A Conversation

Nancy L. Rosenblum & Rafe Pomerance

"The fate of Greenland is the fate of Miami."

Rafe Pomerance has been called "the original climate change warrior." He was profiled in Nathaniel Rich's 2018 *New York Times Magazine* article and subsequent book, *Losing Earth*. At the moment when much of the science was known but there was no awareness in political circles, Pomerance was crucial in shaping recognition by government officials, policy-makers, and the public that climate change is a crisis. In two conversations, on May 10 and August 5, 2019, we talk about his path into climate work; the sequence of his experiences as an advocate, strategist, organizer, and negotiator; his work with Arctic 21 and ReThink Energy Florida; his political assessment of the point to which we have come; and his experience as a "witnessing professional."

NANCY L. ROSENBLUM: Until fall of 2019 you were chairman of Arctic 21, a network of organizations communicating "the unraveling of the Arctic as a result of climate change" to policy-makers and the public. Let's start here: why did you choose that organization?

RAFE POMERANCE: Our one-liner is, "The fate of Greenland is the fate of Miami." The fate of Greenland is the fate of many coastal cities because melting from continuous warming could ultimately lead to twenty feet of sea level rise. We're not going to see all that in the short term, but we're already seeing a significant amount. Greenland, the Arctic high-latitude glaciers, Antarctica, and thermal expansion of the oceans are the major contributors to sea level rise, and your (Rosenblum's) house in North Truro (Cape Cod) is experiencing that, partly due to Greenland. So the interest of the United States is bound up with the fate of Greenland.

A question frames our work in Arctic 21: what is the future state of the Arctic? Or, what is the Arctic we must have to sustain the global climate system? These are different versions of the same question, and governments have to answer the question, or should. Governments have to figure out what is required if we're going to have any chance of achieving climate sustainability. Remember when the earth is 2 degrees Celsius warmer than pre-industrial times, which is coming up on

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us, the Arctic will be about 5 degrees Celsius warmer: that's two-and-a-half times the earth's global average. The question, again, is what do scenarios of the future look like? And how are governments going to decide where we end up? Because one way or another, they must decide.

NR: Where does the U.S. government stand today on the Arctic?

RP: This is an interesting week to talk about that (May 10, 2019) because it was one of the worst weeks ever for the U.S. government with regard to the Arctic. Secretary of State Mike Pompeo went, as he should, to a biannual meeting of the foreign ministers of the eight Arctic countries (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States). They got together to approve a declaration about what they've done, what they're going to do, what their focus should be. The United States negotiated and then refused to accept a draft declaration that included attention to climate change as an element of the Council's program.

The only statement Pompeo made related to climate was that as we lose sea ice, ship channels are opening up. He didn't talk about the other aspects of sea ice, or any other aspect of the Arctic that is falling apart. He wouldn't acknowledge climate change, and he blocked agreement on the declaration because the United States wouldn't accept any reference to warming – a reference other governments had to have in their declaration of purpose.

Pompeo instead made speeches attacking China and Russia as military and economic competitors. This performance was arrogant and inappropriate. To talk about competition is one thing, but to do it at the Arctic Council, which is a multilateral organization focused on the environment that has deliberately kept broader political issues at bay is another. He missed the point. The point is that the unraveling of the Arctic is a threat to U.S. national interests.

NR: You made the striking statement: "The fate of Greenland is the fate of Miami." What led you to that realization? This statement is one of many examples of you speaking eloquently as a witness.

RP: There are two parts to the answer. One is the scientific part: Greenland is the largest sources of sea level rise today. The second part is political: Florida is the potential epicenter of climate politics. Florida is the most important purple state, a competitive swing state that could go either Republican or Democratic in presidential elections. It is existentially threatened by sea level rise. So if you can make the connection between the Arctic and Florida, you can make a powerful case for action.

NR: You've drawn the connection between your involvement with Arctic 21 and ReThink Energy Florida, and we will come back to that. First, let's trace your path

into climate work. It's of interest because your personal story and your involvement in climate politics proceeded together. You were a young environmentalist – how did you first become interested in the environment?

