

Introduction: Paths to Witnessing, Ethics of Speaking Out

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Writing about the threat of nuclear catastrophe in *The Fate of the Earth*, Jonathan Schell observed: “the act of thinking about it is always voluntary, and the choice of not thinking about it is always available.”¹ The same can be said for most of us, most of the time, when it comes to the unthinkable of unchecked climate change. But the choice is not available to men and women whose work is to comprehend the radical dangers of climate change, and to act on what they know. For the authors in this issue of *Dædalus* – along with many other scientists, doctors, public health experts, social scientists, lawyers, journalists, business consultants, and military officers – climate change shapes their professional identity and expands their sense of responsibility. They find thinking about its many elements within strict disciplinary confines constraining, and the codes of professional ethics that govern day-to-day practice inadequate. The extraordinary challenges they confront require more. They push the bounds of their fields and they push themselves to become *witnessing professionals*.

The term witnessing professionals is not part of common parlance. Yet we need a name for those who speak out from the vantage point of their specialized knowledge about the dangers posed by crises like climate change. In this volume, the authors reflect on their paths into climate work and bearing witness to what they know. Each focuses on a different aspect of climate change’s effects and responses to it, so that this constellation of essays helps us grasp that climate change is not one single fearful thing. The familiar phrase obscures its many-sidedness. We may, as Carolyn Kormann writes in her contribution to this collection, “try to see the whole of the moon,” but we must also appreciate the innumerable, dynamic facets of climate change.² Its devastation is pluralistic. It ravages the earth as we know it: Arctic ice, rain forests, islands, and reefs; health and habitats; economic systems and social arrangements; and for many people worldwide, it deranges everyday life. Climate change is all encompassing, and so is the domain of witnessing professionals.

As I write (July 2020), professionals are speaking out about another global threat: a pandemic of SARS-CoV-2, a highly communicable virus causing disease, death, and massive social and economic dislocation. Epidemiologists and public health authorities track the path of the COVID-19 contagion and recommend policies and practices in an attempt to contain its spread. They document the nation's ongoing unpreparedness: inadequate supplies of tests for the virus and store of protective equipment, ventilators, and ICUs. They issue grim warnings about misinformation coming from government officials in the United States, beginning with the president, and they report the erratic, disorganized actions taken by inexperienced political appointees who head the very federal agencies charged with managing national emergencies. A trauma doctor spoke out in *The New York Times*: "The sky is falling. I'm not afraid to say it."³ They become witnesses.

The authors of "Witnessing Climate Change" address a global phenomenon that is slower moving than viral contamination and has no foreseeable end. We gather reflections from men and women immersed in the greatest problem of our time, perhaps of all time: the changing composition of the atmosphere that is altering the earth on a planetary scale. There is no historical model. We see the authors figuring out as they go along the meaning and value of their work, struggling with the necessity and the limits of the authority of expertise, building institutions to draw others into their fields, and finding ways to educate, advise, organize, advocate, and warn policy-makers and the public. Here are odysseys of careers and activism growing from specialized knowledge, by men and women contemplating what it means to respond ethically to this all-encompassing crisis. They speak mainly of experiences in the United States, but their reflections have universal application.

The authors range in age from their thirties to nineties, and they took up climate work and began to speak out at different points in their careers and at different points in their professions' commitment to understanding and action. Multi-generational witnessing adds a special dimension of interest: these accounts add up to a chronology of the evolution of knowledge about climate change from a small circle of scientists into myriad professional spheres and public arenas.

Several themes unite these personal narratives: the path into climate-related work, the constraints imposed by standard codes of professional ethics and the imperative to move beyond them, and the settings and institutions they build to do what Elke Weber calls the "missionary work" of advancing our understanding and communicating widely what they know. They share the moral imperative to speak out, and they recount the challenges and especially the ethics of witnessing.

Climate change's gathering effects occur slowly and vary from place to place; in contrast to intense public preoccupation with the frightening invisibility, disease, and death of the COVID-19 pandemic, attention to climate is fragmented and sporadic. Witnessing professionals to climate change have to arouse and then re-

arouse public awareness. They have to continuously decry inertia and shortsightedness. They struggle against the malignant duo of political opposition and political paralysis.

