

# **A FIELD GUIDE TO MACHINE WILDERNESS**

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# WELCOME TO MACHINE WILDERNESS

THEUN KARELSE AND ALICE SMITS

Machine Wilderness is a collaborative research project organized by Theun Karelse of FoAM, a cultural laboratory re-imagining possible futures in the interstices of art, science, nature and everyday life and Alice Smits, initiator and artistic director of Zone2Source, an exhibition platform in three pavilions in the Amstelpark in Amsterdam that presents art projects, discussions and workshops focusing on developing new relations between art, nature and technology.

Machine Wilderness was the theme assigned by Andrea Polli to the ISEA 2012 symposium, originating from writings of cultural geographer Ron Horvath in the 1960s who researched the impact of cars on the planes of the Southwest. This theme referred to the task for artists and technologists to present “ideas for a more humane interaction between technology and environment, in which ‘machines’ can take many forms to support and sustain life on Earth.” It is used here with full respect for that context.

We became interested in ARTIS Royal Zoo as the location for the first Machine Wilderness symposium, with which we launched a multiple year program consisting of artist led workshops and expeditions in various landscapes, when listening to a lecture by then ARTIS professor Erik de Jong. He narrated the history of ARTIS that did not start as just a zoo, but as a place where nature, art and science merged, following the adagium *Natura Artis Magistra* with which it opened in 1838. Thinking through this history, De Jong went on to envision a future of ARTIS as a place to reflect on the state of nature, art and science in the 21st century. Within this narrative we felt that ARTIS offered an interesting context to launch Machine Wilderness.

Following this, we developed the idea to invite artists for residencies in the zoo, to explore the complex relations between humans, animals, plants and technologies. We explored many ideas and different versions of the Machine Wilderness program originally planned for March 2020 as the pandemic hit the world. Finally Machine Wilderness at ARTIS opened on 11th of March 2022 in the planetarium and ended with a grand finale on 24th of June in the then just opened Groote Museum.

Maria Verstappen, Erwin Driessens, Špela Petrič, Ian Ingram, Antti Tenetz, Heather Barnett, Thomas Thwaites, and Ivan Henriques each spent several weeks in the ZOOdio working together with scientists from Micropia, animal caretakers, botanists, biologists, and many of the other staff of ARTIS. The program focused not so much on final outcomes but on artistic research processes that were shared in various stages through workshops and presentations with the ARTIS audiences.

It was a very special experience for us to be part of the zoo family for a while, sharing coffees with the employees, seeing the chimpanzees make up their beds every day around closing time of the zoo, watching the city herons steal the fish from the zoo animals and hearing the baboons call out early in the morning, long before the zoo opens. It was an intensely rich time, and we thank all the artists and ARTIS staff for making this possible and giving us such generous access and support to many of the spaces and information of the zoo. In the next pages of this book you will join us on our adventures in the Machine Wilderness of ARTIS Zoo.



Participants receive their keys and vests during the opening of Machine Wilderness in ARTIS planetarium.

# ALICE SMITS AND THEUN KARELSE IN CONVERSATION WITH JUDITH DE BRUIJN

*Judith de Bruijn (ARTIS heritage and art) coordinated the Machine Wilderness program from within ARTIS and was the central link in the web connecting the artists to the researchers and staff at ARTIS. We spoke with her a few months after the project ended to reflect on the role of art in ARTIS' past, present and future.*

AS: One of the reasons we were interested in ARTIS as a venue to launch Machine Wilderness with a symposium in 2015 is because ARTIS is so much more than a zoo. We were inspired by a lecture by then ARTIS professor Erik de Jong who talked about how art and science were important from the very beginning of ARTIS and how ARTIS is now again looking for connections between nature, art and science around the issues of our own time. That's why for us it was the perfect place to launch Machine Wilderness back in 2015 and, now with a series of artist residencies. Can you talk a bit more about the role of art in ARTIS throughout history?



JB: Art has always been part of ARTIS since its inception as reflected in the name NATURA ARTIS MAGISTRA; nature as a teacher of art and science. People wanted to study nature there and imagination has actually always been part of it. Works of art were included in ARTIS' collection early on, but artists were also given the space to actually engage with nature as a teacher in ARTIS. As early as the 19th century, August le Grass studied marine life in the aquarium for which work space was made available to him. His painting of fish now hangs in the lecture hall of ARTIS (after the closing of the aquarium, where it was originally hung). Collaboration with the nearby Rijksakademie also developed early on. There is a photo where you can see students drawing a camel that was loaned by ARTIS and regularly brought to the Rijksakademie on foot. Well-known 'ARTIS artists' include Jaap Kaas, Hetty Heijster and Arie Teeuwissen. They were artists who had a workplace in ARTIS for long periods or maintained close personal ties with the caretakers and

were allowed to work here. On anniversaries, there is an old custom for employees to donate a work of art to ARTIS. I found a very interesting quote from ARTIS director Sunier about the conditions that should be taken into account when developing/designing a new animal enclosure. He mentions it is important to take into account the artists who want to study the animals, to have a great view on the animals. That was in 1938.

TK: So in a way, with Machine Wilderness, we have followed a very old tradition in which artists worked from a studio at ARTIS. This studio, located in the Salmhuisjes, was renamed the ZOOdio. An artist from the Rijksakademie also works in the studio every year. Did that arrangement already exist for some time?

JB: That relationship was revived when the Rijksakademie celebrated its 150 years anniversary, with the first artist in residence, Arvo Leo, in 2020 doing research in ARTIS. His residency was not so visible in the park and it is great to see that the current resident, Floris Schonfeld, explores themes that are very close to Machine Wilderness. He will be exploring the question of how ARTIS can be experienced by a variety of organisms, like an animal, a plant, but also an AI. Residents of the Rijksakademie still visit the ARTIS library each year.

From the beginning, ARTIS was a place to study nature, either living or dead, which culminated in a natural history collection. In the early days, the cabinet of stuffed animals was larger than the collection of live animals. For a long time, it was also the case that animals that died here were stuffed for the museum. ARTIS then employed its own taxidermist. Only one year after ARTIS' inception, in 1839, the first museum of ARTIS was created in which natural history objects were presented, ethnographic objects were also collected. So it was not just about the animals but also about the human culture intertwined with them.

The focus often came to be on the places we traded with. The motive was not only curiosity, or scientific, but it was also to get to know how people lived in those places which made total sense in the colonial, imperial context. It was also to show off the extended influence The Netherlands had. This probably also had to do with personal contacts that existed between areas. The collection was mainly brought together by members of the society, sometimes through their own expeditions, but sometimes a collection was purchased, such as the shell collection. Eventually, the ethnographic collection was moved to the Koloniaal Instituut, now the Tropenmuseum (Museum voor Wereldculturen).

AS: Machine Wilderness focuses on the artistic process more than the end goal. We think it is important that the research that artists do is actively shared with the public in order to challenge people to see different perspectives and tap into other forms of knowledge. Are there examples in ARTIS' history where it is not only about representation and imagination of art but also about the artist's research?

JB: At the time, ARTIS was mainly a place where artists came to observe and focus on the realistic or subjective representation of animals and animal portraits. But more recently we had artists who work in a more project-based manner in the zoo, such as Pavel van Houten, who took the public through the park, researched and collected data from the plants at the zoo, from which a visual end result eventually emerged; wallpaper used in the Noordpaviljoen – one of ARTIS' monuments.

TK: With Machine Wilderness, we want to encourage collaborations between artists and scientists to bring different forms of knowledge into dialogue. Artists collaborated with scientists from MICROPIA, with biologists from ARTIS, as well as animal caretakers and botanists. Has that happened before in ARTIS, that artists collaborated with scientists or that their drawings and illustrations were taken seriously as scientific observations, for example within behavioral or movement science?

JB: There were in the recent past definitely more of these kind of explorations. But in ARTIS' long past... in the way you intend it... no, not as far as I know. It would be a great topic for research actually, I would love to dive deeper into that. But since ARTIS and the scientific world were very much intertwined in the nineteenth century – for example the ARTIS-aquarium housed also an auditorium and zoological laboratory of the University of Amsterdam – it seems quite inevitable that there were contacts. But how those worlds met is not easy to deduce from the archive or artworks themselves. Surely there were connections when it comes to scientific drawings. The worlds of art and science only separated about 150 years ago. That is exactly the period when zoos and botanical gardens came into being. So it is really a very interesting question whether and how artists and scientists worked together back then. Boudewijn Bollee, for example, was a caretaker at the reptile house who, inspired by artists who he met at ARTIS, started to create his own sculptures, which eventually resulted in the large dinosaur statues in the park that are still there today. These are speculative, of course, but he did use sources from the ARTIS library.

TK: We are curious whether you were inspired by Machine Wilderness. Do you see a future for artistic research in ARTIS?

JB: Ultimately, my dream would be that we do projects with artists that bring new insights to both the artists and ARTIS and that the interaction between ARTIS and the artist is shaped in such a way that it is always an enrichment for both. This can help us to look at ourselves as an institution, but ARTIS must also remain a place where audiences are inspired, the biophilic side. It would be great if artists were given a place in ARTIS in the future as part of the daily practices of a community that works here. An artist's gaze can illuminate unexpected things, put a spotlight on, or magnify something. Perhaps it does not have to immediately result in a work of art, but that its presence has an impact on both the organization and the public, that is something I would like to see happen.

AS: We initially did have the idea that a Machine Wilderness residency would lead to new art works, and for a long time we talked of an accompanying exhibition that would support the research, including previous work by the participating artists. That all turned out differently and a working period like this is really too short to both conduct research and develop a new finished work. But the core of these Machine Wilderness residencies was always to have artists conduct research in collaboration with researchers, employees, the public and residents of ARTIS in order to turn artistic research into collective forms of exploration and to see what kind of knowledge this could yield.

JB: We have also experienced in Machine Wilderness how important it is that the artist's project is visually and conceptually accessible to the public and collaborators so that people can engage with the research. This is not so much a widely supported ARTIS policy, but that is how I see it myself as a person who is responsible for what happens in the field of art and cultural projects in ARTIS. You always weigh up the substantive investigative side and the visual, communicative side of a residency when selecting the artist. Someone really has to be familiar with the subject and be able to start a conversation with, for example, an animal caretaker. On the other hand, the work must also be able to appeal to a wide audience, because ARTIS has visitors from all kinds of cultures and ages. In collaborations with artists, we have started to look more at both sides, and that is a different vision than the artist who used to mainly make representations, essentially still life portraits of the animals here. In that sense I also found the two weeks with the

Art Science students very inspiring. There you really see the relationship between young artists and scientists with ARTIS as a place where that can come together.

AS: For us it was a fantastic experience to be part of ARTIS for a few months. You and your colleagues have made a lot possible for the artists to carry out their projects, but it often felt as if we were stretching the boundaries of how artists usually work in ARTIS. In that sense, has Machine Wilderness sharpened your experiences and thinking about what is possible in working with artists in ARTIS?

JB: Yes! For me it was a big learning experience for what art can bring about here, without it necessarily being a complete blueprint for the future. But Spela Petric's research, for example, was really challenging for us. Because both her research behind the scenes of ARTIS and the public activities she envisioned had to be developed in a short time, in which we also touched on themes that are sensitive within different parts of the organization or society. But her public activities were also a kind of eye-opener about how an artist's gaze can change how you view yourself as an institution. Just the different perspectives from which each participant in the course of her Performative Ethnography tours looked at the park was so interesting, I had never looked at the park like that before.

TK: That also happened to me during Ivan's tour in which he focused on symbiotic relations between life forms. When he described the different environments and the processes in them, you realize he thinks in microbes. The animals in ARTIS no longer appeared as individual bodies, but you start seeing a body as a whole world onto itself running around there, like the center of a wide network of complex relationships.

JB: In those moments suddenly everything you see changes. If you look at ARTIS that way, there are still so many stories up for grabs!

AS: In the period that we have walked around here and talked to so many people, we have indeed often thought that there is still so much potential here to reach a different audience with the stories that ARTIS can tell. As a visitor you see the animal and find a small information plaque about the origin and characteristics of the animal; but there is indeed so much more to tell. Could artists play a greater role in this?

JB: I'm not sure we'd want to institutionalize the artist in that way, in the sense that the artist becomes a tour guide. But looking together with an artist at other, more performative audience experiences would be very interesting. What other

stories here in ARTIS are interesting to tell, doing other ways of researching and how you can shape that to the audience. That came together nicely with Spela, for example, who took a group of participants to locations where the public usually has no access to investigate how caring for the animals and plants works in practice.

You also saw that other way of looking with Maria and Erwin who spent long days in the park with their A.I., the Spotter. Such a strange thing in the park made sure that everyone asked questions and started a conversation with them. It was also very nice that the caretaker in the birdhouse took the initiative to put the Spotter in the enclosure. He wanted to find out for himself how those birds would interact with the Spotter. That was so special that something can arise from the interest of an employee. A statue might never accomplish that.

TK: With Heather, the setting in the gorilla house worked so well to involve the public. The spectacle of those gorillas compared to the small flags of her ant observatory in front of it, then you don't have to tell anything anymore, but you think: oh yes, ants are also interesting animals. There is much more life here in ARTIS, including animals that come here voluntarily and establish relationships with the animals in the ARTIS collection. All those questions will be asked by everyone automatically.

AS: For us, an important goal of Machine Wilderness was to experiment with all kinds of audience engagement: how can you involve people in artistic research on complex issues about relationships between people, animals, plants and technology is what drives us. The meetings in the ZOOdio did not work very well since they were not visible enough for visitors. What did work well were the artists who worked outside on location for a longer period of time, wearing blue vests with the text Artist in ARTIS that we designed to make them recognizable. People approached them easily and started talking about the projects the artists were working on. If the program had run longer, we could have experimented even more presentation formats. For example, it would have been interesting to put the ZOOdio outside on location, real demonstrations with the artist at work where everyone can join and participate.

TK: That's actually how it worked during the art-science fair on the final day, where each artist had a table and presented his/her experiments. It was the first event in the Groote Museum and it was nice that the employees also experienced it that way.

JB: We were also very happy with the closing event. It really worked as one of those fairs where art and science come together in a festive and lively way. The artists in conversation with visitors at their tables with experiments and the dialogues that were held between ARTIS employees and the artists were really nice. On such a day, when the work of the artists and the caretakers, scientists and archivists come together, it takes on even more meaning for ARTIS and will also mean something internally to the employees. Because that is still a challenge for ARTIS with a program like Machine Wilderness: we can ask whose thinking has this changed and how can you find broad support for this in the organization? In that sense, Machine Wilderness was truly pioneering. Looking back, you could perhaps embed it even more, for example by linking artists to specific caretakers. We do think now about forms where a caretaker can indeed act as a kind of mentor or buddy to an artist.

AS: I think it is very important to pay more attention to the knowledge of the people who take care of a place. In the Amstelpark, where I work with Zone2Source on projects related to art and ecology, you see that the knowledge of the gardeners is hardly included in decisions about the park or in communication to the public. But these are the people who have worked there intensively for a long time, and they know the most about the place and they experience a lot, but this is often overlooked. So thinking about how you can do much more with the knowledge of people who work in daily practice is, I think, very important everywhere in society. There are all sorts of ways to organize this interaction. In retrospect, it might have been interesting to set it up from the start as a series of blind dates between artists and ARTIS caretakers.

TK: It is central to Machine Wilderness to work in-situ. And to do so with a real level of engagement, means looking for situated knowledge, not just about 'pigeons' or 'robots' but about bringing a robot to the pigeons here, including what happens between them and how that relates to the full complexity of the world in a specific location. When you are working from situated knowledge, it can be very surprising who becomes your 'expert', it may not even be human.

AS: It would also be interesting to ask ARTIS employees what they would consider an important subject for artists to research. Questions for which there is simply no time or no space, or questions which are not considered to be within a scientific way of thinking. Maybe to issues that are relevant to the changing identity of ARTIS right now: conservation, changing environments, changed thinking in society about our relationship with animals and other issues. Artists can

connect to this with their own way of doing research and in this way contribute to the public discourse and transformation of practices and directions of the zoo.

JB: I do like this idea of working with artists within the organization to explore certain themes. However, I do think that in the near future we will first of all continue to involve artists in presentations, festivals, conferences and maybe once every three years on a project basis for bigger research projects. With the newest ARTIS addition, the Groote Museum, we actually have a great new platform to involve artists. They are already a part of the programs there and in that way help to shape our thinking in very urgent matters.

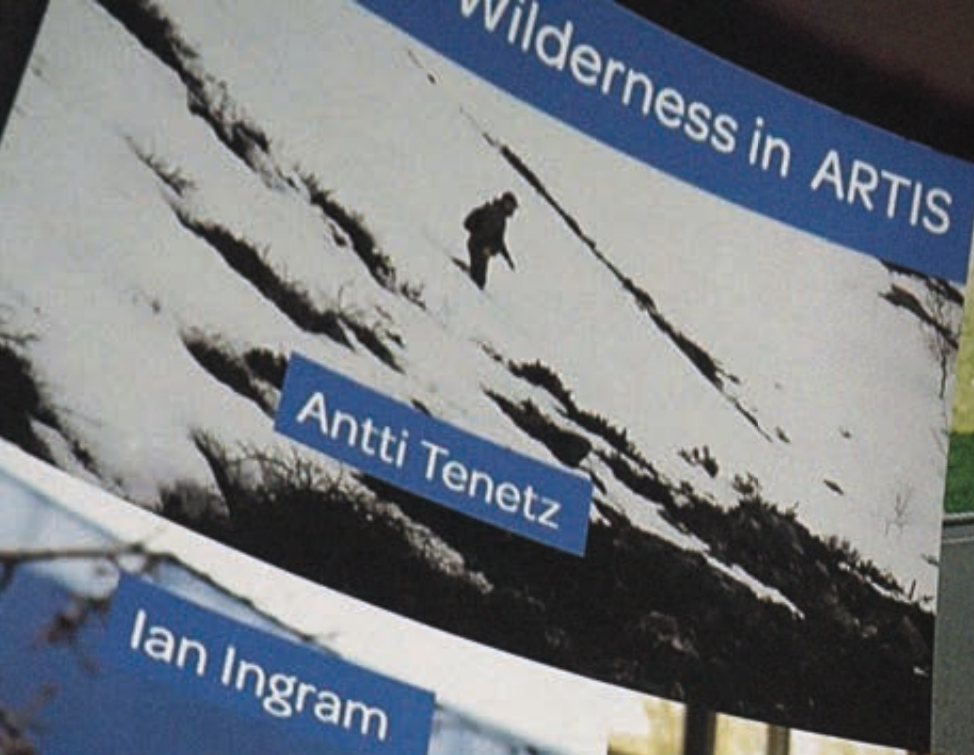
By the way, you sent me a message: "we miss ARTIS".

AS: Yes, we miss ARTIS terribly. We really enjoyed getting to know the people and animals here better. When you come regularly to the zoo you start seeing more and more. For example, I had no idea that chimpanzees make nests to go to sleep. And always around the same time: I often went around closing time at 6 o'clock to see how they make their beds. With Spela I went into the park before opening time, while Theun was often out in the evening with Antti to place camera traps near the wolves and see him engage with them; that was really magical; the animals seem to react differently when there is no audience. And to work with Thomas on his car just next to the studio or when a pigeon walked into the studio just when Ian was setting up his pigeon-robot. Together with the artists chatting in the ZOOdio with Tjerk, the head of animal care, who had so many interesting stories to share. And sitting in the cafeteria with all of the ARTIS staff for lunch wearing our blue ARTIS vests. Those are great memories.

TK: Yes, it was really nice to get to know the caretakers and ask, how are you today? What are you doing? And hear more about their daily work and connection to the animals they take care of. We have learned a lot from everyone. We still go there now and then as visitors, but that feels different than having been part of it for a while. It was fantastic that ARTIS wanted to take on the challenge to set up the Machine Wilderness residences in the park with us, and it is nice to hear that it was also an inspiration for you to think further about the possibilities of art and artists in ARTIS.

