Dr. James Hansen: the 2012 Stephen H. Schneider Award for Outstanding Climate Science Communication

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Greg Dalton: In 2006, I had the opportunity to interview Elizabeth Kolbert up here. She's a staff writer for The New Yorker and author of "Field Notes from a Catastrophe." It's the first time that I had the opportunity to really engage on climate change.

A year later, I went to the Arctic in 2007 with the Commonwealth Club group. We went on a Russian icebreaker and a number of scientists, Ron Prinn from MIT, John Harte from CAL and others, Forrest Sawyer, Tom Brokaw from NBC News. We flew on in helicopters, we walked on a melting tundra, and we actually saw it, touched it, tasted it and saw the -- really, a shrunken sea ice, I was wearing a Hawaiian shirt in the Arctic, a little bit, yeah, scary, and came back and said, "What can I do about this?" This is really scary, this is really interesting, you know, spent a couple weeks crying, putting together a video. And I went to see Steve Schneider. He was nice enough to see me, and I asked him, "Who did this? What about climate change? I didn't know very much." Said, "Hey, how about we get together Carl Pope, head of the Sierra Club and Bjorn Lomborg?" He said, "Don't waste your time. Lamborg is an idiot." (laughter) and laid out a lot of things. Steve became the first member of the -- of the Climate One advisory council, and was privileged -- honored when he chose right here in 2009 to launch his last book, "Science as a Contact Sport," and that's what you saw there. (00:01:57)

In 2010 in the summer, Steve was gonna come to dinner at Climate One. We were having Joe Romm, who is the blogger from Climate Progress, was gonna be here, we're gonna have dinner with some people. And Steve emailed me from Europe a few days before with a headline, "Stanford professor wimps out." and he said that he couldn't make it, he was not in good health and he needed to, quote, "Stop burning the candle at both ends and in the middle, too." and he died that day on that flight back to San Francisco. So I decided what can we do about this, and I approached a couple of his friends at Stanford, Larry Goulder, Paul Ehrlich and said, "How about we do an award?" I don't know him as well as many people at Stanford, many of the people we just spoke with, but it felt like really incumbent upon me to do something, so we formed the award. Last year we were thrilled, Richard Alley was the first winner of the Stephen Schneider Climate Communication Award here and he's the host that you heard of the PBS documentary that is worth watching. And I promise you, we're gonna do this every year and we will have natural and also social scientists, and I assure you they will not all be men.

So, with that, I'd like to invite this year's winner, Dr. James Hansen to join me on stage.

[Applause]

I've interviewed a lot of fantastic people in this room and that doesn't happen very often.

Welcome to Climate One, a conversation about America's energy, economy and environment. I'm Greg Dalton. In 1988, NASA scientist James Hansen told a congressional hearing that it was 99% certain that burning fossil fuels was heating the earth's atmosphere.

The next day, a New York Times headline proclaimed, quote, "Global warming has begun, expert tells Senate." A quarter century later, Dr. Hansen and other scientists are still striving to convince much of the United States that basic scientific observation -- seas are rising, glaciers are disappearing, floods are increasing. Humans are the cause. About half of Americans now accept that fact, 40% do not, according to Gallup.

Over the next hour, we will discuss climate science communication, public policy and opinion, with James Hansen and our live audience here at the Commonwealth Club of California in San Francisco. Today, Dr. Hansen is receiving the 2012 Stephen Schneider award for Outstanding Climate Science Communication bestowed by Climate One. Stephen Schneider was a pioneering scientist at Stanford who was involved in the formation of Climate One that which is a sustainability initiative at the Commonwealth Club. So please welcome, Dr. Hansen to Climate One.

[Applause]

Dr. Hansen, welcome back. It's been two years since you were here. I'd like to begin with Hurricane Sandy. You are a teacher at Columbia, you live in Manhattan, where were you when Sandy was approaching and when Sandy hit New York?

James Hansen: I was on our farm in Kintnersville, Pennsylvania, where we ended up losing power for better part of the week, and four big trees blown over, the railings blown off our deck and windows blown out of the barn. So even in Pennsylvania, which is separated from the Atlantic Ocean by New Jersey, we still --

Greg Dalton: Thanks, New Jersey.

James Hansen: New Jersey didn't do much to buffer it. But that's where I was. And we -- you know, the lights went out and we heard these noises on the second floor as the -- as these railings were getting blown out. (00:06:05)

It was a -- a -- little, I don't know, just an interesting experience.

Greg Dalton: Your first -- first biggest storm like that, you got other storms was this bigger than --

James Hansen: I think this was the biggest one that I was in. Even though I'm from Western Iowa, where we would get these tornado warnings all the time and have to go to the basement, but we never got hit by a tornado. So I think this was the biggest one that I was in.

Greg Dalton: And then, when did you go to New York and what did you see when you went into Manhattan?

James Hansen: I drove to New York excitedly as a 25-year-old graduate from Professor Van Allen's physics department at the University of Iowa in 1967, where I met Steve Schneider who was a student at that time. And, if I could just say a couple words about Steve, it's kind of -- it's ironic that I'm getting the Steve Schneider award because we could not have been more opposite. (Laughter) He had the gift of gab, you know, he's so articulate as a student and as a postdoc. So when I -- then I went off to the Netherlands where I met my wife, who -- then I came -- who eventually became my wife, but I -- when I came back to the Institute for Space Studies, Steve was in a post doc at the institute. And, as I say, we couldn't have been more opposite. He -- as I was this taciturn Midwest scientist who wanted to do the numbers and do my science and not talk about it, but he would come to my door, he would be in the door of my office and talking to me and, eventually, I would turn around and be working on my desk and he -- somehow, he couldn’t take the hint.

[Laughter]

But when Anniek who was then my girlfriend, would visit me, then she would see that, well, I really didn't want to talk to Steve. So she would talk to him, and that was good, let me try to work. But if you try to work, you know, like when the television is on, and you're trying to do work, it's very hard. But, anyway, we actually -- despite this, we became friends and Anniek and I went mountain climbing with him in the small mountains around New York. But --

Greg Dalton: And you've actually delegated to him some of the communications requests that came to you.

James Hansen: Yeah, because I didn't -- and when I -- after I testified in 1988 and realized all the hoopla that went with that, which is not what I do, I'm not a communicator and I don't enjoy it. So, when there were request for interviews, Steve said he was happy to take them. So --

Greg Dalton: And that division of labor was fine with you?