Sustaining hope in the face of accelerating destruction is the emotional burden witnessing professionals assume. Despite advances in knowledge and organized political activism, mitigation is anemic. Targets are missed, greenhouse gas emissions are rising, and 2019 was the second-warmest year on record, in the warmest decade on record.⁴ In 2020, there were wildfires in the Arctic. Research is underfunded. International cooperation is brittle and intermittent. Entrenched obstacles, including impenetrable layers of legal and political jurisdiction, stymie local efforts at adaptation to protect against foreseeable climate-related disasters. Yet hope is elemental to witnessing. Despair is not just psychologically harmful but would be a “mistake.”⁵ And by continuing to expose and act upon painful truths witnesses can communicate a sense of hope.

In April 2018, *The New York Times* published a story, “Climate Change Denialists Say Polar Bears Are Fine. Scientists Are Pushing Back.” Turning “the charismatic bears to their own uses,” deniers challenged scientific evidence of the physical decline of the polar bear population linked to the loss of Arctic sea ice. Rejection of the science of climate change and its effects was nothing new; what made headlines was that fourteen researchers resolved to expose this disinformation campaign. The deniers renewed their attempts to discredit them, calling the scientists’ response a hit piece by “climate bullies,” “smack talk,” and, ramping up their assault, an act of “academic rape.” They demanded a retraction. They filed Freedom of Information Act requests for three of the scientists’ correspondence and agitated for another, Jeffrey Harvey, to be reprimanded for “conduct unworthy of serious scientists.”

The decision to speak out, Harvey explained, was precipitated by the

increasing frustration scientists felt about the spread of false information, the disregard of established evidence, and the harassment of researchers. . . . Every time these deniers make some outlandish claim on the media and we don’t respond to it, it’s like a soccer match and we’ve given them an open goal.⁶

In publicly defending their calculations of the status of Arctic ice and polar bear populations, the scientists were making a larger point. Polar bears need sea ice; it’s a question of habitat loss, “there’s nothing more complicated than that.”⁷ They connected their research to the endangered habitats of virtually all life forms, including our own.

These scientists defended the integrity and validity of their research and insisted on its significance. They pushed back against those who challenged not only their legitimate claim to specialized knowledge, but also its meaning and value for

decision-makers and the public. As Jessica Green puts it, “If we don’t clearly voice our views . . . to counteract misinformation . . . our knowledge will be irrelevant.”⁸

Witnessing professionals are drawn into battle against climate rejecters and deniers and, at the same time, against the wider, wholesale delegitimation of knowledge-producing institutions and expertise. Assaults on the value and authority of specialized knowledge have become a familiar, degrading part of public life, and delegitimation of climate work is particularly ferocious in the United States and at the highest levels of government.

It has multiple sources: fossil fuel industry disinformation campaigns to obstruct regulation of emissions, entrenched economic interests such as real estate developers hungry to build, and bad-faith accusations of partisan bias. Delegitimation also takes the form of wild conspiracy claims: the head of the Environmental Protection Agency (EPA) casts public health researchers as a cabal producing “secret science,” and advocates for regulation of greenhouse gas emissions are accused of plotting to impose despotic measures that extinguish personal freedom.⁹ As one advisor to President Trump charged, “They want to take your pickup truck, they want to rebuild your home, they want to take away your hamburgers. This is what Stalin dreamed about but never achieved.”¹⁰

Speaking out as scientists of the Arctic did is the oppositional face of witnessing. There is also a constructive side: witnessing as education, advocacy, and institution-building. From their professional vantage points, the authors call attention to aspects of climate change that are less prominent than, say, sea level rise. They do not confine themselves to expert circles. They lecture, publish, post on the Internet, and talk to the media. They join and counsel NGOs and international bodies. They bring lawsuits and file amicus briefs. They build and participate in advocacy groups and transnational organizations. They form alliances across fields and across national boundaries. Witnessing professionals sit on commissions and scientific advisory boards and testify before congressional committees. They provide vital information to government agencies; Patrick Kinney describes his satisfaction when the EPA used his findings on fine particle pollution to successfully argue that carbon dioxide and other greenhouse pollutants had adverse health effects and were therefore within the agency’s authority to regulate.

Writing in 2019 from the Korean peninsula during a record heat wave and amidst threats of nuclear missile attack, Scott Knowles observes: “The reality is that the slow disaster of climate change . . . is every bit as ominous as the threat of war, it’s just unfolding at a pace that makes it harder for us to keep in the front of our minds.”¹¹ Yet witnessing professionals do just that.