RP: That's a good question. I grew up in Cos Cob, Connecticut, on a property purchased by my grandfather. I walked in the woods all the time, which included a lake where I skated and played hockey. My mother was heavily involved in the nuclear test ban and nonproliferation treaties, so there was that influence. My father was an architect, a planner; there was that influence, too. My sister was involved in local conservation. My brother was a mountaineer. My aunt was a conservation writer. She had a home in Martha's Vineyard and wrote a couple of fine books on coastal issues.

Another element was that my parents were political. They were members of the Democratic Party and were donors. They went to events and occasionally they'd take me along. So I learned something about politics, and of course I was in college during the Vietnam War. I became part of the antiwar movement, which was another education in politics.

NR: These influences came from home. What about your professional path? Was Friends of the Earth, where you became president, your first job after college?

RP: No. When I got out of school, I was a VISTA volunteer in Virginia learning how to be a community organizer. I did welfare rights organizing. We were organizing poor people to claim what was rightfully theirs under local welfare regulations. There was funding that should have been flowing to low-income communities but wasn't. So we tried to simplify access and to make welfare departments enforce the law. I learned organizing skills doing that.

NR: How did you move from that to Friends of the Earth?

RP: Well, I moved to Washington, because I wanted to lobby for the National Welfare Rights Organization.

NR: Let's just pause on this. I've never heard anyone say they set out to become a lobbyist.

RP: I was interested in how government worked and in trying to influence things. It's hard to recall exactly, but *lobbyist* has become such a pejorative term. I wanted to get into the action. I went from welfare rights to a group called the Urban Environment Conference (UEC), which was a coalition of labor, environmental, and poor people's organizations. (I met my wife Lenore doing this work; we were codirectors of the UEC.) The group was set up by Phil Hart, the former senator from Michigan. The United Auto Workers was very green at the time, and Hart's staff helped organize the coalition of unions, poor people's organizations like Na-

tional Welfare Rights and the National Tenants Organization, and environmental groups like the Wilderness Society. It was a coalition trying to find common ground.

One area of common ground was air pollution. We spun off a really effective coalition called the National Clean Air Coalition that operated from the early 1970s to the early 1990s. It contributed enormously to the environmental success of Congress's amendments to the Clean Air Act of 1970. We might not have had a Clean Air Act with integrity without that coalition.

NR: Another contributor to this volume, Patrick Kinney, also entered climate work through his study of air pollution.

RP: That was my path, yes, but at this point I was not yet into climate work. My transition was sudden. After the Clean Air Act amendments of 1977 were added, I did research with the Friends of the Earth on acid rain. I ran across an EPA report on the environmental impact of coal in which there was a reference to the potential that coal use could warm the planet. I was shocked. I said to myself, "This can't happen!" I stood up, walked out of my office, showed the report to a colleague, Betsy Agle, and said something like: "This must be the whole banana."

A few days later, Betsy brought an article into the office from what I think was the *Rocky Mountain News*. It was a story about geophysicist Gordon MacDonald's speech on the effects of increased carbon dioxide. Gordon had just completed a turn chairing a committee with JASON, the elite independent advisory group of geophysicists that consulted on science and technology for the U.S. government. Gordon was special in that he understood the bridge between science and policy. He understood the need to engage policy-makers. He had served in a policy capacity in the Nixon administration as one of the first members of the Council on Environmental Quality. Right away I called him up and asked if I could come to see him. I went with two colleagues to his office at the MITRE Corporation. We spent two hours together. He explained the whole thing to us.

NR: MacDonald was a mentor to you. What did you learn from him in a personal way?

RP: Gordon was a fascinating person with a great sense of humor, very smart politically as well as scientifically. He loved to eat at French restaurants; we had a special place we'd go to regularly for lunch. He was always very patient with me, explaining the different pieces of the climate problem. I think what he saw in me was somebody who could be helpful, and he was willing to take the time to lay it all out. I became interested in the problem and he was the credible source. He was necessary to everything I did at that time.

NR: MacDonald was crucial to your entry into climate politics, then. What was the first step?

RP: I said to him, "Okay, if I set up briefings, will you do them?" And Gordon was all for it. He had no problem spending time talking to policy-makers, whereas some scientists have no experience with policy.

NR: So you had to set up the venues for him?

RP: You put your finger on what was a critical point: there was nobody out there systematically connecting science to policy. Despite all the years of scientists publishing this report, that report, here and there, there was no systematic effort to make climate a public issue.

