

Chapter 36. Communicating is Hard

Climate science had become clearer in the 15 years since 1989, when I last testified to Congress. There was scientific consensus that observed global warming was due primarily to human-made greenhouse gases, especially CO₂ from fossil fuel burning. However, the rate of fossil fuel burning was accelerating. Did the public and politicians not understand the situation?

I was ready to speak out again, but how to find a platform? The IPCC was now the voice of the climate research community. How could I get attention for an alternative perspective?

A potential source of advice emerged on 3 June 2004: a letter from Frank Loy inviting me to accept an award from Environment 2004 and give a talk on climate change. Loy – the chief climate negotiator for the United States in the Clinton-Gore administration – was chairman of the board of Environment 2004. Other board members included Bruce Babbitt and Carol Browner.

I did not want an award from a partisan organization – I was and wanted to remain a political Independent. The biggest problem in democracies is the role that money has assumed, but Democrats nor Republicans alike give only lip service to campaign finance reform. It will be difficult to solve the climate problem as long as Congress is well-oiled and coal-fired.

Environment 2004 was dedicated to defeating “Bush and his allies” in battleground states in the 2004 elections. Perhaps Loy could help me find a high-profile nonpartisan venue where I could describe the climate threat and criticize the Cheney-Bush energy policies.

I first asked Larry Travis for advice. He reminded me to avoid using any government resources. So, to be extra cautious, I would call Loy from my own cell phone the next week when I was in Washington, where I would be able to go to his office, if necessary.

Loy understood my desire to be nonpartisan. He said that he was on the board of Resources for the Future, which would be able to arrange a high-profile talk in Washington, maybe even at the National Press Club. I should tell them when the talk would be ready.

Naively, I hoped to affect the public conversation during the election campaign. I wanted to have a clear, written, presentation and a separate detailed scientific paper. I needed a month or so to get the presentation nearly ready – then I would contact them to make specific plans.

This, I thought, would be a one-off. My aim was to prepare one good presentation, and then I would return to pure science. So, for a brief period, I needed to be super-focused. I limited my government job to 40 hours a week and worked at least that many hours on my presentation.

However, Jim Pollack was right. Years earlier he advised me: make an honest estimate for how long it will take to complete a paper and then multiply by pi (about 3) to get a realistic estimate. Progress was slow; I felt pressured and could not sleep well. When I woke during the night, I got up, worked a few hours, then took a swig of cold and flu medicine and got some sleep. Probably not healthy, but it was a temporary procedure.

This dragged on until September. The scientific paper and the talk were still in preparation, but I contacted Resources for the Future and asked them to schedule the event for early October.

They chickened out. Lame excuses about needing to reevaluate their outreach and public education agenda: the election was “sucking all the air out of the room,” so they had to postpone any talks until early 2005. I did not try to figure out their real concern. They had known all along that my talk would criticize the Bush Administration’s climate and energy policies.

Poof. I felt deflated. At least I could relax.

Then, on 5 October, I learned from a Goddard public affairs officer that the press release for a paper by a GISS scientist had been held up for a month. All Earth science press releases were being reviewed by the Associate Administrator for Earth Science and by two political appointees at NASA Headquarters. Some of them were then sent to the White House, where they were often edited before approval or disapproval.

NASA’s Office of Propaganda, titled the Office of Public Affairs, again! That night I could not sleep. I got up in the middle of the night and wrote a long letter to 90-year old Professor Van Allen. It took most of the night. I kept it on 2 pages by using small margins and single spacing.

I summarized the whole story – the climate story, the Cheney task force, censorship by NASA Headquarters, retraction of the speaking opportunity – and asked whether a talk at the university was possible. It probably would have no impact, but I would regret it, if I did not try.

Van Allen’s stature was such that he could go straight to the President of the University and get approval for a “Distinguished University Lecture.” The President had Van Allen call me to verify that I was giving the talk as a private citizen and not using government travel funds.

I was glad to learn that a Distinguished Lecturer usually went on the popular statewide radio program “Talk of Iowa.” I agreed to do that. I would describe the climate threat, policy actions that could diminish the threat, and the relevance to the United States Presidential election.