Witnessing climate change adds a dimension to our moral lexicon. The classic moral witness is a survivor of atrocity so horrifying that it evokes evil. Genocide is the grim touchstone. Survivors look back-

ward. They tell what they endured and speak for those who died. They name and blame the people at whose hands they suffered dehumanization, and demand that the perpetrators be identified and punished. They hope to make their unspeakable experience meaningful. By testifying to the identity of perpetrators and the character of events, they can enhance collective memory.¹²

Sometimes professionals are witnesses of this kind even though they do not personally suffer the ghastly violations they report. Anthropologists studying bones to identify victims of mass killing and journalists and photojournalists documenting organized ethnic rape and murder know that the facts they present provide proof of what has happened here. Their work has moral and historical importance. People must be made aware and condemn the evil that made it necessary to identify bones and report atrocity.

But when it comes to the effects of climate change, we are all victims, and certainly in advanced industrial countries, we are all perpetrators. The harm is ongoing, not safely relegated to the past. Witnesses to physical devastation and masses of climate refugees, the extinction of ecosystems and the species that inhabit them, tell stories of suffering and the human cause of suffering. They are not, or not always, acts of willful cruelty, yet the ultimate impact is wanton destruction.

Until thirty years ago, only a small company of scientists recognized climate change and its causes. The turning point was the 1988 congressional testimony by James Hansen, director of NASA's Goddard Institute for Space Studies. He delivered the critical warning: global warming is not a natural variation in climate but can be ascribed with a high degree of confidence to the buildup of carbon dioxide and other gases in the atmosphere. From then on, climate change could not be seen as the unintended consequence of measures to improve human well-being by means of energy produced from fossil fuels. For decades, we have known that none of the basic activities of ordinary life that rely on energy from carbon-based sources are harmless. Robert Jay Lifton calls the condition under which we continue to worsen climate change just by doing what we ordinarily do "malignant normality." "We are born into it," he writes, "and nothing in our lives is outside of it."¹³

Climate change and extreme weather events – wildfires, floods, heat, and drought – require us to exercise the extraordinary human capacity for adaptation, which takes its place alongside mitigation of greenhouse gas emissions as a practical and moral imperative. Adaptation demands more than triage and rebuilding ruined homes after an earthquake. It calls for massive rearrangements: alterations in agriculture, for example, and relocation of entire communities vulnerable to sea level rise, and measures to deal humanely with the displacement of many millions of refugees from parts of the earth made uninhabitable by heat. Michael Gerrard outlines the legal tools available for local adaptation: flood maps, zoning codes, building codes, infrastructure specifications, insurance requirements, and

more. Yet speaking out about the need for adaptation is an underappreciated aspect of witnessing; Gerrard observes that legal practice in this area is “less glamorous than suing oil companies, and it tends to promise no more than local benefits, but it will be an important part of coping with the hot world to come.”¹⁴ Adaptation also presents a confounding dilemma, and in our conversation for *Dædalus*, Rafe Pomerance delivers a cold truth: “What are you adapting to? What climate system are you adapting to? One or two degrees warmer or five degrees warmer? The climate is now transient. . . . There is no equilibrium state anymore.”¹⁵

“Academic writing typically does not happen in the first person singular,” Elke Weber notes. These essays are an exception: the authors reflect on their paths to witnessing. Becoming a witnessing professional entails two deeply transformative processes. The first is a commitment to a professional identity, and as these essays show, it takes a second transformation to propel professionals into the public square.¹⁶ Witnessing is not how the authors understood their role at the start of their careers. They began doing work they were trained to do, in familiar settings, and in accord with “bread and butter” professional ethics, which, they learned from experience, are an inadequate guide for confronting the practical and moral challenges their work exposes. Their idea of social responsibility expands.

This sense of purpose occurs against the background of powerful, often conservative forces of professional education and of professional associations that define and police practice. They set requirements for training and qualifications for certification, advancement, and tenure. They deliver the privileges that come with professional positions and status. They judge and discipline. Professional associations work to preserve their authority over members and their autonomy vis-à-vis government.