The fact that at that moment, through my work with Gordon MacDonald, it might be possible to put climate on the agenda is critical, because it actually needed to have been on the agenda decades earlier. In 1965, oceanographer Roger Revelle and others had produced a report for Lyndon Johnson on carbon dioxide and global warming, yet it did not become a central issue. Remember, I worked on the Clean Air Act for seven years and had never heard about global warming. You might think that I had the wrong education; I was not a scientist. But not so. Nobody brought it up – nobody in the administration, nobody on Capitol Hill, none of the expert witnesses – I never remember hearing about it.

NR: This is another time when you realized something important that no one talked about and no one was taking on. So you assigned yourself this task. I see that you had respect for your own mind – enough to take stands – even at a young age. You realized that you did not know enough to be an authority, but you thought you could do something. What enabled you to confidently recognize the importance of climate change and plunge into action?

RP: It wasn't as though I hadn't had a lot of experience on Capitol Hill. I had spent the last seven years or so working on the Clean Air Act and other issues, so I knew something about the process, something about the issues. A lobbyist is somebody who tries in the best sense to convince other people of the merits of their position through argument and political pressure. What I did with Gordon, essentially, is engage in a process of dialogue with important people. That was not a problem for me: the issue was so compelling, and Gordon was so articulate and credible, that taking that step was easy. I had an authority behind me. Without that, I could not have successfully gone around convincing people that climate demanded attention.

NR: In *Losing Earth*, Rich reports that the decade from 1979 to 1989 was the moment when a massive effort at securing domestic and global commitments to control emissions seemed inevitable. Did you feel that way at the time?

RP: No. I don't think so. There was the possibility of getting started, though. We saw our goal as getting targets and timetables into national policy and international agreements. We worked toward getting governments to commit to hitting certain emission targets over certain timescales. That would have been the beginning of a major step toward a solution. We still don't have that commitment in the United States.

NR: At the time, you did not see the decade as a pivotal moment, but you did see the need for political action. You pushed for clear targets for reducing greenhouse gas emissions. As a witness, you had a good tactical sense for political steps and even dramatics.

RP: That's my job. The important step was taken at a 1988 international conference in Toronto, "Our Changing Atmosphere: Implications for Global Security." It came after the congressional hearing that Colorado Senator Tim Wirth chaired, the same hearing at which Jim Hansen declared that the global temperature record was outside natural variability. The conference occurred within a month of Hansen's testimony, during that very hot summer with forest fires burning, and I decided somebody had to start talking about making carbon dioxide reductions. I actually made a decision. Nobody was talking about it, somebody had to talk about it, so I decided I'll talk about it. That's actually what happened. I had a close working relationship with Tim Wirth's staff and proposed that they consider putting a target for reduction of greenhouse gas emissions in a speech he was giving in Toronto, and Wirth, who was a great leader, did. That was a big "first" by a major politician. The conference embraced the target; they decided it was doable. I think it was a 20 percent reduction by 2005.

Whether that was the right number, the point is, it was directional. It had the good effect of starting that debate and helping to trigger momentum on emission reductions.

NR: I am getting a picture of how you built your own body of knowledge and sense of possible solutions. You're doing this as you go along. In retrospect, then, was 1979 to 1989 a crucial decade?

RP: In that decade, a couple of things happened. The issue emerged from the scientific realm and entered into the policy arena. In the twelve years from 1979 to 1991, we went from nowhere to the 1992 United Nations Framework Convention on Climate Change. The Senate gave its advice and consent to the Framework Convention: ninety-two to zero. The weakness in the treaty was that there were no hard commitments to reduce emissions.

NR: Was the failure to proceed an institutional failure or a failure of individuals to comprehend the problem and to act?

RP: Both. Remember, this issue was new to the United States, and we're talking about the gigantic task of replacing the fossil fuel based energy system with clean energy! It's the largest task ever considered by governments. So to think that everybody is going to jump to it, including all the special interests, is mistaken. Few people understood the problem, except for some of the big companies like Exxon. They knew a lot. In that decade, they knew how formidable the challenge was and how much risk there was for the planet, but they soon switched to a strategy of denial and misrepresentation. Others have studied this history carefully.

