Bang! talks to...

Dr Gavin Schmidt

Bang! talks to Director of the NASA Goddard Institute for Space Studies

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What work does the Goddard Institute for Space Studies (GISS) do relating to climate change?

We were set up in the 1960s to be a theoretical division for NASA. They felt that they wanted to have a connection to academia and generic scientific research, and that's basically how we've kept it. The topic that we looked at was initially mostly astrophysics: we worked on some of the early Venus and Mercury missions, and we had an instrument on one of the early Galileo probes to Jupiter. But as we moved into the 1970s we started focusing much more on satellites that are observing the Earth, using the same techniques that we'd been using on other planets. At the time we knew more about the ice caps on Mars than we knew about the ice caps on Earth. And so our focus became the things that are driving climate change on Earth.

We started working on simulations. We're one of around 25 groups around the world that build simulations of the climate system. We also spend a lot of time looking at climate impacts, how these things actually change agriculture, or change sea-level rise and urban environments. And we still work on instruments: we're trying to get an instrument on one of the next satellite launches to measure aerosol particles in the air. And then we have a new project which is kind of going back to our roots, which is using what we've learnt about the Earth system climate and applying it to exo-planets, and what kind of climates you would see on exo-planets that we're starting to observe now with the Kepler satellite. So yeah, we do a lot of stuff.

What current climate research are you most excited about?

My personal interests are in trying to understand what happened in the past, and seeing if we can explain those things — paleoclimate: climate changes before the historical record. You're looking at proxies for climate change, things which are connected to climate but aren't measures of temperature or rainfall — they're measurements of isotopes, or of lake sediments, or shells or something like that — and you're trying to quantify those and then try to interpret them in a way that gives insight into what happened in the past. Looking at my own research, the earliest stuff that I worked on was the

Cretaceous period, about 100 million years ago. I still maintain a lot of interest in that, but now we mostly focus on the last 100,000 years. Also looking at what's happened during the holocene, the relatively mild period that we've been living in, that all civilisation has been living in, for the last 10,000 years — there's interesting things there. You're looking backwards and you can't see things very distinctly the further back you go, so you look for things that have a similar signal/noise ratio. The ice age's is very large, and we don't know exactly why but we have a similar signal/noise ratio for the ice age as we do for the last 100 years. Which is odd, you'd think we'd do better.

How optimistic are you about the impact of the recent Paris Climate Summit?

The Paris Climate Summit does not exist in a vacuum — if it was just that, you would not be particularly excited. But it is symptomatic of a better level of conversation and better level of appreciation of the problem globally, with the small exception of a particular colony of people in Washington DC. I think it's obviously better that there was an agreement than there wasn't, and governments around the world are talking in ways that are commensurate with the size of the problem, which has to be a precursor for taking actions that are commensurate with the size of the problem. My sense is that once people really start to get going on this, like in many other environmental problems, people will find things that work, and very smart people will apply themselves to finding things that work and making them much cheaper and more efficient, and there will be a cascade of best practices that go out from that. That's my hope, that there will be a cascade of actions that will lead us to a situation where by the end of the century — or hopefully before that — people will be thinking much more sensibly about how we deal with carbon. But it's a long process, and if people think that one signature on a piece of paper is going to change anything then that's not appropriate.

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This is a problem that is unique in its scope, unique in its timescales, unique in its global nature, and we can't fix it. All we can do it moderate

it, but we need to moderate it in a way that hopefully does not lead to disasters. And that's very hard, that's an enormous challenge, and again it's a unique thing that we have to do here. With unique things, we'll be able to look back and say that we tried a bunch of things, and these are the ones that worked, but I don't think it's going to be clear what those are going to be. So I would say I'm cautiously optimistic, but that's tempered with a realization that this is a really big problem, and it's not going to be solved just by a bunch of people going to Paris.

One of the articles in this issue discusses geoengineering as a potential climate change solution. What is your opinion on such large-scale scientific projects?

So that's the thing, that isn't a scientific project. The science that goes into it is not that difficult, it's not that surprising. There are side-effects to the geoengineering plans that people have come up with for the ozone layer, for rainfall in the tropics, but quite frankly if that was the only issue people would probably just go ahead and do it. The bigger issue is how geoengineering fits into world geopolitics, and the ethical, legal and governmental issues associated with it. For projects like this, either something good happens or something bad happens. If something good happens they go away and gain credit, if something bad happens, they run away and say "Well you can't prove that we did that!", and, well, you can't. And so even after more than 50 years of weather modification research, there's still no one significant result that demonstrates that it makes any difference at all.

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Nobody has any idea if these things work, and yet people still pay money. There was one attempt to control a hurricane, [Project Cirrus]: they were tracking it, so when it was going out to the Atlantic and they decided to seed it, they decided to throw lots of [dry ice] into it. But then the day after they did their thing, the hurricane pivoted and started heading directly for [Georgia], where it made landfall, caused enormous amounts of damage, many people died, lots of flooding — at which point they said "Oh well, you can't prove it was us." Of course, the whole thing was shut down immediately. Probably they had nothing to do with it, but that's what happens: at some point something bad will happen — because it's the weather — and they will be blamed.

The reason geoengineering won't work is… nothing to do with the science, and I think a lot of times people look at issues that have science components and they think that resolution of those issues will be about the science, and they're totally wrong.

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The reason why these things are issues is because of clashes of values: it's who wins, who loses, who pays, who benefits. Science never says anything, science informs, but all of these things are value judgments that are very human and very political in a very broad sense, and when people try and squeeze the politics out of things that are clearly political issues, you end up with a situation where it's scientists that get blamed for the bad choices that politicians make.

Which climate change myth would you most like to dispel?

People have no idea what a model is. None. The word is meaningless. People say "Oh, it's just a model," and what I'd love is if people had a better idea of how science works, how we take something complicated and we make something slightly simpler. And it doesn't matter if it's quantum mechanics, or a climate model, or a statistical model. All of these models are wrong, none of these models are right, there's no truth in modeling but there is skill. And you can demonstrate that you learn things from using models of the real world that allow you to make decisions in the real world that actually work out more often than they don't. And people have no clue. That would be the one thing that I spend the most time telling people about, and every time I say something along those lines, it's like I'm saying it for the first time.

You are a passionate communicator of science, being a founding member of the RealClimate blog and an active user of Twitter. Do you think all scientists should take a more active role in public communication?

All scientists? No [laughs]. I run an institute, and we have about 150 people work for us. They're all different levels of people and all have very interesting things to say about stuff, but I look across them and maybe 10 would benefit from media training. And then I look at other people, and they should never be let in front of a camera. Communication is a craft and you can get better at it, but like many crafts there are some people that are completely talentless. To communicate, you have to put yourself in the position of the other person — what is it that they could hear that would make a difference? You can't just say what you want to say, because that's a disaster in terms of communication, you have to listen first then talk. So the idea that all scientists should be out there communicating — no.

But should there be a deeper bench, so that we don't have just Brian Cox and Bill Nye. It's not good when science is three people, science is a much deeper thing. These people are usually all guys, and they're often from the hard sciences. Yeah they're smart, but they're not representative of what science does, or is, or thinks about. And this is not to criticise Brian or Bill, but they're all of one type. Emily Shuckburgh [Bang! Essay Competition Judge] — she doesn't have the reach of Brian, she doesn't have her own TV show. And Neil Degrasse Tyson — he's breaking down some barriers in terms of the kinds of people that are doing these things, but they're a very homogeneous group of people in terms of worldview, in terms of experience, and science is a far more diverse place than that.

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