George Bernard Shaw once declared these institutions “conspiracies against the laity.”¹⁷ That is an overstatement. But broadly speaking, professionals enjoy independence and discretion; many work in settings that do not subject them to direct supervision and accountability. They can do great harm. Dennis Thompson had a leading role in establishing ethics requirements in professional schools around the world, and notes that it took a wave of scandals to prompt programs to begin to teach “role morality.” “Applied ethics journals sprang up,” Thompson recalls. “The ethics movement gained momentum not only among lawyers and doctors but also in the training of police officers, veterinarians, accountants, even economists.”¹⁸

Sociologist Émile Durkheim’s concept of “moral particularism” captures the nature of codified professional ethics. “It has been observed since Aristotle,” he wrote, “that . . . morals vary according to the agents who practice them” and

“a system of morals is always the affair of a group and can operate only if this group protects them by its authority.”¹⁹

Codes of professional ethics typically contain a mission statement idealizing selfless service and benefits to others.²⁰ Their chief purpose, however, is to set the parameters of standard practice: the terms governing research on human subjects, for example, responsibilities toward patients and clients, requirements of data access and transparency, and avoiding conflicts of interest. They constrain what practitioners should and should not do with their specialized knowledge, and the step into witnessing stands out against the background of these constraints. The American Political Science Association, for example, of which I am a member, allows that academics in the field have the rights and obligations of any citizen, but says nothing about obligations to public life arising from their work. Indeed, some professional norms mandate silence with regard to the affairs of clients or to protect proprietary information about climate change’s impact on business. They also censor experts in order to avoid political conflict. For this reason, David Tittle shows, the military controls publicizing its strategic focus on climate effects on military bases, supply chains, and regional conflicts inflamed by drought and food scarcity.

Moreover, because professional schools and associations shape education, offer funding, and sponsor prestigious publications, they define and entrench what questions are important to address and methods for addressing them. At business schools, Rebecca Henderson explains, climate change was considered an “externality” costly to society but not to the firm, and until very recently, it was not part of any curriculum. Jessica Green observes that when it comes to conferences, peer-reviewed publications, and hiring and promotion decisions in political science, narrow disciplinary criteria apply and both climate research and activism are devalued: “I had politics trained out of me.”²¹

Of course, professional associations can facilitate speaking out. Mark Mitchell discusses the National Medical Association (NMA), founded in 1895 to represent African American physicians, who were excluded from the American Medical Association. The NMA focuses on communities “ignored by the larger climate organizations and health organizations whose members did not face the same threats.”²² It gave its members a collective voice and credibility to their warnings about the effects of toxic environmental exposures in their patients.

Writing about the natural and political disaster of Hurricane Katrina, Mitchell observes that effective disaster policy requires an understanding of local communities: “The ‘experts’ don’t know that many people will not get on an evacuation bus without their pets and without knowing where it is going.”²³ Rebecca Henderson and Carolyn Kormann describe their experiences with professional schools that hire faculty and design curriculum to enlarge the terrain of what counts as relevant knowledge.

Professional associations and education are the background from which witnessing professionals emerge, and standard professional ethics rarely entail an obligation to bear witness. Mental health practitioners' "duty to warn," for example, is a specific requirement to report dangerous patients to potential victims or the police. Witnessing professionals transform the "duty to warn" into an obligation to the wider society.

"Is it enough to do good science and publish it in reputable peer-reviewed journals?" Naomi Oreskes asks.²⁴ The authors question the adequacy of ethics designed for standard practice when we require what essayist Elaine Scarry called "thinking in an emergency."²⁵ The authors' paths to witnessing confirm the title of Patrick Kinney's essay: "Leaving the Comfort Zone."

These essays give paths into witnessing a face and a story. For some, an early experience propelled them years later into climate work and speaking out; we can think of their commitment as a calling. David Titley opens his essay with a memory from when he was six years old: "All I ever wanted to do was to forecast the weather."²⁶ The pain of being a target of racial slurs in school, Mark Mitchell recounts, led to his career combating environmental injustice in minority communities long before the concept of environmental justice was recognized by public health officials. Michael Gerrard traces the roots of his dedication to environmental law to his youth in Charleston, West Virginia, a polluted coal-mining area and hub of the petrochemical industry. He entered the arena when laws specific to climate change were undeveloped and "there was little law to practice." Carolyn Kormann was in third grade when she read about Biosphere 2 in a weekly children's magazine. "The idea of a monumental, glass, sun-drenched structure, in a faraway desert landscape, containing miniature versions of seven biomes – rain forest, ocean with a coral reef, desert, savannah, mangroves, intensive agriculture, and human habitat – was thrilling."²⁷

For others, serendipity propelled them down the path to speaking out. Antonio Oposa describes his youth on a small remote island in Central Philippines. When the most powerful typhoon to make landfall struck his region, he was driven to use the law – indeed to make new law – to protect the people of drowning island nations.

