurity and danger in respect to fire, hardly to be paralleled."[1] Indeed, fires leveled St. John's—like many other cities—repeatedly through the nineteenth century.

After every "conflagration," new regulations mandated widening streets as firebreaks and using brick, stone, and slate in building. More space was brought into the public domain and some limits imposed on private construction, moderating rights to property with a developing sense of a public good. Officials discussed better circulation of air and water, and green spaces for health and well-being.[2] It *was* possible to "build back better."

With some caveats. Despite the new language of planning and public safety, each rebuilding returned a dense and wooden waterfront, built quickly and cheaply within the seasonal confines of the fishing industry. Even a new system of water supply by 1850—which led to ludicrous

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claims that the city was now inured to future disaster—could not offer universal protection.[3]

And there were unintended environmental consequences. Clearing burnt rubble into the harbor supplied new space for building along the foreshore, but such "encroachment" caused headaches for navigation (see figure 40.1).[4] Shoreline infill also presaged a dangerous turn by narrowing the expanse of water with heat-absorbing pavement, a pattern made dramatically worse with expanses of parking in the 1950s. Moving fuel storage to the city's edges suggested a local off-shoring, and today, the south side of the harbor is an industrial preserve for Irving Oil. All of these have made St. John's less resilient and less nimble in response to environmental change and environmental risk.

But shared experience generated a network of empathy. After each fire in St. John's, other cities in British America and Great Britain, many of which had suffered fires themselves, sent messages of support and ships full of supplies. Within the city, too, rebuilding was seen as a collective effort, crossing even the strong lines of faith, class, and occupation. As one newspaper wrote, "We do hope that one good result from the present distressing visitation will be a thorough and cordial union of the friends of good order, of all religious persuasions, and of all grades in politics . . . with charity towards those that conscientiously differ from us."[5] Although capital growth still dictated rebuilding, residents of distant cities had begun to identify a shared experience, in the face of environmental challenges, that required collective action.

In 1872, Massachusetts decided to move Miller's River. As East Cambridge and Somerville had grown, their proliferating industries, railroads, and sewers polluted the river, giving it a "repulsive appearance" and a "pungent, nauseating stench."[6] Rather than stop polluting, engineers recommended corralling the river into a sewer covered by infill. The cheapest option promised both to end the stench and to create more land for the growing cities: "The cost . . . would probably be defrayed by the proceeds of the sale of the land created."[7]

By 1879, the year of this image, the inlet dotted with sailing vessels in the bottom center is all that remains of the river that had spurred the development of East Cambridge. The panorama's open spaces (above the inlet and leading to the right beneath the railroad tracks) are newly created land where water used to flow. In later years, additional railroad tracks, new businesses, and more people filled this land.

In building cities, humans altered aspects of the environment deemed inconvenient to urban growth. Construction decisions, once made, obscure

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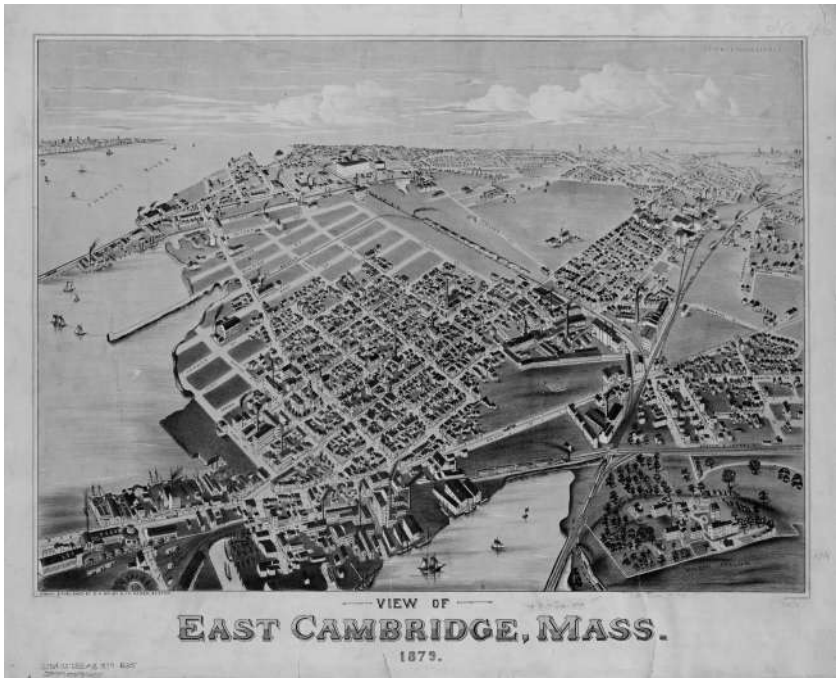

Figure 40.2
A river used to flow here, through the open spaces above the inlet (bottom center) dotted with sailing vessels. O. H. Bailey and J. C. Hazen, "View of East Cambridge, Mass, 1879" (Bailey & Hazen, 1879). Map reproduction courtesy of the Norman B. Leventhal Map and Education Center at Boston Public Library.

both the preceding environment and alternatives. Engineer Phinehas Ball, who surveyed the watershed of Miller's River and the action of the Boston harbor tide, noted that "an area equal to 42 per cent" of Somerville drained into Miller's River.[8] Nearly half the city—then home to 14,685 and now populated by eighty thousand–relies on Miller's River to carry away excess water.

Buried rivers do not disappear. Water still flows, through both the 1870s sewer and the streets and buildings above ground. During heavy rains, Somerville's Union Square—once the source of Miller's River—fills with water. So do the streets and parking lots built over Miller's River. Somerville's engineers have spent years trying to meet the demands once answered by the river, which they call "legacy storm water flooding."[9] Legacy suggests inheritance, but knowledge of the river had been lost.

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Figure 40.3
Asleep in Battery Park on a hot day, Bain News Service (between ca. 1910 and ca. 1915), glass negative, 5 in. × 7 in. or smaller, Library of Congress Prints & Photographs Division, https://loc.gov/pictures/resource/ggbain.09629/ (reproduction number LC-DIG-ggbain-09629).

Rebuilding without history is building blindly. The newest solution does not return the river to its course but rather gives stormwater more space in a series of fourteen-foot by six-foot box culverts that run parallel to the six-foot combined sewer.[10] A six-foot circumference seemed big enough in the 1870s; fourteen feet by six feet seemed large enough in the 2010s. Will it be enough for the river and the city as more rain falls? Climate change is warming the Atlantic, which, in turn, is increasing the moisture in the air, elevating the volume and intensity of rainfall.

When previous generations buried rivers to make land, they deceived later generations—us—into thinking we walk on solid ground. Cities built a legacy of deception, but we need not be caught unaware and unprepared. Examining the past can inform us today to build better cities for circulating forces that include water, air, and humans.

Hot summer days send New Yorkers in search of shade. In Battery Park, on lower Manhattan's waterfront, city dwellers shed hats, jackets, and shoes to cool off. For the working class and poor—unable to purchase

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comfort via additional ice or to flee the city as "heat refugees"—summer's heat and humidity "came like a scourge."[11] In 1900, the 302-square-mile, five-borough city housed more than 3.4 million people; 1.85 million lived on twenty-two-square mile Manhattan Island alone.[12] The overcrowded and overheated city broiled millions.

New Yorkers knew their city building was making the dense urban core hotter—but such was the cost of urban growth. Pavement and stone buildings heat more quickly and store solar radiation in greater quantities than landscapes dominated by plants, soil, and water. At the turn of the twentieth century, physician and public health reformer Stephen E. Smith bemoaned "the discomforts and perils of a New York Summer."[13] A climate of high temperatures and high humidity was partially to blame. Additional causes were anthropogenic. The cityscape encouraged heat absorption due to "the absence of vegetation; the drainage and hence the dryness of the soil; the covering of the earth with stone, bricks, and mortar . . . [and] the massing together of buildings."[14] Smith identified what we now know as the urban heat island effect.[15]

As early as the mid-nineteenth century, New Yorkers demanded the city plant trees.[16] Trees can mitigate heat, but they were unevenly distributed across the city. Sprawling parks such as Manhattan's Central Park (843 acres) were oases, but only 0.03 percent of the island's parkland lay among the poor tenement districts of the Lower East Side, Lower West Side, and Upper East Side combined.[17] Street trees were also in short supply. In 1910, *The New York Times* declared New York "a shadeless city."[18] Areas two to five square miles wide were "almost wholly without trees."[19] When the city failed to plant, residents sweltered.

