



Fig. 26.1. Rafe Pomerance and Michael Oppenheimer

Chapter 26. Living in Jersey, Learning to Testify

We moved to Ridgewood, New Jersey in July 1982, not only because of good public schools there. The bike Erik loved disappeared from the bike room in our coop building in the city. The final straw was theft of his baseball glove. We often played catch on the Columbia campus and Erik liked to throw a tennis ball against a wall or the steps of our building, fielding the return with his glove. However, as he sat on the steps with his glove beside him, a big boy grabbed the glove and ran away. A normal, safe, life for children did not seem possible in New York City.

I minimized the commuting problem by leaving for work before 6 AM to beat the traffic and made it home in time for dinner. I put up a basketball hoop in the driveway and a 70-foot, net-enclosed, batting cage in the backyard, and coached Little League baseball, girls' softball, and biddy basketball. Anniek reminds me that she did almost all of the family work. I got up early on Sundays, drove to my office in 25 minutes, and stayed until afternoon. Such time is needed for research. Science is hard. It is difficult to do good science without blocks of quiet time.

Rafe Pomerance introduced himself, when he came to my office the first time, which was no earlier than 1983, when I began coaching. We began by talking about coaching youth. Rafe was a gangly six feet four inches tall (1.93 m), stooped a bit, as if to apologize for his height. He spoke loudly but friendly; it was easy to like him. He coached soccer (football). Then we got to his purpose: he majored in history, became an environmentalist, and was trying to educate himself and Congress on climate. He had questions about our 1981 *Science* paper.¹ This first meeting is described colorfully by Nathaniel Rich in *Losing Earth*.² It's true, as Rich notes, that my office had 30-40 piles of papers, each marked by topic (methane, volcanic aerosols, etc.), but only some piles were measured in feet, a result of computer printouts of climate simulations.

Computer printouts, in those days, provided the climate model diagnostics: simulated values of quantities such as temperature, rainfall, and cloud cover, including digital maps. I explained to Rafe that we were starting to make simulations for realistic scenarios of greenhouse gases. My goal was to simulate climate futures with our 3-dimensional climate model for alternative greenhouse gas scenarios. If he came back in a year or so, I said, we may have results more meaningful than those from the 1-dimensional column model in our 1981 *Science* paper.

Our group was competing with large modeling groups funded by NOAA and NSF. Goddard was building its own large group. It was not practical to mimic their high-resolution models.

How could we use our coarse-resolution model usefully? The ocean was the big difficulty. Not only does the ocean have great heat capacity, it transports heat from one region to another. Building a dynamic ocean model is a big task, we did not have an oceanographer in our group, and we were beginning a decade after the other groups. We needed a bright idea.

Gary Russell made the suggestion. Then everyone said it was obvious. The idea was to assume that horizontal transport of heat by the ocean would not change much in the next few decades. In other words, big changes such as shutdown of North Atlantic deepwater were unlikely to occur in the 20th century. We could obtain the present ocean heat transport by running our model with observed ocean temperatures, calculating energy fluxes at the ocean surface, and inferring ocean heat transport from climatological (observed) changes of the temperature of the ocean's surface mixed layer,³ as described also in our Ewing paper.⁴ With these ocean heat transports fixed, we then let greenhouse gases change over time and calculated changing climate. Thus, we had a tool for climate studies. We could run experiments with different greenhouse gas scenarios to examine the effect of alternative energy futures. However, because our computer was slow, the model runs would take a long time – about three years, as it turned out.

Meanwhile, could we use our first climate change simulation, the equilibrium (eventual) response to doubled CO₂, to help people understand the potential magnitude of human-made global warming? As a student project in our Summer Institute on Planets and Climate (Chapter 14), I suggested looking at the eventual impact of doubled CO₂ warming on climate extremes in two locations: Washington, DC, and Omaha, Nebraska. The result was an increase in the number of days with temperature above 100°F (38°C) in Omaha from three per year in 1951-1980 to 20 per year. In Washington, it increased from 0.7 per year (7 days in 10 years) to 12 days per year. The number of nights when temperature did not fall below 80°F (27°C) increased in Omaha from 0.2 to 9 nights per year and in Washington DC from 0.4 to 19 nights per year.

