

Script for the Video Documentary on the work of the Institute for Predictive Sonobotanics

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Overview

Scene 1 Interview with Alberto de Campo about the birth of the project

Scene 2 Marije Baalman about the technical realisation

Scene 3 Interview with Prof. Dr. Hortensia Audactor about sonobotanics

Scene 4 Interview with Drs. Albert van der Velde about the reception

1 Foundation of an Institute

Screen displays the logo of the Institute for Predictive Sonobotanics with soft music in the background; the music is, as we will find out later in the documentary, the sound of the stalk of the plant, in a very early stage of its life. This music continues for the whole scene.

Q: Alberto, could you tell us a little bit about how the Institute came into existence?

Screen fades to a typical interview situation, where we see Alberto sitting in a mostly empty, white room in a black designer chair, leaning backwards

AdC: Well, I do not know exactly where we have to pinpoint the birth of the Institute. Our first work on the concept of the sonobotanic plants was during my "Edgar Varèse Guest Professorship for Electronic Music" at the Technische Universität Berlin. We were preparing something for a project together with Andres Bosshard, which eventually became the "Garden of Codes".

Screen shows a slide show of photographs of Alberto and Andres standing around in the atelier and its balcony and in the court yard of "Tesla im Podewils'sches Palais".

AdC: But I think that the birth of the institute was really as I came back from my travels to China. It is strange how these coincidences take place; just before the trip, as part of our brainstorming for the Garden project, I was talking with Marije Baalman, late at night in the Studio of the TU.

Screen shows the small studio of the TU, looking out over the Landwehrkanal, at night, seeing the lights of Berlin through the large windows that cover 2 walls of the studio. The image exerts a great sense of contemplative peace

AdC: I had mentioned something about sonic plants of which I had vague memories from my childhood. At that time, I wasn't even sure anymore whether I had really seen these plants as a young boy, or whether it was only remnants of early childhood phantasies that still lingered.

Q: Could you tell a bit more about these phantasies? I understand that they played an important role in your becoming a composer and sound artist.

Screen shows the interview situation again, Alberto stares up into the air as he answers this question, looking thoughtfully

AdC: Ah, now, I grew up in the city of Graz, in Austria. This is actually a rather small town, back then even smaller than it is now, located in the mountains. Some parts of these mountains are very hard to reach. To most people they were so uninteresting, that they did not bother to go there. As a young boy I was a very solitary person and I used to wander out on my own into these mountains, preferring the quiet, untouched nature.

The screen shows some mountain sights of untouched nature (looking like it might be the mountains near Graz).

AdC: It was there that I heard for the first time a certain melodic sound, which fascinated me immensely. I returned there often in the course of that year, and later on I heard not only the melody, but also a rustling sound and the sound of clear drops. I ventured to find the source of these sounds and could come to no other conclusion than that they had to come from certain plants; brightly coloured plants as far as I could judge - I'm colour blind, you see -, and I noticed also that the exterior of the plants did not change much at all during the time I went there. At home I looked in all the encyclopedias and books on plants we had, but I could never find anything like these. As I grew older, I became more interested in other things and lost track of these things. I only went back years later, but by then an investor had bought the area and built holiday residences there. The plants had vanished.

Q: Some of your biographers claim that your early contact with these plants are the main reason for you to have become a sound artist and composer.

AdC: Ehm, I would not go that far, but it is true that these melodies I remember from long summer days, are still going on somewhere in the back of my mind, and sometimes they resonate when I imagine new sounds while composing. I have simply always been fascinated by sound itself, and I enjoy creating new sounds very much.

During a short silence, we return to the interview situation

AdC: To come back to the birth of the Institute... While I was in China, on one of our excursions, we went to the countryside, to visit a traditional botanic garden. At some point, I lost touch with the group and found myself wandering off into a corner of the garden which is normally not shown to tourists. And all of a sudden I was startled by this sound that has been in the back of my mind for so long. As I looked around I found these plants, just as I remembered them.

AdC: Unfortunately, as I rejoined the group, I was unable to talk about my discovery with the local guide, as my Chinese is on-existent and his English was not sufficient to understand me. But, as I came back from China, I found that Marije had on her own delved into the background of the story I told her.

AdC: She was more lucky than I was as a kid, and had actually found references to a scientist who does research on these sonic plants. And not only that, based on what she had found, she had started to make a model of these in SuperCollider, as she wanted to make these models for the "Garden of Codes" project.