Republican John McCain once had been my favorite for President, when he advocated campaign finance reform. However, in the current election, I would recommend Democrat John Kerry over George Bush, because of climate change and the Bush/Cheney energy policy.

I hoped to spark a debate. Iowa was a purple state, a swing state. If reporters drew Van Allen into a debate, it might affect votes. Van Allen was one of the most respected people in the state.

The “Talk of Iowa” opportunity disappeared, however. “Not enough time to arrange it.” Surely that was not the real reason. Understandably, the University did not want to be seen as partisan. Still, after all the stress, it was disappointing to lose that chance to affect some votes.

There was still one possibility. I could write my talk and make it available to the media, with its figures. My media list was only a few dozen reporters who contacted me, not the thousands of media outlets that NASA had. Still, my presentation might be picked up by several reporters, if it were well written and included important results.

Indeed, we had a fundamental result: observations confirmed that Earth was out of energy balance – energy absorbed by Earth exceeded energy emitted back to space. The imbalance was about what we had inferred in our 1997 “Forcings and Chaos” paper.

It takes a lot of time to write a paper, submit it, get referee reports, revise, get final approval, and publish a paper – I could not complete that process before my talk in Iowa. I would give the main result in my talk, before the paper was published. That was risky – journals might not accept the paper – but it was a necessary risk. I sent a draft of my talk to several reporters.

The day before my talk, it was still not ready. I changed our airline reservations, paying a penalty for my slowness. Anniek, who had not met Van Allen, was going with me. With the new tickets, we would leave early on the day of my talk to guard against a weather problem.

At 4 AM on 26 October, the day of the talk, the final version of my talk was ready. I could sleep only an hour before we had to get up to head for the airport. An article on my talk had already appeared on 25 October in the San Diego Union-Tribune. An article by Andy Revkin appeared in the New York Times on the day of my talk.

The newspaper articles focused on my criticism of the Bush Administration’s energy policy. Revkin included my assertion that the NASA Administrator told me not to talk about “dangerous human-made interference” with climate. The Union-Tribune article included my revelation that the NASA Office of Public Affairs was doctoring science reports for political purpose.

When Anniek and I arrived in Iowa City, I was given a phone message from Larry Travis, my deputy. He read an e-mail message¹ from Andrew Falcon of the NASA Headquarters Chief Counsel’s Office. Falcon suggested that I may be prosecuted under the Hatch Act, if I did not eliminate all political elements from my presentation.

Falcon’s advice did not seem credible, and I ignored it. I was on vacation time, and I was paying all expenses. I felt a little zombie-like from lack of sleep, but it was o.k., because I would read my talk, which would be given in the auditorium of the physics building, Van Allen Hall.

Prof. Van Allen sat in the front row and would introduce me. The seating sloped up to the back. Mrs. Van Allen came in the entrance at the back of the room, walking with a cane, and sat down in the back row. The room was nearly full with students, faculty and townspeople.

I began my talk² by reading the abstract: “I have been told by a high government official that I should not talk about dangerous anthropogenic interference with nature because we do not know how much humans are changing Earth’s climate or how much change is dangerous. Actually, we know quite a lot... Actions that would alleviate human distortions of nature are not only feasible but make sense for other reasons, including our economic well-being and national security. However, our present plan in the United States is to wait another decade before re-examining the climate change matter. Delay of another decade, I argue, is a colossal risk. The scientific method... has the potential to aid the public and decision-makers... So far, this process has been hampered, as the global warming story reveals various dangerous interferences with the scientific process.”

Humans were affecting global climate, I said, by altering Earth’s energy balance. Normally, Earth emits to space the same amount of energy that it absorbs from sunlight. If some “forcing” that alters the balance is imposed, Earth will warm or cool as needed to restore balance, but the restoration requires time because of the large thermal inertia of the ocean.



Fig. 36.1. Sophie showing a 1-watt light bulb to baby brother Connor.

The forcing by human-made greenhouse gases was accurately known because the gas changes are measured: it was about $+3 \text{ W/m}^2$. Human-made aerosols cause a cooling by reflecting sunlight to space: the aerosol forcing is not measured but it is estimated to be between -1 W/m^2 and -2 W/m^2 , leaving a net forcing that is probably between $+1 \text{ W/m}^2$ and $+2 \text{ W/m}^2$.