In the 1970s, Brooklyn residents mobilized to plant trees in the heat-prone built environment they inherited. Hattie Carthan, a seventy-year-old Black resident, played a key role in neighborhood organizing around trees, including fundraising, government liaising, and planting. Carthan helped establish Bedford-Stuyvesant's Neighborhood Tree Corps (1971) and the Magnolia Tree Earth Center (1972), which promoted grassroots environmentalism and youth education. This work integrated urban beautification, microclimate amelioration, and civil rights.[20] Tree planters claimed their neighborhood, suffering from white flight and disinvestment, was worth investing in, worth greening, and worth cooling.

In the 2020s, New York's urban heat island effect subjects some neighborhoods to temperatures as much as 20°F hotter than leafier ones.[21] But street trees and parks—"cool islands" in the heat—are local interventions that offer measurable cooling.

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Conclusion

The residents of St. John's, Cambridge and Somerville, and New York inherited landscapes wrought by older decisions. Despite their appearance of permanence, city environments remain changeable. Rebuilding in crisis has tended to limit people's vision of what the urban environment can be. Too often, authorities rebuilt only to enable further growth, which we know to be unsustainable, and to protect and enrich some but not all. Many features of our cities are actually memorials to past privilege (the well-treed neighborhood), inequity (the polluted and buried river), and unintended environmental consequences (a narrowed harbor). But we also see in these histories an arc toward environmental justice as the needs of a public good are increasingly brought to bear on private interest. These stories challenge us to be generous in our aid and advocacy for others experiencing distress and upheaval in the new climate age.

Knowing that we *can* act, as previous generations did, expands our sense of possibility. What would it look like to build a city that makes space for humans, rivers, breezes, and trees? What would it mean to rebuild with history in mind?

Notes

1. Jenkin Jones, Secretary, the Phoenix Fire [Insurance Co.] Office, London, to Thomas Lack, Office of the Committee of the Privy Council for Trade, 15 December 1817, in *Despatches Received by the Governor of Newfoundland from the Secretary of State for the Colonies*, vol. 2, 1814–1819, 120; and Charles Pedley, *The History of Newfoundland from the Earliest Times to the Year 1860* (Longman, Roberts & Green, 1863), 417.

2. L. A. Anspach, *A History of the Island of Newfoundland, Containing a Description of the Island, the Banks, the Fisheries and Trade of Newfoundland, and the Coast of Labrador* (London, 1819), 255; and Gov. LeMarchant to Earl Grey, June 24, 1847, in *Copies or Extracts of the Correspondence Between the Governor of Newfoundland and the Secretary of State for the Colonies, in Reference to the Appropriation of the Subscriptions Raised for the Relief of the Sufferers at St. John's by the Fire in 1846*, 79.

3. Pedley, *The History of Newfoundland*, 420; Joseph Hatton and M. Harvey, *Newfoundland: The Oldest British Colony, Its History, Its Present Condition, and Its Prospects in the Future* (London, 1883), 110; and D. W. Prowse, *A History of Newfoundland from the English, Colonial, and Foreign Records* (London, 1895), 493.

4. Commander George Robinson, "Harbour Encroachments," *Journal of the House of Assembly of Newfoundland 1883*, 183.

5. *Morning Courier*, June 16, 1846, 3.

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6. *Report of the Joint Commission Consisting of Harbor Commissioners and State Board of Health [. . .] with the Report of Phinehas Ball, Civil Engineer, to the Commission* (J. A. Cummings & Co., 1872), 22–23.

7. *Report of the Joint Commission*, 6.

8. *Report of the Joint Commission*, 15.

9. City of Somerville, "Somerville Ave. Utility and Streetscape Improvements Project: Background," June 7, 2023, https://www.somervillema.gov/somervilleave.

10. City of Somerville, "Box Culvert and Utilities—Cross Section," from "Somerville Ave. Utility and Streetscape Improvements Project," June 7, 2023, https://s3.amazonaws.com/somervillema.gov.if-us-east-1/s3fs-public/Utilities%20and%20Streetscape%20Cross%20Sections.pdf.

11. Julian Ralph, "A Hot Night in New York," *Harper's Weekly*, August 17, 1889, 667–668.

12. Ira Rosenwaike, *Population History of New York City* (Syracuse University Press, 1972), 36, 58.

13. "New York Is Being Surveyed for Planting of Trees," *New York Times*, January 4, 1914, SM6.

14. Stephen E. Smith, "Vegetation a Remedy for the Summer Heat of Cities," *Appletons' Popular Science Monthly* (February 1899): 438.

15. William P. Lowry, "The Climate of Cities," *Scientific American* 217, no. 2 (August 1967): 15.

16. Sonja Dümpelmann, *Seeing Trees: A History of Street Trees in New York City and Berlin* (Yale University Press, 2019), 25–27.

17. Lawrence Veiller, "Parks and Playgrounds for Tenement Districts," in *The Tenement House Problem [. . .]*, ed. Robert W. DeForest and Lawrence Veiller, vol. II (Macmillan, 1903), 2–5.

18. "A Glimpse at Fifth Avenue's Dwindling Shade Line," *New York Times*, March 13, 1910, SM6.

19. Tree Planting Association and Henry R. Francis, *Report on the Condition of the Street Trees of the City of New York, with Suggestions for an Organized System of Scientific Culture and Conservation of Trees for the Greater City* (Syracuse University, 1914), 6. See also Max Page, "Uses of the Axe," *American Studies* 40, no. 1 (Spring 1999): 46.

20. Dümpelmann, *Seeing Trees*, 97–99.

21. Anne Barnard et al., photographs by Stephanie Mei-Ling, "It's Going to Be a Hot Summer. It Will Be Hotter if You're Not Rich," *New York Times*, May 28, 2022, https://www.nytimes.com/2022/05/28/nyregion/heat-waves-climate-change-inequality.html.

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Ocean Futures

Samantha Muka and Anna Guasco

Historically, some people have viewed the ocean as unknowable, dangerous, and infinitely abundant, while others have viewed the ocean as a source of connection and memory.[1] In an era of rapidly changing environmental conditions, it's impossible to ignore that the ocean is exhaustible, changeable, and full of history—histories that can help us understand the present and plan for the future. From the deep sea to the coast, oceans enhance our understanding of environmental change over time in a way that allows us to reflect upon and teach about climate change and the Anthropocene.

Historical studies of the marine environment can help place rising tides in context. They also contribute to addressing contemporary concerns about the intertwined nature of oceanic and human futures through issues such as sea level rise, ocean acidification, overfishing, biodiversity loss, and more.

These histories mirror a future where negotiations between land and sea occur on a wide scale. They can help current historians better understand the future of these constantly shifting regions and think more fully about constructing histories of shifting spaces. So, how does marine history help historians *in the present* imagine the future?

Anthropocene Futures: Destabilizing the Terrestrial Through Marine Archives

Fears about the Anthropocene rely on the idea that dry land is stable and the center of human civilization. Marine history disrupts assumptions about the sedimentary and terrestrial nature of humanity's relationship with environments. Studying it and using it to teach can shift the focus of history and open up ideas about the future. Broadly, marine history offers us stories of a future that is watery by telling stories of the history of surviving in and around these environments. One of the ways marine

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history can change how historians think about the future is to experiment with different ways of thinking about the past. In addition to traditional archives (in the classic "dusty boxes full of papers" model), historians can access archival materials natural scientists are more expected to use. Natural scientists use very different kinds of "archives"—biotic and abiotic (living and nonliving) materials that similarly record phenomena over time, including ice core samples and tree rings. Although these two types of archives might seem quite different, marine historians are bridging the divide between natural sciences and historical research around what can constitute an "archive." Bridging these types of archival research is necessary for imagining potential futures.

Coral is a good example of how marine historians can use a variety of archival materials to understand the history of the ocean and to think about possible futures. Coral is a soft-bodied polyp that builds a crystalline exoskeleton over a long period. Coral reefs are collections of these exoskeletons that become significant coastal infrastructures upon which humans have built cultures of environmental understanding, extraction, and leisure. Coral, then, is both a geographical location and a physical object (the living or dead exoskeleton); both of these objects create opportunities for studying the history of marine environments and human interactions with them.

Coral as a space: Historians can study coral reefs to understand human interactions with the marine environment and how those interactions change over time. Coral reefs grow primarily in shallow, tropical seas. Because their growth is dependent on particular conditions, they have shifted further or closer to shorelines with the rising and falling of historical sea levels. Although much of those shifts occurred before humanity, anthropologists and archaeologists have found evidence of human interactions on ancient reefs from Australia to Florida.[2] Studying the geographical spread of coral reefs, and using archaeological, anthropological, and historical evidence to understand human interactions with these spaces, can lead to a better understanding of how humans have adapted to shifting coastlines over thousands of years.