Human-made climate forcing in the early 1980s was still short of doubled CO₂, and the ocean's thermal inertia would further delay the climate response, but these examples helped reveal that potential effects of human-made warming were a big deal. I wrote a brief draft paper describing these results,⁵ but as yet there was no persuasive evidence of human-made global warming. Thus, the paper did not have priority and remained in a pale green folder, under the roller deck on my file cabinet, by the window looking out on Broadway, waiting for an appropriate moment.

Pomerance returned in July 1985 accompanied by Michael Oppenheimer. The two made a powerful team – Rafe experienced in working with congressional staffers in Washington and Oppenheimer a first-rate scientist.⁶ They wanted Congress to have hearings on climate change. They wanted advice on key scientific matters and how to explain them to Congress. A follow-up 26 July letter from Pomerance and my 4 August reply remind me of the topics.⁷ We talked about climate sensitivity and climate's delayed response; I gave them a preprint of our paper⁸ showing that much of the eventual GHG warming is still “in the pipeline” a century after the gases are added to the air. This delay depends on ocean mixing, so I suggested that they contact Carl Wunsch of MIT, a top expert on turbulence and ocean circulation, as a potential witness.

These topics were esoteric to politicians. Pomerance and Oppenheimer were more interested in our climate simulations with a range of greenhouse gas scenarios, but the simulations were still running on our computer. I dusted off the pale green folder with the draft paper, *Effect of*

Doubled CO₂ on Severity of Summers in the United States,⁹ from the 1983 Summer Institute. They liked it; the big increase of extreme hot days would get attention. In my letter, I warned them⁷ that I may not submit the paper for publication soon. The topic was low priority until there was evidence of global warming. Our modeling suggested that greenhouse gas warming in the first half of the 1980s was largely offset by cooling from the El Chichon volcanic eruption in 1982. However, there was a high probability of warming in the second half of the 1980s.

The Hearing, on 10-11 June 1986, was titled *Ozone Depletion, The Greenhouse Effect and Climate Change*. Curtis Moore, a Republican staffer, persuaded Pomerance to lump the ozone and climate topics to try to stir political interest in climate. It was a deft move, but it forever confused the ozone and climate issues for the public. The ozone hole, springtime loss of ozone over Antarctica, had been discovered in 1985. If ozone loss spread to populated regions, it would deprive the public of protection from harmful UV radiation. The immediacy of the ozone threat offset the slow, futuristic pace of global warming. Robert Watson and Sherry Rowland were the lead witnesses, discussing ozone. As third witness, I summarized my written testimony on climate change,¹⁰ as a response to questions from the hearing's chairman, Senator John Chafee. The questions, including the effect of global warming on extreme temperatures in Washington, were obviously constructed with the help of Pomerance.

My written testimony explained how climate models work, but also mentioned the importance of paleoclimate data and observations of ongoing climate processes. In retrospect, it was too technical, but the larger shortcoming was my response to Senator Chafee's question: "Do any of you believe that we need more scientific data before we could reach the conclusion that what is taking place now, if continued, will increase the temperature of the globe?" It was an invitation for a clear answer and a commentary on the implications of the delayed climate response for energy policy. Instead, I waffled and noted the caveats that must accompany climate projections.

Bob Watson did much better, with a blunt response: "No. I believe global warming is inevitable. It is only a question of the magnitude and the timing." Watson's statement was widely reported in the newspapers the next day. Watson's simple answer got the desired attention, even though the content was small – if the "magnitude" is small, there is no human-made climate issue – we need to know climate sensitivity. Useful communication with the public is a huge challenge. I would try again the next year, but at the moment I had other things on my mind: baseball.

