

Proceedings of the Witnessing Professionals and Climate Change workshop
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Among the many reasons that I'm excited to be here is because of Robert J. Lifton. Robert is a hero of mine. We worked together in creating an event at Yale on March 4, 1969, which dealt with the obligations of scientists in relationship to the military. It was part of a day called "The Scientist Strike" that was organized at MIT and a pivotal experience in my own career.

Witnessing professionals is a pun that works particularly well for me. I do have a sense of duty to become involved, to bear witness. In my 30's, I left theoretical physics and committed myself to a career devoted to understanding the implications of the big idea that ordinary activities of people could overwhelm this small planet. In college I wanted to learn every big idea, and yet I had not heard this one. Like the Ancient Mariner, I feel possessed by that story, and I must tell it.

I also am more of a witness than a participant in the development of climate change science. At the invitation of Michael Oppenheimer, I wrote a paper in *Climatic Change*, the journal he edits, with the title "Tell Us More." It is addressed to the authors about to write the IPCC's [Intergovernmental Panel on Climate Change] fifth assessment report. At the time of the fourth assessment report was winding up, and "us" in "Tell Us More" are the consumers of this report, environmental leaders, business people, government staff, and the intellectually curious in all walks of life.

In that paper, I was urging that the IPCC place less emphasis on reporting consensus, and be more willing to display and explain disagreements. I witnessed not only the climate scientists, but also some of the communities trying to process climate science, notably environmental activists and scientists in other fields. I witnessed other witnesses.

I bring to this talk a career that began in theoretical physics, where I saw science at its best: openness, welcoming contention and resolution (the Big Bang versus continuous creation, for example), error correction, the back of the envelope calculation, and especially the meticulous attention to measures that would prevent putting a thumb on the scale (double-blind experiments, for example).

Some of the best physicists in the world ushered me out of physics when I committed myself to the environment, and I took the norms of physics with me. Ever since, for almost 50 years, I have sought to develop tools that can help the conversation about

sustainability. I keep asking where the conversation is stuck or is incomplete. Today, I will highlight three parts of this climate story. All three make people uncomfortable. I feel empathy for those who resist acknowledging climate change. I am discouraged that climate science isn't yet valued sufficiently by the science community as a whole. And I am dismayed when people who have a favorite solution to climate change don't worry at all about advocates of other solutions carrying the day on behalf of dangerous solutions.

So, first climate change resistance, then climate change science, then dangerous solutions.

Climate change resistance. Humankind has discovered an unwelcome fact of existential significance. Our planet is small. Al Gore uses irony: it is an inconvenient truth. By our own actions, we can fish out the oceans, extinguish most of the species we share the planet with, raise sea level. It will take positive action to sustain ourselves.

Not surprisingly, the message is resisted. It is not hard to empathize with this resistance. We wish we lived on a larger planet. People intuit that there are unappealing implications for consumption, for equity, for population size. Their resistance is similar to the resistance to Galileo's finding that we aren't at the center of anything cosmological, and Darwin's finding that we are part of a continuum of creatures. In all three cases, one finds division and distancing. Galileo and Darwin knew the potency of their news.

Is there a corresponding figure, be it a scientist or theologian or politician or someone in this room, who can communicate the new imperative of sustainability with a generosity of spirit? Right now, there seems to be a preference among environmental leaders and activist scientists for building a movement, and a movement (as Gus Speth explained to me) needs victims and villains. Might some socially engaged scientist lead the public conversation down other paths based on a search for common ground?

Climate change science is undervalued. We could easily have not understood the climate change happening around us. Scientists organized themselves to study the planet coherently about 60 years ago. The international geophysical year was 1957-58, and it spawned the first Antarctic ice cores. Charles David Keeling began measuring the CO₂ concentration on Mauna Loa in 1958. We are deeply in the debt of the climate scientists, a few thousand people. Without them, we would be flying blind, but we rarely acknowledge this. Naomi [Oreskes] is a student of this history.

Why is there no advocacy for what I believe to be an imperative, a much larger global research program in climate science, and one that is risk driven? The current program is not risk-driven. How quickly can things get bad? Which particularly bad outcomes actually can be ruled out? To reorient climate science is a task in itself, widely recognized,

but little implemented because of social norms within the scientific community that need to be better understood.

Would risk-driven climate science be more broadly supported, leading to more satellites, more ocean buoys, tighter instrumentation of Antarctic ice, and myriad studies of the tundra? Effective advocacy for, say, a five-fold expansion of global climate science would need to come from outside the climate change science community.

