

EM DESTAQUE

SCIENCE AND TECHNOLOGY AT UALG

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By its name, our faculty deals with both science *and* technology. Then, what is it exactly that distinguishes one from the other? Maybe we can say that science is trying to discover how nature works and technology is finding out how to use that knowledge to our advantage.

The aspect of science and technology is best explained by an example. Actually my personal favorite subject. The temperature on this planet is allegedly increasing in a so-called Anthropogenic Global Warming (AGW) scenario. This, in fact, is one of the major worries of Western society and a subject that can be studied by our faculty. And *should* be studied by our faculty, since it is that worried society that pays our salaries.

There are very many ways of looking at this subject. It ranges from a politicians point of view – "Let me try to represent your worries and organize a solution" – to an entrepreneur – "Let me see how I can fill the hole in the market of Renewable Energies". The politicians (United Nations) have been founding an investigation committee (with the *ab initio* name of the final outcome of the research, intergovernmental panel on climate *changes*, IPCC) in search of proofs of the theory. After five years of research, the committee came up with some proof of AGW.

The approach of a scientist is now actually to question the theory itself.

This in accordance with Nobel-Prize winning scientist (and my personal hero) Richard Feynman, who wrote in his inauguration speech for Caltech in 1974.

You must convince your audience that you have done everything you could to disprove your own model. Also, you must not only show what data agrees with your ideas, but also what disagrees.

On top of that, your theory has to make a verifiable prediction and not only explain the existing data, but also the data to come. The classical example is of Einstein predicting a different orbit for Mercury compared to Newtonian models, a fact that was later proved and which caused general acceptance of his theories.

The scientist is looking for corrections of the model. The politician is looking for ways to correct the *data* with so-called fudge factors. They were caught red-handed in what is now called Climategate, with the most striking example an e-mail of top scientist Trenberth to his colleagues "The fact is that we can't account for the lack of warming at the moment and it is a travesty that we can't". They were put under pressure by politicians that urgently needed convincing proofs, in order to mobilize society into action.

Many scientists in the sphere of influence of the IPCC have been adapting the model when new data kept coming in that disproved the theory. Since 1998, the hottest year in recent history, the temperature is dropping. Dropping of temperature was not foreseen in 1998. In more recent reports of the IPCC, these are retroactively 'foreseen'. Such adaptations to incoming data are what is called Bayesian science. In stead of abandoning the model, the scientists adapt it to new data, thus never meeting the Feynman criterion of science.

As a scientist, I have personally been undertaking the task of checking where the theory might be wrong. Summarized in the book *De Mythe van Klimaatveranderingen* (In Dutch. English: *The myth of climate changes*).

In my point of view, there are many places where the theory fails (as an example, CO₂ concentrations, allegedly being the cause of temperature changes, in fact trail them by years, thousands

of years later). Actually, there is not even a *theory*. What most people do not realize is that there are no scientific proven laws underlying the ideas. The AGW is a *model* that is simulated on large computers in so-called finite-elements studies (dividing the system in many tiny cells that interact). The experimenters do not know what goes on in the computer. They see that 1) The outcome is consistent with previous data, 2) The prevision is for the (sought) global warming.

Yet, society cannot permit itself a scientific stance and wait for the theory to be proven correct or wrong. If later the theory proves to be right, we will be too late to intervene. That is where technology kicks in. Regardless of the outcome of science, we can already pro-actively do something. If later the AGW model proves to be wrong, then "Nothing gained, nothing lost". This is the point of view that causes the 'virus' (Dawkins Meme) of Global Warming to be able to spread in society. Whereas this way of thinking is also erroneous, it is true that it is anyway beneficial for society if we can reduce oil consumption, to be less dependent on other countries.

Research has been done at our faculty to come up with new materials and devices for cheaper and more efficient photo-voltaics. Devices on both sides of the energy cycle. Better solar cells and better sources of light. The focus is on organic materials ('plastics') since experience tells us that anywhere in society they are more efficient. Our research was summarized in another book, *Electrical Characterization of Organic Electronic Materials and Devices*. However, one major breakthrough was in non-organics, namely using silicon nano-particles to break high-energetic photons up into low-energetic ones that can more efficiently be converted into electricity.

Technology and engineering are now taking all this knowledge and making it into real tangible products. While science will verify the model of AGW.