Coral as an object: When coral is extracted from the marine environment, it is dried and becomes a mobile object. Using the methods of natural and social scientists, we can understand the history of climate and interactions with the marine environment by studying this physical object. Paleoclimatologists use coral cores to read past climates. Similar to tree rings, scientists are using coral cores to read past temperatures, CO_2 levels, and the salinity of the ocean.[3]

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This ability to "read" coral for past environmental indicators can be combined with other historical uses of coral. Humans extracted coral from the ocean for a variety of purposes. Red coral, taken from the Indo-Pacific, circulated through trade routes in Early Modern Europe and Asia, serving as jewelry, sculpture, and textile embellishments from Turkey to Sweden. Coral has also been used as building material on the African and Mediterranean coastlines.[4] Many of these artifacts exist in natural history and art collections worldwide.[5] Coral has circulated with human migration, making it a historical indicator of how people have moved and how they might move.[6] Marine historians can combine natural history and history methodologies to examine these museum collections to better understand the shifting nature of human interactions with the seas. Using coral in all its archival forms, historians can trace human interactions with the sea over vast temporal spans. These tracings show how dynamic coastlines and climate have been over the course of human history, and how humans have adapted to that dynamism. Like coral, other organisms can be seen as archives from marine history approaches. From the largest of marine vertebrate animals—like baleen whales—to very small invertebrates—like barnacles—these organisms accumulate material traces of their environments in their own bodies. So too can abiotic (nonliving) objects be reinterpreted as "archives," as might the landscape (or seascape) as a whole. What if we understood the ocean itself as an archive?

Shifting Baselines: The Role of Baselines in Ocean Futures

Marine history can assist with understanding the longer history and future of climate change. One key area is "marine historical ecology," a natural sciences–driven approach that uses historical methods and materials to better understand past oceanic ecosystems. Marine historical ecologists turn historical records into data points and use these reconstructions of oceans past to better anticipate and plan for future oceans.

Marine historical ecology helps assess changes in memory and perceptions of oceanic ecosystems over time. Fisheries biologist Daniel Pauly coined the term "shifting baselines syndrome" to describe how successive generations identify an ecological "baseline" based on whatever the ecosystem and fisheries conditions looked like when they entered the field.[7] This causes depleted ecosystems to be seen as "normal" or "natural." Historical ecologist Loren McClenachan used historical photographs to trace these shifting baselines in Florida trophy fishing communities, where she traces the decrease in catch size over time.[8] This issue has broad

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implications not just for understanding marine environments in the *present* but also for setting expectations for marine conservation planning for the future—misunderstanding past baselines warps future baselines. This is an issue not just of data but also of memory and perspective, making historians well equipped to contribute to addressing this problem. The future of climate change involves historians' knowledge of the past.

Historians and ecologists are both interested in shifting baselines.[9] One way that they meet is in visualizing change. Ben Schmidt, a historian and digital humanist, used whaling logs to create a visual map of whale population decrease for his blog *Sapping Attention*.[10] Most recently, a group of computer scientists and ecologists are seeking to use similar logs to develop a visualization of whale populations from 1880 to 1986, which they call WhaleVis.[11] These groups can work together to build better visualization to understand the past and predict the future. Historians can provide nuance in finding and reading primary sources, whereas engineers and biologists can help apply historical findings to current problems (and hopefully solutions). For example, in the Woods Hole Historic Whaling Project, historians, oceanographers and climate scientists, and community science volunteers are collaborating to bring together historic whaling logs and climate modeling.[12]

To address shifting baseline syndrome and other issues of remembering, scientists draw upon a variety of archives and materials, including whalers' logbooks and historic photographs. Historians offer important insight into understanding these primary source materials—and, importantly, historical approaches complicate the assumptions and frameworks embedded in marine historical ecology. Historians are trained to see archives and archival information not as neutral repositories to be mined for data but rather as value-laden, dynamic systems inextricable from the social, political, cultural, and economic contexts in which they are produced.[13] What historians offer, then, is a challenge to these assumptions. Historians provide key insights into how to grapple with historical context and specificity of materials of interest for scientific study. To imagine and plan for what future oceans might look like, historians can help remedy problems with how communities *remember* past oceans.

Conclusions and Next Steps: Interdisciplinary Methods for Ocean Futures

Traditional maritime history may have a reputation for being a bit dry (pun intended)—for focusing on the facts and figures of past ships, ports and harbors, exploration, and military action. But marine history offers

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much more than these dry and distant details, and studying oceans past forges connections with contemporary and future questions. The field has grown rapidly over the last few decades, with a greater emphasis on interdisciplinarity and inclusion. Historians of marine environmental history have pushed the field to bring in natural science methods and to include non-Western histories, especially those focusing on interactions outside of the traditional North Atlantic.[14]

Marine history offers a way for us to contextualize the Anthropocene. History shows us that coastal and ocean spaces are dynamic, and humans have reacted in a plethora of ways to this dynamism. Shedding our myopic focus on the terrestrial nature of humanity allows us to see more fully the link between humans and the ocean and to learn from it. By turning our focus to marine history, we prepare ourselves for the watery future.

Notes

1. Epeli Hau'ofa, "Our Sea of Islands," *The Contemporary Pacific* 6, no. 1 (1994): 148–161; and Helen M. Rozwadowski, *Vast Expanses: A History of the Oceans* (University of Chicago Press, 2018).

2. Paulette S. McFadden, "Coastal Dynamics and Pre-Columbian Human Occupation in Horseshoe Cove on the Northern Gulf Coast of Florida, USA," *Geoarchaeology* 31, no. 5 (September/October 2016): 355–375; and Ian McNiven, "Saltwater People: Spiritscapes, Maritime Rituals and the Archaeology of Australian Indigenous Seascapes," *World Archaeology* 35, no. 3 (2004): 329–349.

3. Branwen Williams, "Proteinaceous Corals as Proxy Archives of Paleo-Environmental Change," *Earth-Science Reviews* 209 (October 2020): 103326; and John M. Doherty et al., "Climate-Modulated Nutrient Conditions Along the Labrador Shelf: Evidence from Nitrogen Isotopes in a Six-Hundred-Year-Old Crustose Coralline Alga," *Paleoceanography and Paleoclimatology* 36, no. 5 (2021): e2020PA004149.

4. Zohreh Moradi, "The Role of Coral in Art and Architecture: An Overview," *International Journal of Aquatic Biology* 4, no. 2 (April 2016): 125–142; and Marion Endt-Jones, "'Something Rich and Strange': Coral in Contemporary Art," in *Framing the Ocean, 1700 to the Present: Envisaging the Sea as Social Space*, ed. Tricia Cusack (Routledge, 2014), 223–238.

5. Marion Endt-Jones, "Cultivating 'Response-ability': Curating Coral in Recent Exhibitions," *Journal of Curatorial Studies* 9, no. 2 (2020): 182–205.

6. Michele Currie Navakas, *Coral Lives: Literature, Labor, and the Making of America* (Princeton University Press, 2023).

7. Daniel Pauly, "Anecdotes and the Shifting Baseline Syndrome of Fisheries," *Trends in Ecology and Evolution* 10, no. 10 (1995): 430.

8. Loren McClenachan, "Documenting Loss of Large Trophy Fish from the Florida Keys with Historical Photographs," *Conservation Biology* 23, no. 3 (2009): 636–643.

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9. Wilko Graf von Hardenberg, *Sea Level: A History* (University of Chicago Press, 2024).

10. Ben Schmidt, "Data Narratives and Structural Histories: Melville, Maury, and American Whaling," *Sapping Attention*, October 2012, https://www.sappingattention.blogspot.com/2012/10/data-narratives-and-structural.html.

11. Ameya Patil et al., "WhaleVis: Visualizing the History of Commercial Whaling," *IEEE Visualization and Visual Analytics* (2023): 96–100.

12. Ayurella Horn-Muller, "How Centuries-Old Whaling Logs Are Filling Gaps in our Climate Knowledge," *Grist*, November 2022, https://grist.org/article/how-centuries-old-whaling-logs-are-filling-gaps-in-our-climate-knowledge/.

13. Tamara Fernando, "Ecology's Ghosts," *Hypocrite Reader* 97 (April 2021), https://hypocritereader.com/97/ecologys-ghosts.

14. Christine Keiner, "How Scientific Does Marine Environmental History Need to Be?," *Environmental History* 18, no. 1 (2013): 111–120; and Matt K. Matsuda, "The Pacific," *The American Historical Review* 111, no. 3 (2006): 758–780.