In any case, at that point I was not pinpointing fossil fuel companies as the enemy. I was focused on the Bush administration. As we approached the finalization of international negotiations, some combination of companies and key people in the administration got together and argued against targets. And some negotiators who wanted a treaty were also dissuaded because they thought the effort would fail if targets were included. All this prevented the United States from doing anything really meaningful. If John Sununu, who was an MIT-trained engineer and President George H.W. Bush's chief of staff, had understood climate science, he might have taken the opposite position from the one he took, which was skepticism and obstruction.

To my mind, he represents a type of very smart but ill-informed scientist or engineer who thinks he knows better than all the scientists who actually study the problem. He got it wrong, and that had consequences.

There's more to the story. James Baker, who was a powerful secretary of state, could have been a counter to Sununu, but he dropped out of the conversation. He just said, "Well I have a conflict of interest, so I am not going to deal with this anymore." He recused himself from any involvement in the development of climate policy because, he claimed, of his work with the oil industry. Baker could have been a formidable advocate. In 1989, a letter was delivered to him from eight members of the Foreign Relations Committee: four Democrats and four Republicans, if I remember correctly. After that, Baker made an important speech, perhaps his first remarks on the subject, advocating what he called a "no regrets strategy": that it was prudent to take certain actions immediately, and that we could not afford to wait until all the uncertainties were resolved. He recommended measures like energy efficiency and planting trees. On the one hand, his recommendations did not push for a firm commitment to spend government money on the problem. On the other hand, it acknowledged the issue. No denialist would have ever said that. And then he recused himself.

NR: How did you feel about his withdrawal?

RP: James Baker's recusal – why he did it, its impact – is a good issue for historians to study. The whole episode underscores my understanding that within the structural aspects of history, people make a difference. Structures change because of people. It's interesting to note that Baker is now part of an organization, the Climate Leadership Council, publicly advocating for a carbon tax.

NR: Let's bring your story forward to the present. Nathaniel Rich observed that all of the conversations taking place in the 1970s are still taking place. Yet there are also new conversations. What changes strike you as crucial?

RP: There has been a total transformation in the media coverage of the issue and a huge change in public attitudes. Then there is what appears to be an important awakening of young people; it's not that they weren't awake earlier, but now they are more organized, more vocal. That's very important because this is a multigenerational issue. Their voice is critical and deserves a place at the center of climate action because it's their lives and their children's lives that are at stake – including my children, grandchildren, and my grandchildren's children. So that's another shift. One more thing: we are at a crucial moment in partisan terms because the Republican Party as a whole is an obstacle to progress. Generally speaking, the U.S. Congress is the problem in the world, and within it, the Republican Party is the problem.

NR: Say more about these developments from your special vantage point. The media has clearly taken climate change up, and you've been working on that throughout your career.

RP: I am trying to think what actually led to this transformation in the media. Many people in different organizations have been working on the media aspects of the crisis. Every environmental group has its communications staff, and the scientific community publishes reports all the time, but finally now the press appreciates that this issue is upon us. I think that Rich's article "Losing Earth" had an impact because *The New York Times Magazine* decided to devote the entire issue to the history of how we got to this point. The publication was a signal of the reality and urgency of climate change. It came forty years after the big report of 1979, the Charney Report of the Ad Hoc Study Group on Carbon Dioxide and Climate, which had accurately assessed the effect of carbon dioxide on global warming.

NR: Is public awareness also spurred by the fact that we're experiencing the impact of climate change? Forty years ago, it seemed hypothetical and far off. Today we see its effects, and our catalog of disasters is growing rapidly.

RP: I think so. The impact is undeniable. The climate system has begun to respond to what the scientists call "forcing." The term indicates the amount of additional warming resulting from increases in the concentration of greenhouse gases. The

oceans are warming. The atmosphere is warming. We're losing glaciers. We're losing sea ice. More than half of the world's coral reefs, including large portions of the Great Barrier Reef, are dead from bleaching caused by the heating of the ocean. An early biological signal came from the warming of the ocean, which we started to pick up in the 1980s. Jim Hansen's 1988 congressional testimony was another moment of awareness: the surface temperature record had exceeded natural variability. That was a signal. It goes on and on as more and more signals are picked up, making the whole case more convincing.

NR: We now have organizations and advocacy groups, we have mass movements with marches and protests, even civil disobedience. What's your sense of the significance of this organizing activity?