James Hansen: Yeah, that was fine with me. And if they insisted on someone on the East Coast, then I send them to Michael Oppenheimer, but --

Greg Dalton: He's at Princeton. So --

James Hansen: Yeah.

Greg Dalton: So on Sandy, when you went back to New York after Sandy, what did you see and what were you thinking? You wrote a book, "Storms of My Grandchildren." Were you thinking, "Aha, the storms I've been writing about are here now"?

James Hansen: Well, it was an example. The storm -- you know, I titled it "Storms of My Grandchildren" because, if we pass the point where Greenland begins to shed ice fast enough to cool the North Atlantic, which only requires that you get up to about half a meter or so from Greenland, that will increase the temperature gradients between the high latitudes and low latitudes and that is what drives cyclonic storms.

So some of these storms of the century that we've had, the really big cyclonic storms which, unlike a hurricane, they stretch for thousands of miles. So you can have one that stretches from the Caribbean to Canada and with hurricane force winds. And now, if we increase the temperature gradients by several degrees, which we can do, we're going to get those types of storms and Europe will particularly suffer from them. But when you get a hurricane embedded within one, then you get double dose and that's what happened with Sandy and that kind of thing will happen, too if we get stronger cyclonic storms. And the damage goes like the cube of the wind speed. So it's not like -- you know, if the wind speed had been 10 miles per hour less, we wouldn't have had all that damage. Those trees have been standing there for centuries. These were really big trees on our property. So there haven't been storms like that, or those trees wouldn't still have been there.

Greg Dalton: And was there a human fingerprint on Sandy? Could you say how much climate change contributed to the ferocity and the intensity of Sandy?

James Hansen: Well, there's a human fingerprint in several ways. The ocean was unusually warm along the Eastern seaboard and it was warmer by more than the global average, so people are saying, "Oh, you can only credit one quarter of that to global warming." Well, the warming, it's like, these extreme events that we're getting, we're getting them much more frequently. Of course, you can't say where and when they are going to be, but if you just -- as I say, the climate dice are now

loaded, and they are loaded in such a way that, not only do we get more unusually warm seasons, but those which are most extreme are much more frequent than they used to be. So this warm patch of water, I would say, you would not have had -- unlikely that you would have such extreme warming without this global warming underneath that.

So that's one thing. But in addition, the global warming makes more water vapor in the atmosphere which makes the rain fall heavier and the floods greater. So there is a connection with global warming, even though as scientists always like to say, "Well, you can't blame a single event and connect that in a simple way to global warming." but the frequency and extreme -- extremity of those events, you can connect to global warming in a very straightforward way.

Greg Dalton: Because I had heard from some people that hurricanes was where the data was less firm. Sea level rises very good data, precipitation events, floods has very good data, but hurricanes is where people who are skeptics or deniers like to say, "Aha, not so."

James Hansen: The frequency of occurrence of hurricanes is affected by many factors, not just the global temperature. But the storms that are driven by latent heat are -- that like have their fuel from latent heat and that includes hurricanes, thunderstorms, tornados, you have more fuel for those, so the strongest ones are going to be stronger. The number of hurricanes is a -- is more difficult and that is a matter of research, but the region in which you can possibly have hurricanes is expanding and the seasons in which you can have -- Sandy was the end of October. It's very unlikely that we could have had that without the fact that the seasons are now getting longer -- warm season is getting longer.

Greg Dalton: So what can you say about the probability of more Sandys, bigger Sandys, a bigger area of the country, the world that could have something like super storm Sandy?

James Hansen: Well, the strong storms are if we continue down this path and I don't think we need to continue down this path, we're going to have more strong storms, that's clear. As I said, the fuel is the latent energy that you'll get from water vapor.

Greg Dalton: The author and advocate, Paul Hawken, has often said that two Category 5 storms up the I-95 quarter in one year would be a game changer for the United States that that's when people would wake up. That's basically happened. Two large storms --

James Hansen: Yeah, yeah.

Greg Dalton: -- up the Eastern seaboard --

James Hansen: Yeah.

Greg Dalton: -- in one year, is it a game changer?

James Hansen: Well, it could be. It does require that we put the pressure on the political system that causes it to be a game changer. And we need to be doing the right things, as -- you know, we need to put pressure on the system, and it's not just saying, "Do something." You have to actually look at what politicians are proposing to do.

Greg Dalton: And you, unlike a lot of scientists, actually went, got arrested and have kind of gone from a scientist to an advocate. Do you think that's the right way -- a civil disobedience direct action is a way to pressure the government?

James Hansen: Well, that's one. I think peaceful disobedience is one way to draw attention. I'm

not suggesting that young scientists do that and get an arrest record, but when you're my age, it's not -- it's fine. (Laughter). But, again, it's important to really think through the problem, through the solution. And I really object to politicians and others who say scientists should just stick to narrow science and not look at the whole problem, because you do have to connect the dots and scientists are actually trained to be objective and to understand complex problems and this is a complex problem.

Greg Dalton: But some people would say that your activism clouds your science.

James Hansen: Well, the science has to be judged on its own merrits. I frankly think that the scrutiny of my papers has become greater. And -- but, anyway, they have --

Greg Dalton: The FBI or who are you talking about?

[Laughter]

James Hansen: No, I'm talking about --

Greg Dalton: Scientists.

James Hansen: Not even as much the scientists as editors. You know, they're very cautious, even when I recently got the strongest reviews possible, the highest ratings on a paper that I submitted to the proceedings of the National Academy of Science. The editor was apparently -- got a little worried when he saw the title of the paper which was "The Case for Young People and Nature." and there were statements in the abstract which apparently attracted his attention. So he gave the paper to the editorial board, and the anonymous editorial board says, "Scientists should not be making normative statements about intergenerational injustice and such things." So, I think, I frankly find that, in some ways, it's become harder. So, anyway, the science --

Greg Dalton: You are held to a higher bar, is that what you're saying?

James Hansen: Yeah, it becomes -- yeah.

Greg Dalton: And back on in pressuring the government. So direct civil disobedience is one way. What are other ways that can -- you say this thing -- you know, science is clear, government is the problem. How can the --

James Hansen: Well --

Greg Dalton: -- government be pressured?

James Hansen: Yeah. There are multiple ways and I think we need to use a number of them.

