

'I am fascinated by their behavior'

interview with Annemarie Maes

- *Nowadays the newspapers are filled with the climate change problem. Do you think that, in a thousand years, there will still be humans on earth?*

- I think humans are a strong animals (laugh). Big survivors. Better would be if there are less humans on Earth, it would be good to have a balance and restore Nature more or less. For sure, Nature will exist in 1000 years. When I started my rooftop garden on the rooftop of my studio in Brussels (where we discussing now), the first few meters were a terrace. The actual garden, 750m² is a complete 'artificial' set up. The complete rooftop surface is 2000 sqmeter, it is the rooftop of a parking lot, and it was really difficult to get the authorization from the board of the building to make a garden on it.

It is incredible, how strong nature is, even on a rooftop. This is an artificial environment, but when there is soil and water - water is the most important thing – than Nature takes over. Before this interview, I was away for two weeks only, and see how the garden explodes. I'm not doing a lot of maintenance here. I try to manage to keep it more or less 'natural clean', and because of the climate change it is becoming warmer in Brussels and the humidity (of the leaves) makes the conditions ideal for the garden to become a tropical forest.

- *A jungle?*

- Maybe. I'm learning more and more from Nature. It is a pity that most humans are so greedy. If the humans would'nt be that greedy, it would cause less problems.

- *Yes. Everyone wants everything.*

- That's the thing. If we would be happy with what exists, and not always want everything, there would be less problems.

- *My workspace is located in a concrete office building, but even there, sometimes, I see a little plant coming out from the asphalt. So life is everywhere.*

- Absolutely. Nowadays, scientists make in which specific bacteria live, the bacteria make the concrete self-healing. When the concrete gets weared out and gets cracks, than water and soil seep into it and the cracks get filled with seeds and suddenly you have plants growing out of the concrete. Now they prepare concrete with special bacteria, which are in a dormant state. When the concrete cracks and water comes in, the bacteria get alive and active, and they start to fabricate a substance (often calcium) which fills up the cracks. Material science is such an interesting theme! Those scientists collaborate with nature.

- *There was an exhibition at Centre Pompidou last year, showing an installation with 3D printed plants...*

- La Fabrique du Vivant. Yes, I saw it.

- *It is so interesting that you can actually print the environment for a plant...*

- The artist is Allison Kudla. She has put the little plants into the 3D printer.. I think it's really fascinating. I know most of the artists that work in the bioart discipline. I just got a research grant from the organization STARTS, who organized this exhibition, which is about science, technology and the arts, it is a program from the European Community. STARTS residencies. I work together with the biophysics lab of the Vrije Universiteit Amsterdam (VU Amsterdam). As an artist, I do artistic research, but I am also very much interested in biology. I now develop a biological pollution sensor that can be integrated

within the beehive. This sensor is an interface that can visualize the pollution in the environment, in the foraging fields of the bees.

- *What are you doing with these data?*

- For the moment I am not yet collecting data, I am first creating the sensor, as an interface. I'm working on that since a while, and in Amsterdam I want to push this research to a next level. I call this sensor the Sensorial Skin of the beehive. I work with different kinds of skin, microbial skin grown and made by bacteria. With other species of bacteria, I make colonies growing on this support.

When the bees come back from foraging, they come back with pollen. The bees' body is covered with hairs. The hairs are electrostatic, so everything sticks into the fur of a bee, pollen but also dust from the environment or pollution floating in the air. When the forager bees land outside on the beehive, they activate the bacterial communities that are living in the biofilm which is enveloping the beehive, and the bacterial colony changes from color. They produce genes that have the possibility to produce and express color. When pollution trespasses a certain degree, the color will change. The bacteria themselves are dormant and transparent, but when the bees activate the dormant bacteria due to the pollution in their fur, the bacteria wake up and they react. Their colour expression is a visualization of the status of the environment.

- *Why are bees so interesting? Why do you work with bees and not with elephants?*

- This is purely by accident. I was fascinated by the bees' behavior. I got in contact with bees via a befriended beekeeper, and when I got more involved, I discovered the complexity of a bee colony. When you open a beehive for the first time, it is striking that a bee community reflects often the human society. In the beginning of my work with the bees, I just wanted to do colony behaviour monitoring. Phase 1 in my research was to install DIY electronics (camera's and other sensors) in and around the beehive, in a non-intrusive way. As such, I was able to monitor the honeybee colony in relation to their direct environment. I studied the data that I collected in my several observation beehives. I created a large rooftop garden on top of my studio in the center of Brussels, with native plants and other nectar-rich plants. I took courses on botanics to learn more about the symbiose between flowers and bees and to learn about the needs of pollinators. I started a pollen grains data bank that I filled with samples collected in my garden and in the beehive, and I studied these samples together with researchers at the Brussels University, to learn about the preferences of the bees for specific plants.