RP: I think it's important. It's a way to project the opinions of a large number of citizens into the policy-making process. Take the Natural Resources Defense Council or Sierra Club or Union of Concerned Scientists: they all have representation in Congress, and they have members back in the states who pressure their congressional representatives. So they're a critical element in trying to achieve results. Still, they're like everybody else: they don't know (in my opinion, none of us do) what is the right political judgment at the right moment. They can make mistakes.

NR: What kind of mistakes?

RP: Well, you can overreach. I was part of an effort to design a BTU tax (British thermal unit of heat) that Bill Clinton and Al Gore had proposed very early on. If you tax energy based on BTUs, you get something that works a lot like a carbon tax, without calling it that. The BTU tax passed the House of Representatives but went down in the Senate. The Democrats took a thrashing in the next congressional election, in part because of this issue. The Republicans just made hay, accusing the Democrats of wanting to raise energy prices. They did the same thing with President Obama and the Waxman-Markey Bill to promote a clean energy economy. Anything that is a direct form of energy pricing has to be done on a bipartisan basis, otherwise the Republicans will try to eat the Democrats' lunch.

Maybe it's just not possible anymore. Senate Majority Leader Mitch McConnell is going after the Green New Deal. Why? Because he thinks it too is politically damaging for Democrats. The plan makes a host of claims about what it is going to do, from guaranteeing jobs for all to narrowing the racial wage gap to retirement security. There has been a pretty big debate within the climate community about whether the Green New Deal is going to help or hurt.

NR: What do you think?

RP: I tend to think it helps because it seemed to have a galvanizing effect on the public, with the youth, and on Capitol Hill. It seemed to dramatically increase attention and motivation. We'll see. The Green New Deal may or may not help in terms of the electoral map. In Florida, for example, which is a pivotal place, the case is better argued from the standpoint of the effect of sea level rise on the state.

NR: That brings us back to Florida. You are involved with ReThink Energy Florida, raising awareness of the impact of sea level rise in that very vulnerable state. You see Florida as the linchpin for addressing climate change in the United States. Why?

RP: Yes, in a way it is the linchpin. In my more grandiose moments, I'd make a prediction that sea level rise will decide the 2020 election. It's not going to decide the election based on its impact in North Truro, Massachusetts, but it could in Miami, Tampa, and Jacksonville. The key is that Florida is the most important electoral state in the country. If Florida moves green, so to speak, just a little bit, President Trump could lose Florida and lose the election. He has to win Florida. The theory that I've been operating on for a number of years is that if Florida – which faces existential issues from sea level rise and the increasing power of hurricanes – wakes up, it will shift politics because the Republicans will have to take action.

NR: For some time now, Florida has been engaging in local climate adaptation measures. Can this be done without acknowledging climate change?

RP: Former Florida Governor, now Senator, Rick Scott, refused to acknowledge it. Nor did he assist in local adaptation measures. But leading counties acknowledged the climate change problem, particularly in southeast Florida: Palm Beach, Broward, Miami, Dade, and Monroe. They formed the Southeast Florida Compact, and the movement toward multicounty organizations has been spreading in the state. The three largest newspapers in South Florida – *Miami Herald*, *The Palm Beach Post*, and *Orlando Sentinel* – and WLRN, the PBS station, have formed a collaborative and, with about two dozen smaller local newspapers and public radio stations, publish a joint editorial page on the web called The Invading Sea. Why? Because when they started, they declared that sea level rise is the most important issue facing Florida in the twenty-first century.

Now some members of Florida's congressional delegation and Governor Ron DeSantis have pulled back from Scott's intransigence. DeSantis did an about-face when he took office. He has said climate change is real, and that's huge (though we will see if he goes ahead with state-level efforts). He's appointed someone to be in charge of adaptation and resilience planning. He's appointed a good science adviser. My colleagues there are pleased with the shift because they're not fighting against denialism as they did with Scott. At the same time, there is growing skepti-

cism that DeSantis will deliver. Still, once you've acknowledged the issue, you've taken a big step.

NR: Some people think climate adaptation diverts attention from the vital business of mitigation. Another view is that when adaptation measures are going on right around you at home, and your street is being elevated to accommodate flooding, it raises awareness of the need for mitigation. Do you think it works that way?