One of them that we're using is to file lawsuits against the government to do their job. So Our Children's Trust is -- has filed a suit against the federal government and against some state governments, asking the court to require the government to give a plan for how it's going to protect the rights of young people. Whether this will work, I don't know, because courts do not tend to get way out in front of the public. In the case of civil rights, that tactic worked eventually, but by that time -- and the courts told the government that they should desegregate schools, give a plan how you're going to give equal rights to minority children. And -- but by that time, the public was marching in the street. So we have to get the public behind this, but also we have -- we have a democratic process, we need to try to influence that with the people we elect and the things that we ask of them. So, for example, there's an organization called Citizens Climate Lobby. And they now

exist in -- apparently some of them are here.

[Laughter]

Greg Dalton: Infiltrated.

James Hansen: They have -- they've doubled in size each year the last four years and they now exist in all 50 states and they are going to visit their Congress people, writing up ads, and, in particular, they're advocating a -- putting a price on carbon emissions which -- on carbon, which will be collected from fossil fuel companies at the source, at the domestic mine or the port of entry, and the money would be distributed 100% to the public on equal amount to each legal resident of the country on a per capita basis.

That would provide the -- that's what is essential. As long as fossil fuels are the cheapest energy, then people will keep burning them, and they're only cheaper because they -- partly they're subsidized, but mainly because they don't pay their costs to society. So the air and water pollution that they produce causes lots of health problems and about 40,000 deaths a year at the United States and about a million worldwide. All those health costs are born by the public, not by the fossil fuel companies.

The climate costs, which are already enormous, $50 billion for New York, from Sandy, $50 billion in New Jersey, the drought last summer, these are -- these have enormous costs. Who pays those? The taxpayers, basically.

Greg Dalton: That drought alone took half a point off of the GEP growth from estimates.

James Hansen: Yeah. So those costs are not built into the fossil fuels, and they should be. And the way -- so what you should do is have this gradually rising price on carbon collected from the fossil fuel companies with a 100% distributed to the public. It would spur the economy and --

Greg Dalton: What would the fossil fuel companies think about that?

James Hansen: You know, the fossil fuel companies -- well, they are the problem in a sense, but, you know -- I described this to a meeting of international labor leaders. And I said, "If you do this, then the marketplace will make the decisions, instead of the government saying, 'Let's subsidize solar panels or let's subsidize this.'"

The government usually doesn't get things right and it doesn't provide an incentive for all the other things that could help. There may be things that are much better than solar panels. So you have to just put the price on carbon, let the marketplace decide whether solar panels or windmills or energy efficiency or some things that we haven't thought of. But this -- an international labor leader stood up and said, "That's libertarian letting the marketplace --" of course, it is libertarian with a small "L," but it's also populist because most people are going to get more in their dividend and it gives them the opportunity to reduce their carbon footprint and make money in the process. But it's also democratic because it treats everybody equally. And I was going to say, the other group -- oh, the -- when I gave a talk at Grover Norquist's Wednesday meeting --

Greg Dalton: Oh, that must have been interesting.

James Hansen: -- one of the -- this was at the -- I gave two. There was first a meeting with him and some of the Republican leaders which was open, and then there was one which was closed and I can't talk about that one but I'm sure it was at the first one. That one -- (laughter) -- one of them said, "That's income redistribution." Well, yeah, it is. The people who do a good job will get some of

the money from somebody else. And -- but that's what if we don't do something like that. That's -- you see, we would reach -- if we did that, we would reach tipping points where alternatives would be cheaper than -- say, coal, and then you would quickly phase out the fossil fuel.

So you then leave it in the ground and that's what we have to do.

Greg Dalton: British Columbia is doing something like this so that maybe there's some different details, but British Columbia replaced one kind of tax, it was a payroll or corporate tax --

James Hansen: Yeah.

Greg Dalton: -- and imposed the carbon tax. Now, you think that's not high enough, but it didn't -- for example --

James Hansen: Well, I think the problem with that is -- and, Grover Norquist, by the way, he did decide -- well, you know, the thing -- I think what convinces conservatives is the fact that once they are smart enough -- and those who are smart enough to realize we're not making this stuff up, and there are most -- and I think a lot of them are smart enough to realize that, then, they start to think, "Well, gee, if we let -- if we continue to deny this, we'll reach a point where things happen like super Sandys. And then, the government is going to --" that's Pearl Harbor and the government will take over like the government took over Detroit and said, "You can't make cars anymore. You're gonna make airplanes and you're not gonna make money." They don't want that to happen, so --

Greg Dalton: They're gonna do something about it before -- intervention now --

James Hansen: Yeah.

Greg Dalton: -- is better than more intervention later, more government --

James Hansen: Right.

Greg Dalton: -- intervention later.

James Hansen: But I forgot what your question was.

Greg Dalton: Well, British Columbia --

James Hansen: Oh, British Columbia. Yeah, let me because I want to --

Greg Dalton: -- it's -- you don't like that example.

James Hansen: I do want to comment on British Columbia because -- and so, Grover Norquist said, "Well, maybe a tax is okay if we remove some other tax equal amount."

Greg Dalton: So it's revenue neutral.

James Hansen: And then, within one day, he changed his mind because, undoubtedly, some people helped him change his mind. But, I sent him a note that said you -- but you’re right, because if you replace one tax with another, probably we'll soon forget about that one that went away and they're gonna see every day at the pump, they're gonna see their gasoline is costing them more and they're gonna object ; they're not gonna let it go up.

So that system of trading taxes, I don't think is the right one. I think, instead of reducing another tax, give the money to the public. It will stimulate the economy, it will lead to innovations because,

then as long as entrepreneurs know that that price is gonna keep going up, they're gonna work very hard on finding alternatives.

Greg Dalton: So one more thing on British Columbia and all of that. It goes with this, but they put a price on carbon in place, it is lower than it -- you would probably want it, but they still reelected the government that did that.

James Hansen: Right.

Greg Dalton: It did not wreck the economy, it is still an example that --

James Hansen: Right.

Greg Dalton: -- the carbon price that doesn't sink the economy that can be a step in the right direction.

James Hansen: Yeah. That's -- it's not an unuseful thing, but if you look at their carbon emissions, you're not gonna find them going down. We have to actually get carbon emissions to go down at a rapid rate and that's only gonna happen with a substantial price which is rising over time.

Greg Dalton: Well, that's --

James Hansen: And that's why I -- you know, a state like California which is a leader, which really has people who understand this and want to do something about it, so I'm very disappointed when they choose a half-baked system like cap-and-trade with offsets.