I used our second grandchild, Sophie's 5-month-old brother, Connor, to help give the audience an idea of the order of magnitude of the forcing. In the photo, Sophie is holding a 1-watt Christmas tree bulb. Connor was not much help in choosing between $+1$ and $+2 \text{ W/m}^2$.

Tica Novakov, a world expert on how technology changes during the past century altered the aerosol amounts produced by various engines, and Dorothy Koch, with a global aerosol model, helped to produce and give credibility to a temporal and spatial distribution of aerosols in our climate model. The result was a net climate forcing of about $+1.6 \text{ W/m}^2$ in 2000, with large uncertainty that is difficult to quantify.

Confirmation of Earth's energy imbalance was our new science result. Our 1997 "forcings and chaos" paper inferred indirectly that there must be an imbalance of the order of 0.65 W/m^2 . Now data were available to check that conclusion.

Josh Willis of the NASA Jet Propulsion Laboratory and Dean Roemmich and Bruce Cornuelle of Scripps Institute of Oceanography analyzed a million measurements of temperature in the upper 750 meters of the ocean to deduce changes in the upper ocean heat content. Their result, the red curve in Fig. 36.2, showed that the upper ocean was gaining heat at a rate equivalent to 0.6 W/m^2 averaged over the entire surface of Earth and averaged over the period 1993-2003.

We had an improved climate model that could be compared with this new data. Gary Russell developed a dynamical ocean model based on fundamental equations that properly conserved ocean quantities such as heat, salt, and momentum. Thus, it was a good model for investigating basic issues such as Earth's energy balance, even though the model resolution was coarse.

We used the aerosol history produced by Koch and Novakov and ran the model five times for the period 1880-2003. It produced slightly different results in each run because of the chaotic nature of atmosphere and ocean dynamics, but all runs obtained an increase of upper ocean heat content similar to that observed (Fig. 36.2). In our model the ocean at depths below 750 meters gained heat at a rate 0.15 W/m^2 , so we inferred a planetary energy imbalance of 0.75 W/m^2 .

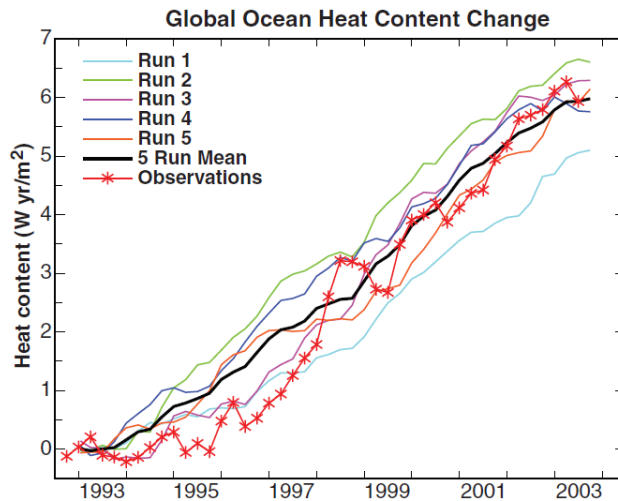


Fig. 36.2. Ocean heat gain in top 750 m of the ocean in observations and climate model.

Such close agreement of model and observations may have been fortuitous. There was potential error in the observation, and uncertainties in the model aerosol forcing, equilibrium sensitivity, and ocean mixing. Yet the observations proved that there was a large planetary energy imbalance and our model gave results in the right ballpark.

There were few questions after my talk. Anniek and I spoke briefly with Van Allen and I accepted his invitation to visit him in his office the next morning – which required changing our plane reservations again. We walked out of the auditorium into cool late October air. It felt good to walk Iowa City streets again. The pressure was off. We had skipped dinner, so we went into a student pub, where I never visited as a student. We had French fries and hot chocolate. I was glad it was over, but it felt anticlimactic – what had been gained by all the effort?

There were several news articles the next day. CNN.com quoted me as saying “In my more than three decades in government, I have never seen anything approaching the degree to which information flow from scientists to the public has been screened and controlled as it is now.”