RP: Well, I think you're not going to stop people from working on adaptation. They've got to cope with what's coming at them. Doing so will lower the costs and impacts of climate change. The problem with adaptation in the long run is, what are you adapting to? What climate system are you adapting to? One or two degrees warmer or five degrees warmer? You know, there may be no point in adapting to a climate that's five degrees warmer. If you live near a coastline, you're going to have to move; even two degrees of warming will probably mean you're going to have to move. The climate is now transient, it's changing all the time. There is no equilibrium state anymore. So what is it you're adapting to?

NR: Do you see a constructive connection between adaptation and mitigation policy?

RP: Yes, because when you start trying to figure out what future you have to adapt to, you are forced to consider reducing emissions. It's an "oh my God" sort of moment: if we follow X scenario or Y scenario, the differences in what we will have to do are huge. There's a logic to the dynamic interaction of adaptation and mitigation because if you're trying to plan for security or resiliency, you've got to consider what emission scenario you are planning for.

NR: You've been involved in international negotiations, including a period as deputy assistant secretary of state for environment and development and as a negotiator for the Kyoto Protocol. What did you learn from your experience that negotiators today need to know?

RP: I was very involved in the lead-up to Kyoto, and I learned a lot from that experience. It was extremely stressful for me because I had a personal connection to the problem. I had personal feelings about it. Some of my colleagues were long-term professional negotiators who weren't as deeply into the science as I was. They had more distance.

In some of those negotiating sessions, I remember saying to myself: we're negotiating the future of the planet and at the same time the future of the global economy. That's what was going on, implicitly, in the room. Those were the stakes. You have to deal with the build-up of greenhouse gases that control the fate of the earth, its climate system. At the same time, you have to substitute an entirely

new energy system for powering the world economy. That's the largest task ever invented for government (though it may be second in importance to controlling nuclear weapons: that is, never using nuclear weapons).

I didn't have any experience with multilateral negotiations when I started, so I had to learn very quickly. I've concluded that we, the United States, can no longer go into a multilateral negotiation unless Congress has approved legislation that would allow us to implement what we negotiate. How do you negotiate in good faith when you can only hope that your government will pass legislation to implement the agreement? It was a terrible spot to be in. That's even true for the Paris Agreement, which has voluntary targets. So we have a problem negotiating anything unless it's clear that the political system supports it. If you were appointed secretary of state or assistant secretary for the Bureau of Oceans and International Environmental and Scientific Affairs, what are you going to do? You can't come up with a scheme to save the planet unless you have the authority back home, unless the Congress has told you "yes, we will do that." That's a huge lesson and a challenge for U.S. negotiators.

The second lesson is how tough it is to come up with an agreed target of reductions because, of course, every country is different. The Paris Agreement reflects everything we learned from the Framework Convention in Rio in 1992 through all the subsequent attempts to get an agreement. Paris is a voluntary accord based on each country's own judgment, and because the targets are self-imposed, it was possible to get everybody in. Developing countries joined. China joined. Then you're reliant – as you are in anything – on domestic political commitments to achieve those numbers.

We're still waiting for the United States to step up and understand that the fate of our country lies in dealing with emissions. We still have no political consensus on that. Some of us understand what's required while others don't, or just don't think it's worth acting on.

NR: So the distributive question, the international justice question, is central to negotiations and to getting an inclusive agreement.

RP: In the 1992 United Nations Framework Convention on Climate Change that committed countries to reduce greenhouse gas emissions, and that was ratified by the Senate, developing countries basically signed up to do nothing. It was the job of twenty developed countries to act first. The same thing happened with the Kyoto Protocol, which acknowledged countries' different capacities and responsibilities for addressing global warming. That was a strike against the agreement, given U.S. politics, and it was never submitted to the Senate for its advice and consent. But President Obama was committed to an inclusive Paris Agreement, and his di-

plomacy – especially with China's President Xi – resulted in two hundred nations signing on to voluntary targets for reducing emissions. Yet President Trump abandoned it despite the fact that it was all-inclusive and voluntary.

NR: Let's talk a bit more about mitigation policy. What has influenced your thinking?