Diving deeper and deeper into the realm of the honey bees, I became convinced that the domestication of the bee colonies by the beekeepers is part of the bigger bee disappearance problem. So I decided to develop 'bee houses' that are completely different from the commercial 'honey producing' beehives. I wanted to design bee houses from the point of view of the bee colony, and not of the beekeeper. Because they have opposite interests. I started reading scientific papers written by entomologists, about the ideal conditions for a bee nest: on form and content, on the ideal place and orientation, on smart organic materials. And I decided to proceed to phase 2 of my Bee Agency project.

The core goal of phase 2, was to change all electronic DIY monitoring technology into biotechnological monitoring. Actually, I wanted to go from an 'observation of' towards a 'collaboration with' the honeybees, and more than that, an understanding between bees, other micro-organisms and humans. You probably know Kombucha, it's a probiotic drink. During the fermentation process of green tea and sugar into Kombucha, bacteria –that are present in the liquid- are spinning a fabric of cellulose on top of the medium. They do this to protect the fermenting culture against other aggressive bacteria. At the end of the fermentation process I harvest the 'skins. The cellulose skin looks and feels like leather. Vegan Leather. Some people in fashion focus their research on processes to improve this alternative leather for creating garments. I made use of this material to wrap my Intelligent Guerrilla Beehive in it. This skin, grown by bacteria, grown by nature and completely biodegradable: this is what is interesting me. And

secondly: I started to research if I could use this cellulose skin as a support for growing other bacteria on it. In a laboratory, the scientists grow bacteria in petri dishes with Agar Agar as nutrient growth medium. Bacteria always need food. Agar is like soil for bacteria. I tried to figure out if I could use the cellulose skins as a substitute for agar. This was the main hypothesis for phase 2 of my project: turning the exterior shell of the Intelligent Guerrilla Beehive into a biosensor that can reflect the pollution in the bees' environment. The way to visualize the pollution is to work with biofilms of bacteria that have the possibility to change color. Not all bacteria can change color, so I had to search for the right bacteria to work with. Little by little I started to collaborate with biologists in different labs. Step by step we worked towards a proof of this hypothesis. First, we made a proof of concept in the Complex Systems Lab in the University Pompeu Fabra in Barcelona. Here we were still working with the bacteria in petri dishes in the lab, in ideal conditions, but we found out that a specific bacteria, *Lactobacillus plantarum*, turned from transparent to green/blue once it was stressed. The following question was: how to take this hypothesis out of the lab, into nature? Therefore I now have a STARTS (science + technology + the arts research grant at the Hybrid Forms Lab at the Free University Amsterdam, to continue my research. Developing the Intelligent Guerrilla Beehive is a complex process that takes time. I have to develop the project step by step. First there was the improvement of the formal design, based upon the external shapes of a pollen grain and bespoke to the needs of a bee colony. Then there was the material, which needs to be natural, organic and supportive for the bees. And now we are working on the pollution sensor, to reflect the pollution of the environment in which the bees are foraging. That is, in short, the story of the Intelligent Guerrilla Beehive.

- *You have an Intelligent Guerrilla Beehive now in Hamburg.*

- Yes! Finally I was able to test the Guerrilla Beehive outside, in public space. This installation is mostly a test for the bespoke design of the beehive. The shape of the beehive is very important, as I created it completely tailored to the needs of the bees. The design of the beehive is supportive to the bees in terms of thermoregulation and aeration. As such, it helps them to save energy that otherwise they have to spend to warm up their nest. There is a second beehive inside, so it's very well insulated from the cold. The bees can use the spare energy to fight the Varroa mite!. One of the reasons that the honeybees are disappearing, is due to the attacks from their natural enemy the Varroa mite. This is a very small parasite insect that invades the hive and nestles in the cells where the larvae grow up. The bees have to fight this enemy but this takes a lot of energy. All the energy that they don't have to spend to heat up their nest (they have to keep up a constant temperature of 36°C), they can use it for other activities. The body of the hive that I installed in Hamburg is made out of local wood. I had the opportunity to work with a Kuka robot –this is a very performative robot arm- that has milled out the beehive body into a nice sculpture.