[Applause]

Greg Dalton: So let's talk about that California system. It's a law signed by Governor Schwarzenegger AB 32. Cap-and-trade is 20% of that system. It gets most of the political attention and oomph and you're a critic of cap-and-trade because --

James Hansen: Because it's not -- it's half assed. (Laughter). It's going --

Greg Dalton: Because they gave away too many free allowances to polluters?

James Hansen: You know, so there was this Waxman-Markey Bill, 3,000 pages long. The lobbyists controled that so that it had giveaways to utilities, to fossil fuel industry and it brings big banks into it.

Why do you want big banks in this problem? Why should they be making money? Every cent that they make is coming out of the public's hide and they add absolutely nothing. What you want is a system which is very simple, and it makes clear. You know, there's this -- people will see in the marketplace that's something that is using fossil fuels is gonna cost more because of that carbon price, and so they will make their decisions based on that, and there's no money going to banks at all. You don't want a system with caps where then you have this trading, you have derivatives and you have markets that then collapsed and you don't actually reduce the emissions much. That's been tried in Europe and it didn't do much. And we have to really get major reductions.

Greg Dalton: The advocates of cap-and-trade would say, "It allows for price variability, but an environmental outcome that is more certain than with the --

James Hansen: No.

Greg Dalton: -- with the carbon --"

James Hansen: Absolutely not. It's certain that it won't be effective; that's what certain. It get --

Greg Dalton: Because of --

James Hansen: -- you'll get -- that's -- it --

Greg Dalton: -- because of the offsets and the carve-outs and the scheming and gaming by traders.

James Hansen: Yeah. They're saying -- well, first of all, you don't even know. All we really know is that we have to reduce emissions as rapidly as we practically can. And, unfortunately, 450 ppm --

Greg Dalton: Parts per million of carbon --

James Hansen: -- parts per million of CO2 is a disaster scenario on the long run. We are actually going to have -- and 450 ppm would make the planet warmer than it was during the Eemian.

Greg Dalton: So --

James Hansen: A 120,000 years ago, the last interglacial period on sea level is now estimated -- was at least six meters higher than it is now.

So we would be setting the planet on a path to disasters. We can't say when the ice sheets are going to melt enough to cause that large sea level rise, but, you know, we already can see with CO2 in the atmosphere now which is about 390 or 300 -- between 390 and 395. But the system has not come to equilibrium with that, we know that the planet is now out of that equilibrium for about seven tenths of a watt per meter square, which means there's almost as much warming in the pipeline as that which has already occurred. And look what's happening with the eight tenths of a degree warming now. And if we're going to double that -- so what we really are gonna have to do, the right -- and I understand why -- I mean people are trying to argue for the saying: Well, if you ask for something that seems unrealistic, then people will dismiss you. Well, you have to say what's honest. We have to keep the climate close to the Holocene. Civilization developed during the last several thousand years the Holocene which was -- we were not at the peak Holocene temperature at the pre-industrial, but now, we've probably reasoned out of the Holocene range. Because sea level, for example, is now going up 3.1 millimeters a year which is 3.1 meters per millennium. It's way out of the range that existed during the Holocene. So we're already a little bit above the Holocene. We've got to stay close to the Holocene if we want to have a stable climate. And that's what -- and that's still possible, because there are lots of ways we can actually draw CO2 out of the atmosphere with better agricultural practices and reforestation. So it's not an impossible problem, but the key thing is we've got to start to get off fossil fuels soon.

We can't burn all the fossil fuels. It's really funny. I've been going around for five years showing these bar graphs for how much carbon there is in oil, gas, which is less than oil, and coal, which is much larger, and then I also had these unconventional fossil fuels. I hardly -- sometimes, I didn't show those because I didn't think anybody is gonna be so stupid as to burn unconventional fossil fuels like tar sands and tar shale. But I was showing -- and I have the purple part on the bottom of those bars and showing this is only a small fraction of the total fossil fuels. We can't -- we cannot burn all these fossil fuels without going to the ice free state which means sea level 250 feet higher. And so it's just crazy, but somehow, I never made that sink in, and is now -- then Bill McKibben. You know, I've talked with him frequently and he's a much better writer, and he wrote this article for Rolling Stone. He said the same thing but he said it in a much better way, and suddenly, he said, "The reserves that these oil companies are counting on their books and their stock prices are based

on this, those are five times greater than what we can burn and still hope to have a livable planet." Then, suddenly, some people, started to realize, we've got a problem.

Greg Dalton: And you, at one point, said that, you think some of those oil executives or energy executives are --

James Hansen: They could be --

Greg Dalton: -- crimes against humanity.

James Hansen: Oh, oh let's go the other side. They are the -- I sometimes say, the captains of industry are the ones who can really help us solve this. And the -- they're not -- these are smart people. You don't get to be the top dog in these organizations unless you're pretty smart and pretty capable. And, you know, I've met with Jim Rogers of --

Greg Dalton: Duke Energy?

James Hansen: -- Duke Energy, and then, the one -- the other one in New Jersey, the big one, and then the Florida Light and Power and I forget the names, but all these guys say that, "If you would give us knowledge of how that carbon price is gonna rise, we can deal with that. We will make the investments so that electricity becomes carbon free over a few decades." They -- but we've got to give them that. If we don't give them that, then they're not gonna do it. As long as they can get away with coal plants as the cheapest energy or now gas as a cheaper -- that's what they will use. So we -- they -- we-- some of them have a heart and they understand this and they have children and grandchildren, too. So they could be our friend, but as long -- but if they're doing -- like the CEO of Exxon Mobil and like the Koch brothers, and if they fund disinformation and actual change in textbooks, that's the thing which I'm over -- between Christmas and New Year, I have an appointment to talk to legal scholars again because I think we should file suits against those people for crimes against humanity, because they know --

[Applause]

James Hansen: -- they're smart enough to know what they're doing and they should be held responsible.

Greg Dalton: And what's the status of -- you mentioned the atmospheric trust litigation. I believe there was a judge in Texas, of all places, that actually nibbled at that one. So what's the status? You sued -- the suit against California was disbanded. You're still going forward with another one --

James Hansen: Yeah.

Greg Dalton: -- and your hope is, you want a plan from these governments to have --

James Hansen: Yeah.

Greg Dalton: -- the courts force them to do something.

James Hansen: Yeah. It looks promising in a couple of states and I can't -- I don't really know the details but that's what a legal scholar has told me and the --Julia Olson who's the head of the --

Greg Dalton: Our Children's Trust.