JB: It was definitely an adventure to share ARTIS with all you guys. I do miss you, the artists and the liveliness in that sense too, but it is great to realize that these residences really opened up opportunities for more residents to come. I am pretty sure about that.

Wilderness in ARTIS



Antti Tenetz



Driessens / Verstappen



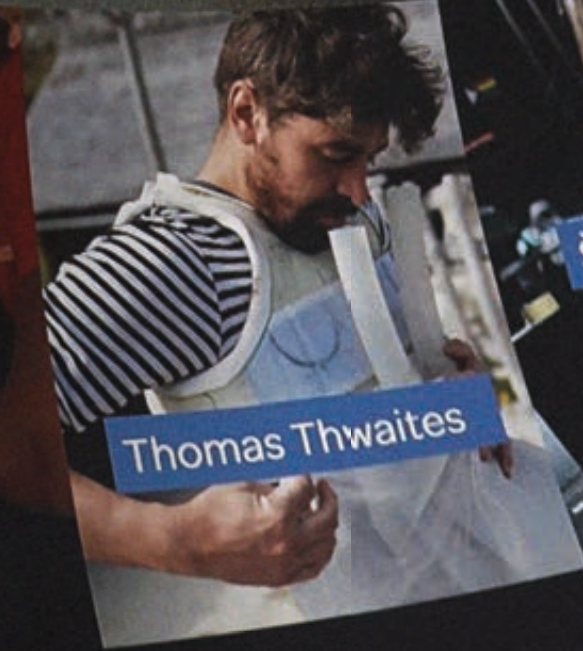
Heather Barnett



Ian Ingram



Ivan Henriques



Thomas Thwaites



Špela Petrič





# HOW DO MACHINES LEARN TO RECOGNIZE ANIMALS?



ARTIS(T) IN RESIDENCE

## ANTTI TENETZ

### CONNECTING WITH ANIMALS

During his Machine Wilderness residency Antti has collected lots of images as material to train a neural network on. Mostly of the wolves and the birds in the tropical greenhouse, but also many other animals. The working process is as much about training the neural network as it is about connecting with the animals himself. Antti says that at home in the Finnish Arctic, being in nature helps him forget his worries, a sentiment who live in the rainforest, savannah or even keen gardeners.

### WHAT WE ARE MADE OF

Antti wrote some time ago: We live in bioregions and watershed areas that are part of bigger systems. Analogue knowledge that accumulated in nature during 3.5 billion years of evolution is within and surrounding us. We should respond to what we are made of. We should try to see the animal within us as well as the non-human realm around us that we are an integral part of.

There is a lot of discussion and writing about multispecies perspectives and ecological thought in critical discourse. This is very theory-oriented. Not many people have walked among bears and wolves or swam in freezing arctic rivers. Antti Tenetz does. He describes himself as an artist and naturalist in equal parts. But anyone who meets him, will feel it right away, his profound connection to animals, rivers and forests. The bear, the wolf, the raven, they somehow seem to be there with him.



### TECHNOLOGY AS PORTALS TO OTHER WORLDS

Antti describes how technology allows him to enter the worlds of animals. The scuba diving gear that enables him to dive with the Arctic Char in extremely cold rivers. Although once he found a small hole in his suit was exposing him to the cold, eventually leading him to get close to hypothermia and thus cardiac arrest, he stripped off and ran through the forest for miles to warm up his body. He speaks of sometimes going into the forest with enhanced hearing gear that help you hear the smallest sounds from far away. And then he just spends time listening to the forest. Hearing life there in amazing detail.

The technology he brings to ARTIS Amsterdam Royal Zoo are camera-traps, used by ecologists to spot animals and animal behaviour during the day and night. He has a complex and varied set-up of 6 traps. Some work better at night, others give higher resolution images, and some are better for close-ups. At night Antti sees ARTIS as an entirely different kind of zoo than during daytime, because there are no human visitors and some animals have very different behaviour at night. Behaviour that the general public can't see. The camera-trap serves here as a portal to help us see beyond the human realm.

### JOINING THE WOLVES

After meeting with Peter, who is in charge of the wolves and other carnivores in the park, we set up a working method for placing the cameras for observations at night. Antti seems to be speaking to the wolves, making



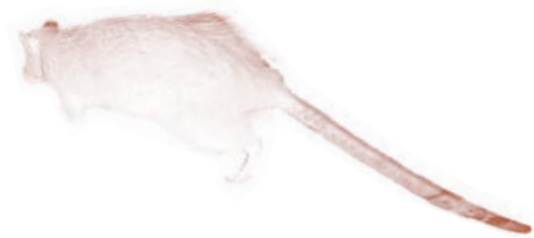
small sounds. Later he says that sitting there with the wolves made him wonder who is more enclosed, the wolf in the zoo or us humans in our concrete boxes and failing systems of hyper-capitalism.

The eye contact is slightly different to the wolves he knows from the wild. Wild wolves stare at you all the time. He is getting to know them, letting them get to know his scent. The sense of smell in wolves is formidable according to Antti. They can smell prey from miles away, just like bears, polar bears and many other creatures can do. It makes you wonder what the wolves make of the scents here. They no doubt recognise regular visitors, Antti says, and can smell all the other animals not just in the zoo but also outside. It makes you wonder about the dogs being walked in the streets nearby, do they know their smells too? Do they recognise all of our perfume-brands? Can they smell the local coffee-shops and restaurants? How far into the city do their senses travel?

### BEYOND OUR GRASP

Antti loves the tropical greenhouse, because it is such a layered space. The complexity of the place, with its lush vegetation means you never see the space fully or can even get a sharp grasp on it. It defies any overview, which reminds him of the boreal forests he visits at home. It offers a complexity that challenges all the senses; the heat, the smells, the uneven ground. You walk through the space on very equal footing with the birds, bats and other animals there. In the tropical greenhouse, like the Finnish forest, you can forget the human world for a moment.





Antti establishing contact with the wolves.

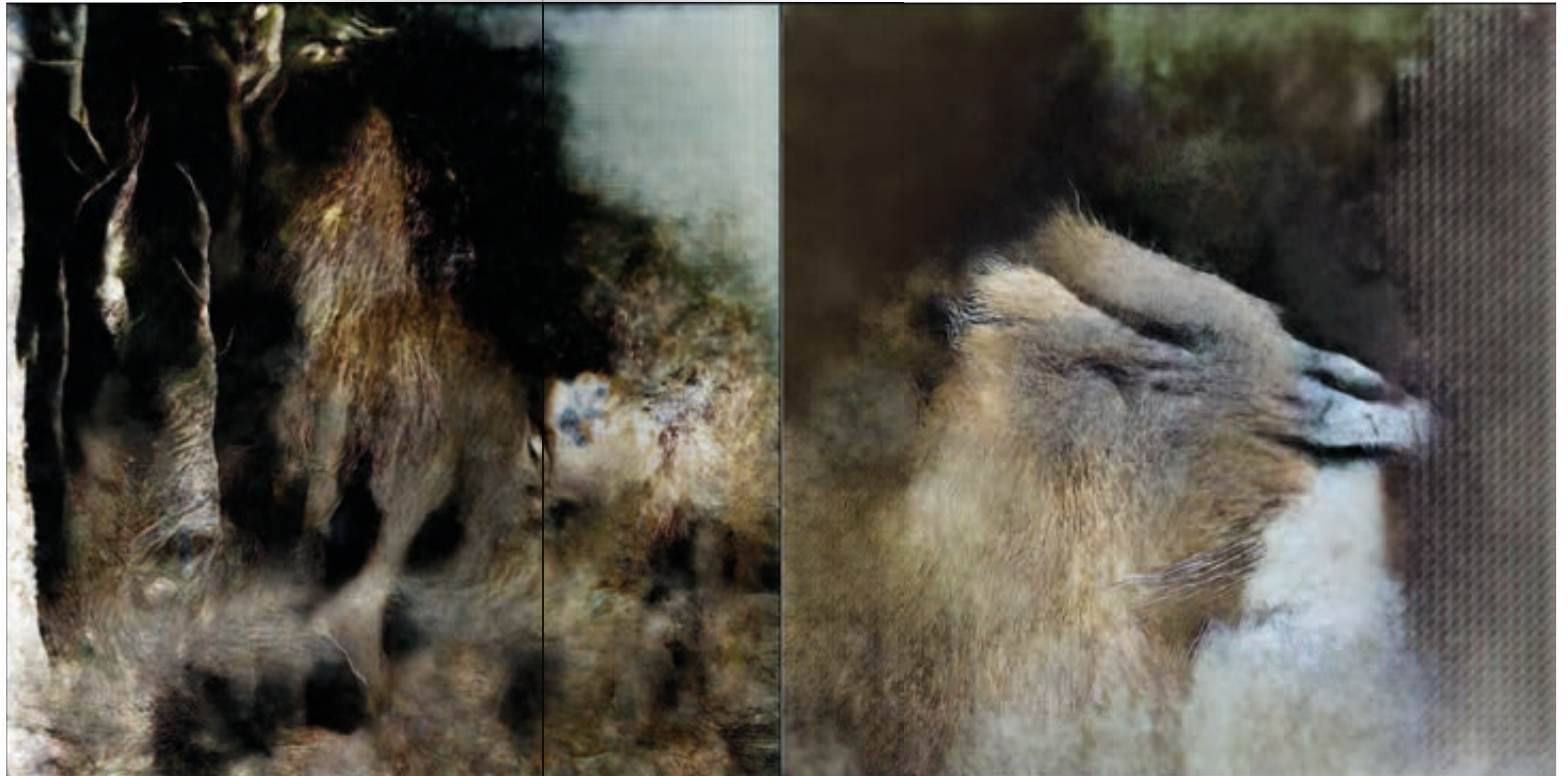


Antti preparing and retrieving data from the camera traps in the ZOOdio.





Images rendered by Antti using machine learning to create Griffins, based on photos he took of the lions and vultures in ARTIS.





Camera trap images of the wolf and the wolf enclosure at night.



Next page: a Griffin Antti rendered using machine learning, based on photos he took in ARTIS of the lions and vultures.



# IF WE LOOK AT THE ZOO AS A FRAMING DEVICE HOW CAN IT INCLUDE OTHER LIFE FORMS?

ARTIS(T) IN RESIDENCE

## HEATHER BARNETT

### FIELDWORK AT THE ZOO

*A conversation between Theun Karelse and Heather Barnett*

TK: Fieldwork always includes adapting to unexpected circumstances, but you really had to improvise, right?

HB: We had extensively mapped prime ant spots in the zoo, but I arrived to find it snowing in the middle of spring. There wasn't a single heroic ant in sight. So I had to readjust my plans on day 1 and move indoors with the gorillas, where ants live among the plants in the borders throughout the building. My residency focuses on animals that live in the zoo on their own initiative, like these ants, and having them just next to such a huge enigmatic creature as the gorilla, made the politics of attention in the zoo very present.

The ants and gorillas form a nice juxtaposition: two species that need a lot of social interaction as a group, but the dynamics are so different. The interaction between gorillas changes dramatically, there are quiet times and very volatile times, you see teasing, parenting, rivalry, boredom, chest beating... and at other times they are quiet and focused on eating, delicately picking up tiny grains of wheat with their fingertips and patiently blowing grain in their palms to separate the wheat from the chaff. Compared to that, interaction between ants looks indistinct and constant, like a stream of energy. It's difficult to engage with any one individual. Observing ants, you do get into a meditative state, tuning in to the rhythm of the colony.

### ANTS AS SUPER-ORGANISMS

TK: so why ants?

HB: I'm interested in emergent behaviour of organisms such as slime moulds and ants. They are self-organising, adaptive and non-hierarchical. The ant colony is a massive sisterhood, with one shared goal to look after the queen and her brood. Their lives are profoundly distributed, where the allocation of roles can change depending on what is needed: a nurse can become a guard, a cleaner can become a forager, but without any overarching control mechanism. No individual ant has an understanding of the colony as a whole, yet the colony possesses a global intelligence. Information is constantly cascading through local interactions. I am fascinated by how knowledge is held by the collective body.

The act of looking at the ants in the gorilla house also means not looking at the gorillas. That is quite a shift to make, when the gorillas are just a few feet away, behind a glass window. Both visitors and gorillas need some time to adjust to that. In the beginning the gorillas may have been a little jealous of the attention I was lavishing on the ants - they certainly expressed interest and curiosity in what I was doing in the bushes - but the lives of these species happen at such different scales, that you simply can't observe both at the same time.

In order to draw the visitors into the world of the ants I have made small observation stations, simple devices intended to draw out the behaviour of ants and draw in the attention of the viewer. These stations offer food to the curious ants whilst out



foraging and act as viewing devices, with magnifying lenses, cameras and microscopes helping to mediate between the scales of human and ant.

Attracting the ants to the observation stations is a major part of the research. Ants love novelty, so this is really about maintaining their interest. To work with living systems like an ant colony, you have to understand that system. The first stage is observation to understand its behaviour and needs, followed by interaction, providing small invitations or interruptions to test or amplify what is happening naturally.

Exploring  
(and influencing)  
foraging behaviour is a nice way to

interact with the colony. We only see the workers above ground of course. Most of the colony never comes out of the nest. There is a lot of speculation about what is going on underground, but you can pick up clues from the foragers. If they are carrying something, they are likely to be on their return journey so you can follow them and find a nest entrance. Gradually you start to see patterns that give an indication of what is going on at this scale. To do this you have to filter out everything else.

## THE POLITICS OF ATTENTION

TK: How did the politics of attention play out in the gorilla house?

HB: Visitors aren't just looking at the gorillas, they really want an encounter. I've observed visitors trying to get the animals attention in different ways. I'm curious about what drives this desire, whether the humans want to be seen by the gorillas or if it is about establishing some form of connection. It doesn't seem to be enough to simply watch and learn. In the time spent in the gorilla house I have noted a rich array of complex behaviours across all the species being observed, the ants, the gorillas and the humans.

The aim of the project is to question perceived hierarchies of life, which animals we chose to look at, appreciate or study. Ants might be small but they are deeply fascinating and definitely worthy of our attention and our time. Their foraging behaviour is used as a model to solve travelling salesman problems. Their collective decision-making on nest choice is used as a model for predicting migration patterns. Many curious humans are asking questions about the biological algorithms that drive their collective coordination. I'm not so interested in the mathematics of the colony, but through observing and understanding self-organisation at this level we can question our own behaviour. An individual ant isn't very intelligent, but the colony has great intelligence as an entity. The ants exist in constant dialogue with the environment





around them, responding to changing circumstances – a dynamic adaptive system. If we can take notice of that, we might find more reciprocal ways to live on this planet with its abundant diversity of life..

### THE GREAT UNKNOWN IN OUR OWN BACKYARDS

TK: Just before you went back home, we spent some time outside the gorilla enclosure. The gorillas were going around in a small chaotic parade which the male somehow leads from the back. It seems inconceivable that we classify these beings as animals, and incredible to think that there still are some living in the wild on this planet right now. What astonishing wealth is fading away around us. The ants you are trying to put centre stage in your research are small miracles in their own right. Isn't it one of the biggest challenges for us to appreciate the non-exotic? Because the world has reached a point where every ant, every hoverfly and every little herb is crucial. Can we bring ourselves to appreciate what is there before it becomes rare? The politics of attention is not just at play in the zoo, but really affects the survival of species. You brought all this to Machine Wilderness and it feels like a precious gift to be cherished.



Ants climbing up a tripod in the observation station Heather installed in the gorilla house.

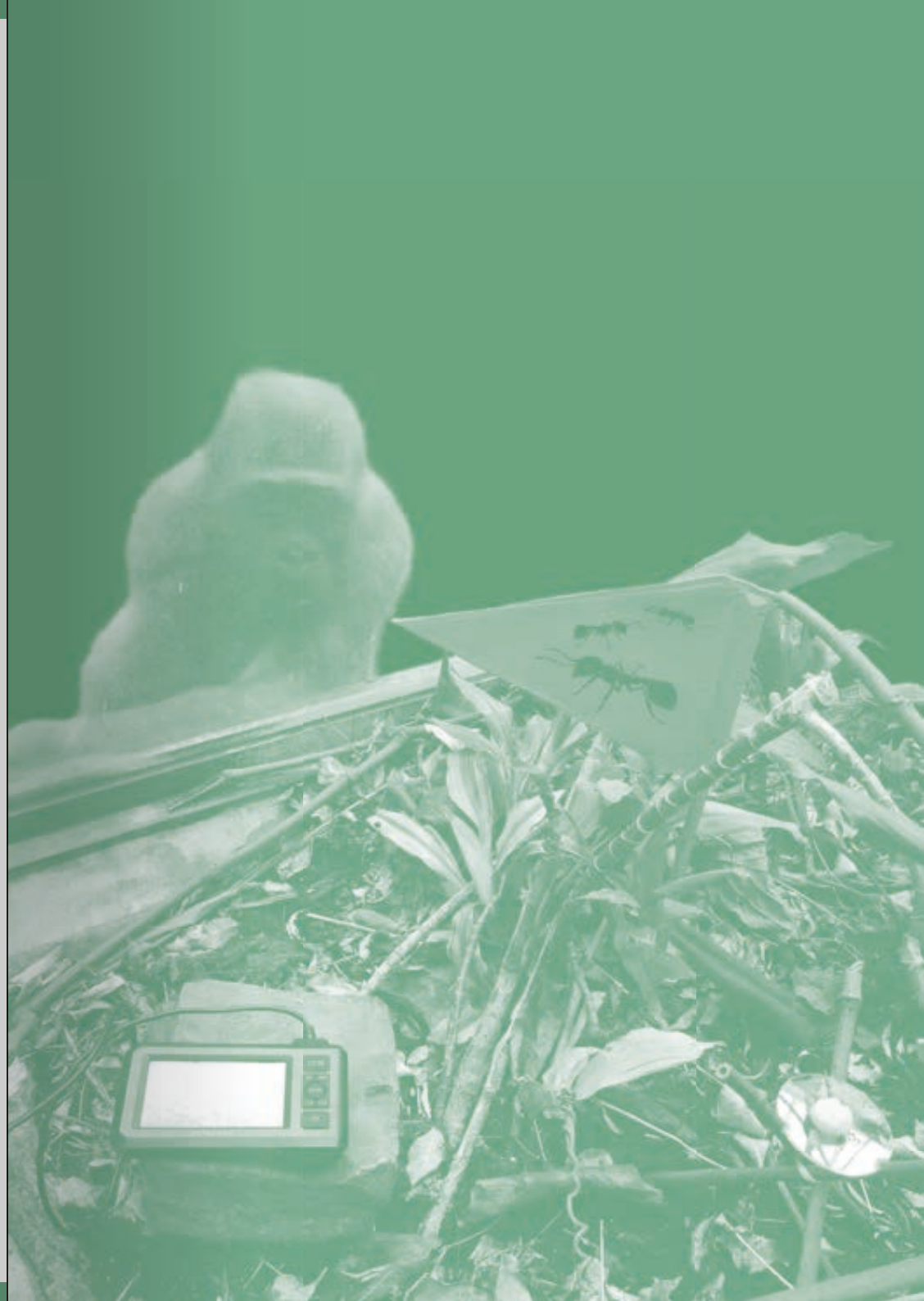


Visitors exploring the ants and their activities through observation tools at the observation station in the gorilla house.





Gorillas, ants and Heather in the gorilla house in various modes of observing each other during the residency.



# CAN ROBOTS AND ANIMALS COMMUNICATE WITH EACH OTHER?



ARTIS(T) IN RESIDENCE

## IAN INGRAM

### ANIMAL ENCOUNTERS

As soon as we step into ARTIS Amsterdam Royal Zoo and start passing by the animals Ian Ingram is in his element. The various animals trigger him into explaining stunningly diverse details about biological and technological beings. Whether it is their physiology, behaviour, signalling, or psychology, Ian's insight is kaleidoscopic. His combined overview of and affection for biology and robotics is remarkable. As we walk he chats about theory-of-mind among Corvids (crow-family), image classifying neural networks, Voronoi patterns of the Giraffes' skin, Chimpanzee politics, the zoo as theater or gesture in robotics and animal kingdoms. ARTIS seems almost an ideal studio for him.