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42

Highlights of US Youth Climate Activism

Elizabeth Blum and Ellen Griffith Spears

In post–Second World War America, as climate change emerged as an international crisis, adults repeated long-used tropes of concern for children's future. Concrete action lagged, even though scientists alerted governments to the climate crisis in the 1960s. Young people—from elementary school to college—pressed for environmental safeguards, aided by changes in their visibility and legal status beginning in the mid-twentieth century. By the twenty-first century, weathering conservative backlash and continued government inaction, young people built on earlier activism to bring a sense of urgency to climate issues.

There are four phases of youth environmental activism in post–Second World War America:

- 1940s to mid-1960s: Young people participate in significant numbers in local conservation actions, generally through school, often focusing on human health.
- Mid-1960s to 1988: As national media attention ramps up, youth efforts become more public and national around Earth Day 1970. Although not universal, young people link environmental issues to social justice, especially rights for young people. Climate is not the central issue.
- 1988 to 2010: After NASA scientist James Hansen testifies to Congress that global warming is occurring, new national and global organizations make climate a central focus. Youth raise climate issues but rarely in leadership roles.
- 2010 to present: Spurred by government inaction, young people take on a more explicit leadership role, forming their own climate-focused organizations independent of adults and schools. With smartphones and social media, young people have more access to their own sources of information and global counterparts. Intersectionality and an international

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focus become explicit cornerstones of activism. The future—their future—becomes a key watchword and the focus of organizing strategies.

American youth climate activism arose from frustration and anger over decades of inaction and even active opposition on climate issues by adults. As early as 1965, President Lyndon B. Johnson reported to Congress scientists' findings on increasing levels of CO_2, including the increased likelihood of rising sea levels, ocean warming, and freshwater acidification.[1] Congress took no action.

Earth Day drew massive crowds in April 1970, with human impact on climate among the alarms raised about pollution and damage to nature. Hundreds of thousands of school children expressed concerns about resource use, wildlife protection, and human health. Young people gathered information, formed recycling clubs, and wrote to children's magazines.[2]

In 1978, pressed by scientific organizations and environmental advocacy groups, Congress passed the National Climate Program Act, which sought to "to improve the understanding of climate processes, natural and man induced, and the social, economic, and political implications of climate change."[3] At the urging of environmental groups, President Jimmy Carter commissioned the Global 2000 report, which again outlined the pending crisis.[4]

Still, legislative progress stalled. Rollbacks of environmental regulations during the Reagan era sparked membership growth in the 1980s for groups such as the Sierra Club. In 1987, a Democratic Congress passed the modest Global Climate Protection Act, which President Ronald Reagan reluctantly signed. The legislation offered few concrete steps toward climate mitigation.[5]

In 1988, NASA scientist James Hansen warned Congress that the climate was definitely warming. "The greenhouse effect has been detected," Hansen said, "and it is changing our climate now."[6] Major national organizations began placing climate change higher on their agendas.

Climate organizing was global from the start. The international Climate Action Network formed in 1989 (see resources). In 1992, the United Nations (UN) Conference on the Environment, held in Rio de Janeiro, Brazil, brought conservation and environmental justice nongovernmental organizations together. The United Nations Framework Convention on Climate Change, adopted at Rio, provided the basis for US government action and a rallying point for activists on measures to reduce global carbon emissions.

Although international agreements exhibited potential for cooperation, the United States stymied progress at key moments. Activists' hopes

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for binding targets to reduce greenhouse gas emissions centered on the third Conference of the Parties (COP) in Kyoto, Japan, in 1997. However, Congress circumscribed the US negotiating posture in advance by refusing to support additional time and resources for developing nations to reduce greenhouse gasses. Hamstrung by Congress, activists nevertheless influenced the debate at Kyoto in new ways by lobbying official delegates via cell phones. The US has never ratified the Kyoto Protocol.

In the 2010s, youth climate activism exploded, with new organizations, tactics, legal cases, and demonstrations. Bill McKibben and colleagues launched the climate organization 350.org, which attracted a large following among college students, who successfully pressured universities and other institutions to divest from fossil fuel corporations (see the interview with Bill McKibben in part V of this book). Inspired by Indigenous-led activism against the Dakota Access Pipeline, many of the new youth groups recognized the intersectional nature of environmental and, particularly, climate-related issues. In 2015, members of the 2011 Occupy Wall Street movement, which focused on wealth inequality, founded a youth-led climate group, Sunrise.[7]

Other groups focused on connections between environment and racism as part of the environmental justice movement. In the early 2010s, high school students in Baltimore began the Free Your Voice movement, working to keep additional toxic industries out of their neighborhoods, reduce emissions, and move toward zero waste.[8] The Black Lives Matter movement began in 2013 as an effort to end police brutality and make urban areas safer for people of color and evolved to link social justice with climate issues. In 2021, when the city of Atlanta proposed building a massive police training center on the site of an urban forest, the Stop Cop City movement sprang into action, protesting the loss of green space as well as the militarization of the police. Organizers faced intense repression; police efforts to shut down the protests led to multiple arrests and the killing of a twenty-six-year-old man.[9] Partly to suppress climate demonstrations, at least six state legislatures passed anti-protest legislation.[10]

Young people and their allies took action through the courts, beginning in the early 2000s. Attorney Julia Olson, inspired by earlier children's activism and Al Gore's *An Inconvenient Truth*, filed the *Juliana v. US* suit in 2015. With twenty-one young plaintiffs and scientists (including James Hansen), Olson's groundbreaking lawsuit alleged that the federal government violated the constitutional rights of young people in contributing to, and failing to act sufficiently against, climate change. Olson built the case around the Public Trust Doctrine, which requires the government to

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preserve public resources. The plaintiffs, referred to as the "Climate 21," demanded that the court tell Congress and the president to devise and implement plans to alleviate the root causes of climate change. After a rocky path, the US Supreme Court officially ended the decade-long case in March 2025.[11]

Nonetheless, during the Obama years, this stepped-up pressure, in the US and internationally, helped to bring about the first major international climate agreement, the Paris Climate Accord, in December 2015. Each nation pledged *voluntary* but *binding* reductions in emissions, and the Accord offered funding and technology assistance, thereby addressing the differential responsibilities and capacities among nations.

Young people also took to the streets to critique adult policymakers' failure to act. The 2019 climate strike originated with then-fifteen-year-old Swede Greta Thunberg, who had begun protesting climate inaction by sitting outside the Swedish Parliament building each Friday in 2018. At the COP24 UN conference in Poland that year, Thunberg castigated adults in the room for talking "about moving forward with the same bad ideas that got us into this mess, even when the only sensible thing to do is to put [on] the emergency brake."[12] Thunberg's speech went viral on social media, leading more young people to join her #FridaysforFuture campaign. Mass protests spread rapidly in Europe and then to the US, led by young people including New Yorker Alexandria Villaseñor.[13] After months of dedicated organizing through social media, on March 15, 2019, millions of students from diverse backgrounds took to the streets across the globe to protest government inaction and lack of progress over climate change.[14]

The *Juliana* case also spawned more successful state legal actions following the climate march. In 2020, sixteen young people initiated *Held v. Montana*, which argued that Montana's anti-climate policies violated provisions of the Montana state constitution, which protected the right to a clean and healthful environment. In 2024, the state Supreme Court ruled in favor of the young plaintiffs in the case, affirming that the Montana constitution protects the climate and forbidding Montana from enforcing the challenged laws. Taking up the more specific climate assaults noted in the *Held* case, thirteen young Hawaiians sued the Hawaiian Department of Transportation for producing greenhouse gasses in violation of the legislature's goal of decarbonizing. In June 2024, in a victory for the young plaintiffs, Hawaii settled the case and agreed to dramatically alter transportation systems and reach zero emissions by 2045.[15] Other youth-led cases brought in Utah, Alaska, and California have faced dismissals. As a successor to the *Held* case, twenty-two young plaintiffs filed *Lighthiser v.*

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Trump in May 2025, which challenged the Trump administration's anti-climate executive orders, and was quickly dismissed later that year.[16]

Climate activism, particularly by young people, has been met with substantial opposition from a well-funded antienvironmental movement in the United States. By the mid-1990s, conservatives, driven by concerns about globalization and the loss of American hegemony, deflected climate science with conspiracy theories, assertions minimizing human impact, and research often funded by fossil fuel companies.[17] Reports in the 2010s listed the US as having the highest percentage of the population denying the human causes of climate change.[18] In 2017, the US president and more than half of all senators and representatives rejected climate science.[19] The Biden administration nevertheless passed significant climate legislation, backed by funding from the Bipartisan Infrastructure Law and the Inflation Reduction Act. The second Trump administration has sought the reversal of climate protective policies, including again withdrawing the US from the Paris Agreement.