National Public Radio provided a flicker of hope. They asked me about a potentially “nefarious” memo from Glenn Mahone, head of NASA’s Office of Public Affairs, to NASA employees. The memo concerned the need for NASA employees to maintain “consistency” of message.

I urged NPR to investigate. I could provide contacts – Rob Gutro and Krishna Ramanujan at Goddard – who could confirm interactions between NASA Public Affairs and the White House. I spoke with Gutro and Ramanujan – they were both scared, understandably, as they had young families to support. They said that I was “not going to get cooperation” from them, they had been “talked to,” and they “could be fired.” They explained that Glenn Mahone had driven from NASA Headquarters to Goddard and had personally chewed them out in front of their superiors. Gutro and Ramanujan were not even NASA employees; they were contractors working for the Goddard Public Affairs Office. I thought that they may be willing to cooperate if NPR assured them that the full story would come out and NPR would try to protect them. I never heard more.

I cast my vote in Bucks County, Pennsylvania. It’s nice to live in a purple state, where a vote counts. That evening Anniek and I settled down with popcorn to watch the returns. Iowa was

interesting – too close to call until the next day, when Bush won the state by a handful of votes. However, the national result was clear by midnight: Bush had won reelection.

It dawned on me that I had better be in my office the next morning, so we packed up for a drive in the wee hours. As we came around a curve, suddenly there was a deer in our path. I hit the brakes, but it was too late. We slammed into the deer, whose body was hurtled down the road.

We sat stunned for moments, as the deer lay motionless. Then the deer raised its head and struggled, trying to get to its feet, but its legs were broken. For the first time since childhood, I burst into tears. Anniek called a friend whose hobby was wildlife rescue – no answer.

“Information” gave us the phone number of a relevant state agency – a machine answered and took a message. Anniek walked up a long lane to a house, rang the bell until a man finally appeared. He was a policeman. Maybe he would shoot the deer, if that’s what they do.

Then we drove on to New York City, silently.

Chapter 37. A Second Chance

The next morning I wrote a letter to John Marburger, Science Adviser to President Bush. I requested a meeting to discuss the urgency of action to address climate change. I did not expect a reply, but who knows – it seemed to be the best chance to reduce the risk of retaliation against the Institute for my criticism of the Administration and to keep a focus on climate change.

Unexpectedly, a second chance for public communication arose in August 2005. Ralph Keeling asked me to give a lecture in honor of his father, Charles David Keeling, who had died in June. The talk would be at the American Geophysical Union meeting in December in San Francisco.

It was an honor as well as an opportunity. Dave Keeling had the foresight to recognize the great value of a precise time series of atmospheric CO₂. He doggedly continued the monitoring, overcoming bureaucratic obstacles. His data brought world attention to rising CO₂.

I suggested that Wally Broecker would be the best person to honor Keeling, but Ralph wrote that he had read my Iowa talk and wanted to “give me the stage for presenting [my] perspective on the overall science of global warming and where we are heading. You’d honor my father best by telling your own story and thereby carrying forward the torch that he helped to light.”

Ralph noted that only minutes before dying of a heart attack, Dave Keeling was involved in a discussion with one of his other sons about our paper³ “Earth’s Energy Imbalance,” which had just appeared in *Science*. That was the paper central to my Iowa talk.

A Tribute to Charles David Keeling: “Is There Still Time to Avoid ‘Dangerous Anthropogenic Interference’ with Global Climate?” was the title of [my talk](#).⁴ I began with the famous “Keeling curve” for CO₂ amount at Mauna Loa, Hawaii (Fig. 15.3).

The Keeling curve reveals a clear annual cycle in atmospheric CO₂. During the Northern Hemisphere growing season, vegetation sucks CO₂ from the air and atmospheric CO₂ declines. Decomposition of leaves and plant litter returns CO₂ to the air year-round, but it is during the fall and winter, when there is little plant growth, that atmospheric CO₂ increases.