### PIGEON ROYALTY

We enter the tropical greenhouse that houses the Victoria Crown pigeon, the main objective of a new robot he is developing, which aims to learn its body language, then mimic it in front of the common street pigeons of Amsterdam which move freely through the zoo. Along with the Crowned pigeon live fruitbats and various other birds including the Nicobar pigeon, the closest living relative to the dodo.

### RULE #14

The camera has only just been installed, so his robot may not reach the stage of learning the Victorian Crowned pigeons intimately during this residency. But Ian has brought a range of robots to make the most of the many opportunities the Zoo offers. Ian's robots develop over longer periods of time. They often evolve from first iterations to more attuned forms or specialised hybrids, much in the way animals speciate or adapt to local circumstances.

Throughout his work Ian has formed rules of practice and the Zoo answers one particular rule; rule 14: 'Work with local and abundant animals'. Over the years Ian has found that working with animals is much more effective if they actually are around and in large numbers. That is basically what a zoo offers its audience, a high probability of encountering animals. This is what this residency capitalises on both for the artist and his robots.



## PIDGIN LANGUAGE

Gesture is an important form of exchange between Ian's robots and their animal and human audiences. Body language is in many ways more universal than vocalisations and languages. Pidgin Smidgen is one of the robots Ian brought to ARTIS. It aims to act as a translator between the majestic Victorian Crowned pigeons and the common urban pigeons of Amsterdam that visit the zoo.

Pidgin Smidgen refers to pidgin language, a grammatically simplified means of communication that develops between two or more groups that do not have a language in common. The robot playfully explores this, acting as an intermediate in communication between the common and royal pigeons at ARTIS.

## A THEATER OF GESTURE

Zoos are places full of gestures. Waving, jumping, dancing apes, birds, lizards and human visitors. In zoos humans display a particularly rich variety of movement and gesture in their efforts to communicate with animals. The sheer volume of human gestures seems to leave some species saturated, but gesturing machines form an entirely novel class of actors on this shared stage, which may enrich the world of everyone involved.

This really forms the core ambition of Machine Wilderness: technology as intermediates or portals bridging the worlds of different species. Just imagine the potential of a zoo as a shared stage of gesture and interspecies communication enhanced by all kinds of robotic mediators, enrichers, explorers, translators and whisperers.

And imagine the insight into animal worlds that the development of such machines would generate for us humans.



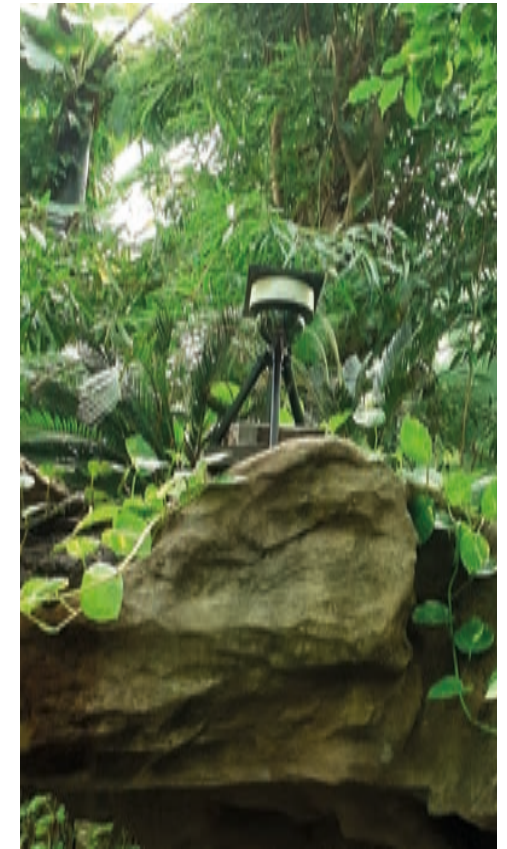
Ian Ingram setting up Nevermore-a-Matic, a robot that tries to communicate with crows. The robot sits on a branch in almost the same place where parrots used to sit in the Papagaaienlaan in ARTIS.



Ian, Spela and a visitor discuss the beak of the Nevermore-a-Matic robot.



A Victoria Crowned pigeon with Pidgin Smidgen in the ARTIS tropical greenhouse.



The Pan-Tilt-Zoom camera installed by Ian to monitor the Victorian Crowned pigeons and enable study of their behavior.





The amazing moment when Ian installed Pidgin Smidgen and a pigeon immediately walked in to the ZOodio workspace to check it out.



In the ZOodio, Ian and Heather discuss animal behavior and research with head of animal care Tjerk ter Meulen.



# CAN WE BUILD TOGETHER WITH LIVING ORGANISMS?



ARTIS(T) IN RESIDENCE

## IVAN HENRIQUES

### THE BIGGEST ORGANISM IN THE ZOO IS NOT THE ELEPHANT

Machine Wilderness at ARTIS is an artist-in-residency programme, but with Ivan Henriques this means not just having the artist in the studio, but all kinds of other beings too. The ZODio workspace now has a whole range of guests, including slime-moulds, mycelia (fungi), plants and various other kinds of beings.

Over the past ten years or so Ivan has developed projects in which he closely collaborates with organisms, many of them microscopic. During this residency Ivan is interested in bringing together different kinds of beings that form networks, like mycelia and slimemoulds in a series of small worlds. These start out as

formal geometric shapes

but get inhabited by

these communities

that slowly reshape

and make the

geometric forms

more organic. His

central interest is in

the communication

within and between

those networks.

### AN EVOLUTIONARY LINE OF MACHINES

The machines and robotic structures Ivan has been creating over the past 10 years are ways to explore the lives of plants, microbes, and other kinds of beings. And each project builds on the previous ones, becoming something like a family tree of hybrid-machines. The robots are like vessels that show something we normally might not see: when he built a hybrid plant-robot that drives around an exhibition space, the sense of touch of a plant steering the robot makes us really appreciate the plant's awareness and ability to act. Or the Symbiotic Machine, with its glass stomach

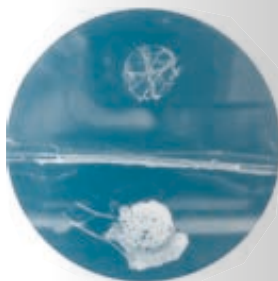
that acts as a bio-solar cell, producing a tiny current, because the pigments of the microbes in the 'stomach' can photosynthesize. These



tiny currents, present in all biological beings and our own bodies, are amazingly efficient. They are a thousand times more efficient than the systems humans build, our cars, smart-phones, refrigerators. Floating in its basin at Zone2Source where it was first shown, the Symbiotic Machine 'eats' Duckweed that floats around on the surface. The robot grinds it to a paste which becomes the photosynthetic layer in its stomach, giving it a little energy to find new Duckweed.

### ANIMALS AS WORLDS

Ivan loves his time at the zoo. It's inspiring to be among all these different beings and their wide range of behaviors. Where landscape architects like Thijs de Zeeuw design spaces for elephants or ground-squirrels to thrive in, Ivan is making tiny spaces in which he brings micro-organisms together. He is making them not for single species but for communities of beings, much like many of the more recent spaces at ARTIS like the monkey-bird-house.



Walking around the zoo, we see lots of large animals, but to Ivan the animals are worlds unto themselves. Inside they all have stomachs full of extremely diverse populations of microbes, like tiny rainforests. The 'microbial rainforests' are different in all these animals, the birds, gorillas, tortoises or snakes. Perhaps growing up in Brazil somehow helps him see that more clearly, the deep entanglement of all life.

### THE ELEPHANT IN THE ROOM IS THE SOIL

Key in the communities Ivan is bringing together in the ZOOdio are the mycorrhiza, the networks of infinitely thin connections that form the underground body of fungi. These tiny connections may be very, very small, but together they are massive. The biggest organism in ARTIS is not the elephant, Ivan says, but these underground networks. In fact, up to 30% of healthy living soils are made up of these networks and many plants depend on them.

Joining him in the ZOOdio is Jasper Buikx of MICROPIA, which is an amazing place, like a zoo for microbes. Jasper speaks about the care for these living communities of beings and about MICROPIA programmes that play an active role in the zoo, like making Bokashi from elephant dung to feed the plants. Jasper has an amazing list of microbial symbioses in the park: for example how the sloths are symbiotic with a green algae that lives in its fur and in return helps it camouflage with the green color. Ivan organizes a public tour of ARTIS, taking us closer to these unseen symbiotic connections within the park.

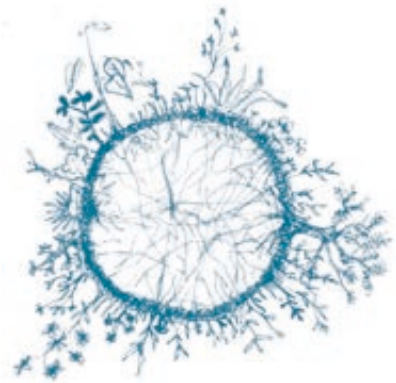
### COMMUNICATION IN THE SOIL

Prof. dr. Toby Kiers also comes to visit Ivan for a chat about mycorrhizal fungi and how to tap into the signals that these fungal networks exchange through tiny electrical pulses. She says these are very important, because if we would understand that language of pulses, we could listen and learn from

them. We could learn about the health of soils directly through these networks that reach into all corners. Toby studies trade-processes between fungi and plant roots and during Machine Wilderness Ivan has been making food-paths to visualize their activity.

Ivan is trying to make this hidden world visible so that we can experience these vital networks through art. Crucially Ivan researches these beings in context, like artists often do, not by separating or isolating something, but by engaging with it in full complexity. Which is exactly what Machine Wilderness is about: investigating and prototyping relationships between human cultures, technologies and living systems, not isolated in a lab, but in the full complexity of the world.

Prof. Kiers advocates for soil health through SPUN (Society for the Protection of Underground Network), a science-based initiative founded to map fungal networks and advocate for their protection.

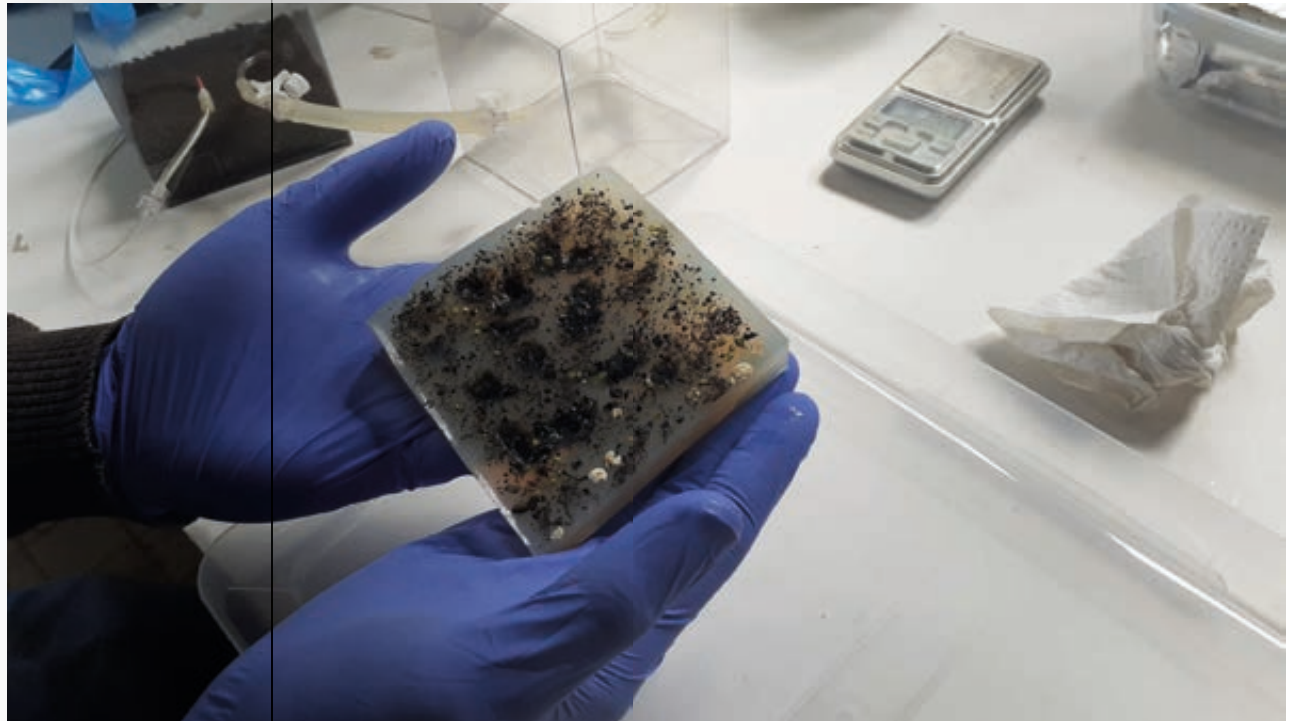


Behind the scenes Nele de Klerk introduces MICROPIA facilities to Ivan.

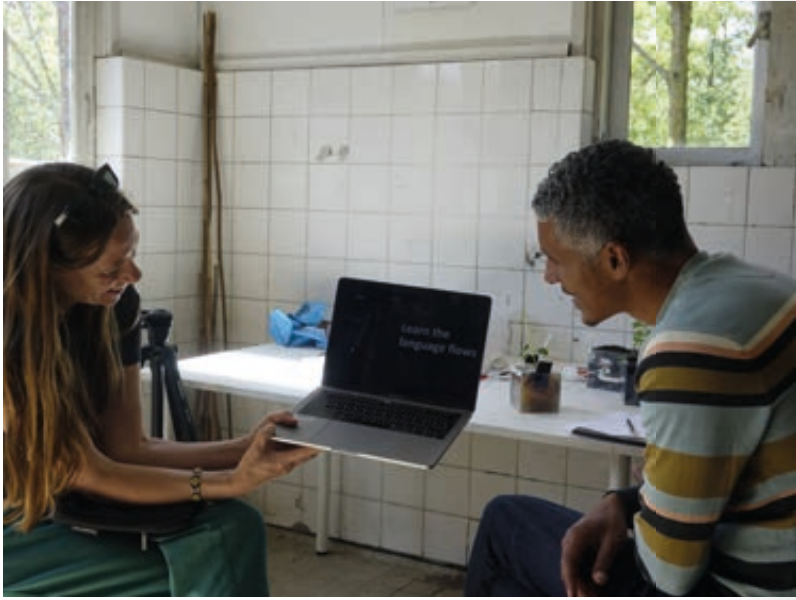




Ivan in the ZOOdio, assembling together different life-forms into his set-up.



Ivan preparing a habitat for a slime mould, plants and fungi.



Prof. dr. Tobi Kiers (VU) during her ZOOdio visit.









# CAUGHT IN THE ACT OF LOOKING

HEATHER BARNETT ON HER RESIDENCY IN ARTIS

'Animals are always the observed. The fact that they can observe us has lost all significance. They are the objects of our ever-extending knowledge. What we know about them is an index of our power, and thus an index of what separates us from them. The more we know, the further away they are.'

JOHN BERGER, WHY LOOK AT ANIMALS?, (1980, P.27)

## WHY LOOK AT ANIMALS?

The role of a city zoo in the early part of the twenty first century is a troubled one. As we face global biodiversity loss and mass species extinction, as public sensibilities shift away from legitimising the containment of 'wild' animals irrespective of the promise of education and conservation, we have an increasingly uncomfortable relationship with zoos. Yet our desire to observe, up close, the presence of animals has not diminished – it's just that our viewing experience is one of internal conflict.

<sup>1</sup> Berger, J. (2009) Why look at animals? London: Penguin books (Great ideas, 80).

In his essay *Why Look at Animals?* (1980)<sup>1</sup> art critic John Berger explores the long and complex history of human-animal relations. From the first depictions of hunted creatures rendered onto cave walls, through the utilization of animals in the toil of our daily lives, to the breeding and domesticating of myriad species, the interdependence of human and nonhuman animals is examined. The zoo is no exception, with the complexities and contradictions of its existence drawn out. Berger notes that public zoos opened at a time when animals were becoming more distant in society, taking on less functional roles in our lives. This also coincided with a time of rampant imperialist colonization, exploiting exotic lands and enthusiastically collecting the spoils found there (animal, vegetable, or mineral). Studying 'natural life in unnatural conditions' became a place to encounter the 'animal other' in all its wild glory.

Our childhoods are full of fictionalized (and often heavily anthropomorphized) portrayals of animals from the savannah, the jungle, the farm, the prairie, and from within our own houses and backyards. Rendered in our stories, our toys, our experiences, the narratives of animal life are packaged in neat humancentric bundles. Most of us will have childhood memories of visits to



the zoo and most memories, I would imagine, are pleasant and nostalgic. Yet, Berger argues, the adult experience of zoos fails to live up to the childhood fantasy because the animals in question 'constitute the living monument to their own disappearance'.

When invited to join the Machine Wilderness residency at ARTIS, I had these tensions in mind... seeing the zoo as a machine for observation, the animals framed by the architectural structures which house them. On first visit I observed the observers, contemplating the behaviours, expectations, and desires of the human visitors. I began to think about systems of care and control, the human effort to look after these animals from all corners of the globe, housed together at the edge of a city in a Northern European temperate climate. Some of the enclosures are built to create a tableaux, staging the animals for the benefit of human viewing (the lions habitat, for example, contains several stages and very little privacy – something that, I later learnt, is being rectified with a more lion-centric refit). Other, more recent, enclosures have been created with a different sensibility in mind, with animal stimuli built into the environmental design (for example, the elephants food is placed in hard to reach nooks and crannies). All enclosures, however, have the human viewer in mind with many windows, platforms and viewpoints framing the animals. Depending on where you stand, these also frame the viewer.



I was interested in which animals were presented most prominently, which were the stars of the show, and why. A hierarchy of creatures was evident in the locations of the enclosures, the signage pointing towards them, and even the stuffed toys in the gift shop. The main star attractions of ARTIS were clearly the lions, the elephants, the apes and most notably the gorillas. As I wandered, I began to notice the other animals within the ARTIS grounds, the animals who were not part of the collection, but who were choosing to reside there or pay a visit to take advantage of the affordances the zoo creates. Some are clearly visible, such as the herons, ducks and pigeons who are particularly populous at feeding time. But others are more covert, such as the rodents and the insects, quietly going about their business. I decided to focus my attention on these incidental resident creatures and to create interventions which would draw attention to their presence, to reframe the hierarchy of animals we choose to look at.

I chose to focus primarily on the ants.

## WHY LOOK AT ANTS?

Ants are fascinating creatures. They are eusocial insects, which evolved from wasps around a hundred million years ago, and are indigenous to all continents across the globe, with the only exception being Antarctica. Ants live in colonies, called formicaries, containing one or more egg-laying queens who produce a large number of female “worker” ants who tend the nest, forage for food and care for the young. Annually the queen will produce winged males, whose only job is to fly to the nest to reproduce (you may see a mass of flying ants in early July when temperatures and humidity are just right).

<sup>2</sup> Schultheiss, P. et al. (2022) ‘The abundance, biomass, and distribution of ants on Earth’, *Proceedings of the National Academy of Sciences*, 119(40), p. e2201550119. Available at: <https://doi.org/10.1073/pnas.2201550119>.

