"We don't understand climate, it's very complicated and we're only at the beginning to understand what the effects may be"

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(Original transcription, partly)

Princeton, New York - May 2016 I interviewed theoretical physicist and mathematician Freeman Dyson (1923), as part of the documentary "The Uncertainty Has Settled". Below a selection of the almost 3 hours conversation I had with Freeman Dyson.

- Obviously we are living in an era where we are pushing major changes in terms of fighting global warming and reducing carbon dioxide. Are we saving the world or missing the point?

I would say missing the point. I mean, roughly speaking there are two totally different things going on in the natural world. It's the carbon dioxide in the climate that everybody talks about and there are the ecological effects of carbon dioxide which have nothing to do with climate. Which nobody talks about. They are totally separate and different.

In the case of the climate effects. This is a very complicated set of problems. We don't understand climate, climate is very complicated and we are only beginning to understand what the effects of carbon dioxide may be. They're maybe good or they're maybe bad. But it's not clear.

But if you look at the non climate effects of carbon dioxide, there is evidence they are very strong. They are easy to observe, easy to measure. They are overwhelmingly beneficial.

- Can you give me an example?

The carbon dioxide directly enables the growth of all kinds of plants. So more carbon dioxide means it is good for the wildlife, it's good for the forests and it's good for food, for the agriculture all over the world. It saves huge numbers of people from starving. The effects are out of all proportion more serious than the effects of carbon dioxide on climate. And that's what's never being said in public.

- So what you are saying is that due to carbon dioxide the world is actually getting greener?

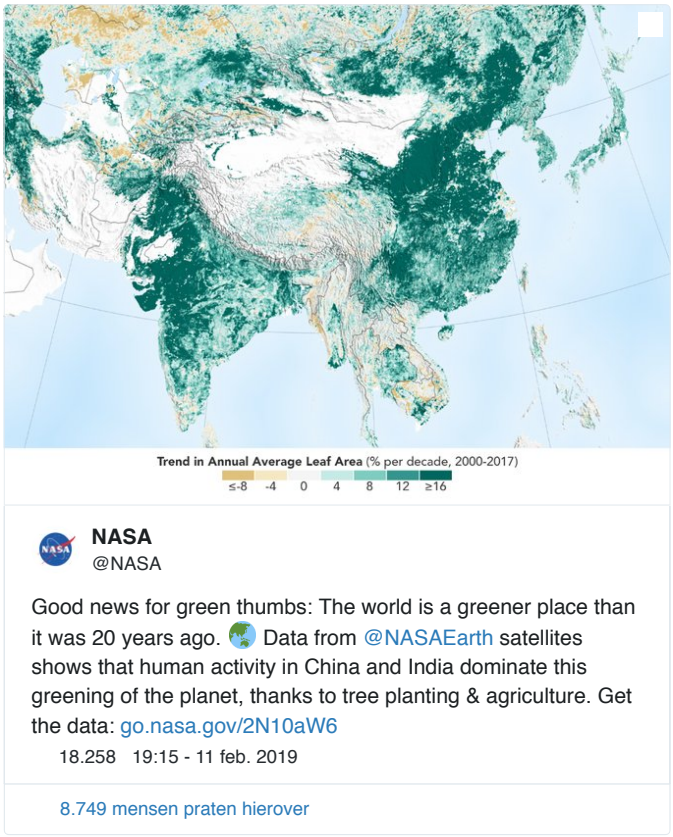
Yes, it is getting greener, that is measurable.

- And it has been measured?

Yes

- What if we're reducing carbon dioxide? I mean, would it mean that plants are not growing as much as they should?

Yes! It would be very harmful. And the criteria of carbon dioxide is also - besides producing growth of plants directly - that it makes them more resistance to drought. Because carbon dioxide is a substitute for water. If you look at the way a plant actually breathes. It has little holes at the surface of the leaf which can open and close . And every time that the carbon dioxide molecule comes into the plant from the air, a hundred molecules of water escape. That’s happening, you can’t avoid that. So absorbing carbon dioxide always implies loosing water. But if the air outside is poorer in carbon dioxide than the plant will lose more water in order to breath. So in fact you are making the plant more susceptible to drought. And that’s the great killer of plants of course. So you are turning green lands into deserts by doing that.



The word pollution off course implies it’s an immoral judgment but in fact the CO2 is good for us, good for the plants, good for the food. The CO2 is not a pollutant. It’s actually a fertilizer.