James Hansen: -- Our Children's Trust. The federal court -- the federal case, unfortunately, the

judge in the District of Columbia, who we thought was -- would be favorable, ruled against it saying that it should first go to EPA, that EPA has responsibility, not the courts. And Our Children's Trust is appealing that decision. But -- and there's also -- I just -- back from the Netherlands where I went to help launch a case against the Dutch government. They're amazing. I mean they're at sea -- basically at sea level, and yet, they are burning coal. And they are -- most recent government there is pretty much in denial about this problem. But, that -- and they're -- they're an intelligent country, so I think there's a good hope that the courts there might have a --

Greg Dalton: Do something about it.

James Hansen: -- do something, yeah.

Greg Dalton: Should we do research on geoengineering? Geoengineering is the idea of putting things into the atmosphere to buy some time to deflect some solar radiations, some heat, some light. We may need that as an insurance policy if things get -- that's sort of break the glass, pull the emergency switch situation.

James Hansen: Yeah. Well, research -- we should understand the system. In some of the -- burning fossil fuels is geoengineering, and there would be some ways of drawing CO2 out of the atmosphere which makes sense.

And that -- you know, you may want to -- one reason to develop carbon capture and storage is not just to let us burn fossil fuels and -- without putting CO2, but also because we're probably going to have to suck some CO2 out of the atmosphere, because 450 ppm is certainly too much. And so we could burn biofuels in a power plant and capture the CO2 and then sequester it. So that's a kind of geoengineering which I would call "soft geoengineering." The idea of putting up one pollutant to block the effects of different pollutants doesn't seem to make a lot of sense to me. And, furthermore, putting up reflection -- reflecting sunlight away will not solve the ocean acidification problem, so --

Greg Dalton: Not much there.

James Hansen: -- not much there, yeah.

Greg Dalton: But as we -- there's also aerosols that come partly from coal burning and if we reduce coal burning, then we could reduce the aerosols which could --

James Hansen: Yeah.

Greg Dalton: -- exacerbate warming.

James Hansen: Yeah. And I'm actually working on a paper which is called "Doubling Down on the Faustian Bargain." The aerosols are a Faustian bargain -- are part of the Faustian bargain by burning coal and putting aerosols up there, and reflecting some sunlight, we minimize the warming. But those aerosols only stay up there five days, so once we stop burning, they're gonna fall out and then we get the full warming. Well, in the last 10 years, if you look at the fossil fuel burning, which have been going up one and a half percent per year, suddenly it started going up 3% a year as China and India really kicked in.

Other things being equal, if you change the rate of emission of CO2 to the atmosphere, the so-called airborne fraction, the fraction of the CO2 that appears in the atmosphere should increase, simply because that quick injection of CO2 causes the ocean surface layers to be relatively saturated so it can't get in to the ocean as fast as it used to. But what's actually happened in the last 12 years is the airborne fraction has plummeted. It's now only about 40%. The other 60% is disappearing. And it's

not mostly going in to the ocean. The good fraction of it is being taken up, somehow, by the terrestrial biosphere. And I think that's because of the -- we were doubling -- I think we're doubling down on the Faustian bargain because we're fertilizing the terrestrial biosphere, both with the CO2 in the atmosphere and the combination of that with more nitrogen which will spread in part of -- the nitrogen is being spread around by these aerosols which China and India are putting out and its actually reaching Canada and some of it is reaching Asia. And so that -- and a lot of nitrogen comes from fertilizing. But, in any case, I think we're doubling down. That is -- all the more reason why we got to get off this rapid curve, we 've got to get on a downward curve and the only way that's gonna happen is if we put a price on carbon.

Greg Dalton: If you're just joining us, our guest today at Climate One is Dr. James Hansen, head of NASA Goddard Institute for Space Studies and adjunct professor at Columbia University's Earth Institute. I'm Greg Dalton.

How would you grade President Obama in addressing climate change?

James Hansen: He missed a great opportunity to be a great president. You know, when he was elected and had 70% popularity four years ago, he could have gone to the public. And like Franklin Roosevelt explained, that for the sake of our National Defense, for the sake of the economy, for the sake of climate, we should deal with this problem in an honest way, putting a price on carbon. You know, when I was in United Kingdom with Anniek after -- she had a mild heart attack there, so I was stuck there for a week. This is right after he was elected before he took office. So we wrote a letter to him and explained this to him. I tried to get John Holdren to deliver it to him, but he wasn't sworn in yet so he couldn't do it.

Greg Dalton: The President's science adviser.

James Hansen: Yeah. But that -- it's a shame because he said he understood the problem. He said we have a planet in peril. But in a way, I don't think he was getting very good advice. I think that people were telling him well we need more solar panels and we need more efficient vehicles, and those things are true, but they're not gonna solve the problem by themselves. Without a price on carbon, all you do by reducing your emissions in those ways is reduce the demand for the fossil fuel, make it cheaper and somebody else will burn it. We have to actually leave those fossil fuels in the ground most of what remains. And the only way that will happen is if they are an -- if they're honestly priced. Right now, they are heavily subsidized by you, the public.

Greg Dalton: And people would say even if the U.S. does something bold, if he went big in a second time, China and India would still continue to burn as much coal and oil as they can get their hands on to have the standard of living that you and I and everyone in this room and everyone listening to this, enjoys.

James Hansen: Yeah. That's --

Greg Dalton: And that's their right --

James Hansen: -- that's wrong, and the reason is, if we put a price on carbon, the World Trade Organization rules, preferably we and Europe or we and China -- you'd rather not have the United States alone, but we're so -- still so powerful economically that we could even go alone and say we're going to put a border duty on products from countries that do not have a carbon fee that's equivalent. So it's fair, and it would be an enormous incentive for that other country, China or other country, to put their own carbon price on, because then they could collect the money, rather than us collecting it at our border. That's the only way that you can get an international agreement. You

can't do it by begging -- the Kyoto Protocol approach was to beg. Beg all the other countries to pick some target and then reach that target without any -- and, of course, even though many countries agreed like Canada, they soon abandon it -- when it's not convenient, they abandon it -- you have to -- the only way you can enforce it is with the price, and that -- so that could be done. And, you know, I was in China and the China -- Chinese leaders understand this. They don't deny their climate problem. They are engineers and they're rationale, and they don't want to be addicted to fossil fuels the way the United States is and have to protect the supply line around the world, so they are, number one in solar panels, wind power and nuclear power, building thirty nuclear power plants.