There are over 13,000 known species of ants on earth, with an additional estimated 8,000 yet to be classified. For each person on this planet there are thought to be 2.5 million ants, which totals a global population of 20 quadrillion. The total biomass of all the ants in the world is around 12 megatons of dry carbon, which exceeds the biomass of all wild birds and mammals put together and represents about a fifth of all human biomass.<sup>2</sup> According to the Guinness World Records the largest colony known on earth stretches 6,000 kilometres from northern Italy, through southern France to the Atlantic coast of Spain, a supercolony made up of a species of Argentine ant (*Linepithema humile*) introduced to Europe around 80 years ago.

Ants make an important ecological contribution by helping to aerate soils, distribute seeds and maintain balanced ecosystems. They are keen predators to other pest insects and help manage populations. Their communication mechanisms enable them to be responsive to environmental change, through a combination of chemical sensing (pheromones), touch (antennae contact), vibration (leg rubbing) and even body language. Individually ants are not so smart, possessing only a small number of neurons, but it is as a collective that they are at their most impressive. Through multiple interactions between individuals, the colony is entirely self-organising and able to distribute information and resources in a highly efficient way. This global intelligence allows the colony to be adaptive and highly resilient. It is considered a superorganism – surely an animal worthy of our gaze.

In the Netherlands there are 60 ant species recorded, half of which are ‘exotic’, non-native species which hitched a ride in cargo and stayed. Within ARTIS zoo there are up to 20 known species of ants, living their lives mostly unnoticed and of little interest - unless their presence is seen as problematic to other more valued species. These non-collection species live incidentally within the confines of the zoo, unaware of the machine for observation in which they reside. Ants tend to make nests at the foot of trees, in plantation areas, within the humidity of the warmer glass houses, making use of the rich foraging terrain that ARTIS park supplies. The summer before the residency, nests were spotted in four outside locations. However, when I

arrived the following April to unseasonably cold and wet weather, there was not an ant to be seen. I spent the start of my residency looking for ants. As visitors moved from one enclosure to another, marvelling at the majesty of the mammals, reptiles and birds, I wandered the zoo, eyes cast down, scouring the verges and the base of trees, seeking any sign of movement. I found some ant action, nesting in some plantation areas, in the relative humidity of the gorilla house.

## WHY LOOK AT ANTS IN A GORILLA HOUSE?

In the gorilla house I set up Observation Stations designed to aid the act of looking at ants. Employing simple devices (such as magnifying lenses) and more sophisticated imaging technologies (such as endoscopy cameras and microscopes) the Observation Stations were an invitation for the ants to emerge from the undergrowth and for visitors to access the lives of these creatures usually beyond our view. My interventions provided the ants with novel feeding platforms, presenting them in a way that echoed the staging of the larger animals, offering them up for human observation. I wanted to mediate between different spatiotemporal worlds, amplifying the scale of ant life to the relative scale of humans. Looking at ants within the context of the gorilla house provided an interesting juxtaposition between two uniquely different species, both highly intelligent, but with vastly different hierarchies at play within their social structures.

Locating ants within the gorilla house turned out to be serendipitous to my aim of encouraging people to take note of other (less dramatic) creatures, as visitors were already in observation mode watching the soap opera of the gorilla troop as they fed, fought, played and slept. For me, looking at the ants meant not looking at the gorillas, which provided a point of curiosity as visitors followed my gaze away from the apes towards the fluid foraging dynamics of the colony in the undergrowth. People wondered what was attracting my attention as I was caught in the act of looking. This was my cue to open up conversation and invite others to make their own observations as the ants sought food, shared information, and took nourishment back to the nest. During the many hours and days spent in the gorilla house I spoke with dozens of people including the zookeepers, the many committed volunteers, the gardeners, researchers, Amsterdam tourists and regular locals who made frequent visits, some specifically to the gorilla house. Conversation topics ranged from the immediate subjects of interest – the social behaviour of the ants and gorillas – but also to wider discussion around conservation, biodiversity, childhood memories, and the challenge of city zoos.

## WHY MAKE LOOKING A PUBLIC ACT?

The Observation Stations functioned as a visual cue, a prompt to engender curiosity in visitors, as did my presence tending them and conducting my research in public view. As resident artists, we were given blue waistcoats to identify us as official ARTIS personnel - with the words "kunstenaar in ARTIS" (artist in ARTIS) printed on the back. My role as an artist / observer became a catalyst, my presence an invitation to question, converse, observe, discover - or ignore, which was also an option. Responses to my 'looking at the small creatures we don't usually notice' were varied. Some were disinterested or bemused, wondering why I would spend my time focusing on such insignificant creatures. Others stopped and looked, and saw, tuning into the activity of the ants as they went about their business. Through watching and talking, they 'got' the connection between these different hierarchies of species.

At times I took off the blue waistcoat, removing any marker of 'belonging' and sat anonymously observing how people interacted with the gorillas and, also, with the Observation Stations I had positioned within the plantation areas. I was curious to see how people would respond to my interventions without direct invitation, if they would be drawn in to view the smaller creatures resident in the soil. I was also curious to see how long their attention would be held once drawn in.

During the residency I made a film which explored these different viewpoints and perspectives. Shot from an ants-eye view *The Politics of Attention* centres on the ants as they locate the feeding platform on the Observation Station and gradually spread the word about the abundant food supply to other foragers. As the ant population builds, there is other activity apparent in the background. Out of focus but within view, and clearly audible on the soundtrack, is the presence of gorillas behind the glass and, at feeding time, the attendance of zoo-keepers in the enclosure. Other opportunistic animals can also be heard, the gorilla house providing a safe habitat for dozens of chirping birds who nest in the trees and feed on the grain when the gorillas are at a safe distance. The sound of humans watching the gorillas can also be heard on the film's soundtrack, revealing the array of emotional response to the encounter with apes - mostly excitement, goading, laughter and shock, but sometimes evident impatience if the gorillas are not 'performing' for the crowd. This is what Berger referred to as the disappointment of the adult zoo encounter, the captive animal not quite living up to human expectations.

Over the two residency visits to ARTIS, one in April and again in June, I observed visits by several people on portable hospital beds, each accompanied by a small group of concerned family and attentive nurses. The entourage wheeled into the gorilla house, taking great care with any uneven surfaces not to cause

discomfort or distress to the patient. The people being looked after were clearly very ill, most likely terminally. I interpreted these visits as end-of-life requests, a trip to the zoo on the bucket list of things to do in the short time remaining. I wondered which animals were on the list, whether people had requested specific animals, and if the gorillas were the main attraction or just one on a long list of creatures to encounter one last time.



Zoos are problematic, laced with nostalgia for past childhood experiences, filled with yearning for some wildness in our urban lives disconnected from the natural world, but they also represent genuine curiosity, a deep care and commitment to conservation. Both these positions can co-exist within the culture of a modern zoo. To witness these moments, observing a final encounter with these magnificent creatures, made me realise just how fundamental and deeply rooted the desire to encounter animal others is, a desire that is far from trivial. Studying natural life in unnatural conditions fulfils something deeply existential.

## HOW TO LOOK AT ANTS: A FIELD GUIDE

Focus attention on the edges of things, where grass meets concrete, where tree meets ground, where there is a plentiful food supply.

Adopt a mid-distant gaze, so you are not really focussing on anything in particular, but allowing for small movements to become apparent.

Once movement has been detected, hone in for closer viewing. Allow your eyes to scan the surface and tune out all else existing on a larger scale, no matter how much of a visual distraction it is.

When you find an ant, follow her. Track her. See where she goes. Does she meet any other ants along the route? If so, how do they greet each other? What conversations do they have? Take note if she is moving in a purposeful

trajectory or taking more of a random walk looking for nourishment or entertainment. If she is moving in a perceptively purposeful way - and who are we to define an ant's purpose - observe whether she is carrying anything. If she is, she is likely to be on the way home after a successful forage. If she is empty mouthed, she may be on the way to a foraging site (though please note that not all foraged material is visible or held externally - it may be honey water or sweet nectar aphid pee held internally until it is shared with fellow ant sisters).

Look for a long time, longer than feels altogether comfortable, and allow your attention to follow the action (and inaction - it might not always be high drama, the ants aren't performing for you).

Recognise that you are only seeing the foragers above ground. Imagine what activity is taking place underground out of sight.

# BIRD BODIES, PRINCESSES, AND DODO THOUGHTS

IAN INGRAM ON HIS RESIDENCY IN ARTIS



Whiskers and beaks, squirms and mating dances. I brought a few robots to ARTIS.

The Whiskerer is a rat re-imagined as a robot that has lingering liaisons with flowers, using its own whiskers to gently whisk them. Ziggy Dirt dust is a crooked, flesh-colored worm robot, an intergalactic space probe that has eschewed extraterrestrial travel to focus on explorations in the Earth's dirt. Nevermore-A-Matic tries to tell crows and ravens stories about the end of the world coded in wipes of its beaks. And Pidgin Smidgen is the seemingly least significant bit of a pigeon's anatomy executing the bobs and spins of the street pigeon's mating dance.

Nevermore-A-Matic was the most long in the tooth of the robots brought to ARTIS. It has also cast its gloomy shadow at quite a few Machine Wilderness programs and events over the years. In 2016, when Theun first asked me about being part of Machine Wilderness at ARTIS we were on a bus traveling south from Kilpisjärvi, Finland, where Nevermore-A-Matic had performed in *Marvelous Meat*, a gestural dirge in the arctic where it told its tales of the end of the world while presiding over a Franken-car-cass of supermarket meats that came wrapped in plastic fascia.

Nevermore-A-Matic sends its doleful messages in human language coded in Morse code and relayed as beak wipes, a fast wipe is a dot, a slow wipe, a dash. As with a number of my projects, the fact that the messages were thus wrapped up and rendered inscrutable and indecipherable, so that the robot's attempts at communication were broadcast into a world that was largely oblivious to them, was core to the project. But the incessant beak wiping is meant to create meaning for the birds nonetheless. Beak wipes are what biologists call a displacement activity – greatly simplified as a fill-in behavior when stimuli conflict or overwhelm. Displacement activities have played a role in a few of my projects in the last decade as a way of creating meaning for non-human animals that have a theory of mind.

Notably, the existence of displacement activities was discovered by the Dutch scientist Adriaan Kortlandt. He and his discovery are honored by a bench at ARTIS because that is where indeed he did much of his work. I was therefore particularly excited for the residency at ARTIS given this historical context and the chance that Nevermore-A-Matic might encounter animals that are the great grandchildren of ones he observed in his studies. Of course, displacement activities are often exhibited—by humans and other animals alike when we are confused by something and my robots can be confusing, ideally in an engaging way. I was pleased to see Nevermore-A-Matic elicit a lot of bemused displacement activities in the form of, for instance, scratching of the head, from the human audience at ARTIS, as well.

The Whiskerer and Pidgin Smidgen are related to one another. Not only are they meant for denizens of our built world that seemingly overlap in the human mind, rats and pigeons, respectively – but they are morphologically related. They both inherit a bit of the form of the robot taxon known as the “arm robot” which is one of the oldest industrially-significant robot types. These are the robots you can see in your mind's eye attaching windshields to cars, spray painting their bodies, welding steel frames, sorting components, deftly and swiftly moving through their tasks. The arms are all very similar to each other but at their distal end they are made different by affixing what is called an end effector: for the windshields this would have suction cups, for the painting task it would be a spray nozzle, for the welding, the tip of a welder, and for the sorting, whatever suits the sorting being done but often some sort of gripper.

End effectors are also on the arms of the celebrity robots that go off to explore other celestial bodies or the abyssal depths of the oceans, where they might also be grippers but instead designed specifically to handle rocks humans have never touched, or shovels to scoop up samples humans could never reach, or drill into the substrate to see what is below.

The end effector is the interface of the robot to the world and also representative of the boundary between the robot and what is around it.

For The Whiskerer, the end effector is some whiskers, its main way of interacting with the world. For Pidgin Smidgen, the end effector is some testicles that the robot moves through the motions of the street pigeon's mating dance. The latter is a departure from many of my robots whose intent was to communicate with an animal using that animal's own ways of communicating insofar as while the robot recreates the mating dance with decent verisimilitude, the testicles never play a role that the birds are aware of, as they are, for them, internal organs. Pidgin Smidgen is thus the right moves with the wrong parts.

At ARTIS, Pidgin Smidgen switched from a robot using its end effector to make amorous overtures to pigeons on its own behalf to an intermediary between the pigeons living in the zoo's tropical aviary under the zoo's tender care and the pigeons in its public courtyards who fend for themselves on the streets of Amsterdam.

A common theme in fairy tales is a beautiful peasant girl capturing the heart of a prince, marrying him, and living happily ever after. In the Artis Royal Zoo the pigeon prince is clearly the Victoria crown pigeon ensconced in his climate-controlled palace. But how will he find the love of his life amongst the common pigeons of Amsterdam? How, in fact, will he transcend the millions of years of differences accumulated between his species and hers since they diverged from their last common ancestor? It is a conundrum akin to finding the foot that fit Cinderella's slipper. And this first effort at ARTIS has only begun the process of finding that metaphorical foot.



In general, the extent of my robots – their corporeal reach – is confined to a body that has similar limits as organic bodies. With this project the body was instead distributed throughout the campus of zoo. One eye of the robot was a camera perched in the Tropical Aviary where it could search for the crowned pigeon and detect when he did mating dances. The computer network of the zoo became the optical nerve connecting that eye back to Pidgin Smidgen in whichever courtyard or sidewalk it sat. And then when the eye in the aviary detected a mating dance, and Pidgin Smidgen's eye detected a street pigeon in its vicinity (male or female, at this stage it can't distinguish between them), the body would execute the mating dance of the commoner pigeon, providing a link for love across material and species boundaries, hopefully attracting a pigeon Cinderella, ready to rise from her modest beginnings to the station of pigeon princess.

Notably, though, during my time at the zoo, it became rapidly clear that the most eligible royal bachelor was not a bachelor at all, and certainly not eligible. He was, in fact, seemingly in a very happy relationship with his Victoria Crown Princess. It might even be more befitting to regard them as the Pigeon King and Queen of Amsterdam given their ages. So, was what I was building as much an internet interspecies pigeon dating system, as I had imagined, or an internet escort service? Or worse, something like a pigeon Ashley Madison!

Ziggy Dirt dust is a worm robot that explores dirt, and plasticness, and dirt and plastic's relationship to one another. You'd usually find it close to the dirt, although mostly not quite touching it. ARTIS was for Ziggy a chance to look a little beyond the soil and try to commune with animals that also are quite

adept explorers of the dirt, even famous, apocryphally, for burying their whole heads in it: ostriches.

The Zoodio, the on-site studio where each of us worked during our spell at ARTIS, was immediately adjacent to the home of a pair of friendly ostriches. There is an unintentional gestural and morphological similarity between Ziggy and these long-necked birds but it was also interesting to think about how our stories and adages so frequently feature a tight narrative linkage between birds and worms. Certainly, a significant number of birds are vermivores. Ostriches are omnivores so worms aren't a staple but certainly not off the menu. An introduction of Ziggy Dirt dust to the biggest of all birds seemed therefore to be something akin to an avian Goliath meeting a robotic David, but certainly without any real conflict. In fact, of course, I kept the robot at a healthy distance from the birds, for both bird and robot safety. The ostriches did seem interested, however. It remains unclear whether they saw Ziggy as a potential friend, foe, or food.

The sociologist Sherry Turkle has written a couple of times about zoos and robots. Most salient in my mind is an interaction with her daughter where the latter said it didn't matter if the animals were replaced with robots: they would probably move more and be cleaner, and it would in fact be preferable. Turkle and her husband were taken aback at the child's – and other children's – insistence that having the real thing didn't matter, the robotic representation was sufficient, and you needn't even tell the public that you had done the switch.

In a meeting room at ARTIS, there is a great collection – with spaces, as above of animal artifacts from a begotten time: bones, skulls, hides and horns. Amongst them is a taxidermied dodo bird. I imagine that, in all likelihood, the feathers used are not actually from a dodo, although I did not verify this. A taxidermied bird is the advanced simulacrum of another era akin to i.e. Turkle's imagined animatronic/robotic zoo animal simulacrum of this age. And of course it falls short. Shortcuts are taken (like using another bird's feathers) and assumptions made.

We have always made assumptions about animals based on what little we can experience of them, a prime example being the fanciful accounts of animal lives recorded in medieval bestiaries following the tradition of Aelian, Aristotle, and Pliny the Elder. Only the living animals themselves are authentically what they are and most of our assumptions about them thus far have led us astray. We wouldn't want to get to a point where all that is left of the other animals is our assumptions and memories.

A zoo is a very rich place to explore what robotic objects that cohabitate with animals, but not to audaciously attempt to replace them, can help us understand about the animals we

share the planet with. A thrust of my work over the last couple of decades has indeed been that gestural objects that have bodies and behaviors more attuned to other species can help us perceive more of what those other animals truly are, make fewer assumptions, and achieve something closer to the communion that we perennially wish to have with them. Fairy tale princesses, like Cinderella, do achieve this communion in their own bodies. But those are fairy tales.



# NOTES ON THE MACHINE WILDERNESS RESIDENCY

IVAN HENRIQUES ON HIS RESIDENCY IN ARTIS

Since 2010 I have been investigating symbiotic relationships, focused on human x machine x plant interactions, with a deep concern for environmental issues. Symbiotic relationships are the close associations formed between species. They come in a variety of forms, such as parasitism (where one species benefits and the other is harmed), commensalism (where one species benefits and the other is neither harmed nor helped) and mutualism (where both organisms benefit). An example of the latter are the oxpecker that land on rhinos or zebras to eat ticks and other parasites that live on their skin, or the bacteria that helps in our digestion. During the residency I have explored further mutualistic relationships, research into caring and the space in between things. You can observe it on a macro-scale, however one of the most important activities for terrestrial life happens almost imperceptibly for human eyes under our feet.

Working together with scientists from Micropia, we document and measure the progress and the activity between three different organisms: one fungi, one slime mold and a yeast, which were selected organisms that passed the security control from the institution. With several trials and errors of different combinations, as already expected, there was always one organism that dominated the whole petri-dish. The possibility of unsuccessful combinations of 3 different specimens of microorganisms to find balance and autonomy in a mixed-culture petri-dish is enormous. A puzzle that is deciphered only by time and 'made by nature', as in the case of the lichens that are a combination of at least 5 micro-organisms living together in balance.

I have decided to deepen the focus on the underground activities between micro-organisms, mushrooms and plants and how to make this communication visible. The communication between fungi and plants is fundamental for gas exchange and the basis of the food chain. The underground network that provides care for plants is called mycorrhiza, which forms the Fungi Kingdom.

1 TEDERSOO, L. ET AL. "How Mycorrhizal Associations Drive Plant Population and Community Biology" SCIENCE 36 (2020) FREW, A. ET AL. "Plant Herbivore Protection by Arbuscular Mycorrhizas: A Role for Fungal Diversity?" NEW PHYTOL. (2021) RIMINGTON, W.R. ET AL. "The Distribution and Evolution of Fungal Symbiosis in Ancient Lineages of Land Plants." MYCORRHIZA 30, 23-49 (2020) STRULLU-DERRIEN, C. ET AL. "The Origin and Evolution of Mycorrhizal Symbiosis: from Paleomycology to Phylogenomics." NEW PHYTOL. 220, 1012-1030 (2018). [www.spun.earth]

Mycorrhizal fungi are a group of network-forming soil fungi that create symbiotic associations with plants. These associations have shaped life on earth for more than 475 million years. The rise of plant-fungal partnerships corresponds with a 90% reduction in atmospheric CO2 levels. Today, between 80-90% of all plant species form a trade symbiosis with mycorrhizal fungi. Mycorrhizal fungi grow into large networks of tubular cells, known as mycelium (individual cells are called hyphae), which forage for nutrients in the soil and exchange them with their plant partners. A single gram of soil can contain up to 90 meters of mycelium.<sup>1</sup>

I built 3 cubes and each one contained a restricted variation of organisms in the soil: slime mold + mycorrhiza + potato plant; mycorrhiza + oyster mushroom + mint plant and mycorrhiza + oyster mushroom + potato plant. All the boxes had probes to measure electrical activity through the growth. Observing the activity from the mycorrhizal fungi is clearer for naked eyes through time, when you see the plants and mushrooms growing. However, through a microscope it is possible to see the flow of nutrients being exchanged between plants and fungi. This underground network benefits all organisms that are living in the soil, which can be an indicator of soil quality.