Fathers coach Little League in Ridgewood. There was one good coach, Lew Dickinson. He pitched in college and knew baseball. He loved kids; his job was working with them at the Y. His wife was a school teacher. He knew the right things to say to encourage kids. He did not favor his son on his team. In other words, he was impossible to emulate successfully. Erik was 11 in 1985 when I inherited the Renato's Pizza team from a retiring father. We got second place to Lew's team. Being ultra-competitive, I scouted the 10-year-old league. One kid, Gene Ret, struck out 15 batters in a five-inning game. In the spring 1986 draft I picked next to last, but nobody else had scouted: Gene Ret was still available. With Gene and Erik doing most of the pitching, we did not lose a single game in 1986, and in the traditional crosstown game at the end of the school year we easily defeated the champions of West Ridgewood. Our players had swagger as the "green machine," in their green Renato Pizza shirts. Sure, it would be better to have a competitive league, but I'm telling you how it was, not how it should be.

I was asked to coach the East Ridgewood team for the Little League World Series. I bought a chain-link fence and dragged it behind our car to smooth out the lumpy field at Hawes School, then worked with players individually and as a team. I hit infield and outfield practice from home plate with Kiki's softball glove on my left hand and a bat in my right hand. After hitting the ball to a fielder, I caught the return throw in the glove, flipped the ball in the air, and hit it to another fielder. I could easily hit the ball over the fence with one hand. Other fathers thought that I had been a semipro player. I didn't tell them that the last time I played, at age 15, I couldn't hit the ball out of the infield. That danged Robert Burns: best laid plans gang aft agley. On the day of the game, Erik awoke with 105-degree fever. Anniek stayed with him. Gene pitched well, but we lost by a run. We had to play again the next day in the two-loss elimination first round. Erik dragged himself out of bed and played, but we lost by one run again. Season over.

Oh, well. I could focus on science and be better prepared to testify again. A request came the next year, from Senator J. Bennett Johnston, asking my views on the likely pace and regional implications of the greenhouse effect and global climate change. I took that as a license for testimony of my choice. The hearing was in November 1987, by when we had completed climate simulations for all three of our greenhouse gas scenarios. I made a list of seven questions that I thought they should ask, and followed each one with a discussion and a succinct conclusion.¹¹

The questions included: "Are major greenhouse climate changes a certainty?" "Will the temperature changes be significant to the man-in-the-street?" Still another topic was: "Climate response time: implications for emissions policies." My prepared testimony consisted of what I believed were good answers to meaningful issues.

Friday morning, 6 November 1987, I received a call from Lynne Murphy of the Office of Congressional Affairs at NASA Headquarters. My testimony was not approved. What? I was not aware of the approval process; it had not come up in 1982 or 1986. Lynne told me that the White House Office of Management and Budget (OMB) wanted changes to many statements in the testimony. The specific changes were substantial, diluting and distorting my conclusions.

I suggested clarifications that I was willing to make. Interactions with OMB went via Lynne. By mid-afternoon there was no response from OMB. My anger grew as I waited. I had worked hard on the testimony. I knew it was good. Late in the afternoon I told Lynne that I was going home, and so was my secretary. That evening, I got a call at home from Lynne. OMB insisted on almost all of their changes. Stubbornness is a characteristic I seemed to have inherited from my mother. I would be damned if I would accept their changes. We were at an impasse. Lynne was on my side. Out of the blue, she said that I had "the right to testify as a private citizen," if we could not get OMB to agree on the testimony. I doubt that employees in NASA's Office of Congressional Affairs are encouraged to make that suggestion to a scientist.¹² Late Friday evening Lynne told me that she got "approval" of OMB for me to testify as a private citizen. She had the 50 copies of my testimony shipped back to my office overnight.

On Sunday, I went to my office, tore the front page off each copy of my testimony, and stapled on a new page, changing my address from NASA to 33 North Pleasant, Ridgewood, New Jersey. [We had just moved. Thanks to Anniek's improvements on the South Irving house, we could sell it and move to a larger house with an acre of land and a big red barn.] I sent a note by express mail to Jim Trainor, my Goddard supervisor, explaining what I was doing. By the time he got it Monday, I would be at the Senate. It would be too late for him to stop me from testifying.