Rafe Pomerance's career was propelled by sheer chance. He describes "running across" an EPA report on the environmental impact of coal and saying to himself: "This can't happen!"²⁸ In 1972, as the facts and causes of climate change were just beginning to circulate within a small group of scientists, he took on the self-appointed mission to expand the circle and move climate change into the political arena. Later, he seized an opportunity to set an agenda for climate action. At the 1988 Toronto conference "Our Changing Atmosphere," he recalls, "I decided somebody had to start talking about making carbon dioxide reductions. I actually

made that decision. Nobody was talking about it, somebody had to talk about it, so I decided I'll talk about it."²⁹

Elke Weber's early work as a psychologist focused on financial risk when, in her first faculty position, she was thrown together with agricultural economists studying farmers' awareness of climate change. She recognized the unanticipated opportunity to address "the intellectual puzzle of our time: what lies at the root of pervasive inaction, wishful thinking, and denial."³⁰ Before the public health community began to think about climate change, an unexpected invitation to join a newly created team assessing climate's impact on the New York City region launched Patrick Kinney into his study of heat effects on health.

Robert Jay Lifton, at the age of ninety-one, coined the phrase "witnessing professionals" in his book *The Climate Swerve: Reflections on Mind, Hope, and Survival*, published in 2017. His plunge into the subject followed more than sixty years studying extreme situations in the twentieth and twenty-first centuries and leadership in the doctor's movement in opposition to nuclear arms. He calls nuclear and climate threats "the apocalyptic twins."

Witnessing is associated with testifying, advocating, and warning, but the authors remind us that expanding knowledge and the authority to speak out require institutions dedicated to these purposes, institutions that provide "research ecosystems" of colleagues, reliable funding, and career ladders to sustain the next generation of climate-oriented lawyers, scientists, and others, and to encourage public engagement. The authors are institution builders, and a sample of their initiatives provides another window into the many-sidedness of climate change itself.

Michael Gerrard founded the Sabin Center for Climate Change Law. Rebecca Henderson taught the first required course at Harvard Business School on the bearing of climate on business decisions. Elke Weber led the creation of the Center for Decision Sciences to advance social science collaborations among behavioral economists, psychologists, and anthropologists. David Titley led the first U.S. Navy Task Force on Climate Change, which acted as a "forcing function" to include climate impacts in strategic reviews for the Pentagon and the General Accountability Office. Patrick Kinney was among the founders of the first academic program dedicated to climate change and health. Mark Mitchell built the Connecticut Coalition for Environmental Justice and is associated with the recently created Medical Society Consortium on Climate and Health.

Novel legal strategies belong to this category of institutional innovation. "Lawyers are scrambling for legal theories that might be available," Michael Gerrard writes; avenues to creating a legal status for climate refugees, for example.³¹ Antonio Oposa, a legal advocate for the principle of intergenerational responsibility, describes his decision to bring the first (and successful) class-action suit with children as plaintiffs to oppose government deforestation.

As witnessing professionals move outside the company of colleagues, clients, and patients, they face a distinct set of practical and ethical challenges. How do they assess opportunities and select arenas for speaking out? Judge which powerful interests are susceptible to education and pressure? Expand the short time-horizons of policy-makers and the public? Facilitate involvement of people on the sidelines? Consider what activities are effective, where, and whether we even have a measure of efficacy?

Witnessing calls up qualities that are not part of any professional training, among them a fighting spirit and political judgment in the widest sense. It is infused with moral fervor, but urgency demands sensitivity to temper and tone. Rebecca Henderson describes coming to the insight that “there are some things one can say in public as an economist and as a businessperson, and . . . ‘the planet is burning and we must fix it at any cost’ is not one of them.”³² These essays make the challenges vivid.

The process of “translation” is the most familiar challenge experts face on entering the public square. Citizens carrying posters of polar bears and marching with 350.org, a leading activist group, are free to be personally expressive; they can speak the language of civic responsibility or religious conscience, green virtues or sanity. Professionals have the responsibilities of citizens but also the distinct obligations that come with expert knowledge, influence, and privilege. They struggle to communicate technical knowledge so that it is intelligible, its significance clear, and its tone modulated for specific groups of policy-makers and segments of the public.

