

Top boffin Freeman Dyson on climate change, interstellar travel, fusion, and more

Andrew Orlowski, *The Register*, 10-12-15

The life of physicist Freeman Dyson spans advising bomber command in World War II, working at Princeton University in the States as a contemporary of Einstein, and providing advice to the US government on a wide range of scientific and technical issues.

He is a rare public intellectual who writes prolifically for a wide audience. He has also campaigned against nuclear weapons proliferation.

At America's Oak Ridge National Laboratory, Dyson was looking at the climate system before it became a hot political issue, over 25 years ago. He provides a robust foreword to a report written by Intergovernmental Panel on Climate Change cofounder Indur Goklany on CO₂ – a report published [\[PDF\]](#) today by the Global Warming Policy Foundation (GWPF).

An Obama supporter who describes himself as "100 per cent Democrat," Dyson says he is disappointed that the President "chose the wrong side." Increasing CO₂ in the atmosphere does more good than harm, he argues, but it is not an insurmountable crisis. Climate change, he tells us, "is not a scientific mystery but a human mystery. How does it happen that a whole generation of scientific experts is blind to obvious facts?"

We invited Dyson to talk about climate change and other matters, including a question from your correspondent's kids – how will we do interstellar travel?

You were being invited to help solve problems in an era when things looked pretty grim, and those problems looked insoluble, during the Cold War, and before Norman Borlaug's Green Revolution. Now we've conquered a lot of these, but there seems to be an unquenchable thirst for apocalypse.

[Laughs] Yes. I don't know why, it's a mood of the times. I don't understand that better than anyone else. It is true that there's a large community of people who make their money by scaring the public, so money is certainly involved to some extent, but I don't think that's the full explanation.

It's like a hundred years ago, before World War I, there was this insane craving for doom, which in a way, helped cause World War I. People like the poet Rupert Brooke were glorifying war as an escape from the dullness of modern life. *[There was]* the feeling we'd gone soft and degenerate, and war would be good for us all. That was in the air leading up to World War I, and in some ways it's in the air today.

The years before 1914 were a tremendously promising time. Russia was getting richer, *[but then]* the whole thing fell apart. It's comparable today – we've done a much better job with feeding the world and if you look at the number of desperately poor people, it has been decreasing quite steadily.

The most important thing at the moment is China getting richer. What the rest of the world is doing doesn't really matter.

If you could give your own scientific recommendations for carbon dioxide policy at COP21 in Paris, what would they be?

Certainly land management would be one. Particularly building up topsoil, which you can do in lots of ways. Not just growing trees, there are many things you can do which are just as good. Inducing snowfall is

something you can do which hasn't been discussed very much, to keep the oceans from rising. The rise of the oceans is a real problem and while they're not rising as fast as people say, they're still rising. That could be stopped if you could arrange that it snows a bit more in Antarctica. That's something that could be quite feasible, but it's not been looked at very much.

Are climate models getting better? You wrote how they have the most awful fudges, and they only really impress people who don't know about them.

I would say the opposite. What has happened in the past 10 years is that the discrepancies between what's observed and what's predicted have become much stronger. It's clear now the models are wrong, but it wasn't so clear 10 years ago. I can't say if they'll always be wrong, but the observations are improving and so the models are becoming more verifiable.

It seems almost medieval to suppose that nature is punishing us, rather than the Enlightenment view, that we can tame nature, and still be good stewards of it.

That's all true.

It's now difficult for scientists to have frank and honest input into public debates. Prof Brian Cox, who is the public face of physics in the UK thanks to the BBC, has said he has no obligation to listen to "deniers," or to any other views other than the orthodoxy.

That's a problem, but still I find that I have things to say and people do listen to me, and people have no particular complaints.

It's very sad that in this country, political opinion parted [*people's views on climate change*]. I'm 100 per cent Democrat myself, and I like Obama. But he took the wrong side on this issue, and the Republicans took the right side.

Because the big growing countries need fossil fuels, the political goal of mitigation, by reducing or redirecting industrial activity and consumer behaviour, now seems quite futile in the West.

China and India rely on coal to keep growing, so they'll clearly be burning coal in huge amounts. They need that to get rich. Whatever the rest of the world agrees to, China and India will continue to burn coal, so the discussion is quite pointless.

