Q&A

WITH WARREN M. WASHINGTON PhD.

What was your reaction to learning that you had been selected as the 2019 Tyler Prize Laureate?

It was quite a surprise when I got a call one Saturday morning, saying that I would be awarded the Tyler Prize along with Michael Mann. I was extremely pleased to get that news, because it showed to me that the work of people like Michael Mann and I have been doing on climate change is getting the recognition that it deserves.

What do you think the future looks like for our climate?

Right now we're on the path of greatly increasing carbon dioxide in the atmosphere. It's what we call "business as usual". Or in other words we are not doing enough about cutting back on the use of fossil fuels – therefore, getting the biggest and worst effects from climate change over the next 50 or 60 or 70 years.

It's just amazing to me that we have these forest fire outbreaks or hurricanes in coastal areas, that we're seeing increasing more people being affected in very dramatic ways, that we didn't see 20 or 40 years ago. We understand what the effect is. We need to take very large societal steps to cut back on the use of fossil fuels.

Recently, a lot of your scientific outreach work has focused on diversity. What motivates your work in this area?

I think it is more healthy for society when we have a good representation of everybody who come from different backgrounds and cultures.

When I got my PhD, the attitude was "Well, you're of a certain ethnic group or racial group and we don't want you here". During my baccalaureate degree work, my student advisor, a faculty member, told me that I probably shouldn't go into physics: "It's too hard, and you probably should go into another curriculum." I said, "I want to be a scientist" and I stuck to my guns. I did not let him talk me into an easier subject.

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I just think that students need to be encouraged and need to find a challenge, and it probably results in people being more motivated to do well if they are following their own interests.

I was the first African American President of the American Meteorological Society and during that time there were very few Hispanics, Native Americans, and African Americans in the society. Now we have probably more than 100 members from underrepresented groups.

I should say that one of the big things that has changed, isn't just in terms of ethnic minorities, but the female population has increased substantially, as well. That was always a problem, very few females. Now we are probably 40% female students in the education pipeline, so we're making progress on several fronts, gender as well as with minorities.

You've worked for six U.S. Presidents, both republican and democratic. How would you compare Trump to Obama?

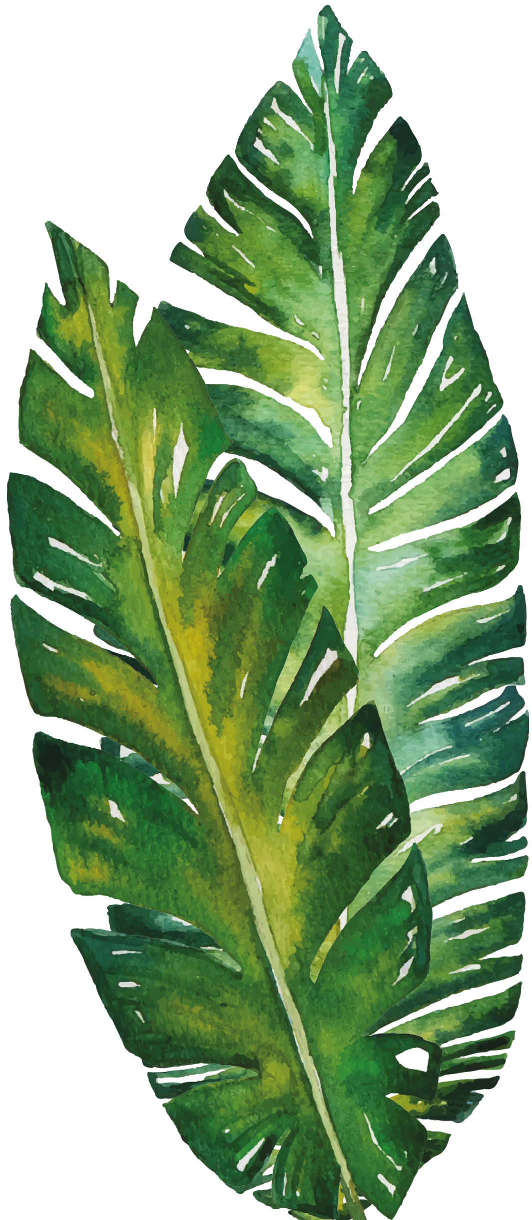
My time with Obama showed me that he actually spends a lot of his time preparing his talks, so that they're carefully worded and carefully researched. He actually tries to understand the details of what he's doing. Once when I was on a climate change panel with him, he preceded me in his talk and I mentioned to him in a joking manner, "You gave my talk,". President Trump does not get briefed or study what the science community knows about climate change or doesn't know. Moreover, the present president is not concerned about details and whether it is scientifically accurate or not.