For the same information can have opposite import depending on the audience. Robert Socolow observes that scientists outside of climate work are skeptical that 97 percent of climate scientists believe in human-induced warming; it goes against engrained assumptions that no finding is “incontrovertible,” and that confirmation bias is always a problem. At the same time, lay audiences are vulnerable to those who sow doubt about climate science by falsely claiming that experts disagree about whether carbon emissions are a principal cause of climate change; for the general public the accurate fact of 97 percent consensus is an effective corrective.

Because climate work does not respect disciplinary bounds, “learning how to talk,” as Patrick Kinney puts it, is also a requisite for working with colleagues across disciplines.³³ From “learning to talk” comes the creation of new fields, and Elke Weber describes the birth of “environmental decision-making.”³⁴

The challenge of translation is really the challenge of translations in the plural. Witnessing professionals must be multilingual.

Antonio Oposa poses the difficulty of getting a hearing differently. His approach to litigation to force government protection of old-growth forests is a form of storytelling. He explains: “If I went to the media and attended hearings in Con-

gress, who would listen to a young lawyer who represented trees? . . . But in a court of law, the story can be told better.”³⁵ Carolyn Kormann expands the principle of storytelling to journalism: “Reporting on climate change should require not just understanding and conveying the science, but understanding the culture of a place, the stories that a culture tells itself about itself. . . . These stories would always be tied to a landscape, and a place, they would always, in a sense, be local.”³⁶

There is no single rule for translating specialized knowledge; explanation must fit the audience and the purpose. Nor is there one best way of warning and propelling action. In *The Uninhabitable Earth*, journalist David Wallace-Wells insists that no approach is too dangerous to try. As he reads it, the 2018 report from the Intergovernmental Panel on Climate Change offered “a new form of permission, of sanction, to the world’s scientists” emboldening them to “scream as they wish to.”³⁷ Should they?

The authors reflect on the ethical challenges of speaking out. Many of these considerations are intrinsic to expert witnessing and center on the imperative to protect the authority of specialized knowledge. Canvassing the potential risks of witnessing, Dennis Thompson emphasizes the “obligation to respect the knowledge that is the basis of their authority to witness.”³⁸ Every contributor to this volume is sensitive to the demands of truth and honesty. They acknowledge the pitfalls of over- and undersimplification. They are aware of the risk that some forms of activism may undermine their standing as experts by raising questions about their objectivity. For many, that is the very definition of irresponsible advocacy.

Professionals can endanger their authority by overreaching or “fearmongering.” Robert Socolow advises climate scientists to build “a political middle” that diminishes polarization between apocalyptic assertions on one hand and lack of urgency on the other. Advocating for research funding to better understand the sensitivity of the earth to human activity and to assess the risks of worst outcomes associated with new technologies fall into this middle ground. But professionals can also fail as witnesses by excessive caution and reticence. Jessica Green warns against the propensity to avoid activism and to validate only modest incremental policies: “We are in a fight for our collective survival. This takes precedence over our precious credibility. . . . We need to plant a flag: we must be explicit about what our findings indicate we should *do*.”³⁹

“What we should do” is itself double-edged. On one side, witnessing professionals have been accused of abandoning objectivity just by advocating for specific policy solutions. They are liable to be cast as biased, as partisans. The authors do not accept this argument for constraint, and their witnessing often takes the form of pressing for and against specific actions. It is a different matter, however, if they prescribe policies that fall outside their own area of expertise. Naomi Ore-

skes insists that beyond the bounds of their own work, reticence is appropriate, not least because professionals model respect for specialized knowledge by deferring to colleagues in other fields.

Yet ethical considerations extend beyond the responsibility to protect the value and authority of specialized knowledge. A second set of moral considerations is not unique to professionals and the authors take on these daunting challenges as well.

They join moral philosophers in attention to injustice. Responding to climate change requires dismantling the structures of energy use that poison the earth and inventing both clean energy resources and new social and institutional resources. In all this, there is the imperative to assess kinds and degrees of suffering and inequalities in burdens and resources. Rafe Pomerance, Jessica Green, Michael Gerard, Mark Mitchell, and Antonio Oposa speak to the profound and vexing question of distributive justice within and among nations and across generations.