Scientist Toby Kiers from VU Amsterdam is researching the ecological network system that exists in soil between these organisms, and I invited her to discuss the experiments I have been doing. Afterwards I extended some experiments in her laboratory at VU, working in a controlled and sterile environment. It is fascinating to research these alchemies and bring the perception of elemental activities to the surface, in an expanded time, which is one of the most important factors when working with the living. My research will continue after the Machine Wilderness residency and the results will be presented in 2024 at Zone2Source.



# AUGMENTED ECOLOGIES, THE INTERTWINING OF EMERGING TECHNOLOGIES AND WILDLIFE

THEUN KARELSE

Over the past decades the intertwining of technology and wildlife has grown immensely. In 2010 when we built Boskoi, the first smartphone app related to nature, it caused such a sensation that WIRED wrote about it even before it was finished. Apps were a very new thing and until then had only been built from a perspective of office work or gaming; like finding restaurants or timetables for public transport. The game Snake did not involve any kind of reptile.

So we were in uncharted territory when we set out to make this app for sharing wild edible food sources like herbs, fruits, mushrooms worldwide, we were advised by our sponsors to call the Gegevens Autoriteit Natuur (Data Authority for Nature) for advice on best practices. What if someone places a rare mushroom on the map and it is subsequently harvested until nothing is left?



Calling the Gegevens Autoriteit Natuur was a sobering experience. We were passed on from one person to the next until we reached their web developer, not someone with a background in ecology at all. No-one had any real advice. This triggered my interest. When I asked ecologists about the impact of emerging tech on wildlife and particularly data in relation to protected or endangered species, they would argue that best practices were in place for environmental and ecological data. Data on nesting birds of prey was only shared publicly in very low resolution (only at the level of square km blocks). My point was that with smartphones a lot of data was starting to be generated in the public domain, by ordinary citizens, and there was zero initiative

coming from tech companies to address the impact of their platforms on the lives of non-humans.

A lot happened in quick succession and I started tracking such developments on my research blog Augmented Ecology. In 2013 there actually was an advert for Google Glasses where a team was going on safari to spot rhino's, while at the same time a photo of a sign on a safari vehicle warned that poachers were using the GPS data in online photo sharing platforms like Flickr to hunt for rhinos. Face recognition software that caused upheaval in terms of human privacy were deployed on chimps, bonobo, even adapted to spot whales. Drones became a thing. People started bringing them to National Parks, scaring the hell out of deer, others adapted them for hunting wild boar with infrared cameras. GPS-tags to track animals were around for a while already, but now became rich data-collators, capturing all kinds of biometric data to form libraries of animal behavior. At Microsoft, developed devices for elephants to work together at herd level, creating what the team themselves referred to as a Facebook for elephants. Detailed enough even to know fertility cycles within the group. The data was harvested by collars worn around the neck and gathered by a fleet of drones which could self-launch and fly missions autonomously, like a flock of machine birds. Underwater drones were starting to patrol coral reefs, to identify and kill Crown of Thorn starfish, an invasive species. Autonomous vehicles started to appear increasingly in ecosystems like animals do, as participating entities, with bodies floating, flying and walking around, able to move, sense and act. The next thing that emerged were online platforms for environmental data, satellite imagery, which would lead to online citizen-science initiatives like Zooniverse, where you could contribute to environmental or conservation science from your couch at home. Or Wildlabs, an online multidisciplinary platform for developing tools for ecology and conservation.

All of these things brought the realization that a Machine Wilderness was emerging out there in the world, largely unstudied and back then entirely without critical reflection. In its earliest inception we saw the project as a physical site where machines and organisms could meet each other. With Zone2Source operating in a park, the vision was that such a place could be a space not just for humans and animals to co-inhabit, but to add mechanical entities as a way of studying emerging relations between humans, animals, and autonomous machines. We figured this could be a living laboratory for developing such autonomous machines, until we saw a TU Delft professor describe the struggle to make his 5 million dollar robot walk. But the idea of working in ecosystems rather than clean laboratory spaces stuck, and that is how Machine Wilderness became a program for in-situ prototyping, field experiments, transdisciplinary research and critical debate.





# AN OVERVIEW OF MACHINE WILDERNESS ACTIVITIES

*Machine Wilderness is a long-running research program with many fieldwork sessions, residencies and presentations. Below is a short overview of these events and activities.*

## OPENING SYMPOSIUM

AT: ARTIS Royal Zoo, Amsterdam, November 2nd 2015  
WITH SPEAKERS: Prof. Dr. Gusz Eiben, Prof. Em. Petran Kockelkoren, Dr. Erik de Jong, Kenzo Kusuda, ir. Paul Roncken, Špela Petrič, Xavier San Giorgi, Anouk Visser, Reinier Kop, Ivan Henriques, Judith van der Elst. Presented by: Alice Smits and Theun Karelse.

The launch of Machine Wilderness at ARTIS Royal Zoo, on invitation by ARTIS professor Erik de Jong, brought together a wide array of speakers for Machine Wilderness, attracting researchers from the Netherlands, UK, Germany and Belgium to explore the increasing intertwining of technological systems and biological systems in university labs, in the artist studio, in conservation of species, in new forms of agriculture, and in the wild.

## JYNNWEYTHEK GODHVILES (MACHINE WILDERNESS IN CORNISH)

AT: FoAM Kernow, Penryn Cornwall, November 12th to 15th 2015  
TEAMS LEAD BY: Amber Griffiths, Ivan Henriques, Judith van der Elst, Alice Smits and Theun Karelse

Our first Machine Wilderness fieldwork session on the southern coast of the UK in collaboration with the FoAM Kernow studio included over 30 brave participants, including poets, robotics professors, bird ecologists, hack-lab community members, designers, singers, politicians and students, ready to unconventionally explore local ecosystems and environmental flows. After a day of attuning to the land, sea and sky in various ways, teams of participants started ideating and prototyping machines that could inhabit these places; and participate in local food-webs, material flows and environmental rhythms. These prototypes were festively released into their wild habitats on the final day.



Visitors gathered for the opening symposium in ARTIS.



A prototype being released into its new habitat, the Penryn harbor.

## FOREST BATHING WORKSHOP

AT: Zone2Source, Amstelpark Amsterdam, April 7th to 9th 2016  
LED BY: Judith van der Elst

This workshop explored the ways technologies enhance, mitigate, numb or heighten our senses. A group of artists, designers, botanists, and researchers came together engaging with sensory design in order to navigate the sensory landscapes of the park. The workshop was extended later in May 2016 with a field session entitled The Periodic Table, Aromatope, in Montefeltro, Italy, looking into the 'elemental' tangibility of sensory design and the role of technology in sensory landscapes.

## SYMBIOTIC SYSTEMS WORKSHOP

AT: Zone2Source April 29th to 30th 2016  
LED BY: Ivan Henriques

In collaboration with UVA LaserLab, artist Ivan Henriques led us into the world of micro voltages in which biological beings operate. The group gathered a wide range of pigments from the park to construct DIY bio-solar cells. Painting the pigments to form small receptors of solar energy, which were then tested to see which natural pigments could generate a high yield. More generally this workshop addressed to what extent our technologies could be sourced locally and thus diversify geographically and defined according to local conditions. Could local conditions give rise to more site-specific material cultures and could this deepen our relations to our local environments?

## ARS BIOARCTICA RESIDENCY

AT: Kilpisjärvi Biological Research Station June 18th to 30th 2016  
TEAM: Ian Ingram, Antti Tenetz, Theun Karelse

Our second Machine Wilderness fieldwork session was organized as a team residency at the arctic biological research station in the most Northern point of Finland. Each team member worked on a research experiment connected to arctic wildlife and landscape. Ian experimented with Nevermore-a-matic, his robot that tries to communicate with birds in the crow-family. Antti explored the hunting strategies of hawks, discovered at the station, which look for prey through heat signatures (UV range of light) and trails from high altitude. Antti hacked a drone camera to see the environment in the same range of light. Theun tested a small terrestrial robot to explore how seeds and epizotic species get trapped and travel in the fur of animals like reindeer.



A dye-sensitized solar cell being injected with fluid at Zone2Source.



Antti Tenetz descending mount Saana near the biological research station after testing his drone.

## MACHINE WILDERNESS WORKSHOP

AT: Pixelache festival, Helsinki, Finland September 22nd 2016  
LED BY: Clemens Driessen, Theun Karelse

A workshop trying out strategies of seeing and repurposing city infrastructure from animal perspectives, with an introduction by Clemens on his research into infrastructure for play among farm animals and farmers.

## DIGITAL DESIGN WEEKEND

AT: Victoria and Albert Museum, London, UK,  
September 24th to 25th 2016  
WITH: Ian Ingram, Matthew Creasey, Alice Smits, Theun Karelse

Exhibition of Machine Wilderness field-experiments in the garden of the Victoria and Albert museum during the Digital Design weekend, which was themed 'Engineering the Future'. Alice and Theun presented the program with bird biologist Matthew Creasey, who had participated in the fieldwork session in Cornwall, and artist Ian Ingram, who participated in the fieldwork session in Finland and had brought several robots to show to the public.



Matthew Creasey and Ian Ingram talking to visitors in the V&A garden.

## BECOMING EARTH

AT: Transmediale festival, Berlin, Germany,  
February 3rd and 4th 2017  
WITH: Theun Karelse, Matthew Creasey

We were invited to join a panel discussion with Paul Seidler and Paul Kolling of Terra0 exploring emerging entanglements of technology and nature into hybrid landscapes, and present a Machine Wilderness workshop in which we explored local animal behavior as a basis and inspiration for design interventions. Biologist Matthew Creasey gave an introduction into observation strategies for studying animal behavior.

## ECOLOGICAL ROBOTICS, BIOPOLITICS AND CREATIVE PRACTICE

AT: Nida Art Colony, Nida, Lithuania, September 1st to 10th 2017  
LED BY: Theun Karelse

Migrating Art-Academies (MigAA) asked Theun to co-lead a group residency examining the emerging field of ecological robotics, biopolitics in relation to creative practice. Through experiments, discussion and in-situ prototyping the participants explored these topics in relation to their own practice and the local environment on the Lithuanian dune-peninsula.

## ARTIFICIAL ECOLOGIES

AT: MicroClima, Venice, Italy, October 20th to 23rd 2017  
WITH: Alice Smits, Ivan Henriques, Theun Karelse,  
Roland Fischer, Paolo Rosso

Floating around an enigmatic Venice lagoon, visiting ruins on its small islands, Alice, Ivan and Theun travelled to the Venice Art Biennale to assess the possibilities and thematics of a Machine Wilderness fieldwork session in the lagoon on invitation by independent curators Roland Fischer and Paolo Rosso. They presented the Machine Wilderness program at MicroClima: a garden and greenhouse exhibition space in Venice.

## MACHINE WILDERNESS WORKSHOP

AT: Association PiNG, Nantes, France,  
December 06th to 08th 2017  
LED BY: Theun Karelse, in collaboration with Julien Bellanger  
of PING and Anaiz Rolez of BeauxArts

During this workshop in Nantes, the birth place of Jules Verne, students of the art school BeauxArts Nantes and members of Association PING, a local hacklab, the hacklab members presented a series of experiments: Woody bot, BIODIVERSITOR, Roach Bot, Ovide, www MAPPING, Platform and Ghost Beasts. The students then worked for several days in a derelict industrial area. We tried methods of field research and did small experiments tapping into the vast and derelict body of the forgotten factory infrastructure: the holes, niches, and toxins left behind in their wake. This in addition to the beings repopulating the terrain. Students worked in small teams trying to feel the history and future potential of this machine wilderness and presented thoughts, ideas and small artworks reflecting on their experiences.

## MACHINE WILDERNESS EXHIBITION AND RESIDENCIES

AT: Zone2Source, Amstelpark, Amsterdam, Netherlands,  
May 20th to July 8th 2018  
WITH: Driessens & Verstappen, Ian Ingram, Rihards Vitols,  
Jip van Leeuwenstein



Erwin Driessens training the Spotter to follow a moving object during the residency at Z2S.

To learn specifically about what makes a successful Machine Wilderness residency, we set up a precursor to the ARTIS residency program at Zone2Source in the Glazen Huis in the Amstelpark. This enabled the participating artists and designers to work in the public context of the Amstelpark and its diverse garden-landscapes to develop experiments engaging with local life forms and artificial systems. Their research was given

context in the exhibition space by presenting existing works of all participants. Experiments included Ian's 'Nevermore-a-matic', a robot that tries to communicate with crows, and his 'Danger Squirrel Nutkin!', a robot that is related to predator-prey dynamics among squirrels. Several of Rihards Vitols' 'Woodpecker' robots were placed in trees in the park. These are small acoustic robots that attempt to protect trees from parasites that are spreading uncontrolled in the warming climates of the Northern Hemisphere. Jip van Leeuwenstein finalized his 'Diverse Monoculture', a robotic insect predator. Driessens & Verstappen developed their 'Spotter blackbird', an AI that observes and then creates its own 'dream images' of blackbirds. Later in 2022 they would develop the Spotter during their ARTIS residency.

These are some of the main events and activities that formed the long-term Machine Wilderness program. Working with diverse people in various settings, the fieldtrips, discussions and collaborations in the Machine Wilderness program sparked two successive research strands: Random Forests and Deep Steward. These became field research programs in their own right.



Team members exploring dunes on the Dutch island of Terschelling during the Random Forests fieldwork week.

### RANDOM FORESTS: ENVIRONMENTAL MACHINE LEARNING

Machine Wilderness sprouted a few spin-off research programs and projects. One of these is Random Forests which explored what environmental machine learning could entail and if an artificial agent (an AI) could become environmentally literate. Where do the specific cognitive talents of machines overlap with our own environmental intuitions; where are they susceptible to humans or where could machine-perception even be complementary to human environmental learning? During several field sessions diverse teams addressed such issues through in-situ prototyping, de-sign experiments and critical reflection.

Field sessions were held at: ArsBioarctica at the Kilpisjarvi Biological Field-station in the Finnish Arctic with Antti Tenetz, Ian Ingram and Theun Karelse. On Terschelling Island (the Netherlands) at IMRAMA with Jan de Graaf, Jeroen van Westen, Michelle Geraerts, Sjef van Gaalen, Paul Seidler, Tivon Rice, Jackson Rice, Sander Turnhout and Theun Karelse. At Dinacon at Koh Lon Island (Thailand) with Sjef van Gaalen, and MAAJAAM Estonia residency with Theun Karelse. Workshops were held in collaboration with Klaas Kuitenbrouwer and Het Nieuwe Instituut, Jarl Schulp and FIBER festival and Border Sessions festival.



The camera-eye of Deep Steward gazing upon a tree in the garden of the Milan Triennale.

### DEEP STEWARD

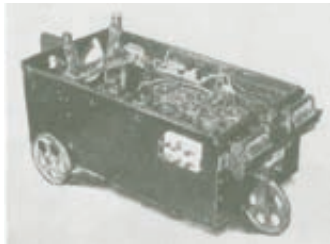
This Machine Wilderness spin-off project asked; with much of our current environmental predicament stemming from anthropocentric bias, should our machines learn exclusively from humans? Or do machines need a broader horizon? Do they deserve to spend their weekends away from analyzing our stock markets, away from spilling fake news in our toll-farms? Should they be free to float around coral-reefs, hike across mountains, or get stuck in a swamp? Ian Ingram and Theun Karelse set out to prototype such an AI, a Deep Steward, that was deployed first for several months in 2019 overlooking the large ponds at Het Nieuwe Instituut during the Neuhaus exhibition. In 2022 it traveled to the Milan Triennale as part of the Zoöp exhibition 'Have we met?' in the Dutch pavilion with Het Nieuwe Instituut, to stare with great intent at a tree in the venue garden, classifying it not according to any Linnaean taxonomy, but making its own classifications, clustering features into groups and thus building up a visual survey that challenges human preconceived notions about beings, environment or behavior.

# ENTERING THE WORLD OF MACHINE WILDERNESS

ALICE SMITS

## A timeline of early cybernetic animals

1912



Seleno, the Electric Dog – Hammond Miessner

1932-1933



Mechanical Horse – D. G. Alzetta

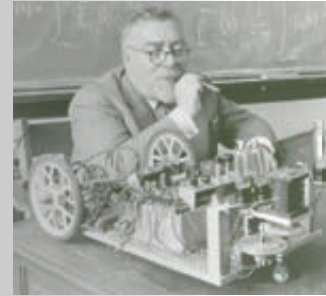
## MACHINES AS ACTORS IN ECO SYSTEMS

We are living in a world where the biological and the technological are encountering each other on a vast scale. But even though we could define technology as a way through which humans mediate their environments, it is remarkable how little thought we have given to how our machines – their material being, their sounds and smells, their movement, their energy and impact – relate to everything they encounter as they move through the world.

Machine Wilderness is a speculative arts and science program which explores what our machines could look like when we do consider them as permanent inhabitants of earth's ecosystems. Not as a next nature or a techno-sphere overlaying the biosphere: once we move beyond the nature-culture dichotomy and start realizing that everything we are and make comes from nature, then everything will appear as connected and interdependent. Rather than considering technology as the innately destructive and alienating force it is often taken for, responsible for climate change, species extinction, soil depletion and more, we are wondering what kind of technologies would emerge if we design them from a different vision of the world, one in which an ethics of care and solidarity with the more than human world becomes our core value.

It should only be common sense that an understanding of our relationships to the world is a prerequisite for how we design our tools. But since the industrial revolution and even long before that, humans designed technologies from a desire to become independent of nature, considered in opposition to our human societies. When men left their nomadic ways, they started dominating and controlling the environment around them rather than adapting to it. Whereas in western culture this took the form of an ideology of increasing control and apparent liberation over the forces of nature - equating civilization with separateness from nature while dependency has always been condemned as primitive – in reality we enslaved ourselves only

1949



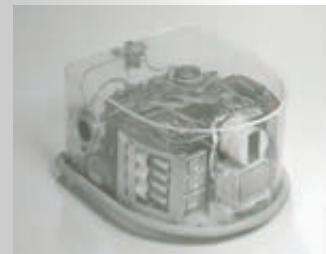
Moth "Palomilla" – Wiener Wiesner Singleton

1951



Cybernetic Tortoise – Paul-Alain Amouriq

1954



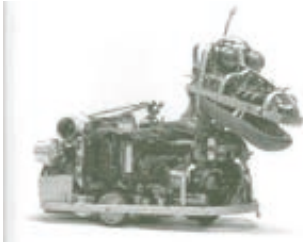
Vienna Turtle – Eichler Zemanek

more, working hard to maintain the right conditions for our food to grow and laboring on enormous machines to extract increasingly hard to get to resources in remote places. With capitalist cultures and extractive technologies destroying the very earth that supports our existence, it is paramount that we find new meanings for concepts such as civilization, emancipation and rationality, stemming from a sense of connectedness, situatedness, embodiment and co-habitation in a shared world.