So I don't -- but, of course, they do have a major problem with so many people in poverty and they're -- and they need -- they know they need to get them out of poverty or they may -- their government may not survive. So the -- of course, they're doing everything they can to raise the standard of living, but they are planning, by the middle of the century, to really have all their electricity from -- both India and China are really looking to go non-fossil fuel. But to make that happen soon enough, we have to have a price on carbon.

Greg Dalton: Well, I'm gonna touch quickly on the Keystone XL pipeline then we're gonna have the audience participation. You've been an opponent of the Keystone XL pipeline. I wonder what you think about Susan Rice, possibly Secretary of State, having holdings in the companies that are gonna build that pipeline.

James Hansen: Yeah. It's amazing. As I said, I thought that it's so obvious that we couldn't be so stupid as to develop the unconventional fossil fuels because they're dirtier, you get less energy per unit carbon and you get all these other pollution, regional pollution. So we need to try to talk common sense into them and we've -- you know, we've done -- I've been arrested in the front of the White House because of the tar sands. And there are more and more people who are willing to stand up and protest against those. And I know I sound like a broken record, but just -- and I've realized that just trying to block an individual carbon source, although that's meritorious, it won't work if we don't have a price on carbon.

Greg Dalton: Yeah. And China will just -- All right. We're gonna invite your participation and, particularly, if you haven't had a chance to ask a question.

And I'm gonna be assertive about -- I'm encouraging you to be brief and get to your question so we can get as many people to participate as possible. The line starts with our producer Jane Ann right there, and then I welcome your comments for Dr. Hansen. Let's invite the audience participation. Yes, welcome to Climate One.

Holly Kaufman: Thank you. Congratulations. You deserve this award and thank you to all the scientists who are here who are providing we, policy makers and activists, with the information we need. I'm Holly Kaufman.

My question is, in addition to the price on carbon, for some shorter term measures, what is your opinion on dealing with some of the shorter term but higher global warming potential gases like methane, which might not be as politically controversial to deal with?

James Hansen: Yes. I think methane and black carbon and some of the trace gases are -- it's important that we deal with those and they may be the way on which we can handle the Faustian bargain. Because as the sulfate aerosols decrease, we've got to try to find a different way to reduce the climate forcing the energy imbalance, that is caused by removing the sulfate. So I think those are important, but I -- the priority has to be on CO2 on the -- because of the fact that if we continue on this path with CO2, we'll get to a point where it's really consequences are too great and very

difficult and are impossible for our children to deal with without having great disaster.

So I think that they're important, and I just don't talk about them as much as I used to because it's kind of distracting from the main problem which is the fossil fuel, CO2.

Greg Dalton: Yes, welcome to Climate One. Thank you.

Male Audience: Hi. If we were to do something like pyrolize sewage, garbage and agricultural waste, what's the potential for that to remove carbon from the atmosphere, how fast might it be possible to do that?

James Hansen: Yeah, we've looked at so-called biochar. Biochar, in many -- not everywhere, but in some agricultural systems, it can be very beneficial for improving the productivity of the soil. And so, that is a one way that we can get some of that excess CO2 out of the atmosphere. And it's, you know, I'm looking at the numbers, it doesn't look huge and it -- but it's -- and it's uncertain how big it can be. And it's one thing that we should be researching in our agricultural schools, because it is potentially very helpful.

Greg Dalton: So the next question for Dr. Hansen, yes.

John Addison: Yes, John Addison, Clean Fleet Report. A price on carbon would of course encourage energy efficiency, fuel efficiency. Where are you seeing progress there? Where do you think are some of the most effective mechanisms?

James Hansen: Technologically, for -- well, the biggest -- the quickest thing -- our energy efficiency in the U.S. isn't -- is not very good. And we've run economic models which suggest that if we put a $10 a ton tax on carbon, increasing $10 a ton per year, so that after 10 years, it's equivalent to a dollar a gallon on gasoline. That that would reduce carbon emissions in the US by 30%. Which is about 11 times -- that 30% reduction is 11 times greater than the amount of carbon carried by this Keystone XL Pipeline. So it just shows how foolish that pipeline is, compared to the kind of steps that we should really be taking to ensure our energy independence.

But the -- there are multiple ways that price would affect -- would reduce emissions. But, yeah, I -- and I don't really know that I should or could actually specify what -- which technology is gonna do. As I say, the marketplace is going to make those decisions. But there's a lot of potential already, well California is twice as efficient as the rest of the nation. It's about equivalent to Europe, which is also twice as efficient as the United States. So there's a lot of potential in just energy efficiency but anyway.

Greg Dalton: And so the next question, welcome.

Male Audience: I'm James. The ongoing talks in Doha, basically focusing on Kyoto, I believe, you've said you sort of have issue with Kyoto, what do you think the United States should be putting forward there, and how can we convince the countries who have equity issues with the United States and our carbon development to participate? What do you propose for that?

Greg Dalton: The United Nations process hasn't done a lot. What do you think should happen there?

James Hansen: Yeah, it's -- they -- as I've already said, I think instead of trying to fix the Kyoto process but keeping the cap-and-trade system, we need to realize that we have to put a price on carbon.

Now, we do have a debt to developing countries because the climate impacts are actually going to be felt and are already beginning to be felt more at the low latitude countries where more of the developing nations are, and yet, they have not contributed at all or very, very little to that carbon in the atmosphere. So we're gonna have to figure out some compensation for them, and it actually takes not very much money to encourage them to have better practices and to restore for us or to preserve for us, for example. So that's -- that needs to be part of the process. But we need to -- you know, when I was in the Netherlands, a week or two ago, we met a man, who had -- that had this lamp that's all powered by solar. So it has a solar panel which can charge up in the daytime. Even on a cloudy day, it would charge up, and it will provide light for up to eight hours. It has different strengths depending on how bright you use it. But he was -- and he wants to -- this to be -- replace kerosene lamps.

And I know about kerosene lamps. I was born on a farm that did not have electricity, and we used kerosene lamps. And my four older sisters all did their homework -- after it gets dark, that's what provided the light. And they did their homework and coloring and things with these lamps, and, of course, my parents were in fear of them tipping one of these things over and burning down the house. It turns out that there are 15,000 serious burns per day from kerosene lamps in the developing world, and there are 800 million women and children who are breathing the equivalent of two packs of cigarettes per day from the fumes from kerosene lamps. And yet, you -- with one of -- this little lamp can be -- it has a cost of $9 to $10, and they're spending 30 cents a day on kerosene. So this thing could -- can replace the kerosene lamp with about a month's worth of kerosene can replace -- So we -- so a developing world -- anyway, what I'm saying is, there are a lot of ways that we can -- the developing world can jump over technologies and not make the mistakes that we did. And we have to help them do that; that's part of our debt to them. We should be making an effort to do those sort of things.