Witnessing professionals grapple with another aspect of justice. When public officials and others in a position to effectively address climate change and reduce its danger and suffering fail to take responsibility, they are active agents of injustice, and calling them to task is part of witnessing. Citizens who sit on the sidelines, perpetuating “malignant normality” and its differential effects, can be seen as passively unjust. The challenge for witnessing professionals is to appreciate both faces of injustice. At the same time, they must take care that demonization and castigation do not eclipse the constructive content of education, advice, and warning.

The perennial ethical question of means and ends presents its own set of challenges. What means are justified in pursuit of climate awareness and action? What forms of persuasion or manipulation should be ruled out? Elke Weber is a leading contributor to research on the cognitive mechanisms that obstruct thinking about the long term and make, in her words, “believing is seeing” as true as “seeing is believing.” She presses us to question how professionals should employ psychological knowledge in advising, warning, and prescribing action.

Political theorists (and politicians!) know that fear can be salutary. Considering whether professionals should induce or exploit fear, Weber argues that arousing dread is only temporarily effective; after all, people are loathe to suffer that emotional state for long. In order to motivate attention to climate change over time, fear must be paired with positive messaging.

There are many such challenges. “Framing” refers to how an issue is defined; in some settings, for instance, the terms “climate change” and “green” are interpreted as partisan and policy advocates substitute “energy-saving” or “good for health.” What is gained or lost by this shift in language? “Soft paternalism,” “nudging,” or “choice architecture” alters how information and incentives are presented in order to subtly redirect people’s actions; when is it warranted? Un-

certainty is endemic to many areas of climate research; how much transparency is necessary to avoid being misleading? Should the uncertainty of projections into the future be communicated to policy-makers? To lay audiences? Returning to an earlier example, acknowledging unknowns about the time frame of disappearing Arctic ice can be exploited to perpetuate popular doubt about the devastating demographic trends of polar bears.

The authors take on these ethical challenges. For many professionals, however, they are daunting and dampen willingness to step into the public arena. Naomi Oreskes observes that scientists in particular are reluctant to speak out, and she offers an additional explanation for their reticence. Scientists' sense of social responsibility is more limited today than in the past because of specialization, she observes. It orients them almost exclusively to their discipline and its community norms so that the prospect of collegial censure discourages witnessing. Against this insularity, Oreskes posits "the obligation to be witnesses, testifying to matters that they as the relevant experts are uniquely positioned to observe, understand, and explain to the rest of us."⁴⁰ She calls this robust demand "sentinel obligation."

Witnesses for climate change also confront fundamental political challenges. One is the uneasy relation between democracy and expertise. "Science isn't about . . . voting," Robert Socolow observes.⁴¹ True, but political decision-making is. Witnessing is imperative precisely because professionals share civic responsibility for responding to the climate crisis with other citizens.

Reconciling the authority of specialized knowledge with respect for democratic political agency is a perennial problem. Citizens and their political representatives have to judge when deference to the authority of expertise is warranted. Experts can be wrong. Experience provides good reasons to be wary of technological hubris and averse to paternalism. There are grounds for reasonable skepticism. Beyond that, unreasonable rejection of expertise, which is widespread today, is intensified in the case of climate change by the inherent radicalism of necessary responses and fierce partisan conflict.⁴²

A dimension of witnessing, then, is sensitivity to public wariness of expert authority. It underscores the responsibility to explain just why, in each particular case, specialized knowledge is vital to democratic decisions and, at the same time, calls on professionals to demonstrate humility with regard to what they don't know. They publicly demonstrate tolerance for uncertainty and exhibit the capacity for learning and self-correction.

"We can raise our voices . . . and hope to move some minds. But neither the UN nor the pope can force action," Michael Gerrard acknowledges.⁴³ Witnessing aims at moving minds and propelling action. As Jessica Green points out, "We

must remember that policy is not a substitute for politics.”⁴⁴ The authors’ commitments to a certain course of education, warning, and advocacy reflect their judgments of how to best contribute to effective climate action. These judgments are rooted, sometimes implicitly, in their thinking about the political dynamic of change.

Does effective climate policy come, or will it come, from above? From an alliance of political and professional authorities? From executive emergency powers operating outside regular institutional or constitutional constraints? From decisions by national judicial branches? Or from international negotiations or legal structures created by international courts? And who will enforce these decisions?