More important, the Keeling curve showed that CO₂ was increasing year by year. The annual increase was about 1 part per million (1 ppm) in the 1960s. One ppm of CO₂ is a lot; about 2.12 GtC (gigatons of carbon; a gigaton is a billion tons) or 7.77 GtCO₂ (see Chapter 20). Today the annual increase is about 2.5 ppm per year (blue curve in Fig. 37.1a).

The annual increase of atmospheric CO₂ averages just over half of the CO₂ that humanity is emitting to the air by burning fossil fuels (37.1b). Deforestation, increasing wildfires, and human disturbance of soil carbon also affect atmospheric CO₂, but fossil fuel use is the basic cause of rising atmospheric CO₂. The ocean, biosphere and soil on net take up 40-50 percent of fossil fuel emissions, despite less than optimum agricultural and forestry practices.

Keeling’s iconic CO₂ time series was the first critical climate metric to be established with the accuracy needed to monitor the global system. Other metrics include global temperature and Earth’s energy imbalance. We need precise time series of the basic metrics to help us understand the system and assess our progress in dialing back human-made interference with climate.

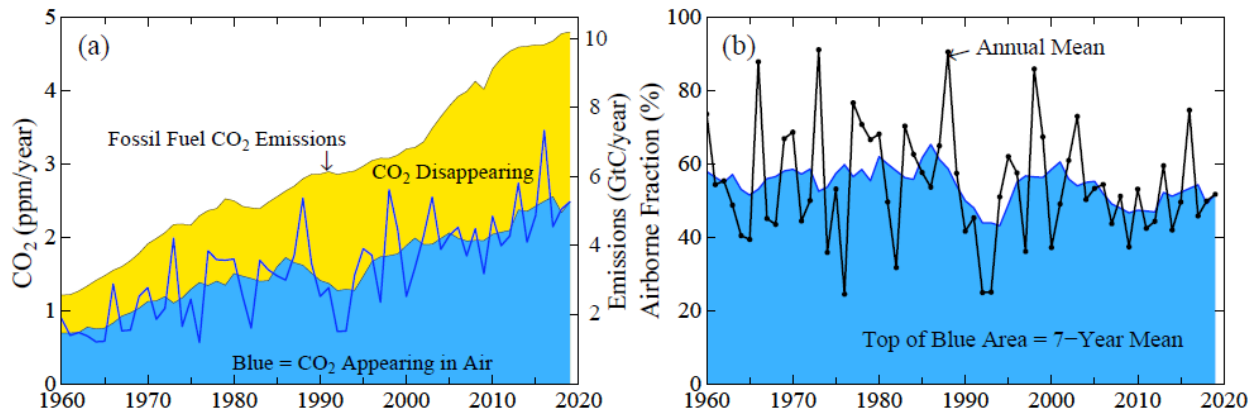


Fig. 37.1. Annual fossil fuel CO₂ emissions and annual increase of atmospheric CO₂ (blue line), which amounts to 50-60 percent of the fossil fuel emissions, as shown in (b).

Something about my AGU presentation caused consternation at the White House and NASA Headquarters, as noted below. It is unclear to me what may have sparked their anger, but here are assertions and topics in my presentation that conceivably were unwelcome.

(1) Lines of evidence that Earth’s climate is nearing a tipping point, beyond which it will be impossible to avoid “far ranging undesirable consequences.” Warming of the ocean initiates melting of ice shelves that buttress the ice sheets on Antarctica and Greenland, which could unleash a dynamical process – aided by amplifying feedbacks – that we would be unable to stop.

(2) Likelihood that dangerous warming is lower than implied by IPCC’s “burning embers,” which had danger at +2-3°C relative to temperatures of the past decade. Business-as-usual fossil fuel emissions may lead to multimeter sea level rise on the time scale of a century, not millennia.

(3) Need to work with China and India to help reduce their emissions. I organized workshops on air pollution and climate at the East-West Center in Hawaii in 2002 and 2005 including scientists from China and India. We found many reasons to work together for mutual benefit, but concluded that it would not happen without government leadership and time was running out.

(4) I ended my Keeling talk by reading the statement:

“There is little merit in casting blame for inaction, unless it helps point toward a solution. It seems to me that special interests have been a roadblock wielding undue influence over policymakers. The special interests seek to maintain short-term profits with little regard to either the long-term impact on the planet that will be inherited by our children and grandchildren or the long-term economic well-being of our country.