Chairman Johnston was not present for the hearing. I scratched “Mr. Chairman” as the first words of my oral testimony and instead read: “Senator Wirth, Senator Murkowski, thank you for the opportunity to testify. Before I begin, I would like to state that, although I direct the NASA Goddard Institute for Space Studies, I am appearing here on the basis of my scientific credentials; the views I present are not meant to represent in any way agency or administration policy.” Tim Wirth of Colorado was a Democrat and Frank Murkowski of Alaska a Republican. They had in front of them my written testimony with my home address. I expected this strange beginning to my testimony to elicit dialogue, if not consternation. There was not one peep.

Two issues cried out. First, why did the White House try to reduce confidence in human-made climate change and its importance to the public? Second, on what basis is OMB allowed to alter the opinion of scientists? The latter, NASA Congressional Affairs told me, was to assure that any testimony of government employees is “consistent with the Administration’s budget request to Congress.” What? Science is altered to fit the budget? It made no sense.

That day was just one step in my education about how Washington works. Later I learned that both political parties use OMB and Offices of Public Affairs to filter information that scientists present to the public. Neither political party is willing to change the system. It took decades for me to understand that these political machinations were only superficial manifestations of a more basic problem that deters effective governance. In 1987, I was simply distressed by our failure to draw public and political attention to the threat posed by human-made climate change.

Three of us – Rafe, the staffer who organized the hearing, and I – went into a smaller room after the hearing. Rafe wanted another hearing. I was grumpy. I worked hard on the testimony, but to what use? Only two Senators attended and there was little media coverage. One reason for lack of interest, I argued, was the cool season. I did not want to testify about global warming again unless it was in the summer, when the public and lawmakers might pay attention. Mother Earth is the most powerful witness. Perhaps Senator Tim Wirth got that message. He scheduled the next hearing for 23 June 1988.

¹ Hansen J, Johnson D, Lacis A *et al.* [Climate impact of increasing atmospheric carbon dioxide](#). *Science* **213**, 957-66, 1981

² Rich N. Losing Earth, the decade we almost stopped climate change, *New York Times Magazine*, 5 August 2018

³ Russell GL, Miller JR, and Tsang LC, [Seasonal oceanic heat transports computed from an atmospheric model](#), *Dynam Atmos Oceans* **9**, 253-71, 1985

⁴ Hansen J, Lacis A, Rind D, *et al.* [Climate sensitivity: analysis of feedback mechanisms](#). In American Geophysical Union *Geophysical Monograph* **29**, 130-63, 1984

⁵ Ashcraft PG, Hansen JE, [Effect of doubled CO₂ on severity of summers in the United States](#) (available in *Docs*)

⁶ As chief scientist for the Environmental Defense Fund, Oppenheimer played a lead role in addressing acid rain. Specifically, he advocated the cap-and-trade approach, which allowed utilities to collaborate to achieve an inexpensive, overall, reduction of sulfur emissions from power plants.

⁷ Available in *Docs* as [Pomerance](#).

⁸ Hansen J, Russell G, Lacis A *et al.* [Climate response times: dependence on climate sensitivity and ocean mixing](#). *Science* **229**, 857-9, 1985

⁹ Available in *Docs* as [Doubled CO₂ Hot Summers](#).

¹⁰ Available in *Docs* as [Testimony: 1986](#)

¹¹ Hansen JE. [Prediction of near-term climate evolution: what can we tell decision-makers now?](#) Testimony to United States Senate, 9 November 1987, 29 pages, available in *Docs* [Testimony: 1987](#)

¹² Later – I believe it was May 1989, when I again had difficulty with OMB – I asked about Lynne and was told that she was no longer with NASA. They thought that she was working for “an environmental organization.”