- *And do you think that the design is successful?*

- For the moment we are collecting data. I installed a camera at the entrance of the beehive to monitor the activity of the colony, how many bees fly in and out compared to the data of outside temperature and humidity. I register these data in a database, and a beekeeper with experience can also follow the development of a bee colony through their foraging behaviour and the time the bees spent at the entrance of the beehive. I have a similar beehive in Brussels, also with camera and sensors and I compare the data of the 2 beehives, the one installed in Hamburg and the one in Brussels. Data in Brussels and Hamburg will differ, as the locations on which the beehives are installed are not similar. The hive in Hamburg is located close to the water, outside the harbour, and in Brussels the hive is located on a rooftop in the city center. On the longer term, when I will have collected enough data, I will be able to judge on the design of the beehive. The whole project is about studying and collaborating with nature.

- *Collaborating with nature is interesting but I do not see this very often in contemporary art... Do you want to change something or observe and learn from nature?*

- More the second point. I want to observe nature, and through my art I want to raise awareness with the people and I also want to give them recommendations on how to behave towards nature. Collaborate and work together with nature, opposite to the nature/culture divide.

- *I read several times that, if honeybees disappear from the planet, we will be in big problems...*

- Yes, because the bees and other pollinating insects are an essential link in the food chain. They pollinate 75% of the crops, their task is absolutely necessary. And this is not only done by the honeybees. There are also wild bees, butterflies and so on. If they disappear it's a huge problem. You know that the Nasa is busy to develop small robot bees, but they will never be able to make a substitution for the millions of bees that pollinate. Because just one beehive contains 50.000 bees! Imagine Nasa to make 50.000 little robots that are flying around... And then this is yet only the population of 1 beehive!

- *And you have to charge 50.000 batteries...*

- Haha, yes! Actually, I think that these robot bees are just part of a spy program in development. There are some places in China where they used so many pesticides that the bees are completely eradicated and pollination had to be taken over by the people of the villages, they had to pollinate the flowers on the trees manually. In the documentary 'More than Honey', we see how, spring after spring, all citizens of the village go to the local shop to get a little bag with pollen and a brush, and they have to go and pollinate the flowers in the trees.

- *I often have the feeling that we still don't know Nature and how Nature functions. We learned at school, that the smallest existing part is the atom, but later it turned out that there are much smaller parts...*

- Yes, it's incredible and fascinating. It never stops, it's always evolving. Nature has so much power we, as humans, can only dream of. But if you collaborate with Nature, you can make Nature helping you. You know, one of my (hahaha) problems is that I'm an artist, and not scientist, I don't have the budget of a scientist. My job is to work with my ideas in an artistic way and show these artworks to a public and make people more aware of problems via my exhibitions. In my concepts I show the problem and a direction towards a possible solution, but most of all I put attention to our relation with nature.

- *Do the people usually understand your projects? They seem rather complex to me.*

- The key is that my projects need some explanation, what is the case with most of the art/science projects. Unfortunately people don't like to read in an exhibition, so the solution is that the organizers foresee mediators, or that the artist is always present (haha). But often these art/science projects are presented to peers. The community of the art/science practitioners is very small, and they understand everything, this makes that we even go more into details. But for a general audience it's probably a lot of information at once, in an exhibition. Most art/science projects start from daily problems but possible solutions are often complex and they ask for some intellectual investment. But to reach a larger public, problem and solution need to be exposed in a catchy way. It is something to work on. At the one hand, the artworks on show in an exhibition need to appeal to as many people as possible, and the persons that want to dive deeper into the matter they can do it, but if not, even then the message has to pass for everybody.

- *I usually fail to understand deeper science, because there are too many circumstances I have to accept, and usually I don't know why these are important.*

- Science is very specific. This is one of the advantage of an art/science project: the scientist can have some input from an artist. Artists are often thinking out of the box. We are not afraid to ask questions or set up unusual experiments. A scientist would never do this because of all the predefined circumstances.

- Yesterday I met with Manuel Abendroth from Lab|Au, and he told me that the contemporary art scene in Brussels is different from other cities, because there are no big institutions like Tate or Moma, but he also sees this as an advantage. How do you experience the art scene?

- Société is a good example, they are doing fantastic things, setting up great exhibitions. I think that in Brussels we have much more interesting spaces than Palais de Tokyo or Moma. What do you see in Moma or Guggenheim? It's all about artists we know already. They never show new artists, nothing unexpected. For me it's interesting to have new input from what's happening in the city. I think that, in this regard, the offer in Brussels is better compared to other cities. The climate is good in Brussels because there are a lot of artists and they are a real international mix. Brussels is not so expensive, the rent is not yet too high comparing to London, Amsterdam or Paris ..., so artists can find more easily studios to work in. I think its good not to have too many big institutions. Soon we will have Kanal, a big institution, which is closed for renovation now.