In most of the time during the history of the earth, CO2 was much higher than it is now. The world at the moment is sort of half way starved for not enough carbon dioxide. Vegetation would like it better if there was three times as much…

- Why do we not see it in the mainstream media? Why do I only see advertisements of apocalypse?

I don’t quite know the answer to that. For some reason the media always love disasters. Disasters sell newspapers. They also sell television and good news does not.

- But here is my point. I am an average person living a middleclass life, an average guy sort of overwhelmed by a labyrinth of information - whether that is left winged or right winged - but all are claiming a monopoly on the truth. And how can I as an average guy, sort of, choose my own truth?

It is difficult. You have to make of it with whatever information you have. The media is lazy, is very often wrong. I can’t tell you a source of information which is guaranteed to be correct. Generally speaking there are two kinds of information. There are observations and there are theories. So generally speaking you can believe the observations and you don’t have to believe the theories. That’s the most useful guide. The observations of the greening of the planet are very clear, the theories on climate are very confusing.

Science off course is all about things we don’t understand. So it’s not difficult for me to deal with uncertainty. That’s how I make a living and when you are sure about something it becomes boring… and so we like to be on the edge of truth but not yet achieving truth. In the case of the climate off course there is plenty of uncertainty. The experts are well aware of that. So they are mostly interested in the many things we don’t understand and particularly the effects of carbon dioxide on the weather. These are very interesting scientific problems. Unfortunately the thing has become so political - it’s no longer science. So when you have strong political dogmas, then the methods of science don’t work anymore. You have to pick up your own mind. So I can’t tell you how to do that. If I could tell you how to do that I wouldn’t be a scientist.

- Did we create too much a religion out of it?

Yes! And the environmental religion is good: the idea that we should preserve nature as much as we can, preserve rare species and preserve forests. To me, all that is very good. But the idea that we can stop climate change is absurd. We don’t know enough even to really imagine how to do that.

"Whole other kind of question is whether the warming is actually harmful or helpful"

- Has it been proven that human produced C02 is causing global warming?

Well, that are two different questions. Humans have been putting carbon dioxide into the atmosphere, that's for sure. We know that the carbon dioxide has gone up by thirty percent during the last hundred years. That’s due to human activities, that’s quite clear. The question is what effect that has had on the climate. That’s not clear. Whether the carbon dioxide actually caused the warming, we don’t know. Certainly there has been some warming, not as much as most people said there would be. But still, certainly it’s real. for sure had said

Whole other kind of question is whether the warming is actually harmful or helpful. I actually went to Ilulissat, which is a place in Greenland, where Al Gore went to make his film “The Inconvenient Truth”. So this was a great public film to show the bad effects of global warming. He went to Ilulissat because that’s the place where global warming is most spectacular. It’s where global warming is the strongest.

The pictures are all true and you can see the ice falling into the ocean and great rivers flowing down from the ice. So it really is warming there. There is no question. But I also talked to the people who live there. And they love it! They are very happy that it's warming. They would like it to continue. So for them it is actually a great benefit. The only way they could live in the past was by fishing. And fishing in that part of the world is very dangerous. So one third of the young men were drowning because of accidents at sea. Now they don’t need to go fishing because they have tourists. So for them it’s a much better life than before.

So anyway, the whole thing is very local. There are some places where the warming is doing harm and other places where it is doing good. But certainly I would say on average more good than harm.

- forty years back you were involved in the first kind of climate studies right? At Oak Ridge. What was the goal back then and who were the people involved in the project?

Well, the leader was Alvin Weinberg who was the director of Oak Ridge Laboratory. And he was a physicist by training but he was very much interested in climate in a much broader sense. And he was also interested in biology. So we had a good collection of people there who were experts in various fields. I forget all their names, but R.F. was the keeper of the information. He had the best information about forests and plants and soil and atmosphere. Everything that was being measured. We were trying to measure everything. And to see what the effects of carbon dioxide really are in the real world.

- Which year was it?