Greg Dalton: I think Secretary Clinton is a big supporter of those solar cook stoves and those other things to do that at a reasonable cost. Let's have our next question. Yes.

Warren Linney: Yeah. I'm Warren Linney from Kiara Solar. And I just want to thank you for your courage. I've been arrested a few times for these issues as well. It's worth it.

My question is, I wanna know if you're aware of any council of engineers and scientists that are evaluating and prioritizing the various low carbon technologies, and also the ones that maybe will pull out enough carbon from the air and--like carbon engineering, global thermostat, in order to have a priority of funding these, and do you know of any fund that's being ready to, you know, save life on the planet as well.

James Hansen: Well, you see, those studies are academic. You know, so we had this nice paper, one called "Wedges," which said, you know, we can -- there's this wedge that could reduce our carbon 10% or 5% and there's this wedge should do five more and then there's this wedge five more. So they list a whole bunch of technologies that might reduce the carbon emissions. In principle, they could do that. And then, actually, when you talk to the authors, they say, "We’re -- are there any more wedges?" They say, "Oh yeah, there are a lot more wedges. At least we got tired." you know. So -- but those things were theoretical. What will cause those in reality, you put a price on carbon, some of those wedges would really be great stuff and they would -- you'd pass a tipping point that would really take a big chunk of the energy. And some of them wouldn't work out at all. But, you know, you just can't do it with theoretical exercises. The way that it will work -- sorry, it's a broken record, but you got to have a price on carbon.

Greg Dalton: And so --

[Laughter]

Greg Dalton: Right. But you talk about the marketplace. One of the ways that U.S. has reduced its emissions is through switching from coal to gas, and that was government innovation 30 years ago developing some tracking technology that no one saw a few years ago, and -- that proponents would say that that switch is a good thing, it's reduced carbon emissions more than Kyoto or anything else has been technology innovation and markets.

James Hansen: There are two different things though. The gas -- yes, if gas were treated as the transition fuel allowing us to leave the coal in the ground and be working on the successor to gas so that that's all we burn, then we could actually meet the targets. But that's not what's happening its exactly -- they're actually going after every fuel they can find. It's fracking -- in addition to tar sands, in addition to drilling in the Arctic, in addition to mountain top removal, and in addition to tar shale, that's why they say, United States is gonna be the Saudi Arabia of oil. How is that? We're gonna cook the Rockey mountains and drip oil out the bottom. And that's gonna be -- that's almost -- it's 50% more energy to get that oil out. We -- and the fracking, we can't do that. There's so much gas if we insist on finding ways. It's actually very expensive and energy intensive to do that, but because we're subsidizing it, they're able to get away with that and --

Greg Dalton: And it's also happening in California in a big way.

James Hansen: Well, that's the problem. And there's only thing that will stop that. (Laughter)

Greg Dalton: All right. And so far, we got six minutes left. Let's try to get a couple of questions in and quick questions, quick answers. Yes sir, welcome to Climate One.

Male Audience: Well, thanks a lot for your book. As you said, the issue is very complex. So is there an organization which will train citizens like me on how to explain this issue to my network?

James Hansen: Yeah, that's what I've been told. I thought that I was writing a book that would allow people to understand this. And I guess some people that -- even college-educated people said they have to read it twice, and so it's not -- they say it's too technical.

So we need clearer -- maybe Mike's book because I haven't read it yet, but --

Greg Dalton: But your -- but your next book is gonna be letters to your granddaughter.

James Hansen: Yeah, my next book is gonna be "Sophie's Planet." And Sophie is helping me. I'm writing her letters and making sure they're understandable to her.

Greg Dalton: And Sophie is a teenager?

James Hansen: Sophie is now 14. She's my oldest grandchild. And I'm gonna try to make this understandable, more understandable.

Greg Dalton: I'm sure she's smart. Let's have our next question. Yes, sir, welcome.

Nils Michael Langenborg: Yeah, hi. I'm Nils Michael Langenborg from Sustainable Adam Smith. Congratulations from the award.

So Adam Smith wrote about -- he said consumption is the sole end and purpose of all production. So if consumption is really the issue here, how do we get all -- how do we get everyday Americans to modify their consumption, and how do we get policy makers like Governor Brown who's sitting in the

room here, spoiler alert, and what is his position on this, I would be more than happy to hear. So how do we get people to be -- to change their behavior? And, secondarily, how we make this fun because this is such an intense topic, when you walk out of here and all you wanna do is --

Greg Dalton: Drink. Okay, so --

Male Audience: Drink.

[Laughter]

Greg Dalton: Well, we can work -- we have some wine outside afterwards. A quick question. We got a few minutes left, so consumption --

James Hansen: Yeah, consumption. Well, that -- again, the carbon price will help with that, to make things -- but and that is an education thing. We need to get our children and grandchildren and the public to appreciate nature and things, not just more things. But that's a -- that's part of the problem, so -- and putting a price on it will help a bit.

Greg Dalton: Welcome to Climate One. Yes, we're getting toward the end. Thank you.

Male Audience: It's an honest pleasure to be here with you. And before I came up, I was gonna ask you what's it like being around your Christmas or Thanksgiving table, talking among your family, when you get to talk about your passion, because I don't think that you actually talk climate science 26 hours a day. But could you tell us a little bit of your conversations with Sophie? Thank you.

James Hansen: Yeah. So I don't think that it's appropriate to frighten children. (Laughter). And I -- so the only thing that -- until -- now, Sophie is -- I have five grandchildren, Sophie is the oldest, and finally, I am starting to explain the problem and the fact that there are solutions. But, other than that, I just -- the only thing that I've really done with grandchildren related to this is to try to help them understand nature. So for -- in particular, as I mentioned in my book, we have addressed the monarch butterfly problem. You know, a monarch butterfly as we've noticed on our farm, they are many fewer than they used to be, and that's mainly because not of global warming, but because of pesticides which have been used to reduce the number of milkweeds. And that -- so, therefore, with my grandchildren, we plant milkweeds. And then they learn about this remarkable life cycle of monarch butterflies which migrate all the way to Mexico. Well, I did -- I actually put one of my letters to Sophie on my website. And I -- and it was worked out very nicely because I then got a letter, I got an email from a scientist in Mexico. These monarch butterflies migrate all the way from Canada to this mountain in Mexico where they hibernate for the winter on a one small region.