Alternatively, does the dynamic of constructive political action operate from below? Is the critical mover mass popular mobilization, including protest movements by young people who affirm with John James Audubon that “the world is not given by our ancestors, but borrowed from our children”?⁴⁵ Or does the impetus to political action come from community-level organizing and coalitions of advocacy groups?

Or is the path more complex, running from a combination of popular mobilization and social organization to the creation of stable electoral majorities capable of holding political representatives accountable?

Witnessing professionals differ, as well they might. These essays suggest that no political dynamic can be ruled out. No effort is lost. Every effort enhances our moral self-esteem. One thing witnessing does not countenance is disparaging democratic political agency. Representing humans as a “psychopathic colony . . . of suicidally productive drones in a carbon-addicted hive” expresses frustration, even despair, but it is self-indulgent.⁴⁶ Witnessing is directed at awakening and life affirmation, at harnessing the human capacity for adaptation and innovation, and at actions consistent with democracy.

Yet hope and despair thread through these narratives. Witnessing imposes personal costs. The scientists who rallied and pushed back against deniers of the decline of the Arctic polar bear population were not fired from their jobs, but David Titley bluntly acknowledges the peril: “We now have an administration in which it is hazardous to your career’s health to bring up climate risks in any form.”⁴⁷ Climate witnesses suffer insults, attacks on their reputation, hounding, harassment, and loss of funding. Naomi Oreskes endured violent threats and Antonio Oposa was the victim of a devastating violent assault.

Witnessing professionals also bear the emotional and psychological cost of having their advice and warnings ignored while evidence mounts of how far things have gone wrong. As one researcher whose career is dedicated to studying frogs put it, “We are losing all these amphibians before we even know that they exist.”⁴⁸

Still, the *Dædalus* authors persevere. They exhibit stamina. Scott Knowles confesses, “I’m a disaster researcher, worry is my business”; but worry is not resignation.⁴⁹ Michael Gerrard’s essay is titled “An Environmental Lawyer’s Fraught Quest for Legal Tools to Hold Back the Seas” – a frustrating quest, not a futile one – and Carolyn Kormann’s is “The Coral Is Not All Dead Yet.” Elke Weber practices what she calls “applied hope.” Antonio Oposa leads the Normandy Chair for Peace, which he describes as a search for “the good, the right, and the bright.”⁵⁰ David Titley’s essay on selling climate change inside the halls of the Pentagon – “A Patron Saint of Lost Causes, or Just Ahead of Its Time?” – sits on the knife-edge of despair and hope. The final note Rafe Pomerance strikes in our conversation is pitch perfect: “Shouldn’t I be totally depressed? Yet I’m not. . . . We started at zero. Well, look at us now. Everybody in the world knows about climate change. So is that progress? Let’s hope.”⁵¹ As Robert Jay Lifton concludes, “With climate issues, it is always late in the game and yet, in mitigating potential catastrophe, never too late.”⁵²

Inaction is massive carelessness. It is also a violation of what is right. Antonio Oposa takes stock of the absurdity:

We cut down trees that took all of time to grow, sell them off as lumber, and count them as revenue. We scoop out the Seas to eat fish by the millions of tons, fish that were here long before us. In a matter of hours, we dig out carbon that formed over one hundred million years, and burn it as coal, oil, and gas. In a matter of minutes, we burn them . . . belching out poisonous gases into the very Air we breathe. We take out so much from Earth, use it for a while, and then throw it away as “waste.”⁵³

For most of us, climate change as a whole and the fearful future it portends are beyond imagination. These essays give us grounding. They help us grasp the many-sidedness of climate change and its effects, the next steps, the laws, the business decisions, the regulations and policies and political actions that are within reach. Witnessing professionals show us how to think about and beyond the unthinkable.

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Dædalus stepped onto the field of climate change in 1996 with "The Liberation of the Environment." "Religion and Ecology" followed in 2001, and two volumes on "The Alternative Energy Future" in 2012 and 2013 focused on solutions. In 2015, "The Future of Food, Health & the Environment of a Full Earth" and "On Water" were published. I am grateful to the American Academy for adding this volume on the experiences of those who do climate work and bring what they know into the public square. Peter Walton and Heather Struntz did expert and speedy work copy-editing these pieces. Phyllis Bendell, Director of Publications and Managing Editor of *Dædalus*, brought her experience as guide and editor, her supreme good sense, and her enthusiasm to this effort; she made this publication possible.

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