So I was there I think around 1970 to 1980, I forget the dates. Anyhow. So this was a very active group of not just climate experts, but ecology experts looking at the whole natural world seeing what the effects of carbon dioxide would be. And I think we did a good job. Then there was another group of people, mostly in Colorado, who did computer calculations. Looking at the climate from a theoretical point of view. So they did beautiful computer calculations looking at the effects of carbon dioxide on temperature and rainfall. And then off course it became a political fight which of these groups would get the money. And so at the end of course everything was decided by who gets the money. So the people in Colorado won. And ever since then climate experts and computer experts have had the money and they also had all the public attention. And the group at Oak Ridge has dissolved for various reasons. I think there are still people there but the people I knew of course are not there anymore.

- Why not?

Well, it’s forty years ago. They are retired or have disappeared. So I don’t know now what they are doing. Anyway, I got out of the field when it became political. So I haven’t worked on the subject actively but of course I’m interested in what they are doing. Particularly in the last ten years I’ve been reading literature. And now it has become, I would say, a scandal. So many people are telling lies. So I became engaged not as much as a scientist, but as a citizen.

- Those who are involved in the computer modelling, is that what they are mainly working on right now?

Yes! They believe their models. It’s a very dangerous game if you work with a computer model. I mean I’ve seen that, not only on climate but in all fields of science. To work with a computer model for years and years, always improving the model, fixing the weak points, making it better and better all the time. In the end you end up believing it. It’s very difficult to remain objective.

- But why do you think it is dangerous to believe in these fluid models?

Because they are wrong! It’s very simple, they are wrong and still people believe them!

- You are basing your opinion on?

They disagree with the observations. And nature ought to be the deciding voice. The observations should always tell you in the end who is right and who is wrong. Those people don’t look at these observations. They are in a world of their own.

"I don´t say they are dishonest but I think they are inevitably influenced by the fact that they live by scaring the public"

- So what you’re saying is that we should look at it more holistically, like an organic thing and we shouldn’t model the world the way we want?

Right! That the world is much more complicated then the computer models. I have a good friend in Princeton who is a computer expert, Sugu Manabi is his name. He is Japanese but he lives here in Princeton. He did some of the first climate models on carbon dioxide. And he always said from the beginning “The climate model is a very good tool for understanding climate, but a very bad tool for predicting climate”. That’s still true and he understands it. So the reason is: what the computer models can do is vary one thing at a time, which of course is wonderful for science. You vary one thing at a time — carbon dioxide or whatever you like. Then you can see directly what the effect of that is. So that’s an understanding what is going on. It’s very helpful. But if you look at the real world there are hundreds of different things going on all the time. The computer model can´t possibly give you a complete picture. It´s actually just fluid dynamics. A computer model gives a good model for the motion of the air in the atmosphere, or the motion of the water in the oceans, — that´s all it can do. But all the other things like trees, clouds and snow and all the fine details the models cannot do.

- But are you saying that the whole history of global warming is based on fluid models, computer models? And less on observations?

Yes I think that is true. It is sort of an accident that it happened that way. Computer models became the dominant voice.

- So the truth out there is, well you can almost call it that: a subsidized truth?

That is the problem! It is a subsidized truth, to the people who are believing the models. I don´t say they are dishonest but I think they are inevitably influenced by the fact that they live by scaring the public. If they do not scare the public they wouldn’t get support from the government. The military does the same thing. I think they are very much like the military.

- How so?

Well the military also lives by scaring the public. But they are honest people. The military people I talked to, they are good people, they are honest people and they understand war is terrible and they don’t enjoy fighting wars. But they’re still there and their existence depends on scaring the public, so that’s what they do. Anyhow, it’s a similar problem.

- German farmers are struggling because of huge loans to produce bio energy fields, to place windmills in their backyards. All in the name of 'saving the climate'. What is the solution according to you?

Of course the answer is that we don’t know yet. The way to find out is to try many different possibilities and develop new technologies. And of course we have huge possibilities that are still unexplored. Particularly in the room of biology. I mean, making energy crops I think is a good idea, but we don’t know how to do it yet. It’s a big mistake to start subsidizing technology when it’s expensive. That sort of "fixing it" becomes an invested interest that continues the technology even when it is expensive. And that is not going to solve the problem.

What we need is cheap technologies which will pay for themselves. Of course a good example is fracking. Fracking is a huge success economically. It’s cheap and convenient… Actually it's producing a substantial reduction of emissions in this country. Because of fracking we are now actually producing less carbon dioxide than we were. In Europe the emission of carbon dioxide is rising because they are burning more coal. So it’s a paradox that in fact fracking turns out to be cost-effective.