RP: I talk to experts. On this issue, a lot of economists base their assessments on the most efficient policy. I made my judgments, leaving aside the politics of any particular measure for a moment, after many conversations with economists: mostly, Robert Repetto at the World Resources Institute; Roger Dower, who came to the World Resources Institute from the Congressional Budget Office; Dick Morgenstern and Ray Kopp, who were at Resources for the Future; and Adele Morris at Brookings. Generally, they were all carbon tax proponents.

The best, most efficient policy mechanism for reducing emissions is a carbon tax. But the obstacles are significant. To get there, you need Republicans on board. You have to take care of the distributional issues by using the revenues in a certain way. You have to take care of the trade issues. You have to take care of those interests, let's say energy-producing regions, that could get hit. So you want to design a policy that acknowledges transitional costs and attends to the impact of the tax on low-income communities. We've learned a lot about these questions of distributive justice over the years, and people are designing comprehensive packages of policies to make the impact equitable.

I think we have to bail out some of the energy producing, fossil fuel producing regions of the country. I recall a speech I gave in Charleston, West Virginia, maybe twenty years ago. I started out by acknowledging the role that West Virginia had played in building the country's energy system. We have to acknowledge that. We have to understand people's vulnerabilities.

In my book, the fastest solution to the equity issue is low-cost clean energy. It has to be cheap enough for developing countries to embrace solar or wind or nuclear – whatever it might be that out-competes coal and natural gas. If you can lower the cost of substitutes enough, emissions will drop faster. That's where innovation comes in and why investment in research and development is so important.

NR: What about the view that nuclear power is the best answer?

RP: Well, that's probably hugely expensive, absent a carbon tax. With a tax, the economics would work themselves out, in theory. If you impose a carbon tax, the winner tends to be the low-cost option. So if coal and gas become much more expensive, nuclear becomes relatively cheaper. I would say that in that scenario, if nuclear is low-cost, then fine. In the context of the dire risks of the build-up of

carbon dioxide, I'm not overly worried about nuclear power. We need all hands on deck to avoid the worst. I wouldn't take that option off the table unless there's good reason to do so, like safety or proliferation.

Do I have reservations? Determining whether nuclear power is "safe" is up to the regulatory process. I'm no expert on nuclear power safety, or on disposal, or on the connection to nuclear proliferation. Those are all important problems. The question becomes, what can nuclear power contribute to addressing the climate problem and is it worth the risk? If it's too expensive compared with solar and wind and even coal that has had the carbon pulled out, then why go there? But if it isn't too expensive then you have to evaluate it on these other grounds. I am not a *no* on nuclear power.

NR: Often some energy source, nuclear, for example, is described as transitional. Is that a helpful way of thinking?

RP: Some people say natural gas is a transitional fuel, but that's getting less popular because methane leakage and gas still produce carbon dioxide. Geoengineering may be a transitional strategy, not forever. It's essential that while society is implementing geoengineering, it is also eliminating carbon as a source of emissions and even pulling it out of the atmosphere. It may take a long time, but you can envision a point at which the temperature of the earth is either rising so slowly or is flat that you could stop. Now, that could be a long time from now; it could be a century. Transition is not short term.

NR: How did you get involved as an advocate of geoengineering research?

RP: I've spent some time supporting the establishment of a research program in the U.S. government. We don't have a research program on solar radiation management – reflecting some amount of inbound sunlight back out into space – and we need one. Even if we oppose geoengineering, we have to be able to point out its problems and explain why opposition is warranted, if it is. We may need to intervene in a planetary manner to cool the earth off in a hurry when no other tool is available.

NR: All along, in discussing your evolution as a climate activist, we've been talking about your emergence as a witnessing professional. Could you say more about that, both your view of yourself in that light, and your view of others around you? You worked closely with scientists who moved from their community of expert knowledge to public testimony and activism. What did you observe about others who were reticent about speaking out, and about professional constraints?

RP: I think there was a period when scientists were the voice of urgency. Urgency was implicit in the science. Initially they were the appropriate people to speak

to the issue, because they understood it and could lay out how it worked, what the consequences were, and so on. Then, in theory, policy-makers, diplomats, and everyone else would come to grips with it. In theory. Even if they are knowledgeable about policy, scientists risk losing credibility if they start to weigh in on policy because those discussions are always politicized. Sometimes it's better for them, even if they have an opinion, to withhold it.