Climate scientist are often heavily scrutinized. How do you react when people doubt the accuracy of your work?

Well, as a climate modeler, we're quite aware that there are some people who say that our models aren't good enough and that we haven't accounted for certain factors. I find this almost a remarkable statement, because we rely on the use of our models to essentially establish: 'are they giving the right answer for the right reasons?' We do make some adjustments in our models as we acquire we build these models, but we constantly validate them by looking at observed data.

The observed data is what we rely upon to see if our models are able to simulate the present climate first. Then after we have satisfied ourselves that we can do that, we then use these models for looking at future climate change and past climate change, where we understand, for example, going in and out of ice ages every 40,000 years or so. We can simulate that just by changing carbon dioxide and other aspects of the climate system.

I think that we have validated our models quite well and carefully, to make sure that they are not giving a false answer. Now, we are constantly improving our models. The early models had fairly simplified physical processes such as clouds, rainfall patterns, temperature patterns and so forth. Now, our models are constantly refined by including much more detailed structure about these processes and compared them with numerous observations, so we have more confidence that they're doing the right thing.



How did you get interested in climate computer modelling?

I think there was a need for a tool to understand climate and climate change. We knew the basic mathematical equations that go into climate models as early as 1906.

I was going to graduate school at Oregon State University and a small group at Stanford Research Institute was looking for a mathematician and physicist student to help. I was employed by this group for the summer of 1959. They were examining the idea of making computer models of the Earth's weather. At the end of the summer, I asked them, "Where can I go to get a PhD in this field?" They listed five schools that had new programs and I ended up going to Penn State University.

How did you handle working with early computers?

The first computer that I used was a vacuum tube computer, like the old radios that used vacuum tubes. It was about the size of a room, maybe 20 feet wide and 20 feet long, and it was primitive. It generated a lot of heat because it did not have the types of circuits that we see on our iPhones and modern computers. In fact, I suspect that I have more computing power in my iPhone than the computer that I first ran on.

Way back in about 1956 and '57 at Oregon State University, they received one of the earliest modern computers. It was called the ALWAC, which is similar to the ENIAC – which was the first electronic computer. I learned how to use it for solving mathematical equations, which came in handy later because I was ready to make use of my mathematics and physics background to work with others on developing climate models.

You were very limited on what you could do on those early computers, because they just did not have much in the way of software. It took us one day of computer time to calculate one day of model weather, so it was painfully slow because we would wake up the next day, after it ran all night and looked at the answers. Early results were encouraging.

Why do you think climate computer modelling is so important?

Our modeling is useful for both weather forecasting and long-term climate changes research. Our purpose was to make these models capable of doing almost anything that deals with climate or climate change. In addition, the models were freely available to researchers worldwide. The objective at first was to simulate the observed climate change that we see in the observations.

We were able to do some early experiments in the late '1970s and 1980s' on more advanced computer systems. We could actually run models for a century or so and look at different scenarios. This is important, because we were able to provide to the Paris Accord several different scenarios, depending on how much cutback in fossil fuels. We had to make various assumptions about, "are we going to cut back 20%, 30%, 50%, and 100%?". We really gave them a whole set of scenarios that they could use in the policy debate.

The research community continues to provide the policy makers worldwide different scenarios, which can potentially influence political issues. If you cut back fossil fuels too much and increase the price of energy, then people are going to not pay attention and say it is too extreme. If leaders do not do enough, then society is going to get in the future more severe impacts such as increased flooding, increased forest fires, and sea level rise.

Numerous scientific studies have shown many serious climate impacts that are already happening, and society has many choices to make. Some will be painful ones. What the climate research community is offering is research on what is happening now and what will happen in the future, depending on which scenario is selected by the world's leaders.