

## **GIGGLING AND WIGGLING IN MATERIALS**

Working on sustainable materials is important, because the materials that we need for renewable energy are a finite resource. And they are more finite than the source of renewable energy, which is the Sun! For nearly everything. So we have to use them in as wise and moderate a manner as possible, which is the opposite of what we're doing at the moment! Otherwise, we won't survive.

If you take a material like silicon, which is the mainstream of electronics, and it fractures, and it breaks, there is nothing you can do. Broken. So that is where at the moment I am focusing heavily on materials that can repair themselves and that can heal themselves. This is something that Nature knows, for example the DNA does it, but generally when we heal, it is because a lot of energy is put into us and there is material available to heal that. That we cannot do with a man-made material, made from minerals, like what we have in our electronics and in our solar panels, and in our batteries and in our windmills.

But there are materials, and not only organic polymers, and there are inorganic materials, and that's that I work at the moment, they are perovskites, if you break them, and you put them together, they will heal. And they won't need anything else to do that, maybe a little bit of humidity, but even without it. Furthermore, if I hit them with a very strong laser beam, or with a particle beam, and they will be damaged, and they will heal themselves. How can they do that, because these are a new family of materials, that we haven't known before? It is, like silicon on steroids, because they have a lattice that wiggles and giggles, but on the average it's a beautiful periodic lattice. However, on a very short time scales giggling and wiggling! That giggling and wiggling allows the atoms to rearrange themselves in order to go back to the most energetically favourable condition, which is when they are on the average ordered. And that is for me a fantastic thing that happened in the last 8 years, it's as if a new window on materials has opened. And we have now to try to find other families that can do that, for using our renewable energy.

I don't want to be the one that says what's correct and what's incorrect. Because there might be ways to get to sustainability that I haven't thought of. I just want to make sure that it is understood, that that's what we have to do in whatever way will become possible. And that's also why I spent a lot of time in the last 20 years to teach. And to teach mainly to make sure that everyone who has an education in science, exact sciences and life sciences and engineering, that they can become critical observers and critical readers of what is thrown at them as supposedly facts. What the politicians will do with it, it's a problem! But in the end the politicians get elected. And we vote for them. And

hopefully, by making this an important part of what we want them to do, we can change things.

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