And this Mexican scientist is -- realized that these trees where the butterflies are hibernating, they're not doing well. The tops of the trees are turning brown because of their -- they've had multiple droughts. And the -- and that was one of the things I wanted to get to in my book and explain it to Sophie, that the danger to species is the shifting of climate zones. If we go with too large of climate change, that rapid shifting of climate zones is going to put additional pressure on species and cause many of them to go extinct, and then because they're interdependent, ecosystems can collapse.

Well, this scientist was trying to convince the Mexican government to plant these seedlings higher up the mountains because it's getting warmer, and for those trees to exist, they need to be in a cooler -- and -- but then he figured, he looked at IPCC, this intergovernmental panel, the climate change report and realized that by 2090, that mountain won't work. So then you've got to try to plant those trees on a different mountain and you've got to convince those monarch butterflies,

which have been programmed to go to that one region, that they've got to go to a different place. Well, we've tried to do that with some species, the whooping crane, which is one that I know about because it almost went extinct. But anyway -- but they tried to guide that whooping crane to a different place, so that it's not in danger -- it's not in so much danger of having only one place where it can winter. But anyway, the point was -- what was the question?

[Laughter]

Greg Dalton: It was getting out of -- we got a chance for one last quick question, one quick answer. We're out of time. We got to present the award. Yes, sir.

Male Audience: Yeah. Okay. A very quick question. Have you --

Greg Dalton: I don't know what your question was but the answer was good. Okay.

(Laughter)

Gerald Harris: Okay. Hi, my name is Gerald Harris. I specialize in scenario planning in the energy industry. But you're the first scientist I've heard say something positive about sequestration of carbon. And as I understand it, there is no way that we can store it without a risk of a catastrophic release. So maybe you know something that I don't know about this but is there any way we can actually store sequestered carbon without a risk of a catastrophic release?

James Hansen: Well, I think that there are ways, but it's going to be a case of many -- you don't want it in your backyard. It's very possibly the case. And, you know, we've done so much oil drilling -- drilling looking for oil that this -- that is not clear that most of the continental sites are safe. But there are places you could put it offshore where you're putting it at a depth where just the pressure and temperature are such that you don't have to worry about it coming out. So it is possible, but it's gonna cost money. So you have to let it -- let that technology compete against energy efficiency and other forms of energy.

Greg Dalton: And we got to wrap it up there. Thanks to James Hansen, head of NASA Goddard Institute for Space Studies, adjunct professor at Columbia University's Earth Institute for his comments here today at Climate One.

[Applause]

Greg Dalton: Okay. I'd like to -- thank you very much. I'd like to invite Ben Santer up here to present the award to Dr. Hansen. Ben is a member of the jury and a climate scientist in his own right at Lawrence Livermore Lab.

Ben Santer: Jim, you and Steve were pioneers of the frontiers of climate science, exploring the role of the oceans in climate change, the role of clouds, the role of aerosol particles, and I could spend a lot of time recounting your scientific contributions. I won't -- I just wanna tell you one very brief story. Back in 1988, I was doing my postdoc in Hamburg, you testified in front of Congress. You said, "We see the signal emerging from the noise." That had huge influence on me and on hundreds, thousands of my colleagues. The idea that we could see some coherent human-caused warming signal emerging from the year-to-year or decade-to-decade noise of natural climate variability, it certainly had a discernable influence on my career and on the science I chose to do.

Germans have a word, zivilcourage, there's not really an English translation for it. And what it means as best as I can translate it is, individuals who show extraordinary courage, not in the extraordinary circumstances of war, but in the extraordinary circumstances of our day-to-day lives.

For me you embodied zivilcourage. You've shown not only through your science, but also through your defense of the science, through your congressional testimony, through the work that you've done in the last few years telling the world that we don't have the luxury of remaining silent anymore. We have to go and speak truth to power, to tell people, this is where the chips are lying. This is what the science tells us. It's a real honor and a privilege to, on behalf of the jury, on behalf of Bud Ward, Larry Goulder and Greg Dalton, present you with the 2012 Steve Schneider Climate Science Communication Award.

As you know, Steve had the metaphor about cloudy crystal ball -- (laughter) -- hold this up -- getting across the idea thsat we can't precisely see the details of what's in the pipeline as you put it, the shape of things to come for the climate system, but we know enough. We can see clearly enough. Thank you for everything that you've done. It's a real privilege to call you a friend and a colleague.

[Applause]

Greg Dalton: And we've been talking -- today, we've been talking about courageous communication and climate communication. A lot of politicians have walked away from this issue with a few exceptions; Governor Huntsman is one, Governor Jerry Brown of California. It is another -- and I'd like to invite Governor Jerry Brown to come up here and say a few words.

[Applause]

Jerry Brown: Thank you, no it's all right. I just wanted to say congratulations. You went out in the forefront, doing great science with good public policy. So on behalf of California, we are also on the forefront. As we just heard, the forefront isn't good enough, (laughter) but it's still pretty damn good. So, anyway, keep on doing what you're doing --

James Hansen: Yes, sir.

Jerry Brown: -- we've got a lot of work to do from the idea to the execution into the politics, it's -- a lot of gaps there, and you're hoping to close in and I just want to thank you for it. (01:14:02)

James Hansen: Thanks very much.

[Applause]

Greg Dalton: Thank you very much.

James Hansen: May I?

Greg Dalton: Sure.

James Hansen: Okay. Do I need this?

Greg Dalton: I think you have your own.

James Hansen: Okay. Yeah, just one more comment about -- as I mentioned, Steve Schneider was a friend from many decades ago. Tell you one more thing about him. In his first year as a postdoc, he was -- Steve was very outgoing and very -- already, at that time, he was trying to reach to the public. And he wrote a letter to the editor of New York Times. And, at that time, the director of the Goddard Institute did not appreciate that sort of thing. (Laughter). He called a meeting of entire people in the building, you know, more than 100 people coming to -- and he really gave it to Steve. And the great -- and the really impressive thing about Steve was, you know, he didn't back down.

So he -- even at that time, when he's just as around 26 or 27-year-old postdoc, he had the courage to stand up for what he believed in. So he was really a good example of courage of a scientist at a very early age.

[Applause]

So anyway, it's -- for all those things about Steve, it is a great honor to get an award in his name. Thanks.

[Applause]

[END]