AdC: And so it was then that we decided to found the Institute for Predictive Sonobotanics.

2 Realisation

Screen shows again the logo of the Institute for Predictive Sonobotanics with soft music in the background; the music is, as we will find out later in the documentary, the sound of the stalk of the plant, with some rustling sounds which represent the leaves. This music continues for the whole scene.

Screen moves to a table where there are several circuit boards with chips and resistors soldered on, and a lot of wires can be seen. The camera is hand held and unsteady.

MB: What we see here are the basic elements of the electronics inside the plant. We have a microcontroller, which will get all the sensor data and converts it to a USB signal. Oh, and there is a small preamp here, for the microphone.

Camera moves to a number of sensors, lying on a part of the table. A small hand points to specific sensors as they are named.

MB: We have several light sensors, one temperature sensor and a humidity sensor. There is also a microphone. The electronic board is mounted inside a plastic ball, together with a loudspeaker which is glued to the inside.

We see the plastic ball

MB: The sensors will be placed on haulms coming out of the ball, to resemble what the plant looks like in real. In our model, inside the haulms there is an iron wire, to give it some strength and to make it possible to bend the haulm as we want it to be, and the electronic wires that lead to the sensor. The sensor is at the end of the haulm. Around the wires we shrink some plastic, so you don't see what is inside.

We see how the plastic is shrunk around the wires with a lighter

MB: Now this is really hightech (*laughs*). But actually, I think the side effect of doing the shrinking with the lighter is quite nice. It adds a nice organic looking blackness on the haulms.

We see the resulting plant, hanging from the ceiling on an iron chain. (This shot is clearly taken on another part of the day than the previous shots)

MB: So this is the physical model, with the electronics inside, the sensors, and then... the cables running to the computer. We have a microphone cable, a USB cable, a loudspeaker cable, and a DC cable to give the microphone preamp some power.

We see a flickering computer screen; we can distinguish several windows open, but are not able to decipher anything meaningful. During the next monologue, the camera slowly moves to focus on Marije, who is explaining about the model.

MB: And here is where the real work is done: the computer gets the sensor data and from that it calculates the development of the plant. The model is loosely based on what you find in roleplaying games. Based on the sensor data, the plant gets what I call "growth points" and when it has a certain amount of these, a part of the plant can grow. How much it growthpoints it gets, depends on the state of the plant; it can be in hibernation, it can be growing or decaying. I also put in certain extreme limits, which for example models that a plant cannot have too much water, but also not too little.

MB: Each part of the plant is represented by a pattern in SuperCollider... A pattern is a sequence of notes. When a part grows, one note from the pattern is chosen randomly, and replaced by two new ones, according to predefined rules. This gives a nice mixture of randomness and structured growing.

MB: The different parts of the plant have different sounds. In SuperCollider these are just synthdefs, small patches if you want. Like the stalk has a slow melodic kind of sound, the leaves have a rustling sound, and the flowers have a clear glass like sound. (*softer:*) I should maybe just show you.

Marije turns around and types rapidly on the computer. Camera focuses on the flickering screen again, where we can still not distinguish anything meaningful.

MB: So here we have the sound of the stalk.

We hear the sound of the stalk.

MB: Now we add some leaves.

Marije types a bit more... and we hear the sound of the stalk, as well as some rustling sounds.

MB: And now the plant starts blossoming.

More typing... and we hear the sound of the stalk, as well as some rustling sounds, and some clear drop like sounds

MB: Oh, now I can show you also how the model works. I have here a graph of one of the simulations.

She puts the focus on some other window on the screen. We can see there is a graph in this window, but not clearly what is depicted as the filmed computer screen flickers too much.

MB: So we see here the size of each part of the plant over time.

Marije points to a certain part of the graph.

MB: We see here that the stalk grows, and after a certain time, the leaves start to grow.

Marije's hand moves slowly to the right of the window as she talks on.

MB: Again after a certain time, the flowers start to grow, and then it all starts to decay again, after they have reached their maximum. Until, in the end, they enter the hibernation period, where nothing happens.

The camera moves again from the computer screen to Marije, sitting behind the computer still.