There is a form of appropriate caution and a form of political caution. Scientists work in a world of peer reviewed literature, and there they exercise appropriate caution. They want to get it right. At the same time, some scientists become very active in policy areas where they don't have the credibility they do as scientists, and it's arguably counterproductive. It's a matter of doing it properly, arguing the case, and recognizing the risks.

The risks are real. Take Florida under Governor Scott when the word went out: "Thou shall not talk about or use the words climate change." Eventually many scientists in the state did speak out. In the Trump administration, people are keeping their heads down. The administration hasn't restrained experts at NOAA or NASA from talking about climate science, but they have tried to silence the EPA. And government has censored data that are used by the public; at a minimum, this is a failure of government's responsibility to educate.

NR: Scientists enter the history of the global climate crisis because their work is the basis for understanding where we are and where we are heading. You enter this history by providing a bridge from science to politics and policy. As a political strategist, you are not bound by the established norms of a licensed profession, such as law and medicine. Even so, have you experienced constraints on witnessing?

RP: I'll give you an example. Geoengineering has been a topic that has been unmentionable for a long time because of the fear that talking about it would dissuade people from reducing emissions, or that the risks would be too great. Geoengineering is not a new subject. I remember the testimony in 1987 of Wallace Broecker, one of the world's top geophysicists. He said that we may have to fly 747s with sulfur into the stratosphere to block sunlight. His testimony went nowhere; no one took notice. When John Holdren, Barack Obama's science adviser, was asked by an AP reporter at the end of an interview, "Are you in favor of doing geoengineering research?" Holdren responded, "Of course." Well, that became the lead of the story, and as I remember, the result was that Holdren was battered for it. Until the very end of the Obama administration, that was the risk of even mentioning geoengineering.

So in most settings, introducing a discussion of geoengineering requires gumption. Just recently I stood up at a National Academy of Sciences event, where a

speaker was talking about how to prevent the ice sheets in Greenland and Antarctica from melting, and I asked him why he didn't mention geoengineering. It took me years to stand up in public and ask that question because of fear of ridicule. And still eyes roll. Often scientists don't know anything about it, even though it's a relevant policy response. Political opinions about geoengineering tend to override the necessary policy and scientific debate.

I am an advocate for research. And the more time goes on, the more I can see that the odds of an intervention go up. We are already deeply committed to a massive warming of the earth – it is baked in – and if you don't cut the warming off, somehow, while you're getting emissions down, you lose the fight. A friend who is a paleoclimatologist sent me an email that read: "We're on our way to the Pliocene." The Pliocene was three million years ago, and the concentration of carbon dioxide then was the same as it is today, but the temperature and sea level were much higher. Given enough time, the planet will look like the Pliocene. Impacts take a long time to happen after concentrations of carbon dioxide have changed.

When I have to do something tough, I wear a bracelet given to me by my granddaughter. I use that to remind myself that I have to be outspoken. Unless there's some strategic reason not to speak out, I don't hold back, because this is about her.

NR: If an international agreement on targets for restricting carbon emissions and sticking to it is hard, imagine overseeing and enforcing an agreement on geoengineering.

RP: Everything is hard. That's no different. What we're dealing with here is an unprecedented effect of humanity on the planet. There is nothing like it. Nothing at this scale.

NR: My last question: We've all heard expressions of despair from climate scientists, from biologists who study species that are becoming extinct, for example, and many others who have been personally and professionally entrenched in studying the effects of climate change. What gives you courage, and what gives you hope?

RP: At this point, having courage is not a problem for me. I speak. I know what I think. I know that every time I speak out, my own voice, my own words evolve in responding to different issues. Shouldn't I be totally depressed? Yet I'm not. Does that have to do with the substance of the issue? Or in the end, perhaps it's a matter of personal disposition.

What gives me hope? The emergence of young people, if they get organized, is really, really, really important. They have a legitimate stake in this, more so than baby boomers like me. And the progress we're making on some technologies gives

me hope. The cost of solar and wind has come down. Also hopeful is the number of people involved in the issue. When I started, nobody had heard of the problem. Nobody was active. When I went around with Gordon MacDonald briefing people at high levels in the Carter administration, they had never heard of climate change. We started at zero. Well, look at us now. Everybody in the world knows about climate change. So is that progress? Let's hope.

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