## ENGINEERING THE EARTH

The question of what we imagine our tools to be like if we develop them from a different vision of life on a shared planet urgently begs answers. The Anthropocene concept at its best is a warning that we need to take a step back and realize that we never will understand our impact on the complex ecosystems we are embedded in. Most often however it presents itself as an ideology in support of humans, with a whole geological area named after this dominant species, putting themselves even more blatantly at the steering wheel of engineering the planet for maximum profit. Dressed up in an eco-modernistic guise of green capitalism with global companies taking the lead in the development and implementation of our most advanced machine learning technologies, it is only the latest version of a narrative of technological determinism we have lived with for these last centuries (as so well argued by TJ Demos in *Against the Anthropocene*). Believing that as we now realize the consequences of our actions on earth's systems we can do it better, scientists such as Paul Grutzen who coined the term Anthropocene at a geological conference in the year 2000, promote technological solutions to our climate crisis such as geo engineering, which entails shooting a screen of sulfur around the earth. This follows the same logic of the Greek philosopher Aristotle who more than 2000 year earlier put men (excluding woman who stayed on the side of nature) on the top of his hierarchy. With human exemplarism leading to a singular creator made in our image, humans design technologies with the purpose of manipulating and controlling their environment. We build on the earth as if it is a platform for us humans to walk on, taking little account of other living bodies below, around and above us other than as a vast resource to be exploited and extracted for human use or as deposits for our waste. There are other proposed names for our current predicament, such as the Capitalocene coined by Jason Moore, which implies it is not humans as a species but a specific kind of system, namely western capitalism, that is the cause of our negative impact on earth's systems, making certain people responsible while others experience mostly the consequences, having had little share in this vast colonization of people and nature alike. Machine Wilderness rather plays out in Donna Haraway's Chthulucene or the Symbiocene coined by Glenn Albrecht, which projects an alternative world view in which the human is

1958



"Tati" the Cybernetic Dog – Daniel Dennett



1958



Cyber the Dog – A.H. Bruinsma



1958



Machina Reproducatrix – Angyan



no longer at the center, celebrating instead the myriad of relationships between humans, more than humans and technologies that make up our shared worlds.

### MULTISPECIES SOLIDARITY

Every living organism perceives the world through bodies equipped with different senses and their own ways of navigating the environment, thus responding differently to the impact of the smells our machines emit, the sounds they produce or the weight by which they trod the earth. Research has shown that our cars, trains and industrial machines produce an endless low rumble which makes it impossible for many species to communicate. Certain bird species have had for example to change to a higher pitch in our cities, which impacts again on their social relations as females prefer those with lower voices. But much of this is harming a vast number of humans as well, causing health and habitat loss across species. Human infrastructures and nation states makes it impossible for both animals and humans to migrate, which with climate change is becoming ever more important. Only now we are witnessing the speed of climate heating, loss of biodiversity, fertile soils and sweet water, are people becoming increasingly aware how our own health and survival is dependent on the myriad of relations we form with everything around us. We have no choice than to pay attention if we want a future for human kind on this planet. Developing a politics of multispecies solidarity and care is to the benefit of all.

Let's move beyond the stagnated dichotomy of asking whether we should use technology or not but rather explore what kind of technologies we need to act ethically in a multispecies world. What would happen to our technologies if we start planning and designing our cities not for millions of people but for billions of lives?

### ART AND SCIENCE

Ecology- the study of interrelationships between all beings and things – has permeated almost every discipline, acknowledging the need to move from specialized and decontextualized research to a more intimate engagement with the world. The recent rejoining of art and science is signaling this shift into other ways of doing research and producing valuable knowledge about the world. Artists collaborate with scientists, not only to turn scientific fact into meaning but by interrogating critically into scientific methodology while proposing an alternative epistemic culture in which embodied cognition, care, solidarity and engagement are the defining values. These artists reflect on traditional notions of what it means to be human, which is often taken for granted in technological innovation which still takes as a standard the human male body. Asking which bodies are included in our designs and policies and how they gain acces-

1959



Machina Combinatrix – Kretz Angyan Zemanek



1961



"Dumbo" Moon Walker – by RCA



1962



Cybernetic Tortoises – Otto Walter Haseloff

sibility, what they need, how they move, communicate, sound, smell and look like is an important question in a radical inclusive multi-species politics.

Machine Wilderness invites artists to collaborate with scientists and engineers in order to reimagine our technologies and ways of doing research towards developing symbiotic rather than destructive relations to the world around us. This involves not only changing our design processes and objectives, but also our way of thinking about ourselves and other living organisms. Much of our current thinking about the newest technologies for machine intelligence is modeled on the human brain, fed on human (read again white male) preferences and prejudices, with systems like biometrics that shadow a colonial history of racial classifications and a corporate intelligence that is constructed as an extractive, profit making optimization machine. An ideology that ultimately also ignores the well-being of humans as that of any other living being as it continues to work towards a rational, quantifiable and controlled society in search for maximum growth of financial profit. With Machine Wilderness we explore what other potentials other than that of optimization our learning machines might have, and how they can become potential allies in our efforts to rejoin the big conversation with life on earth.

### WE HAVE TO BECOME MORE HUMAN

This does not mean we need to go beyond our humanness, as we here so often these days, on the contrary. Although we certainly need to get rid of the centrism of our current anthropocentric world view, it is about exploring the full richness of our human sensorial capacities through which we as embodied beings know and live within the world. It is through all our senses and embodied cognition that we can share a world, as humans, with more-than-human bodies and not only as a detached brain. This is where decisions as taken in ARTIS a few years back to not give animals names anymore, considering this anthropocentric, often misses the point while making a strange turn back towards scientific objectivization. Isn't it exactly in creating emphatic bonds and opening ourselves up to the strange other from our very humanness that we can at least try to imagine other ways of being, relating to them not just as a species category but endowing other living beings with specific histories, desires and needs, realizing that intelligence, emotion, memory, play, mourning are not exclusive human concepts but are part of the thriving of life itself?

Technology has not just alienated us from nature, but it also has given us access to see, hear and feel other life forms that our senses are not able to perceive. We can answer the question "What is it like to be a bat" somewhat better because through technologies we have discovered they negotiate the world through echo location, and even though we can

1962



Beast – Johns Hopkins Applied Physics Lab



1966



Cybernetic turtle – Otto von Guericke University



1968



Cybernetic Mouse – Johan de Boer



never really embody what that is like, it does allow us at least to better imagine and thus respond to their needs. Technology is expanding our senses into macro and micro life worlds we were unable to perceive before. But it is a misgiving that it is only because of new research questions and technologies that we now gain a deeper understanding of life worlds very alien to ours. Too often I recently have heard scientists say that we only now through their research begin to understand that other than humans also possess pain, emotions and capacities for learning and remembering. As Vinciane Despret narrates vividly in *What Would Animals Say if we Asked the Right Questions*, we have started to believe more in scientific knowledge that puts living beings in unusual isolated laboratory conditions and man made experiments as producing objective facts, than the common sense of people living intimately together with animals in their daily habitats. Once we start from an understanding of ourselves as more than just a detached brain with full embodied cognition, we start opening up to the knowledge that comes from existing in the world in all its complexity and messiness. Many artists working in the field of art-science are developing methodologies of unlearning and relearning to explore relational complexity in situ as a fully situated and engaged way of knowing. In that sense art science not only produces content on a specific topic by asking different kinds of questions, but also points to a new epistemic culture in the face of ecological crisis which demands a deep sensorial engagement with the world. As the philosopher Timothy Morton once said, we don't have to try so hard to be ecological, but rather recognize that we are always already rooted in the dirty smelly mess of our earthly lives.

### TAKING RESEARCH INTO THE PUBLIC SPHERE

Taking research out of the labs and studios into the public domain turns it into a collective exploration of issues which concern each and every earthling. We cannot leave the future of our shared planet to the technocrats alone. With Machine Wilderness we make artistic research into public research, inviting artists to explore outdoors in various settings where audiences can engage them to work and think together. We ask ourselves, if we adopt another vision of world building, how does this change our tools and technologies with which we mediate this world? How can we start designing technologies that work with, instead of against, nature, transforming technologies of domination and control into technologies of care? Artists working within the field of techno-science often work in transdisciplinary teams to create their own tools and machines that can tell different kinds of stories. Understanding that every intervention has impact on something or someone and negotiating the inevitable costs and losses should be at the basis of our design processes. Thus, observation and listening to whom we are with, and not only understanding but also taking responsibility, is an important step before we start making interventions. Ecological

1970



"MERV" – Peter Vogel



1980-1981



"SUPERKIM Meets ET-2" – D. F. McAllister



thinking is the opposite of the tabula rasa of modernity: it is the realization that there are no empty spaces but that there is always already somebody there to account for even if they are beyond our vision or hearing: to realize that the air around us or the soil under our feet is teeming with life and that there are always others before, with and after us. To start thinking from ideas of co-creation and co-design, is taking seriously the way other living beings give shape to their habitats and how their worldmaking intertwines with ours. As the philosopher Donna Haraway stated, it is all about "staying with the trouble". This means involving many more human and more than human voices in the direction of where we want to go with our shared planet.

Therefore Machine Wilderness sets out to rethink design processes by starting to think together from an environment. Studying living bodies in the complexity of their environment instead of in the isolation of the laboratory, accounting for our own complicity and ties, brings research back in both the relational world of ecosystems and multispecies politics. Rather than asking first which function the machines we design will have for people- commonly the driving question which has gotten us in the ecological crisis we are facing now in the first place - we start instead with imagining how something technological can co-exist in a specific ecosystem. In speculative workshops we first set out with observing, listening and understanding where and with whom we are. Then we begin to imagine the technological creatures that could coexist and collaborate symbiotically within this environment: which relationships does it need to make, how does it draw its energy, how does its material body move and finally decompose. To explore experimental design methods that aim to engage with the complexity of the ecosystems, transdisciplinary collaborations are key. Including artists, ecologists, engineers, scientists, choreographers, designers, environmental philosophers, farmers and many others who all contribute valuable insights, we aim to trace out new contours and map new domains for eco-technological imaginations.

### MACHINE WILDERNESS IN A ZOO

With the Machine Wilderness residencies at ARTIS Royal Zoo, we took a very particular environment for exploring such art-science practices. Taking its slogan *Natura Artis Magistra* – nature is the teacher of art - to reflect on relations between nature, art and science in the 21st century, this seemed to be the perfect setting for our program. As a zoo it is a site where the complex colonial relations between people, animals, plants and microbes and the way we look at these relations as a society play itself out. Well aware of these more contested origins, ARTIS nowadays is reflecting on giving the zoo new relevance in society, re-imagining it as a place of learning about life on our

1984



Moth, a light-seeking robot – Gene Oldfield



1980-1982



ROBERT-II Sentry Robot – H. R. Everett



shared earthly habitat. This involves such changes as building larger habitats in which different animals live together rather than singling them out as species, designing their habitats based on observations of enrichment and considering them as domesticated animals rather than imitating a wild life they never have been born in, focusing on conservation with an emphasis on animals that are threatened with extinction, recycling elephant dung and growing gardens with edible plants for the animals. Recent additions to the zoo include Micropia which is focusing on our relations with microbial lives and the newly opened Groote Museum which presents itself as a museum where people learn about their multisensorial entanglements with everything around us.

Interestingly, many of the artists of Machine Wilderness focused on what lives outside of the enclosures, while still being a part of the zoo: the voluntary other-than-human visitor. Heather Barnett focused on the zoo as a framing device, which is essentially a panorama that presents certain animals as worthwhile to look at, while others are kept out of view. But there are many animals and plants that visit the zoo out of their own free will, such as the ants that Heather focused on in her observation stations in the gorilla house. Just witnessing her exploring the ants against the backdrop of the spectacular setting of the gorillas enclosure, evokes a lot of questions and thoughts that zoo visitors engaged in. Špela Petric also looked at the zoo itself as a machine in her *Performative Ethnographies*, a methodology for engaged collective research into infrastructures that took a varied group of participants on a tour in front and behind the scenes. Each participant was asked to take on a role from which to make observations providing a basis from which to initiate a discussion afterwards, opening up to multiple perspectives of engaging with technologies of care in a zoo. Ivan Henriques worked with scientists from Micropia on exploring the collaborative strategies of various microbes and gave a tour through the zoo while narrating the many symbiotic relations that can be found there, one of them being the microbes in the food that give flamingos their pink color. This gave an entirely different way of looking at the animals not as individual beings but as complex eco systems in themselves. Driessens and Verstappen brought their Spotter to ARTIS, with which they explored the question of whether an A.I can be used differently than for optimization processes and can dream of nature by learning from observing specific animals. Ian Ingram and Antti Tenetz also worked with machine learning technologies to explore its potentials to create relations between different animals that do not live in the same geographical time zone but are otherwise related, such as the Crown pigeon in the zoo and her commoners in the streets of Ian's home town Los Angeles, or the wolves in ARTIS and those in the subarctic where Antti resides. Thomas Thwaites took a different perspective in focusing on the environmental ethics of our technologies in an attempt to build a Harmless Car: an

1986



Herbert – Adolfo Plasencia

unattainable goal but one which raises many issues of what and who we design our technologies for and how much harm we are willing to take responsibility for.

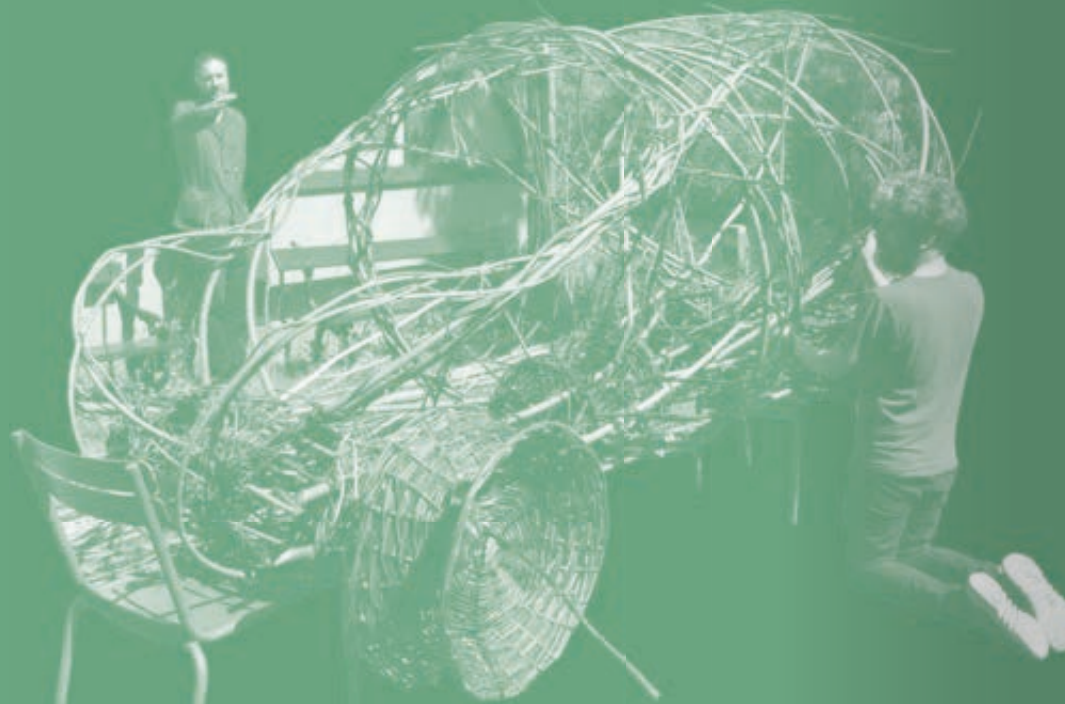
Working from a studio in the zoo and embedding artistic research in a public program of expeditions, demonstrations, workshops and presentations, we explored various ways of making artistic research into collective research engaging people in questions of how and for whom we design our technologies. In this complex environment of human, animal, plant, microbe and machine relations, which in many ways reflect the values of our current societies, we explored different imaginations of what a Machine Wilderness could be when our technologies start taking account of the more than human lives they encounter.







# IS IT POSSIBLE TO BUILD A HARMLESS CAR?



ARTIS(T) IN RESIDENCE

## THOMAS THWAITES

### THE MOST HARMFUL OBJECT EVER CREATED?

Thomas Thwaites was fastening his young daughter in the back of his car in London. The girl was crying profusely. "How right you are", Thomas thought to himself, realizing just what a terrifying object the car is. If industrial design is a way of transferring harm from one place to another through the creation of objects, then the car has transferred harm through countless millions of instances of roadkill, human tragedy and excessive pollution.

He decided to design a harmless car. Harmless to all forms of life, an impossible ambition, not unlike the Jainist position of 'Ahimsa', to be utterly harmless, not only to oneself and others, but all forms of life, from the largest mammals to the smallest bacteria. What better location than ARTIS to build such a car, in the presence of a wide range of beings, from the elephants to the minute bacteria at MICROPIA.

### MECHANICAL MONSTROSITIES

The concept Car must be one of the best known examples of design forecasting in our material culture. It is so ingrained into our psyche that anyone recognises it not as an existing product, but as the embodiment of an ambition. But cars were once an unknown phenomenon. There is a revealing anecdote from the appearance of the first cars in Pennsylvania, where farmers said that cars spooked the livestock and travelled so fast that drivers kept running over chickens and hitting cows or horses. They were so alarmed that they formed a protest group. The Farmers Anti-Automobile Association set up a list of demands, perhaps with some level of irony, to control the impact of these dangerous new devices.

From this list we can get a sense of just how revolutionary their appearance was in our environment. People were absolutely terrified of these mechanical monstrosities travelling at speeds up to 40km per hour through the pastures.

The Anti-Automobile Association therefore demanded:

- Automobiles travelling along country roads at night must send up a rocket every mile and then wait 10 minutes for the road to clear. The driver may then proceed with caution blowing his horn and shooting off roman candles.
- If the driver sees a team of horses approaching then the driver must stop, pull to one side of the road and cover the car with a blanket or dust cover which is painted or colored to blend into the scenery.
- If the horse is unwilling to pass an automobile on the road the driver must take the car apart as rapidly as possible and conceal the parts in the bushes.

Cars now dominate our landscapes, but in most ways they remain as alien to the environment as they were when they were first seen.

### WEAVING A CAR

Thomas decided the first step should be the construction of the chassis from willow, a material that can be sourced without permanent damage to the trees. With the



help of a TU Delft professor who calculated stress patterns within a car's body, a visit to vintage wooden-wagon builder Toon Wortel and after a crash course of weaving by expert weaver Piet Hein Spieringhs, Thomas started constructing his harmless car from a large pile of willow branches just next to the ZOOdio in ARTIS, under the watchful eyes of visitors of all ages and animals of all sizes (ants were the first to take a seat in the car, even before humans).

### PROTOTYPING BRANCH BY BRANCH

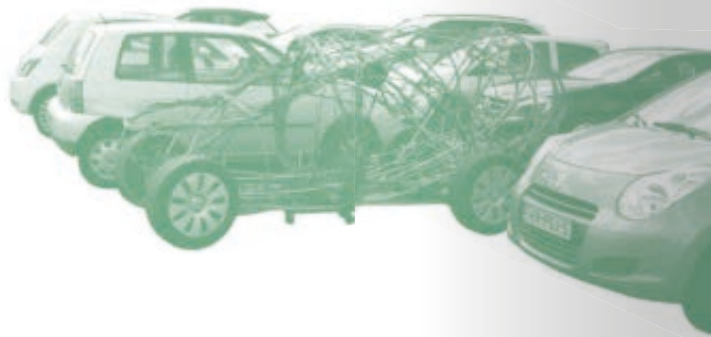
Visitors absolutely loved it and after a few days they actually started guessing what the object was, but were still surprised to hear this was not going to be a willow sculpture of a car, but an actual working prototype.

Where to start though?! Thomas had no previous experience either in car design or weaving. Piet Hein had shown some basic techniques, so it really became a process of figuring out the project branch by branch.

### AUDIENCES TO BE DRIVEN OVER

The ambition for the harmless car is to carry a family and to drive along some section of road. Some elements are beginning to get clearer, others remain nebulous. Of great importance to Thomas are the wheels of the harmless car. The current wheels are just there as place-holders. The wheels should eventually be giant balloon-like things, so the car can drive over anything without crushing it. Many

children visiting the zoo have volunteered to lie down and be festively driven over by the harmless car. This remains a distant dream for now, but the body of the car proudly stood in the Zoo and after the final event in the Groote Museum, was transferred to Zone2Source. There Thomas will continue work on the car in the summer of 2023 during his exhibition and residency, where he will drive the car around the Amstelpark.