MB: The microphone is connected to a sound input in SuperCollider. We analyse the incoming signal, detect various frequencies, and divide it into phrases. It is then passed into a memory, which has several layers, just like our

own. The plant then reacts with a phrase from its memory. The stronger a certain memory trace becomes, the bigger the chance it is repeated and transferred into a next layer of the memory. The weaker a certain phrase in the memory, the bigger the chance it gets forgotten altogether.

short silence

MB: There are still some other things we want to implement, like the emotional influence of talking with the plants, and the intercommunication between plants, but we still have to get around to do this.

another short silence

MB: Oh, what I forgot to tell. What we did implement already, is the communication between two kinds of plants; there is the Periperceptoida Dendriformis Sensibilis, which is the one I just showed you, with the sensors and all, and there is the Periperceptoida Dendriformis (*pronouncing this tongue-breaker for the second time, is not without problems*) Imaginaris.

MB: This last one does not have any sensors of itself, but is actually a mirror of one of the Sensibilis. So it just plays the exact same sound as one of the Sensibilis. Technically, between Berlin and Cologne, we achieve this by sending OSC messages over the internet from both slang-clients to both scservers on either side. There is some special program, called Rubicon, involved in that, written by Stefan Kersten, so we do not have any problems with firewalls and such.

3 The science of sonobotanics

Screen shows again the logo of the Institute for Predictive Sonobotanics with soft music in the background; the music is the sound of the stalk of the plant, with some rustling sounds which represent the leaves, and we start to hear first droplets of flower sounds. This music continues for the whole scene. The camera in this scene is again hand held, but starts to be more steady.

Image moves to a green garden with several flowers in it. The camera moves along a path to find a woman with grey hair tied in a knot, in a black dress with green flowers at the bottom, standing in the garden carressing a plant; she is talking to it and the plant seems to answer something, but as the camera comes closer the plant ceases to reply.

HA: (soft) ah, daar zijn jullie al.

She moves away from the plant to the path and looks into the camera. She is clearly nervous about the camera and surely not used to being filmed.

HA: We have to stay at a slight distance from the plants, as they are very sensitive. I have noticed very often that if I get too close with my tape recorder, the plants just shy away and do not react anymore to me.

Q: Is that the reason it is so hard to do research on these plants?

HA: It surely is one of the reasons, yes. For years I was just looking for a good way to document my research. Western science demands a certain reproducibility of the experiments and some kind of neutral proof of the observations. Describing what you hear is often not accepted. But this makes it very hard, as the subject of my research is very sensitive. I even believe that they are aware of me researching them, which is why they shut up as soon as you put them under any kind of observation mechanism.

Q: (*slightly disbelieving*) You are suggesting that these plants have intelligence?

HA: I suspect they do, yes. (*slightly irritated at being confronted with such disbelief*)

short silence

HA: There is some evidence in literature of plants having emotions and making sounds, though not in the audible range such as the plants I study. (*slightly indignant and certainly not amused*) This is not something I am making up.

From this moment on, we cannot escape noticing a tension between the interviewer and Hortensia Audactor

Q: There are many scientists who ridicule your work and there has not been any proper publication yet about these plants. Can you explain why that is?

HA: (*Slightly agitated*) The problem is that current botanical research is so far away from the real nature, that they cannot imagine that these plants exist, even though I have written a number of convincing and very thorough papers about my findings. None of the botanical magazines has dared to publish them, as review committees reject papers that question established conventional views... It is just because they are unfamiliar with these plants and the fact that these plants do not fit into any existing taxonomy, it is hard for them to accept. As I said, most of those botanists hardly ever come outside, let alone in parts of the world where these plants exist. It takes a certain human warmth to grow these plants in a garden; in most botanical gardens, this human factor is badly neglected, and the plants wither and die very soon.

The screen shows Audactor's study: an 19th century Dutch style study, the walls lined with book shelves, filled with old books, on her oaken desk, there are heaps of papers, we can distinguish several drawings of various plants and many papers with hand written texts. We also see a heap of tapes lying around, labeled with various dates. As the camera has shown the interior of the study, it zooms in on a first page of a manuscript, the title is written in a old fashioned hand writing and says: "De Principiis Hortorum Culti Sonorum".

HA: This is the manuscript of the book I resolved to write about my research. It encompasses all that I have been able to find out about the sonobotanic plants. Just recently, I made some new discoveries and now I have to revise several passages, but still I expect that within the next three years, there will be a first edition. That is, if I can find a courageous enough publisher for it.

Q: I suppose the market for such a book would be quite small.

HA: Hard to say. I do think that the market will be smaller than the market has been for the popular scientific books I wrote, as of course the text is much more scientific inclined. Nonetheless, I do hope that it will find the market it deserves and that it would finally make way for the acceptance of sonobotanics in Western science.