The public, if well-informed, has the ability to override the influence of special interests, and the public has shown that they feel a stewardship toward the Earth and all its inhabitants. Scientists can play a useful role if they help communicate the climate story to the public in a credible understandable fashion.”

(5) In an interview, a few days after the Keeling talk, I noted that 2005 was set to be the warmest year in the historical record – exceeding even 1998, which was boosted by the strongest El Niño of the 20th century. The record warmth was evidence of a strong underlying global warming, consistent with the increasing CO₂ and the planet’s energy imbalance.

Perhaps it was the combination of all those. In any case, as Mark Bowen describes in *Censoring Science*,⁵ my presentations at the American Geophysical Union meeting elicited several phone calls from the White House to NASA Headquarters. In turn, on 15 December 2005 a “shit storm” broke out in the NASA Office of Public Affairs.

This “storm” was investigated in detail by Bowen and documented in *Censoring Science*. Additional information is given in Chapter 7 of my first book, *Storms of My Grandchildren*.⁶

David Mould, Assistant Administrator for Public Affairs, had been at NASA six months, replacing Glenn Mahone.⁷ Mould declared that a new rule was being put in place by the Administrator, Michael Griffin, who was Sean O’Keefe’s successor. No one was to take a call from the media without notifying the Public Affairs Office. NASA Headquarters retained “right of first refusal” on all interview requests. If they did not want to do the interview themselves, they would choose an appropriate NASA person.

I followed these rules for several weeks, keeping a record. National Public Radio’s *On Point* program requested an interview with me. It was denied by Public Affairs, which offered an alternative scientist. The *Los Angeles Times* was also directed to an alternative person to discuss our 2005 global temperature analysis.

As I grumpily completed mandatory annual government “training” exercises, which are reminders of NASA standards of conduct, ethics, equal opportunity, and so on, I suddenly sat up straight. I realized that the words provided ammunition that I could use for fighting the censors.

The first line of NASA’s mission statement was: “to understand and protect our home planet.” The last word in NASA’s core values: “integrity,” defined as honesty, ethical behavior, respect, candor. The first principle of government ethics: “public service is a public trust.”

I combined these principles with evidence for dangerous human-made climate change in a memo to my supervisor and higher levels of Goddard management, arguing that we should fight the Public Affairs restrictions. My memo concluded “If NASA is to fulfill its mission of providing information that helps the public and policymakers understand and protect our home planet, if it is to uphold its public trust with integrity, it cannot knuckle under to political pressures.”

Goddard management, however, was not the problem. The problem was at higher levels, at NASA Headquarters and above. We needed to get the information out. I had a chance meeting with the editor-in-chief of Time, Inc., publisher of *Time* magazine, as described in *Storms of My Grandchildren*. He expressed interest, so I spent two days writing a description of events in the prior two years. Anniek hand-delivered the package to his office, but nothing came of it.

Then I sent the package to Andy Revkin, a New York Times reporter. He found career civil servants, including a Public Affairs employee, who confirmed the story and provided specific quotes of instructions received from the NASA Headquarters Office of Public Affairs.

“Climate Expert Says NASA Tried to Silence Him” was the headline of a story on the front page of the New York Times on Sunday 29 January 2006. A light was shone on politicization of government Public Affairs offices. That light quickly dimmed.

The story had no lasting positive consequences. However, it did result in deletion of the first line of the NASA mission, “to understand and protect the home planet,” which I had been using as the first chart in my presentations, to justify talk of “dangerous” climate change.

The Administrator also reduced the NASA earth science research and analysis budget 20 percent. Cleverly, it was retroactive to the beginning of the fiscal year, so the budget for the next year showed a 1 percent increase, rather than its true 19 percent cut. Remarkably, Jack Kaye, the Earth Science program manager, a career civil servant, did not reduce our funding.

The conclusion of this story, described in Bowen’s *Censoring Science* and my *Storms of My Grandchildren*, is sordid. In short, NASA management and Congress managed to lay the censorship blame on a 24-year-old “gopher,” who carried instructions from the Administrator’s office to Public Affairs employees.