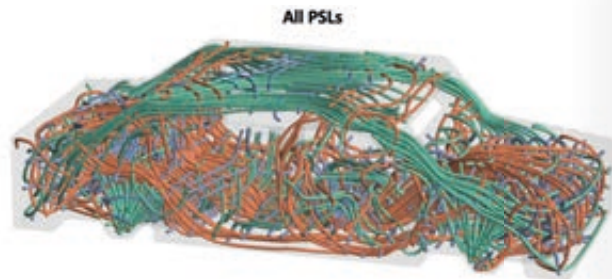


The Harmless Car being tested in ARTIS by Thomas.

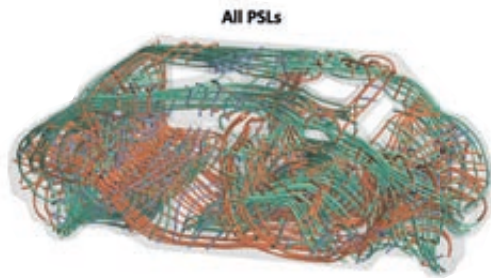


A family in ARTIS helping Thomas to test the car.





All PSLs



All PSLs

Modeling stress lines of the Harmless Car, renderings in collaboration with Jun Wu, TU Delft, 2022.



Major Principal Stress Lines (PSLs)



Major PSLs



Medium PSLs



Medium PSLs



Minor PSLs



Minor PSLs



# HOW TO LOOK AT SYSTEMS OF CARE AT THE ZOO?



ARTIS(T) IN RESIDENCE  
**ŠPELA PETRIČ**

*Reon Cordova who collaborated with Špela reflects on the time they spent in the zoo.*

A sunny morning stroll at your local zoo usually is not accompanied by a dying wish, or so I was naive enough to believe. It was near the birds of prey enclosure; vultures and man bounded to a gatch bed. Construction workers behind the bars were improving the living conditions of the scavengers. Nurses and tour guides on the opposite side of the enclosure were looking after the well-being of the dying man as he enjoys what might be his final gaze. This of course was a protocol procedure. The zoo staff is trained for these happenings. Again, it's nothing but another sunny morning at your local zoo.

Safety of the animals and visitors, disease, reproduction, winter storms, species extinct in the wilderness. Every step in the zoo is followed by the fragility of life and, by design, unnoticeably so. Work after hours, countless digital sheets, air traffic tracking, secret passages and personalized penguin tags.

The zoo does its best to decorate away their care. Seamlessly and well attuned, the care within the zoo is fully automated.

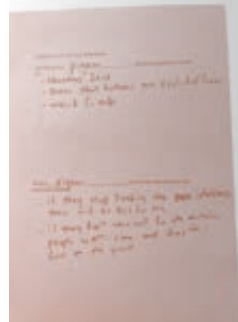
As such, in order to investigate the intricacies of this labor, a mere, single minded perspective will not suffice. Care is the work of a whole village and so is understanding it. For this, to properly approach the net of care hidden in the zoo, artist Špela Petrič implements 'Performative Ethnographies', a practice where a group of participants are welcomed to choose one unique perspective for themselves and experience a guided tour with this role ever present in their gaze.

Taking the group composed of a journalist, a lawyer, a child, a mythical dragon

and whatnot with the goal to explore rooms and spaces closed off to the public. Food storages, shipping containers, tool sheds, all the spicy secret doors. A direct encounter with the components, professionals and protocols keeping the zoo afloat that we as mere visitors can't possibly begin to imagine. After the tour, the group gathers to share and discuss their unique observations and findings. Be it with poetry, jokes or anecdotes, the group unwraps not only the automation but the burden of care.

Unsurprisingly, the conversation gets messy in no time. A vestige from savage colonial times that simultaneously evokes treasured memories of virtually anyone who visits it. Call it a necessary evil, rewinding of human spaces, a relic from the past, a dying institution in desperate need to create itself anew, a sanctuary for soon-to-be extinct creatures. These perspectives, these realities superimpose each other and furthermore, they do not necessarily contradict each other. The zoo simply and effortlessly summons a passionate opinion on anyone who decides to stop and think about its function in society and the wellbeing of the creatures inside its walls.

Exactly why the *Performative Ethnography* is such an effective tool to familiarize us with the infrastructure of care



within the zoo; it begins by asking the person to embody a role, as foreign or familiar as could be, allowing to have the performative ethnographer's view fleshed out or challenged, often times, both. Followed by granting access to the participants to unexpected situations, the performative ethnographer receives inside information and experience that could simply not be accessed otherwise. To close the collective performance, the storytelling aspect provides insight into the plurality of possible views, moments that only a nurse would consider, shapes that only a giant could see, mischiefs only a cat would seize. The performative ethnography does not seek one truth but a multitude. How was that old joke? A journalist, a lawyer, a child and a mythical dragon walk into a bar...

Once the heated debate begins (once, not if), it's always fascinating to witness how much of the individual bleeds into the perspective of the ethnographer; the performance blurs itself. The observations soon get tainted with memories of past summers with the monkeys and the desire to be closer to the panthers. A complex conversation questioning an institution constantly questions itself; the merits that it can potentially bring to the animals, plants and citizens. A timeless place urged to keep up with the new century. Preservation efforts and the resolve to transform its space into a diversity hotpot. All the unseen labor, all the care this institution demands daily; is it all applied in the right place?

Truly, a sunny morning stroll at your local zoo usually is accompanied by a dying wish but it depends on who you are asking.





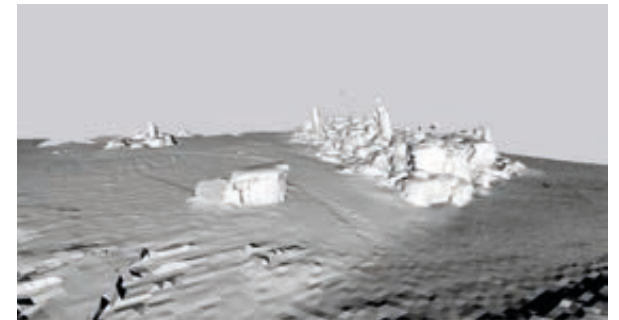
Jantien Koenders guiding the group as part of the performative ethnographic explorations of ARTIS by Špela.

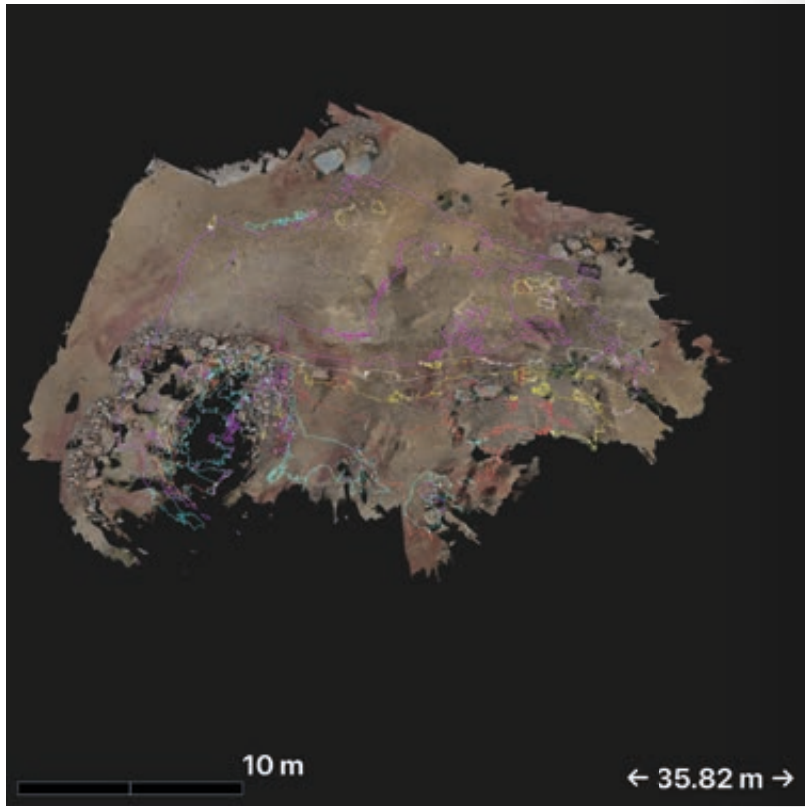


Špela addressing the group in the Algazel enclosure which was still under construction, but nearing completion.



3D survey imagery of the Algazel enclosure by Reon Cordova.





# CAN AN ARTIFICIAL INTELLIGENCE DREAM ABOUT NATURE?



ARTIS(T) IN RESIDENCE

**DRIESSENS &  
VERSTAPPEN**

## MACHINES SPOTTING BIRDS

Birds hold a particular fascination for us humans. Spotting them is a preferred activity for many. Perhaps it has to do with their elusiveness as flying beings or temporary visitors, that we cherish the moments of close encounter. In 2018 Maria and Erwin were inspired to extend this human activity to the nascent world of machine learning with their Spotter project. The first iteration of the Spotter was introduced to Amstelpark in 2018 during our Machine Wilderness residencies at Zone2Source, which formed a prelude to the more extensive residency programme at ARTIS Amsterdam Royal Zoo which eventually started in 2022 after a Corona delay.

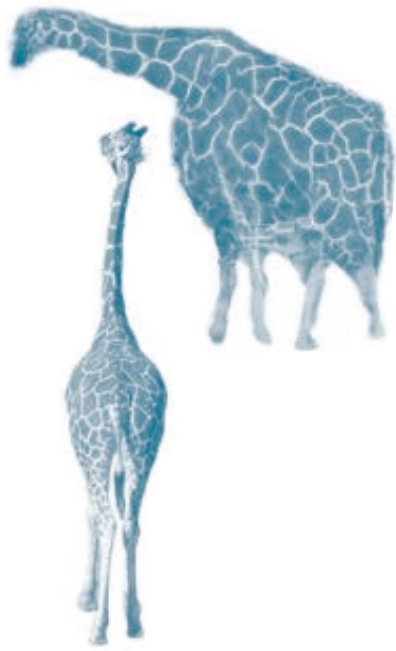
## ARTIFICIAL ANIMAL PORTRAITS

When Erwin and Maria speak of the Spotter it is clearly placed in a long tradition of nature observation and depiction by artists in the zoo. But it operates differently, Maria explains, because it isn't looking for an idealized pose. Humans tend to depict animals in attractive poses, where all the parts of the body are clearly visible, but the machine is just taking pictures in any pose, even when the animal has turned its back to us, as the Mandrills often do. We had a full day of asses there,

Maria laughs. From the images the Spotter collects, it is training at night to generate its own interpretation of what that particular animal looks like. Having a limited size brain forces the machine to improvise. So the objective is less on perfect identification as is usually the case with image classifying software, but more on its generative potential. The research will result in short films that take us from the earliest renderings when the machine knows little about what it is seeing, until the latter stages when its visualizations become increasingly detailed and also recognisable to humans. If the imaginative power of the Spotter gains something from limited brainpower, one wonders what that means to the worldview of organisms like insects, which also have to cope with limited amounts of synapses. Does that give them a huge imagination?

## EFFICIENCY IS IN THE EYE OF THE BEHOLDER

When Maria and Erwin are set up by the giraffes, the Spotter is immediately drawn to a pigeon. The Spotter identifies a selection of animals set by Erwin and Maria. So they 'switch off' birds as they have 'switched off' other animals and in fact humans, so the attention of the Spotter is only alerted by the main species of interest. The great advantage of working in the zoo, Erwin explains, is that we can expose the Spotter to such a wide variety of species and the design of the enclosures makes them highly visible. In the wild it would be much harder to get footage this quickly. But there are still many challenges. When the giraffes pass behind a large tree trunk sometimes the Spotter identifies the head sticking out behind the opposite side of the tree trunk as a separate giraffe. It thinks there are two. Ideally the machine might understand the body-structure of animals, the ability to



tell what is a leg, tail or head. But making the machine ever more effective is also somewhat unsettling. It starts to feel like enhanced surveillance with military precision.

### HOW TO TEACH A MACHINE TO SPOT AN ANIMAL

In reality the Spotter has made many humble steps to get to its current level of performance. In the early days during a preparatory session at Zone2Source in the Amstelpark in 2018, Erwin was initially trying to get the machine to distinguish any moving object from a background, by swinging a roll of tape in front of the camera. A machine doesn't understand the distinction of object and background, it can't distinguish between the animal moving and just the shadows of a tree shifting in the wind, or it doesn't understand that when an animal turns around it is still the same entity. All these things the human eye takes for granted have to be painstakingly learnt. Particularly striking was to hear how for the machine it wasn't at all obvious that when there is a zoom-in on an animal, that it is still the same scene, because so much changes within the image.

At the zoo a main focus was to make the machine persistent. When it 'loses' an animal it doesn't immediately start a new search, but it is patient: something was here recently, so let's keep looking. That way it has more time to relocate the animal. And we see it happening with the Alpine ibex: It finds an ibex laying on the rocky surface in the distance. A rectangle appears around the body of the animal shortly and disappears again. The camera waits and yes, it is seeing the animal again, the rectangle returns. It continues to zoom in until it can take a good sized photo.

### BACKGROUND LAYERS

One benefit of having a residency of a few weeks at the zoo is spending entire days at specific locations, where a typical visitor only spends a short time with a species. This deepens your appreciation for the animals and there are surprises. The Meerkats seem able to spot birds and even airplanes flying at a very high altitude, or small birds collecting fur that the Alpine ibex are shedding. Perhaps a disadvantage to working in a wild habitat is that the background behind the animal is quite homogenous in a zoo. When you see images of Alpine Ibex online you find them with amazingly rich backdrops of mountain peaks, streams, rock formations or fields full of herbs. The range of contexts is more limited in a zoo. When it sees a Meerkat it sees either sand, or a particular rock formation behind it. So the animal becomes rather engrained with the background. Working in a full landscape might challenge the imagination of the Spotter more.



## DRAWING A BLANK

In preparation for the residency, the work by Maria and Erwin on the Spotter hasn't generated one specific neural network, but rather a massive family of related networks. For different locations and conditions they apply different networks. Many however at some point collapse, when the network no longer renders anything that is even remotely like the animal in question. Its imagination suddenly collapses and it only draws vague monochromes like an abstract painter. As if the network has gone 'fully Barnett Newman' on us. Normally the network doesn't really recover from that, so it becomes redundant. Even some artificial artists can suffer from over exposure it seems.

1dmm+2gmm\_k5\_0.0002+0.0002\_19.2+18.0M\_lsgan\_b4 is the name of one of the preferred networks Maria and Erwin have built. It is favoured because of the impressionistic images it generates. When we are standing by the zebras and giraffes Maria and Erwin are already excited by the prospect of letting 1dmm+2gmm loose on the material. It is particularly good at combining a rich diversity of features because it seems to take them from a wider range of sources. And the more preferred networks also generate interesting stuff in a relatively short time. 1dmm+2gmm only needs one day's worth of material to already generate interesting looking images. It's not a very memorable sounding name, but Erwin breaks it down into parts:

- 1dmm+2gmm refers to: 1 'mm' discriminator step + 2 'mm' generator steps,
- 'mm' stands for 'makemix' which is a one of a family of network architectures,
- k5 refers to: the size of its filters, 0.0002+0.0002 refer to: the learning speeds of the generator and discriminator networks,
- 19.2+18.0 refers to: the number of parameters per network, in millions,
- b4 refers to batch size: if it learns from only 1 image it tends to be erratic, b4 indicates that it learns from four images simultaneously, which gives it a more steady direction.

## RESIDENCY REFLECTIONS

Observing animals over many days has changed my view about the zoo, Maria says. It is like visiting another world and every day is different. It is like a strange dream to have all the animals here. You see how animals react to changing conditions. You start to see subtle indications of hierarchy among the animals that share an enclosure. You slowly get to know some of the caretakers. It is a commercially run park of course, but you see how care for the animals really is the first priority here. We found out how nice it is to spend long periods with specific animals. After that experience, I will be a different zoo-visitor forever.



Erwin and Maria at the Weaver birds in the ARTIS aviary.



Erwin with the Spotter at the Alpine ibex enclosure, pointing out an ibex on the screen.



Early interpretations by the Spotter of its observations at the meerkats enclosure.



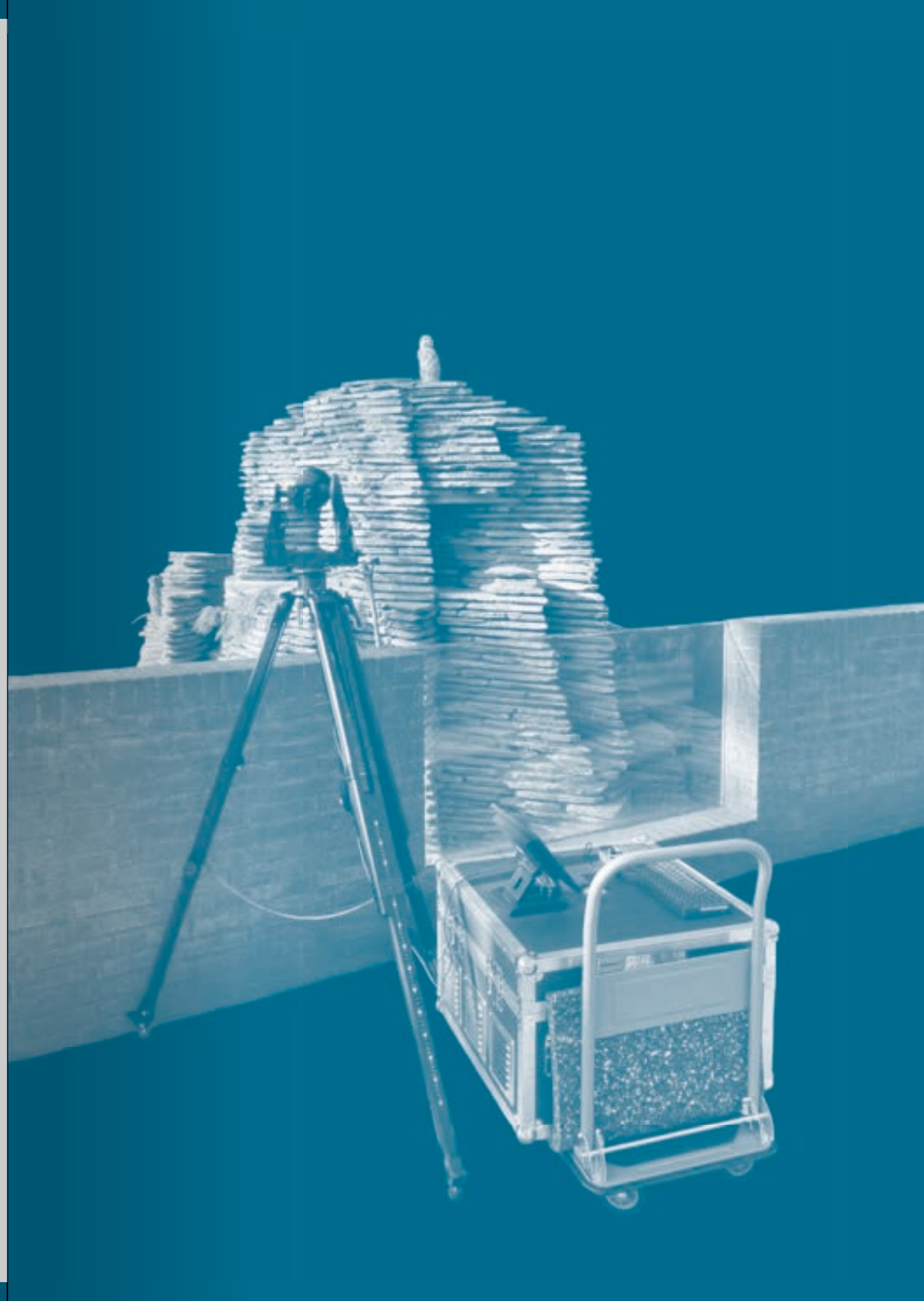




The Spotter studying a mandril.