Today, advocacy for continuing today's climate science observations is critical. In the news this week is that the Trump administration is suspending a satellite-based carbon inventory program, and yet I don't hear comments on it from the broader community. Such advocacy isn't even on the minds of NGO's [non-governmental organizations] as far as I can tell. Their narrative is that climate change is settled.

Portentously, raising the priority of climate change also isn't on the minds of the scientific leaders in other fields either. Unfortunately, the politicization of climate change has made climate change science suspect in the minds of influential scientists in the two fields I know: physics and aerospace engineering.

Assertions that 97% of climate scientists believe x (here, x is that climate change is caused by people) are counterproductive for that audience. Science isn't about believing and it isn't about voting. Every good scientist leaves room for doubt. No other scientific field is shackled by anything resembling 97% as far as I know.

I sometimes think that I'm 97% sure that the dominant cause of climate change we have seen so far is human activity, but I'll hold back 3% for natural variability. The signal is gradually emerging from the noise in the form of specific patterns of warming.

But I was at a meeting yesterday with an expert on climate change communication, who is at Climate Central. Her name is Karen Florini. She made the point that nothing is as effective, as far as they can tell, in persuading people to take climate change seriously than the statement that 97% of climate scientists believe that climate change is real. The very statement that makes me cringe – and makes colleagues of mine whom I want to bring along cringe – is the one that is most effective in public communication.

Respect for climate science is slowly increasing. I think it is partly generational: one of the reasons people's paradigms shift is because people die. It is important to take into account, in today's discussion here, what makes scientists in one field respect the science in another field?

Dangerous solutions. My third part today. Melissa [Lane] and Nancy [Rosenblum] have asked us to discuss "the distinctive obligations" we have by virtue of being people with

special knowledge. Within this charge, Melissa and Nancy suggest that our "special knowledge is about the concrete impacts of climate change on people's lives." I wish to insert two words into their sentence: "the concrete effect of climate change *and solutions* on people's lives."

I feel compelled to bear witness to the risks of solutions. I resist the entire framing that says we have a single overriding problem called climate change and that we must throw caution to the winds to solve it. Climate change is one of several big problems, and there are several ways of addressing climate change that could be cures worse than the disease.

I have in mind: 1) nuclear power without strong international controls to prevent leakage into nuclear weapons programs and then nuclear war; 2) strategies that modify fractions of the Earth's land (why privilege the atmosphere over the biosphere?); and 3) manipulations of the stratosphere so that more sunlight is reflected: so-called geoengineering.

All three solutions are in play. Regarding nuclear power, I quote from an article in *Daedalus* that I wrote with Alex Glaser, another professor here, called "Balancing Risks: Nuclear Energy and Climate Change." We struggled to write this paragraph:

The upper limits of climate change are terrifying, amounting to a loss of control of the climate system as positive feedbacks of various kinds set in. Nonetheless, at this moment, and conceding that such calculations can only embody the most subjective of considerations, we judge the hazard progressively pursuing the global expansion of nuclear power today, to be worse than the hazard of slowing the attack on climate change by whatever increment such caution entails.

Nuclear weapons are more desired today than at the time that Alex and I wrote that paper. The US in the past two decades has made them more desirable.

A geoengineering discussion, which is vexing on its own, is imminent. There was a meeting of scientists and religious leaders devoted to geoengineering here on campus about a week ago. The participants came to understand that they're going to be asked to come to terms with the deliberate modification of the planet for human convenience. "Deliberate" as opposed to "accidental." It may not be straightforward to decide what "deliberate" entails.

A modern version of the Hippocratic Oath, attributed to Louis Lasagna, goes like this: "I will apply for the benefit of the sick, all measures that are required, avoiding the twin traps of overtreatment and therapeutic nihilism." Anyone who's had a very sick friend or relative – or perhaps has been very sick herself – and has had to deal with whether to use

a strong drug knows this concept of the twin traps of overtreatment and therapeutic nihilism.

To summarize, I think scientists have a role in bringing about a less strident and more nuanced discussion that, over time (perhaps a decade), will elicit the forceful action that most of you in this room and I would like to see.

I also know that nuance can obviate action. To me, an essential question for the engaged professor is how much complexity to reveal. Does candor build trust but not lead to commitment? I err in favor of candor, perhaps to a fault. There's so much to do, and I want us to ask why we aren't moving faster.

Thank you.

[“Witnessing Professionals and Climate Change”](#) was a workshop hosted by the [Social Science Research Council](#) [Anxieties of Democracy](#) program as part of its [Working Group on Climate Change](#). The workshop was hosted in collaboration with Princeton University’s [University Center for Human Values](#), [Program in Science, Technology, and Environmental Policy](#), [Climate Futures Initiative](#), and the [Princeton Environmental Institute](#).