Although concern for climate change can often affect young people's mental health negatively—increasing uncertainty about the future—those who become active have implemented change. Among the hopeful signs for the future, concern about climate change has driven unprecedented youth involvement in American politics, prompting young voters to turn out in the highest numbers since eighteen- to twenty-one-year-olds gained the right to vote in 1971.[20] The United Nations reports that young people are "valuable contributors to climate action. They are agents of change, entrepreneurs and innovators."[21]

Notes

1. Lyndon B. Johnson, "Special Message to Congress on Conservation and Natural Beauty," The American Presidency Project, http://www.presidency.ucsb.edu/ws/?pid=27285P; and President's Science Advisory Committee, *Restoring the Quality of Our Environment* (White House, 1965), 111.

2. Adam Rome, *The Genius of Earth Day* (Hill and Wang, 2014).

3. 15 U.S. Code §2904, Sec. (d) (2).

4. Council on Environmental Quality and the Department of State, *Global 2000 Report to the President* (Government Printing Office, 1977); and 15 U.S. Code §2901, Sec. 1103 (b), (c).

5. Nathaniel Rich, "Losing Earth: The Decade We Almost Stopped Climate Change," *New York Times*, August 1, 2018.

6. James E. Hansen, NASA Goddard Center for Space Studies, *Testimony to the U.S. Senate Committee on Energy and Natural Resources*, June 23, 1988.

Downloaded from direct.mit.edu/books/book-pdf/2641078/book_9780262056311.pdf by guest on 26 November 2026

7. Mark K. Matthews et al., "Inside the Sunrise Movement," *E&E News*, December 3, 2018.

8. Nicole Fabricant, *Fighting to Breathe: Race, Toxicity, and the Rise of Youth Activism in Baltimore* (University of California Press, 2023).

9. Jozsef Papp and Shaddi Abusaid, "More than 60 Atlanta Training Center Activists Named in RICO Indictment," *Atlanta Journal Constitution*, September 5, 2023.

10. State Innovation Exchange, "2017 End-of-Session Report," accessed November 1, 2023, https://stateinnovation.org/wp-content/uploads/2017/08/2017-SiX-EOSR.pdf.

11. *Juliana v. United States*, No. 24–645. March 24, 2025. US Supreme Court, https://www.ourchildrenstrust.org/juliana-v-us.

12. Connect4Climate, "Greta Thunberg Full Speech at UN Climate Change COP24 Conference," 2018, https://www.youtube.com/watch?v=VFkQSGyeCWg.

13. "'Why Go to School When You Have No Future?': A Q&A with a 13-Year-Old Climate Striker," *The Nation*, March 14, 2019; and Oliver Milman, "'We Won't Stop Striking': The New York 13-Year-Old Taking a Stand Over Climate Change," *Guardian*, March 12, 2019.

14. Somini Sengupta, "Protesting Climate Change, Young People Take to Streets in a Global Strike," *New York Times*, September 20, 2019.

15. *Held v. Montana*, DA 23–0575 (Montana Supreme Court, December 18, 2024). The Hawaii case was *Navahine v. Hawai'i Department of Transportation*. Angie Jaime, "Hawai'i Youth Reach 'Historic' Settlement in Climate Case," *Teen Vogue*, June 26, 2024.

16. Dharna Noor, "Trump Violating Right to Life with Anti-Environment Orders, Youth Lawsuit Says," *Guardian*, May 29, 2025; *Lighthiser v. Trump*, CV 25-54-BU-DLC, USDC Butte, Montana, October 15, 2025.

17. Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Climate Change* (Bloomsbury Press, 2010).

18. Ipsos MORI, "Global Trends 2014: Navigating the New," slide 65 of 245, accessed November 1, 2023, https://www.ipsos.com/sites/default/files/ct/publication/documents/2020-01/ipsos-global-trends-2014-charts.pdf.

19. Sarah Emerson, "The Climate Change Deniers in Congress," *Vice*, April 28, 2017, https://www.vice.com/en/article/pg5zqg/a-guide-to-the-climate-change-deniers-in-congress.

20. Statista, "Youth Voter Turnout in Presidential Elections in the United States from 1972–2020," November 3, 2023, https://www.statista.com/statistics/984745/youth-voter-turnout-presidential-elections-us/.

21. United Nations Climate Action, "Youth in Action," accessed November 1, 2023, https://www.un.org/en/climatechange/youth-in-action.

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Histories from Above the Water's Mark

Gabriela Soto Laveaga

In early August 2022, as historic heat waves broke records, riverbeds dried in Europe, the United States, Latin America, and beyond. As bodies of water ran dry, forgotten worlds emerged alongside some pasts that were meant to remain below the water's surface. As we experience historic climate change–fueled drought, bodies of water are regurgitating the past. What does it mean for us, contemporary scholars, when our pasts, presents, and futures collide before our eyes? How are these discoveries altering how we understand and write about our present and, potentially, our attempts to alter a climate-changed future?

In the past few years, entire cities, some that had never been catalogued before, have resurfaced, coughed up during extreme weather. For example, the Mosul Dam reservoir in Iraq, drained to save crops during a drought, revealed an unknown ancient city. As the press reported, "With just days to examine the area before the waters came back, archaeologists successfully mapped what they believe to have been a major city in the Mittani Empire built 3,400 years ago."[1] The waters had hidden—and preserved—the remains of a city that, now known, can help us better map our past. On the flip side, in 2015, receding waters revealed Native artifacts in California and opened them up not for cataloguing but rather for looting. As an article in *The New York Times* lamented, "Though archaeological pillaging is age-old, the receding waters of the state's lakes, rivers and reservoirs have lent special urgency to the issue here, exposing the remains of a lost California and alarming archaeologists, historians and especially Native Americans whose ancestral grounds are increasingly vulnerable to thieves bearing picks and shovels."[2] The article also made clear the ties and multiple meanings that these objects have for displaced populations, like many Native tribes, for whom, say, obsidian spearheads tether them to place and help lay claim to ancestral spaces.

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Equally, some resurfaced places illustrate how they have become intentionally forgotten layers to make way for so-called progress or modern infrastructure. In Spain, for example, the village of Aceredo, in the country's north, last seen in 1992 when it was flooded to make way for a 630-megawatt hydropower plant, was not only visible, but tourists could also again walk the formerly submerged streets and photograph eerie images of village life interrupted to make way for hydraulic power.[3]

But it is not just forgotten bridges, roads, and cities that are resurfacing. Previously unknown dinosaur footprints reveal deeper histories of nonhuman life, giving us a fuller picture of where species long extinct once roamed.[4]

However, also coming to the surface are lives cut short that were meant to remain hidden. For example, in the American West, murdered bodies have emerged. The first body was found at the Lake Mead National Recreation Area near Las Vegas. A drought had depleted the lake, a crucial water source for twenty-five million people, drying out tributaries, threatening hydropower production, and closing boat ramps at the popular site. The lake was at its lowest level since it was filled in 1937.[5] Lake Mead is also the largest reservoir that feeds the Hoover Dam. By the end of summer 2022, a total of six skeletal remains had been found in the same body of water. The bodies appeared to be coming in such quick succession that a law firm, known for its off-beat humor billboards, advertised, "Injured while searching for dead bodies at Lake Mead? Demand compensation!"[6] Apparently, many viewers did not understand that it was a self-parody of lawyers and lawsuits.

Despite these grisly findings, in some ways, more alarming for some was the resurfacing of *Hungersteine* (hunger stones) such as the one in the Elbe River, which ominously read, "If you see me, weep."[7] The stone, dating to the devasting drought of 1616, had already resurfaced in the twenty-first century during the drought of 2018. Merely four years later, Europe's drought was reported to be on course to be the worst in five hundred years.[8] Hence, the emergence of a 406-year-old warning of famine, plagues, and social unrest sent journalists and doomsayers loose on the Internet and social media, where articles, blogs, and musings concurred that the stones were forgotten oracles of doom.

Hunger stones had emerged from rivers before, even in years without drought. Their resurfacing was often still linked to human intervention, as when dams or canals altered river flows. Yet, as a writer remarked in 2022, "This year a record number of stones have resurfaced, and new stones uncovered that had not been recorded in living memory."[9] Curiously, the

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initial 2022 stories of the hunger stones were linked to a single tweet from 2018. In other words, the frenzied message with hunger stones in the summer of 2022 was left without context and thus conflated histories, places, and times.[10] Many of the images and articles that went viral in 2022 about hunger stones turned out to be from 2018 when they had again resurfaced. Yet, in 2022, in a pandemic world buffeted by ongoing loss, the hunger stones seemed to grip our collective imagination. It seemed that, as a planet, we had a heightened sensitivity to death, hunger, loss—and to how to interpret old evidence in a climate-changed world.

