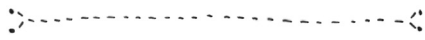


Franz John



One of Franz John's motivations for making art, is to understand the world better. At his studio, one can find models of primordial oceans, a telescope he once built, earthquake detectors, camera obscura photographs, and small Grätzel cells. These are the main focus of our interest this afternoon. They can generate energy by the same principle as plants do. After he explained how they work, we wonder why we don't learn more from the plants, the insects and other living beings.

I've been working for one year now with so-called Grätzel cells in an artistic way. These are dye-sensitized solar cells that -- in contrast to typical solar cells -- don't work with silicon, but with dyes. And this is something very remarkable, this discovery that in the early nineties Prof. Michael Grätzel made in Lausanne -- and who gave the Grätzel cell its name and patented the idea. So far, it hasn't carried through yet, but the invention is rather spectacular. It is based on processes that are taking place in plants. If you remember biology classes from school, you will have heard of the concept of photosynthesis. By this principle, a tree absorbs light by the means of dyes and can generate its own energy. Like this, each tree is its own power plant.

This is something that caught Michael Grätzel's attention back then, and he tried to learn from nature: how do plants manage to generate their own energy and why can people not recreate this process? Grätzel's discovery is also exciting in that sense, as the generation of solar power is ecologically more harmful than generally noted. One needs tremendous amounts of energy for melting the silicon out of the sand. This energy is usually obtained from coal or coke, and it takes five years for a solar cell to balance its environmental impact that it caused. This is what is called environmental balance.

What is special about the dye-sensitized solar cells, or Grätzel cells, that we experiment with, is, that we also produce our own dyes. That means, we chop down a variety of plant scraps that normally would go to compost heaps. For instance, you can take Broccoli or onion peels, grind them up and extract their dyes. Mixed with titanium white and some harmless other chemical substances, the paste gets squeezed between two sheets of glass or foils. Simply based on this physical correlation, you can generate electricity -- just according to the principle of photosynthesis.

We, that is Michael Rodemer, a professor from the United States and I, experiment according to these principles with two school classes -- with an art major class and a chemistry major class. Thus, we've been experimenting for nine months now in two fields at the same time, and the students have managed to create such Grätzel cells in only two hours as a group. With one cell, you can produce 0,4 Volt at 200 milli-amp. That means, that with a row of serially connected home-built Grätzel cells, you can power an mp3 player. For the students this is always a great experience to see how electricity is generated and how to produce it oneself with scraps of plants.

It's very exciting to imagine this system working on a bigger scale. We work now on just a small scale with something, that every tree can produce in enormous amounts. A tall oak tree can generate on a hot summer's day about one kilowatt of electricity per hour. That is the equivalent of two stoves for boiling water. If you think in such dimensions, you can imagine what it would mean to produce such Grätzel cells systematically.

This principle doesn't only exist with plants. I was amazed when I received an email from a researcher at the Helmholtz Institute, where she sent me a picture of an oriental hornet. This insect carries within its yellow stripes a kind of Grätzel cell power plant. In fact, the hornet does generate electricity with this yellow dye. Scientists do not know yet what this electricity is used for -- whether it's for cooling the insect or whether it makes it flap its wings better. However, it shows that there are very many mechanisms in nature we haven't discovered yet. There are plenty of resources around us that we keep overlooking. Maybe we should have a closer look in our vicinities to discover where these resources lie and how we can use them.

The field of bionics partly employs already the Grätzel principle. We use these principles and make art with them. This means, that we want to create something that is perceptible and perceivable in a tangible way. This is also one of the reasons why we work together with an art class. From August 20th we will be presenting the objects that the students have created at House of World Cultures, to demonstrate the visitors what is already possible. Which is, that with just some dyes and very little chemistry we can produce power in an environmentally friendly and sustainable way.