At the same time, coal is very unpleasant stuff, and there are problems with coal quite apart from climate. I remember in England when we burned coal, everything was filthy. It was really bad, and that's the way it is now in China, but you can clean that up as we did in England. It takes a certain amount of political willpower, and that takes time. Pollution is quite separate to the climate problem: one can be solved, and the other cannot, and the public doesn't understand that.

Have you heard of the phrase "virtue signalling"? The UK bureaucracy made climate change its foreign policy priority, and we heard a lot of the phrase "leading the world in the fight ..." and by doing so, it seemed to be making a public declaration of its goodness and virtue ...

No [laughs]. Well, India and China aren't buying that. When you go beyond 50 years, everything will change. As far as the next 50 years are concerned, there are two main forces of energy, which are coal and shale gas. Emissions have been going down in the US while they've going up in Europe, and that's because of shale gas. It's only half the carbon dioxide emissions of coal. China may in fact be able to develop shale gas on a big scale and that means they burn a lot less coal.

It seems complete madness to prohibit shale gas. You wondered if climate change is an Anglophone preoccupation. Well, France is even more dogmatic than Britain about shale gas!

Is theoretical physics still possible?

Oh yes, but I really would consider myself an applied mathematician. What I do is old-fashioned applied maths applied to problems: some physics, some engineering, a little bit of biology. Whatever happens to be interesting. Theoretical physics is part of that, and there's a lot to do. What's happened in the past 20 years is that there's a split between string theory, which has gone off into a world of its own, and everything else. The division between string theory and the rest of physics is now wider than the split between string theory and mathematics.

Physicists complain that they can't get funding unless there's a particular application for the work.

A lot of that is still being done. The recent Nobel Prize for the neutrino experiment pleases me very much. It's much more cost effective than building a big accelerator, and it's good to see that being recognised.

In one particular book review from 2004 [the NYRB essays are collected in [The Scientist As Rebel](#)], you expressed the reservation with string theory that it isn't measurable. What do you think today?

I would say it's just very good mathematics. Mathematicians love it. It isn't clear string theory applies to the real world, it may or may not. It's quite likely it may turn out to be useful for reasons nobody today can guess.

Well, I have a difficult time with things that aren't measurable or findable being science.

I would say those things aren't science. They don't belong in science. But you can still have interesting speculations that may be useful in unforeseen ways – but if it's not verifiable, it's not what I would consider science.

And it's quite convenient and handy to invent another universe ...

There's no reason other universes shouldn't exist; if they are unobservable, then they don't belong to science.

You have reminded us that science was actually a rebranding exercise for what was known as natural philosophy ...

Yes, William Whewell invented the word science.

Well then, if so much of "science" isn't science, should we go back to calling it "natural philosophy"?

No!

OK, I'm being slightly facetious. Now for my space-mad children's question. They want to get to the stars. So how are we going to get there – what's the best prospect for interstellar travel?

The main point is to leave the energy source behind; don't carry it on the ship. What makes a huge difference if you really want to go fast is have a big laser in space, and ride the beam. The beam will supply the energy and you don't have to carry it with you. It's essentially a public highway system with the laser beam as the highway, and little ships with sails. That works and doesn't involve any new physics – it's just a question of

engineering. And you could get up to half the speed of light, and that's much better than you can with any energy source you have with you.

That was proposed by Bob Forward, he worked out the details, and it certainly does work. He called it [Starwisp](#). You're using the speed of light in your favour: you're borrowing the momentum from the light.

How about altering spacetime in front of the ship?

That's ... probably completely unreal.

Finally, what are your views on fusion? Do you see any real progress being made?

I think they made a terrible mistake 50 years ago when they stopped doing science and went to big engineering projects. These big engineering projects are not going to solve the problem, and they've become just a welfare programme for the engineers. You have these big projects, both national and international, that are really a dead end as far as I can see. Even if they're successful, they won't provide energy that's useful and cheap.

But it's not clear when you do science, whether you'll discover anything or not. But that's the only answer.

So with fusion, we should go back to the drawing board?

Yes, and it's not going to solve any problems for the near future.

But I don't think there is a problem in the near future anyway [laughs].