While the world was seemingly transfixed on the hunger stones in the past few years, we seemed to be missing the larger picture. In some ways, the revealing of the stones, as opposed to the receding water level alone, was seen to be *the* cataclysmic event. In fact, with the hunger-stones story, we seemed to have, once again, made *visible* the trait that mattered. When it comes to water futures, however, it is what lies unseen below—groundwater, diminishing water tables, and polluted aquifers—that will help determine how humanity will live into the future.

In this past year, for example, it has been not resurfacing hunger stones but rather invisible groundwater that has often dominated a news cycle. An example of this was the revelation that farmers in California had drained a river months before any authorities took note of what could only be called water theft.[11] This newer twenty-first iteration follows the long practice of "taming" rivers and containing them in dams to create agricultural empires across the globe. In fact, river (ab)use was often encouraged to promote the construction of irrigation infrastructure that would then lead to more commercial crops. But with drought now impacting "a quarter of humanity," our former ways of interacting with rivers, groundwater, and even our food systems requires a new assessment of the past as we face unprecedented levels of global hunger—which leads us back to the hunger stones.[12]

To state the obvious, the stones' warnings send a different meaning to us today than to those who inscribed them and even to those who saw them decades ago. Our cultural understanding and scientific knowledge of climate change shapes how our contemporary society "reads" this warning. Moreover, the stones, emergence while we are still in a post-pandemic moment seems to have acquired more gravitas as we all seem to be more attuned to our own and our communities' mortality.

Although the stones have emerged at different times in our past, it is technology that allows us to "witness" what was once site specific. Through images and online news coverage, different traces left by receding

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waters are seen at once: the dinosaur tracks, the bodies, the archeological sites, and the hunger stones. These were all site and temporal events that together become evidence of a planetary phenomenon. This jumble of time, all lying in wait below the waterline, can be seen as remarkable bullet points of both life and extinction on earth and yet appear to be happening (are being revealed) at the same time. In some ways, the receding waters give us a preview of what future archaeologists might see—all at once and across the globe—when we are no longer here.

In a recent essay, environmental historian Bathsheba Demuth reminds us that "change in a pattern in the land is no danger if you see it in time."[13] Yet, what if the frame we are using to evaluate current ecological disasters consists of timescales that limit our understanding and thus our potential social and technological solutions? As historians, what is "our ability to recuperate" the past using these found material objects that have resurfaced? Can these be an entry point to question how to best carry our pasts into the future, especially in this ongoing pandemic present when we don't yet know fully what we have lost? Instead of focusing on these objects, I wish to use examples of what remains invisible that is portent to a potential future to come.

If we place water, hunger, and receding waterlines together, an apt site to think with is the US–Mexico border, in particular the 1944 Water Treaty, which, although written nearly eighty years ago, binds the United States and Mexico into measures of water that no longer exist. When an initial water treaty between Mexico and the United States was first hammered out in the nineteenth century, water was not understood as part of an ecological system. Rather, it was seen as something isolated, measurable, and plentiful. These beliefs colored the science and made it into a treaty that has now created impossible obligations, especially for Mexico.

According to the 1944 Water Treaty that is still in effect today, Mexico owes water to the United States.[14] But the history of this treaty examined by scholars on both sides of the border reveals the difficulty in accurately measuring the futures of water. In 1944, when this treaty was written up, each country was seeking to demonstrate the contemporary use of water so that that number would be projected into the future. The scramble to prove evidence of use was entangled with agricultural futures. But rivers have lives of their own, and as data from researchers on both sides of the border illustrate when it came to water, these did not often align. Moreover, in the decade leading up to the treaty, there was a series of unusually rainy seasons that engorged the river, leading to faulty readings and

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faulty assumptions about predicting a river's life into the future. Finally, researchers in the mid-twentieth century could not have imagined our climate-changed world with change happening so rapidly. In short, Mexico "owes" water to the United States based on the mid-twentieth-century flow readings of the Colorado and Grande Rivers. In this instance, it is not ebbing, moving waters but rather 1944 readings that are a warning about fixity or rigid understandings of future water sources. If we return to the hunger stones, it is curious to note the obvious: The stones remain fixed in place. It is the water that rises and falls. It is the water's level that alarms. It is the lack of water—not the stones—that frightens us because historically "normal" levels have been breached. But we are now at a time when many erstwhile measures no longer count. How does the science of the present translate into the future? What does it tell us about projecting measures into the future? What can we as historians learn from this moment?

I was thinking about the above questions when a pre-Hispanic figurine prompted me to rethink timescales and the value of meaning. Let me explain. In Aztec mythology, Xipe Totec is the god of agriculture, seeds, and vegetation, also more generally the god of spring. His name quite literally translates to the "flayed one" because the arrival of spring is like the world shedding its old skin for a new coat. Human sacrifices were made to honor Xipe Totec, and the skin of the sacrificed would be worn by priests, followers of the "flayed one." The significance of both the god and the ritual was regeneration—not death but new life. For new life to happen (i.e., spring and agriculture), first there needed to be death. We cannot have one without the other. I first encountered mention of Xipe Totec in a museum in Puebla, Mexico. I stood transfixed in front of the glass case and fell into the seductive analytic trap of attempting to find twenty-first-century meaning in a fourteenth-century deity. Was there a lesson about how we carry our histories, our pasts? We need to carry our past selves, but we need to shed these old shells before we move into the new season. As these thoughts began to spin, I read the last sentences of the description. Followers of Xipe Totec, I learned, understood this as well, for in the depiction found in the museum, there is a curious detail. On the deity's nose appears a butterfly, a symbol of transformation, renovation, of life that continues after an end. The so-called flayed one is depicted in stone, wearing the skin of another. Yet, when rendered by a human sculptor, a butterfly was added. In sum, it was a symbol not just of regeneration and life and death but also of hope.

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Before Submerging Again

In precarious times such as our own, what is the obligation of scholars? Do we speak about the impermanence of human history? Or do we instead choose to muse about what survives? Is it useful to think about loss instead? How can we explain these emerging pasts?

To return to the hunger stones, the stones show us that this is not the first time, nor will it be the last, that we find ourselves in such precarious times. The stones were carved as warnings for future generations, for us. Despite the hunger and chaos, there was reason to believe that there *would be* a future "us" to read the stone. It served as a warning, yes, but it was also carved as an instance of care. As we recuperate in these ongoing seasons of loss of life, loss of rights, loss of nature, and loss of humanity, maybe we can turn to the *Hungersteine* and see them not only as harbingers of catastrophe but also as revealing other meanings, especially when we move beyond a Western-centric understanding of the world around us. The histories that we write, the spaces of our research sites—rivers, forests, cities, entire landscapes—will eventually be submerged, but the submerged remains will continue, an archive of our existence, for future generations.

Notes

1. Jane Recker, "Drought in Iraq Reveals 3,400-Year-Old City," *Smithsonian Magazine*, June 6, 2022.

2. Patricia Leigh Brown, "Receding Waters in California Expose Artifacts to Plundering," *New York Times*, December 1, 2015.

3. "Ghost Village Emerges in Spain as Drought Empties Reservoir," *Guardian*, February 11, 2022.

4. Claudia Dominguez and Raja Razek, "Dinosaur Tracks from 113 Million Years Ago Uncovered due to Severe Drought Conditions at Dinosaur Valley State Park," CNN.com, August 23, 2022, https://cnn.com/2022/08/23/us/dinosaur-tracks-discovered-texas-park.

5. "NASA Images Show Extreme Withering of Lake Mead," *Guardian*, August 1, 2022.

6. Duncan Phenix, "'Dead Bodies at Lake Mead': Las Vegas Law Firm Turning Heads with New Billboard," kron4.com, August 10, 2022, https://www.kron4.com/news/national/dead-bodies-at-lake-mead-las-vegas-law-firm-turning-heads-with-new-billboard/

7. Aspen Pflughoeft, "Centuries-Old Warnings Emerge from Riverbed as Europe Faces Historic Drought," *The Sacramento Bee*, September 2, 2022.

8. Victoria Seabrook, "Europe's Drought On Course to Be Worst for 500 Years, European Union Agency Warns," *Sky News*, August 9, 2022.

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9. Julia Schneeman, "'When You See Me, Weep,': 'Hunger Stones' Resurfacing in Europe Due to Record Drought," *Snow Brains*, August 16, 2022.