Coal is horrible stuff and we have many good reasons to get rid of coal.Coal is a pollutant. It produces all kinds of poisons which really are bad for human health and bad for vegetation too. So we should by all means try to get rid of coal. But the substitute of coal, which has worked extremely well in this country, is natural gas. Natural gas is still a fossil fuel, it still has some carbon but only half as much as coal and it has none of the bad chemicals. So what’s happened in this country is that we’re substituting natural gas for coal. As a result reducing pollution and also reducing global warming, if that is what you want. So the rest of the world can do the same thing. Just because coal happened to be a pollutant doesn’t mean that natural gas is pollutant, it’s just the opposite.

As for all the other tricks: windmills and solar energy and energy crops, they are not cost effective. They are too expensive to be sustainable. So it remains to be seen what will work. I would say let’s go on with solar energy. In the end, that is probably the winner. But not yet. It´s still too expensive. So we just have to continue pushing many different possibilities, if that´s what you want to do. Because I also happen to believe that carbon dioxide on balance is good. So the whole enterprise doesn´t really make sense.

- The sea levels are rising, is that true?

It is true, on the other hand it has been rising for ten thousands of years. So most of it has nothing to do with human activity. So the rising sea level of course is a problem but it's not clear that it has anything to do with humans. That is certainly not understood — either whether humans are contributing to it or how much. It seems that it has not been rising

more rapidly in the last twenty years than it has before. It seems to be fairly steady and slow and the amount is certainly not catastrophic. It’s, I forget the numbers, it’s something of the order of one meter per century or so. Which can be serious. But it is not a disaster. The trouble is a lot more due to sinking land rather than a rising ocean. The sinking land is from human activity. Mostly from humans pumping water out of the land, and as a result the land sinks. That is actually more serious than the rising ocean. But it’s easy to cure that. If you stop pumping you stop the falling land..

- But can we control the sea levels?

I think the answer is we simply don’t know. At the moment we certainly don’t know how to do it. We don’t know how much of the sea level rise is natural and how much is due to us. It’s still quite small anyway.

New study says California land is sinking

- How do you look at the Paris climate conference?

The Chinese and the Indians are the two countries that are most important. They are the ones that burn the most coal. So what the Indians and the Chinese decide to do is actually the most important thing.

And they, in Paris, did not agree to anything substantial. They have let themselves free to burn as much coal as they want. So I think that is the main result of Paris as far as I can see. It really doesn’t matter what we do. Either in Europe or in America the quantities are comparatively small. So the Paris agreement was actually an agreement to do whatever we feel like doing and not much more. A lot of words but not really much action.

- What should be the action?

Well I would say… as little as possible. To try to dictate technology by politics is not good and that’s what the climate people would like to do. They like to have political control of technology. I think that is on the hold there. So fracking is a good example. Fracking was never pushed by a political agenda. It just happens to be a very good way of getting oil and gas out of the ground. It is environmentally quite good and also very cheap. So it happened just as a natural result of improved technology. But I think we can go further that way. If Europe would do more fracking it would certainly help.

"And whether their believes where right or wrong was not so important. As long as they believe the same things they would survive"

-There are a lot of politicians and scientists who do not feel the obligation to listen to sceptics like you. How come there is only one kind of truth?

Yes, this is of course a question I cannot answer. I have a theory about that. Which has to do with the evolution of humans. We evolved in small tribes. A hang-together-society in which we lived for a million years or so. As small tribes hunting in the forest, competing with each other. That’s how humans evolved. And under those conditions the important thing was loyalty to the tribe. It was absolutely the most important thing to have people totally loyal to the tribe. Holding the tribe together. And whether their beliefs where right or wrong was not so important. As long as they believed the same things they would survive. And I think that is very much driving us still. To be with the herd, to be thinking the same thoughts as other people is build into our nature. So it's still more important to belong to the tribe than it is to speak the truth. And so I think that explains it a bit. And scientists are not different from other people, we have our tribes also. This believe in global warming, it is a tribal loyalty which is very strong. It’s always difficult for the heretic to find people to believe what he is saying. But still heretics are also important and luckily they are not burned at the stake anymore.

- Thank God!

This conversation was part of the documentary The Uncertainty Has Settled. Watch the 90 minutes film below. You can choose your preffered subtitles by clicking on the settings button at the right bottom. More info @ THE UNCERTAINTY HAS SETTLED

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