Sherwood Boehlert, Republican chairman of the House Committee on Science and Technology, was properly outraged by the censorship. However, in the aftermath of the affair, on 11 October 2006, at a meeting of the League of Conservation voters, where I was in the audience, Boehlert declared that the affair at NASA had been entirely the work of a renegade young man and that Administrator Griffin had fixed the problem comprehensively.

Both declarations were patent falsehoods. Later that evening I approached Boehlert and said “What you said isn’t right. The problem went all the way to the top, and it hasn’t been fixed.” Boehlert touched my shoulder and said “I know. I know.”

Boehlert was one of the good guys in Congress, a friend of science. He was universally respected and worked hard at bipartisanship. If the public were offered a return to a Congress of his sort, most would likely drop to their knees in thanksgiving and relief.

Yet that would not be enough. Young people must demand better for the sake of their future. We cannot allow the party in power to control the flow of scientific information from scientists to the public and put their political spin on the information.

Publicity about censorship, I hoped, would help the next Administration fix the problems. Nope. The Obama Administration did a study. It led to wordy guidance, too wordy, including words that solidified top down review and control of the release of scientific information to the public.

More important, political appointees still head Offices of Public Affairs. OMB still reviews and censors testimony of government scientists. Neither Democrats nor Republicans have been willing to give up these advantages of incumbency.

A democracy is hindered by these constraints. These problems can be fixed, but the public has grown impatient with continued failure of elitist governments. Failure to address legitimate public grievances strengthens the power of extremists within both parties in a two-party system. Bipartisan cooperation becomes more difficult. As the amplitude of political oscillations grows, the stability of our democracies is threatened.

I will suggest ways to address this situation, but I must present additional evidence first.

My public affair with Public Affairs was a turning point for me. It started a chain reaction, one activity leading to another. One consequence was that I was forced to try to communicate

orally without reading my talk. More important, the affair encouraged me to broaden my horizons beyond the physics of climate change.

It seems to me that the scientific method should be useful in considering the full range of options for dealing with climate change. Decisions will ultimately be made by the public and their representatives, but the public should be presented with full objective information.

I had focused narrowly for 15 years on trying to understand the physical climate system. But what about the effect on living things? Bill McKibben helped open a door to another world.

¹ “If the Times article is correct, he [Hansen] is going further than he has in the past, thereby placing himself at significant personal risk this evening. NASA does not have any control, input, or even insight into a decision by the Office of Special Counsel to prosecute Hatch Act violations....I think it would be advisable for Dr. Hansen, for his own sake, to consider modifying his speech to eliminate the political elements. This is not a direction from NASA management, which has not expressed an opinion on the speech, at least to my knowledge. This is simply offered in my capacity as an ethics counselor solely for the purpose of ensuring that, whatever Dr. Hansen does, he understands the ramifications of it, and, if he deems it appropriate, takes steps to mitigate the risks to himself.”

² Hansen, J., [Dangerous Anthropogenic Interference](#), Lecture, University of Iowa, 26 October 2004.

³ Hansen, J., L. Nazarenko, R. Ruedy, M. Sato, J. Willis, A. Del Genio, D. Koch, A. Lacis, K. Lo, S. Menon, T. Tsvakov, Ju. Perlwitz, G. Russell, G.A. Schmidt and N. Tausnev. [Earth's energy imbalance: Confirmation and implications](#). *Science* **308**, 1431-1435, 2005.

⁴ Hansen, J., [A Tribute to Charles David Keeling](#), 6 December 2005, AGU meeting, San Francisco, California.

⁵ Bowen, Mark, *Censoring Science: Inside the Political Attack on Dr. James Hansen and the Truth of Global Warming*. New York: Dutton, 2008.

⁶ Hansen, J., 2009: *Storms of My Grandchildren*, Bloomsbury, New York, 320 pages.

⁷ According to Bowen, Mould, a political appointee, previously held senior positions in public and media relations at the Southern Company of Atlanta, the second-largest holding company of coal-burning utilities in the United States and thus the second greatest emitter of carbon dioxide. Southern's contributions to the Republican Party in 2000 were exceeded only by Enron's.