10. Jennifer Ouellette, "When Context Is Key: 'Hunger Stones' Go Viral, but News First Broke in 2018," *Ars Technica*, August 16, 2022.

11. Raymond Zhong, "They Abducted a River in California. And Nobody Stopped Them," *New York Times*, January 18, 2024.

12. Somini Sengupta, "Drought Touches a Quarter of Humanity, U.N. Says, Disrupting Lives Globally," *New York Times*, January 11, 2024.

13. Bathsheba Demuth, "Living in the Bones," *Emergence Magazine*, September 16, 2021.

14. There are websites such as this one that tally reports about the amount of water Mexico owes to the United States: https://www.rgrwa.org/index.php/issues-policies/mexico-water-debt.

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Resources Related to Part VI

Alexandra Hui, Elaine LaFay, Samantha Muka, Emily Pawley, Sarah Pickman, and Anna Zeide

VI.1 Brainstorming Exercise: Suggested Items and Skills to Include in One's "Historian's Climate Change Go Bag"

- Science fiction narratives to help us think about change

  Omar El Akkad, *American War* (Alfred A. Knopf, 2017)
  Ursula Le Guin, *Always Coming Home* (Harper and Row, 1985)
  P. D. James, *Children of Men* (Alfred A. Knopf, 1992)
  Annalee Newitz, *The Terraformers* (Tor Books, 2023)
  Kim Stanley Robinson, *Ministry of the Future* (Orbit, 2020)
  Jeff Vandermeer, *Annihilation* (Farrar, Straus and Giroux, 2014)

- A map of your interpersonal networks
- Some useful skills

  Saving and telling and listening to and sharing stories
  Identifying when to bring in the social / put on your humanist hat—that is, when are discussions overly focused on the technical issues and ignoring the sociocultural ones?
  Disaster response and resilience planning are often especially fraught
  Know how to locate and save potable water
  Know how to apply for asylum
  Know how to read (and question):
    Migration maps
    Floodplain maps
    Temperature, coastline, drought, and other futures projections
  Know how to calculate:
    Community food needs
    Fossil fuel needs (Fuck that—no more fossil fuels for you)
  Climate change scenarios

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Projected deaths

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VI.2 Some Sites of Futures Conversations Happening Outside Your Usual Academic History Beat

Intergovernmental Panel on Climate Change scenarios
TED Talks
Art gallery openings
Movie sets
Investment conversations
Science fiction movie comment sections
Military planning
Curriculum planning
The career center at your high school and community college
Insurance policies

VI.3 Further Reading

We asked the contributors to this part of the book to share texts they found inspiring or provocative. We encourage you to dig in!

Baker, Shalanda H. *Revolutionary Power: An Activist's Guide to the Energy Transition*. Island Press, 2021.

Beckert, Sven, Ulbe Bosma, Mindi Schneider, and Eric Vanhaute. "Commodity Frontiers and the Transformation of the Global Countryside: A Research Agenda." *Journal of Global History* 16, no. 3 (2021): 435–450.

Booker, Matthew. *Down by the Bay: San Francisco's History Between the Tides*. University of California Press, 2020.

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Chagnon, Christopher W., Francesco Durante, Barry K. Gills, et al. "From Extractivism to Global Extractivism: The Evolution of an Organizing Concept." *The Journal of Peasant Studies* 49, no. 4 (2022): 760–792.

Cooper, Melinda. *Life as Surplus: Biotechnology and Capitalism in the Neoliberal Era*. University of Washington Press, 2008.

Curley, Andrew. *Carbon Sovereignty: Coal, Development, and Energy Transition in the Navajo Nation*. University of Arizona Press, 2023.

Degroot, Dagomar. "Blood and Bone, Tears and Oil: Climate Change, Whaling, and Conflict in the Seventeenth-Century Arctic." *The American Historical Review* 127, no. 1 (2022): 62–99.

DeLoughrey, Elizabeth. "Submarine Futures of the Anthropocene." *Comparative Literature* 69, no. 1 (2017): 32–44.

Dhillon, Jaskiran, ed. *Indigenous Resurgence: Decolonialization and Movements for Environmental Justice*. Berghahn, 2022.

Gray, Summer. *In the Shadow of the Seawall: Coastal Injustice and the Dilemma of Placekeeping*. University of California Press, 2023.

Gumbs, A. P. *Undrowned: Black Feminist Lessons from Marine Mammals*. AK Press, 2020.

Healy, Noel, Jennie C. Stephens, and Stephanie A. Malin. "Embodied Energy Injustices: Unveiling and Politicizing the Transboundary Harms of Fossil Fuel Extractivism and Fossil Fuel Supply Chains." *Energy Research & Social Science* 48 (February 2019): 219–234.

Hecht, Gabrielle. *Residual Governance: How South Africa Foretells Planetary Futures*. Duke University Press, 2023.

Hoare, Philip. "Sperm Whales in 19th Century Shared Ship Attack Information." *Guardian*, March 17, 2021.

Lacoste, Alexandre, Alexandra Luccioni, Victor Schmidt, and Thomas Dandres. "Quantifying the Carbon Emissions of Machine Learning." *arXiv*, November 4, 2019.

Langston, Nancy. "Iron Mines, Toxicity, and Indigenous Communities in the Lake Superior Basin." In *Mining North America: An Environmental History since 1522*, edited by John Robert McNeill and George Vrtis. University of California Press, 2017.

Lester, Gustave. "Land, Fur, and Copper: The Union of Settler Colonialism and Industrial Capitalism in the Great Lakes Region, 1815–1842." *Early American Studies: An Interdisciplinary Journal* 21, no. 1 (Winter 2023): 122–165.

Lewis, Jason Edward, ed. 2020. *Indigenous Protocol and Artificial Intelligence Position Paper. Honolulu, Hawai'i: The Initiative for Indigenous Futures and the Canadian Institute for Advanced Research (CIFAR)*. https://spectrum.library.concordia.ca/986506.

Liboiron, Max, and Josh Lepawsky. *Discard Studies: Wasting, Systems, and Power*. MIT Press, 2022.

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Mejia-Muñoz, Sara, and Sally Babidge. "Lithium Extractivism: Perpetuating Historical Asymmetries in the 'Green Economy.'" *Third World Quarterly* 44, no. 6 (2023): 1119–1136.

Miller, Ian Jared, Paul Warde, Ariane Tanner, et al. "Forum: The Environmental History of Energy Transitions." *Environmental History* 24, no. 3 (2019): 463–533.

Nesper, Larry. "Law and Ojibwe Indian 'Traditional Cultural Property' in the Organized Resistance to the Crandon Mine in Wisconsin." *Law and Social Inquiry* 36, no. 1 (2011): 151–169.

Newkirk, Vann R., II. "Floodlines." *The Atlantic*, 2020. https://www.theatlantic.com/podcasts/floodlines/.

Reid, Joshua L. *The Sea Is My Country: The Maritime World of the Makahs*. Yale University Press, 2015.

Riofrancos, Thea. "The Security–Sustainability Nexus: Lithium Onshoring in the Global North." *Global Environmental Politics* 23, no. 1 (2023): 20–41.

Sivasundaram, Sujit. *Waves Across the South: A New History of Revolution and Empire*. University of Chicago Press, 2020.

Sluyter, Andrew. "The Ecological Origins and Consequences of Cattle Ranching in Sixteenth-Century New Spain." *Geographical Review* 86, no. 2 (1996): 161–177.

Sultana, Farhana, ed. *Confronting Climate Coloniality: Decolonizing Pathways for Climate Justice*. Taylor & Francis, 2024.

Swanson, Ana. "This Remote Mine Could Foretell the Future of America's Electric Car Industry." *New York Times*, September 1, 2022.

Van Deelen, Grace. "Climate Change Threatens the Future of Wild Rice." *Eos* 104 (December 18, 2023).

Whyte, Kyle Powys. "Toward an Indigenous Energy Transition: Justice, Renewables, and Infrastructure." In *Required Reading: Climate Justice, Adaptation and Investing in Indigenous Power*, edited by NDN Collective Climate Justice Campaign. Loam, 2021.

Wintersteen, Kristin A. *The Fishmeal Revolution: The Industrialization of the Humboldt Current Ecosystem*. University of California Press, 2021.

Witgen, Michael J. *Seeing Red: Indigenous Land, American Expansion, and the Political Economy of Plunder in North America*. University of North Carolina Press, 2022.

Zografos, Christos, and Paul Robbins. "Green Sacrifice Zones, or Why a Green New Deal Cannot Ignore the Cost Shifts of Just Transitions." *One Earth* 3, no. 5 (2020): 543–546.