Q: *(almost mockingly disbelieving)* Your popular scientific books?

HA: *(in a defensive tone)* Yes, I have written a book called "The Soundness of Plants", which has sold very well. Only recently the third revised edition completely sold out. I am working on a new revision for the fourth edition. It has been translated into several languages, for example into German by Viola Gärtner, "Wie Pflanzen hören" is the German title.

We see several shots of the front covers of the older editions of this book in various translations. After this, we move back to the garden and see Hortensia Audactor again, standing on the path, looking into the camera.

Q: What is your opinion on the models of the plants made by Marije and Alberto?

HA: Well, as Marije first contacted me, I was quite startled. Even within my own family, many have broken contact with me over the years, as they could not understand that I spent my whole life studying these plants. So as I received Marije's letter, I was both surprised to get in touch with my family¹, as with finally finding someone who took a genuine interest in my work.

Short pause in which Hortensia Audactor looks thoughtful.

¹*ed. note:* Marije is an indirect grand-niece of H.A.

HA: Of course, I do not understand exactly how their models work, with all this modern technology, but they have been able to convince me that this is a novel and promising way to find out more about the plants. With their models, we can attempt to simulate the plants and compare the behaviour of the models to the behaviour of the real plants, and hopefully, learn to understand these beautiful enigmatic beings better and better.

4 Reception

Screen shows again the logo of the Institute for Predictive Sonobotanics with soft music in the background; the music is the sound of the stalk of the plant, with some rustling sounds which represent the leaves, and we hear a multitude of droplets of the flower sounds. This music continues for the whole scene. Again, the camera is hand-held; however the camera-man seems to have gotten the hang of it, and the camera is more steady than in the previous scenes.

*We see a young man walking around in the court yard of Tesla in summer, stopping near one model of the *Periperceptoida Dendriiformis Sensibilis*.*

Q: Albert van der Velde, you are one of the few people who have both experience with the real sonobotanic plants, and with the models of Alberto and Marije. What is your opinion on their work?

AvdV: Well, I must admit that I am very excited about them. They managed to achieve a very high degree of sonic similarity with the real plants. *(softer:)* Though I must admit that the sound of the stalk is still rather high; I shouldn't forget to mention this to them.

AvdV: From the short time that I have been able to examine the models here, I cannot say yet how well they compare on a deeper, long term level.

Q: Apart from the scientific value of their work, do you think that their approach will have other important consequences?

AvdV: Most certainly, from the people that have visited this garden and the enormous interest after Professor Audactor's lecture at the opening of the garden, we have realised that with this approach we can reach a much bigger audience and create more interest for this work. This will certainly help to get the field of sonobotanics established.

Screen changes to the garden of the Overstolzenhaus of the Kunsthochschule für Medien in Cologne; again we see Albert van der Velde walking in the garden; in the background we can see Hannes Hölzl behind a computer, working on final details for some artistic projects presented in the garden.

AvdV: It is quite interesting to see the difference between the environment in Tesla, which is more of a court yard than a garden, and the rich, green garden here in Cologne. Though the models had some difficulties to start up here, they flourish very nicely in this garden.

The Periperceptoidea Dendriformis Sensibilis, next to which AvdV is standing reacts to this with a singing voice.

AvdV: (*Exclaiming enthusiastically*) See, how the plant reacts! This is just marvellous! Normally, near a camera a real plant would most likely 'play silent'. Of course, one can find this a flaw in the model that should be corrected, but I think it just helps us to study their behaviour more closely. If one would model the shyness too well, there would be almost nothing to observe!

AvdV: (*getting agitated*) In the scientific field, as in many other fields, we are very often bound to present our results in certain ways, with accepted methods of representation or documentation. And it is just not always possible to do so. Especially in new fields like sonobotanics, it is insane to think that methods which work for normal botanics, are also applicable here. It is unreasonable to think that a certain medium of representation can encompass all the aspects of a certain area of research; just think of how Kuhn and Feyerabend explained how scientific revolutions only happen because researchers *invent* new methodology and new forms of proofs. I think one should be open-minded, and enjoy the creation of new concepts and ideas. In the end, every concept has its own medium in which it is best expressed.

Credits

Screen shows a view on the sonobotanic plant models; we hear their stalk sound in the background. Text appears in the screen alternating between coming from the left and right.

Script

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Publisher

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