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Solutions Lightning Round!

Welcome! We wanted to end *A Historian's Handbook for Saving the World* in a manner that underscored the book's overarching goal of usefulness. So, we asked contributors to send us suggestions of things a historian, as a person in the world, particularly in the Global North, could do *right now* to respond to the unfolding climate calamity. It turned into a pretty incredible reply-all email thread. So, here are their suggestions, loosely organized. Pick a thing and then do the thing!

For Workspaces:

Investigate your institution's climate action plan, see the extent to which it relies on carbon offsets (look for "net zero" and "carbon neutrality" targets), and organize to reform that to 90 percent true decarbonization within this decade.
—Cathy Gere

Build meaningful collaborations between college and K–12 teaching. Professors: Reach out to local high school history teachers, ask about how they teach environmental history, and ask what resources you can offer. Teachers: Reach out to faculty at your local university and/or contact authors of books or articles on environmental history and look for ways to bring more environmental history into your curriculum.
—Keith Pluymers, Richard Hughes, Grace Bartlett, and Robert Fitzgerald

Choose to eat less meat, of course, but also propose that the institutions you are associated with, whether a college, museum, institute, library, agency, business, or profession association, establish policies in which delicious and nourishing vegetarian or vegan menus become the normal default for formal, professional, or group events. If participants want meat, they must actively and explicitly request it.
—Gabriel Rosenberg

Send a copy (perhaps the Open Access electronic version!) of *A Historian's Handbook for Saving the World* to all the historians you know.
—Emily Merchant

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Use your historian's superpower to help climate activists. You can become an expert witness in their trials to tell the history of how important it is to stop the insanity of continuing to burn carbon as well as the historical effectiveness of nonviolent civil disobedience.
—Troy Horton

Reach out to a group working on climate cases to add you to their list of potential expert witnesses. All kinds of expertise is welcome, but especially US social movements, protest or civil disobedience history, or environmental history. And help recruit other historians to do the same!
—Amy Woodson-Boulton

Connect and collaborate with local museum professionals working in university collections or natural history museums to codesign collections-based research questions, projects, or outreach about climate pasts and futures with them. Together, seek to move beyond ecology or climate science and forge new approaches to relating climate change to culture through collections.
—Katherine Arnold and Martha Fleming

In your storytelling, commit to reframing depressing tales of human hubris as helpful knowledge. "Now we know," for example, "that re-routing rivers is a stupid idea both ecologically and socio-culturally. So, let's not do that again."
—Alexandra Hui

When publicizing an event, include references to public transit and bike racks as well as parking.
—Conevery Valencius

When you take an airplane trip, stay longer and do more (visits to people, archives). When you decline to take an airplane trip for a single event, be sure to explain to the organizers that you are doing so because of climate change.
—Conevery Valencius

For In-the-World Spaces:

Find a patch of bare earth and plant a garden.
—Kate Brown

Google "extreme heat" AND "legislation" AND "[insert your state]". You will see what your governor and/or local municipalities are doing to protect laborers from extreme temperatures. Use this knowledge to then contact your representative or governor and push for more.
—Kara Murphy Schlichting

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See what local governance boards—planning, natural resources, housing, etcetera—have openings and apply to be on the board.
—Leif Fredrickson

Become a primary source for future historians. For example, integrate a practice of journal or diary keeping, notes, drawings, photographs, videos, clippings, ephemera, and so on related to weather or climate. Note complaints, joys, sensations, stray thoughts, experiences, worries, manifestos, schemes, whatever.
—Anya Zilberstein

Find your nearest body of water, anything from a brook to the ocean! Look at what grows around or near it. Is it clean, dirty, polluted? Make notes and then find out who is involved in managing or caring for it and ask how you can help.
—Sam Grinsell

Reduce food waste! Intervene at whatever level you can: keep a special section of your fridge for foods that need to be eaten quickly, learn waste-free preservation methods and recipes, start a student club that helps repurpose leftovers at the end of campus meetings, work with your campus Dining Services to reduce waste (check out Menus of Change), use food recovery apps like Too Good to Go, join or form a glean team, dumpster dive, be conscious where you're able.
—Anna Zeide

Write to your elected officials (city, county, state, provincial, federal) and ask them to take action to reduce global warming. Include a locally grounded example of why you care about the climate.
—Kendra Smith-Howard

Pedagogical variation: Ask your students to read letters from constituents to their elected officials in the past—archives are full of them! Encourage them to write their own letters that emulate effective correspondences.
—Kendra Smith-Howard

Earnest citizen variation: Look up and program all your elected officials' phone numbers into your contacts so that you can call them more easily. Note that phone calls from constituents are "counted" more carefully than emails and social media tagging.
—Kendra Smith-Howard

When a heat wave hits, help someone vulnerable. The AARP has a handy guide that includes instructions for assessing heat-induced illness.
—Helen Curry

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Find the local groups in your region that are pushing for renewables and other practical responses to climate change (moving the power grid away from fossil fuels, etc.). Look at what the Indigenous communities in your area are doing in terms of environmental stewardship and follow their lead. A New York State example is Win Climate.
—Sarah Pickman

Build a connection with the nonhuman world around you by making a community of care with the living things in your everyday, mundane life. The first step in making new friends is learning names. Take the time to notice the trees and plants and birds you pass every day. Learn the names and habits of one or two and greet them. Touch and smell and listen to them.
—Cara Daggett

Take walks, hikes, or bike rides wherever you live. Take your friends and colleagues on these outings. Discuss what you can do to maintain, protect, and improve the built and unbuilt environment around you, but also enjoy the hike, the places you see, and the people you meet.
—Philipp Lehmann

Be attuned to the needs of the beings around you. Caring for the least among us is an everyday act that can be quite radical. Grow lots of plants that aren't grass and encourage your apartment building, neighborhood, city, and county to do likewise.
—Kristoffer Whitney and Whitney Barlow Robles

Be mindful that climate change will shift animal ranges, and we may need to welcome newcomers rather than brand them as "invasives." All the ladybugs and lady beetles are fine; squishing bugs you can't identify probably is not. "Pests" aren't always pesky.
—Kristoffer Whitney and Whitney Barlow Robles

If you can afford it, get solar panels installed on your roof! I live in Manchester (UK), which is hardly the sunniest city, and it's making a huge difference to my bills and consumption of electricity.
—Elsa Devienne

Commit to eating like a medieval peasant for the week: mostly local produce, with very little meat.
—David Patterson

When your life feels too full to do anything about climate, take fifteen minutes to brainstorm. Is there something you can put down? An expectation you can choose not to meet? A way to combine climate action with something you already do? If your answer to all of these time queries is no, and you have money, send money to people who do have time.
—Emily Pawley

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Take five minutes and think about your media habits. How can you change them to get more news about climate *action* into your daily media diet? Can you follow people on social media? Sign up for a newsletter or podcast?
—Emily Pawley

When climate grief surges up in you, rather than trying to push it away or ignore it, observe and accept the emotions as they arise, reflect on how you have responded historically, and consider experimenting with different ways of how you honor and act from that grief. That might be visiting your favorite tree to read beneath it. Sometimes, that might be calling electeds. Sometimes, that might be writing an essay for a local paper or crying some healing tears. Prioritize how you honor this grief as part of your broader work and values so that we can continue to labor as teachers, writers, friends and family members, activists, and human beings, striving over our whole lives to build kinder, more just relationships with each other and the natural world around us.
—Paul G. Nauert

Dress against fast fashion! Shop at second-hand and vintage stores. Participate in clothing exchanges with friends. Learn how to mend and repurpose clothing items that are worn or stained or that you no longer wear.
—Camille Suarez

Mention climate change in the grocery-store line when people are complaining about weather *and* add, "But there are things we can do to change that!"
—Conevery Valencius

I'm enamored with the historian's superpower to disrupt inevitability. Things didn't have to turn out the way they did. People made choices. The future is also not preordained. My one-line Lighting Rounder is thus to find an audience every day, every week, to share an example of the non-inevitability of the future. This is easy if it's students in our classes—they're a captive audience. But it can be neighbors at a BBQ, colleagues at a town hall, friends at dinner. Let them take the topic of artificial intelligence, for example—why not, everyone else is—and talk about the energy, water, carbon, and labor demands of digital systems. Bring up how corporate models that we can challenge drive those consumption demands. Bring up how we don't have use delivery apps or opt for next-day delivery to be happy. We can (some can, I know, not everyone) choose to walk or bike to a store. We can choose to wait two days. Doing all these things can disrupt the idea that the future will be inevitably more one-clickable. That more clickable future is one of greater and greater carbon emissions.
—Benjamin Cohen

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