A render by the Spotter through machine learning, based on its observations at the meerkat enclosure.



# WHY LOOK AT ANIMALS?



ARTIS(T) IN RESIDENCE

## ARTSCIENCE PARTICIPANTS FROM ROYAL ACADEMY OF ART, THE HAGUE

*From March 21st to March 31st 2022, a group of 11 ArtScience Interfaculty students from the Koninklijke Academie Den Hague, participated in Machine Wilderness by exploring and creating performances and projects at ARTIS Royal Zoo.*

**LEAD:** Cocky Eek, with guest-teachers Kenzo Kusuda and Thijs de Zeeuw  
**STUDENTS:** Daan Boer, Pelle Schilling, Olivier Blom, Christine Gronborg, Andrzej Konieczny, Ziming Zhao, Jacob Wallett, Tom de Kok, Lola Brancovich, Myles Merckel, Simon Barette.

*Why look at animals?* is the title of a famous book by John Berger who wrote that we underestimate animals:

“To suppose that animals first entered the human imagination as meat or leather is to project a 19th-century attitude backwards across the millennia. Animals first entered the imagination as messengers and promises. For example, the domestication of cattle did not begin as a prospect of milk and meat. Cattle had magical functions, sometimes oracular, sometimes sacrificial.”

Why look at animals was also the starting question for a student fieldwork session during Machine Wilderness. In a way this course asked if we can rediscover animals as highly esteemed informants and guides, but as field research it was entirely open to what might unfold during the process.

ArtScience interfaculty students spent 2 weeks doing research in ARTIS Amsterdam Royal Zoo. These are students who are used to

doing research, working in specific contexts, working collaboratively and often have a strong scientific interest. So they were perfect young researchers for a field session in this kind of setting. Typically ArtScience students not only are comfortable expressing themselves creatively in various media, but often they develop their own media. It would be interesting to see, therefore, what being among extremely varied organisms with wide ranging behaviors, signaling modes and life-worlds would trigger in these students.

Here are some of the notes, images, observations and experiments by the students:

### JACOB WALLETT

The following text was read out-loud to the herons, who naturally didn't listen.

The zoo receives many visitors. Indeed, most at the zoo are visiting. Some visitors fly in from very far away; other visitors were born in the zoo. Some visitors come to the zoo on the backs or in the mouths or in the fur or on the feet of other visitors, and some dig their way in under the fences. Some came here so long ago that all but the slowest beings have forgotten what it was like before they were here to hold the ground together or hold the roof up. Still visiting, slowly.

By entering the ARTIS site the Visitors accept the following regulations:

The following is prohibited:

- To stray outside the designated paths, corridors, rooms and playing fields.
- To enter enclosures or to pass the no entry zone of enclosures.
- To disturb animals in enclosures or place items in enclosures.
- To insert or move body parts or objects through, over, in or under enclosures and pens.
- To appropriate, steal, disturb, destroy, damage or remove items belonging to ARTIS or otherwise



present on the site, including animals, trees, plants, works of art and furniture.

- To use the items present on the ARTIS site in a manner other than that for which they are intended according to their nature and design.
- To bring or admit animals onto the ARTIS grounds, or take animals from the ARTIS grounds (assistance dogs on a lead are permitted under certain conditions).
- To behave or dress in an offensive manner, to cause noise, nuisance or otherwise disrupt order at the ARTIS site or exhibit otherwise socially unbecoming behaviour.
- To deposit waste outside the indicated waste bins.
- To stand, swim or bathe in the waters or water features on the ARTIS site.
- To eat and drink at the Lemur Land.
- To leave cars in the car park for more than 24 hours.

### CHRISTINE GRØNBORG

The soundscape in the tropical butterfly greenhouse made a big impression on me from the start as it was the first place I visited. At first I thought the massive soundscape stemmed from crickets but realized it was frogs singing; A poisonous Amazon frog in fact. I was informed the frogs were triggered by a looping sound recording while normally they would sing only closer to night time. Now they were singing all day.

This somewhat absurd information started questions I never thought about before. Somehow it makes sense: while everything

else related to a zoo environment is very constructed and artificially designed in order to create a certain environment or habitat, why would sound not be an element in this composition? Were other areas of the Zoo utilizing sound composition to enhance certain behavior or to create a specific atmosphere?

I tried to mimic the principles of the shy frogs through a simple frog sound installation prototype. I was very focused on the soundscape of the Zoo. And listening. In the bird house. Many hours. Developing a method for listening. Long term listening allows for a meditative state, a presence, and slowing down into other rhythms.

How to distinguish the sound from the source?

What to listen for? I find myself confused about this.

How to unsee the tree but only see the person? The animal. The human.

How to unhear the concept but listen to the sound?

Some sound characters: global – focal || distant – intimate || internal – external

In the end I made a guided listening session.



## OLIVIER BLOM

The insects interest me. They are so diverse and have wildly varied abilities and senses.

When visiting the butterfly house I noticed their antennae, or feelers (voelsprietten in Dutch). Feelers imply a sense of touch, but I read a little online and they relate to many other senses.

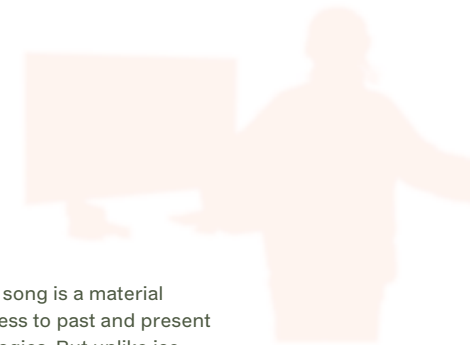
Antennae can be sensitive to smell, taste and hearing. There was an article about species with senses that are so sensitive, that they in a way become useless.

I think it's interesting to extend our senses. I want to try and make antennae or feelers with sensors on them and use them to explore a space.

## MYLES MERCKEL

Sonic interactions between native species in a shared acoustic ecology have encoded complexity into an already intricate sound. Yet these almost imperceptible changes can represent a reaction to a colossal event occurring somewhere downstream in a birds' entangled network of connections. The presence of a monkey call or a cicada's hum can be felt within the boundaries of a bird's song.

European air conditioning units replace the evening drone of a South American bullfrog. Sliding automatic doors populate the frequencies once filled by with the periodic calls of finches. How are these new animal-machine hybrid ecologies mutating the vocalizations of birds? The mass of ecological data encoded into bird calls is slowly being overwritten by the environments that are built to conserve them. Should we attempt to preserve the wild bird's song when bringing species into conservation? Or would these conserved songs only be Simulacrums of their wild song?



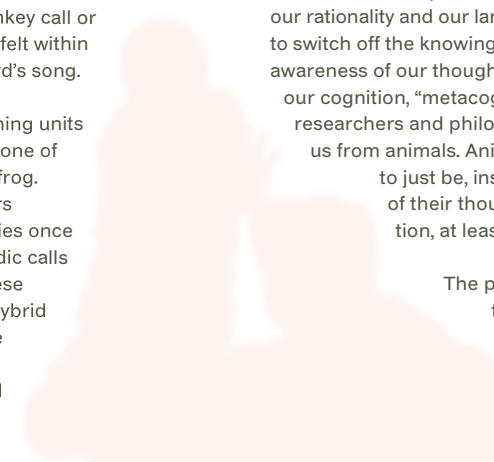
Bird song is a material witness to past and present ecologies. But unlike ice cores or rock strata, we cannot freeze bird songs in cooled laboratories or sterile labs. A singular Wreathed hornbill is adjusting its call temporally to make space for the call of a clicking gas heater. Possibly overwriting its entanglement with the calls of an unknown cricket species that it once shared an acoustic environment with, deep in the tropical evergreen forests of southern Bhutan. Do we have to accept these changes? Are these new animal-machine entanglements becoming markers of our efforts of conservation for later generations to decode?

## PELLE SCHILLING

We as humans experience the world through our rationality and our language. It's impossible to switch off the knowing of language and the awareness of our thoughts. This awareness of our cognition, "metacognition" is what a lot of researchers and philosophers say distincts us from animals. Animals have the ability to just be, instead of being aware of their thoughts, of their cognition, at least I think.

The passiveness a lot of the animals exhibit could be described as laziness. Which is interesting but also very weird and stupid in a way. Translating animal

behaviour into our rational language is just a way for us to relate to our rational view of their world. But once again, I think animals just are, they don't give a fuck about our ratio. They don't even have the concept of giving a fuck. Probably, how can I know?





I envy this lack of metacognition, the ability to experience my perception as is, without a train of thought steaming on indefinitely.

The closest I got during the residency to ratiolessness was when I decided to lay down on a bench in the bird house. I laid there for around 2 or 3 hours. During this time I never fully fell asleep but I did start to glide in and out of consciousness. By being in this pre-sleep state I felt my ratio turning down. The train of thought was still happily steaming on but the tracks were merging and there were more trains running at the same time. Because of the fluidity of thought in that state it became easier to just experience the surroundings. The ratio still tries to fight in my head but it loses its sharpness and makes less sense. It felt like becoming a bit more of an animal and a bit less human in a way.

#### LOLA BRANCOVICH

I kept working on/with the 'enclosure method' which consists of tracing a mental journey through the harsh lines from one Umwelt to the other in a consistent distance, using points of relation that give generous flows of introspection by taking 'steps out of ourselves' using points of relation and exactly the same amount of steps back into ourselves. Composite environments brought me to introspection of my body as a composite environment.

I am pregnant with the space, the space is pregnant with me. We produce emotion and

it produces us

There is no barrier,

It is not a fence, not a defense but a de-fencing

An enclosure to be turned into an enclosure

Ambitious experiments,

ambiguous bodies,

experiences making

bodies and bodies making

experiences, signs that wonder,

hesitate to fix themselves

The inner world is outside, the outer world passes inside.

The ability for me to guide people through this method is the next 'step' that I want to pursue.

#### ZIMING ZHAO

In the process of photographing animals, I travel to and from all corners of the zoo, gradually starting a process of constantly visiting neighbors and observing their behavior. Based on the understanding of their dynamics, a process of intimacy is established.

#### TOM DE KOK

I wanted to spend most of the time in the three indoor birdhouses and observe what is occurring in sound and behavior. I had a few questions for myself, which were:

Does sound only feel good if, after it, there is silence? And does silence only feel good when you know that after it, sound comes back? What does silence mean for birds? What does silence mean for humans?

How do birds hear and how are they influenced by artificial sounds like fan noises, broken fan ticking noises, reverb etc.

Birds choose the timing of their sound very precisely and carefully, so they don't get unnecessary attention from other more dangerous species. What happens with the birds in the zoo when they are surrounded by birds that they normally wouldn't meet?

Human hearing is between 20-20000 Hz and the threshold is 0 dB. Most birds can hear between 1000-4000 Hz and are the most sensitive in that range. But the hearing range of frequencies is not the impressive part about the birds, because they are very sensitive to the tone and rhythm of sound. This is so they can more easily discern sounds. Their brain



is incredible and can process sound up to 10 times as fast as humans. As humans we can process 1/ 20th of a second but birds can hear 1/ 200th of a second. A lot of birds have a soft(er) layer of feathers on top of their ears, the feathers are there for the same reason that we use "pop filters".

On the last day I went back to the birdhouse and tried to record the birds as best as possible with the one condenser mic that I have. Then I tried to calculate how to pitch the bird recordings down, so it was 10 times as slow. The results are a bit lo-fi because of the noisy birdhouse acoustics and the audio editing of the pitch, but still very interesting to listen to. For the future I would love to recreate the rhythms and tonality of my recordings and see how it feels to play and listen with them.

#### ANDRZEJ KONIECZNY

Questions about why we look at animals become questions of how to become an animal? How to unfold layers of social behaviors to encounter presence and possibility, driven by observation and primal urges of the body. While making observations I didn't want to be an observer of the animal phenomena, but of how we as human beings can incorporate animalistic movements to extend practice of everyday presence.

How to be us?  
How to be closer to the reality?  
How to be closer to the reality of performing?

As a practice we can make our body tired and create a frame of exhaustion for unfolding the natural movement that is layered by focal points of the solidified behaviors.

How to become a presence?  
How to create accidental expression?  
How to create space for the unexpected and the unrepresentable?

After animal observation I tried to incorporate unexpected and accidental expressions of animals that are not connected directly to any basic need of a being. It could be body language, exploring places, playing with shadow and perception of a light, sounds occurring and many subtle movements that are driven by the curiosity of an apparent animal.

After all, the main point of the embodied research is how to become a performer without performing? Can we add all observations and an embodied empathy as our second nature and natural language of expression?

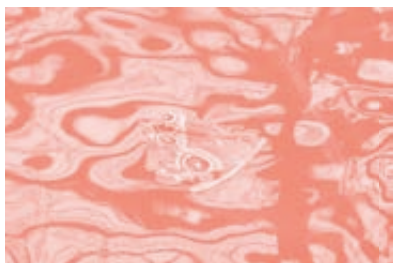
#### DAAN BOER

Over the course of the two weeks I further developed a practice of taking on the perspective of animals, studying behavior, trying to communicate with and embodying different species.

##### Porcupines

The first animals that caught me were the two Indian crested porcupines. They seemed very friendly and at the same time dangerous and threatening. Their personality seemed to be reflected in their quills. They have medium length quills around their face, almost hair-like at the ends. After petting them I knew they were friendly. Further down their bodies were the longest quills, marked with several white stripes. These aren't very sharp but if they put them up, almost like a peacock does its feathers, it looks very dangerous. Another type of quill to warn their potential predators are the short, thick and open quills on their tails. These aren't coloured nor do they look impressive, but are used to rattle when defending themselves. Finally they





have the two-toned, short, thick and extremely sharp quills they use to stab their predators with. They fall out easily and are known to have killed lions and tigers by infecting the wounds inflicted.

I studied their behavior and tried to instinctually get a sense of how the porcupine experiences the world. I then attempted to take part of their body and add it to mine. With thick paper straws taped to my back I noticed how this influenced how I felt and expressed myself. With only the open quills on my back, none of the defensive weaponry and being part of a group of humans, I felt like the quills were openly showing others how I felt. It became another way to communicate, but because I was the only human-porcupine around I could only speak and be heard, I couldn't converse.





## IN OUR GENTLE SOLITUDE - MIRRORS & EARS IN ARTIS BY KENZO KUSUDA

Around that time in 2017, one of the main focus points in my movement practice was to become more alert and conscious about "Feeling the Bones of Everybody" ... literally.

We could easily forget the simple fact that the bone is indeed one of the most fundamental and indispensable elements inside everyone's body. We could explore and appreciate this simple fact more, and moving with such appreciation could drastically change the quality of our movement from the depth of our being. Move the bone even a little bit, then we would immediately find our entire body already starting to move by itself effortlessly and vigorously as an inevitable consequence from a tiny micro movement of a bone, that surprised me and inspired me tremendously. Bone became a key element for generating new movements.

Bone is not just a simple hollow dry material made of calcium, but it is a very vital source and vibrant fountain of our life, that happens to look calm and tranquil like an ancient tree. Bone is a mystery we all carry inside us, or rather, bones are carrying us.

When you were dancing with another person (for example; a duet situation in the dance studio), I was especially navigating my attention to feel not only my own bones in my own body, but also attempting to feel the other person's bones in their body.

As if we were together becoming a totally one new large animal without a name, a new living creature or organism, exploring a new world with new senses, in some way.

Instead of focusing on the surface appearance (for example; the face, the skin, body types, names, clothes etc...), approaching directly to the bones is almost seeing through the surface, names and attributes, and making a deeper connection into the solid core of every being, and uniting with each other in that deeper realm of being. And the bones are our mutually trusted common element we all carry deep inside us yet cannot directly see or touch, therefore giving attention to each other's bones often simultaneously evokes a profound sense of introspection and empathic affection to other beings, in order to see into that which is not obviously visible from the outside surface.

Visiting the Goethe House in Frankfurt after a performance, an unusual thing started to happen to me already from the first painting I saw in the exhibition. She (the person in the painting) was there as an eternal and immortalised still figure perpetuated on the canvas, and indeed she was very alive and very present, breathing vibrantly and looking back at me from the other side, like someone in the mirror.

Somehow I started to feel an unfamiliar sort of inner emotion or hidden temperament seeping into me which I had never felt before by myself alone, that might have been seeping out from her pictorial presence, that was like a gentle mountain stream flowing into me through the bones. Something deeply universal and essential that she might have been possibly feeling deep inside her without herself even being aware of it when she was once living



as a person and happened to be portrayed by an artist more than 200 years ago. I was symbiotically drawn into and navigated through to find a mutual connection via the bones of each other exactly in the same way as I would usually practise collective group dance movements, attempting to feel and unite with real people who were moving together with me in the dance studio.

To my surprise, I was almost instantly tuning in to the bones of all the rest of the portraits that were made by many different artists with many different models, my bones and their bones were resonating and breathing with each other, playing with each other like a family or siblings of shadows, as if that were natural course of things in the world.

That was what happened while looking at the portrait paintings at The Goethe House Museum in the summer of 2017, the episode I shared with a group of ArtScience students in ARTIS during their Machine Wilderness work period entitled “Why Look At Animals?” that took place in the spring of 2022.

At the grass yard in ARTIS, I asked a simple question to everyone: What is the colour of this blade of grass? This is so called green grass or green leaf, but is it really green????

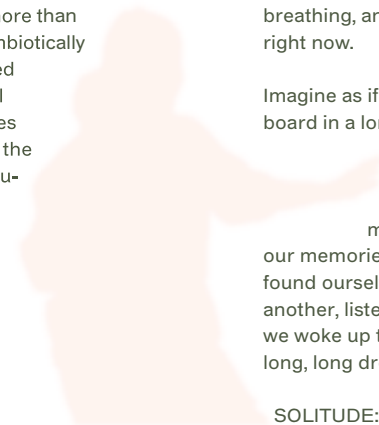
Imagine that the naming of the colour, in this case, the colour “green”, is only an assumption, a generalization, of what this colour really is. As long as we call this leaf a “green” leaf, we will never be able to truly see this. Naming it this or that, might prevent us from seeing what it really is. If this is NOT green, then, what is it, really??? There comes the opening. There comes the sense of wonder. We start to become vibrant and alive, for the reasons that we don’t know, but we start to feel more vibrant and resonant, we start to cherish every little wonderful thing we encounter every second,

including ourselves living in this very moment, breathing, and listening to our breathing, right now.

Imagine as if we have been travelling all on board in a lonesome spaceship called tiny planet Earth, floating in the middle of the vast cosmos, spinning and rotating for millions of years, and we have lost our memories of how we all got here, we just found ourselves standing here and facing one another, listening to our own breathing when we woke up this morning, waking up from a long, long dream.

SOLITUDE: SOLI = implies (\* plural form of Solo, \* Solos, \* more than one kind of Solo) & also implies (\* Soleil, \* The Sun). Solitude that we all share under the same sky. Solitude that embraces all of us as One.

This is an excerpt from Kenzo’s full text available on the website [machinewilderness.net](http://machinewilderness.net).









# UNMAKING SPECIES: SOME DESIGNS FOR RESTORING THE PARADOXES AT THE HEART OF THE SYSTEM OF NATURE

CLEMENS DRIESSEN



*We invited Clemens Driessen from Wageningen University to engage with the artists during the final event at het GROOTE MUSEUM, and reflect on their works and research in an article for this publication.*

## SPECIES

We are surrounded by species. We are a species. At least since Linneaus' proposal to order the natural world into binomially categorized creatures with certain shared anatomical features. He proposed the system of double naming for all organisms, using a single logic (sexual reproduction – it was a scandal!) to sort out plants and animals into distinct kingdoms (mineral, plant, animal) and within those in a series of increasingly specific categories: class, order, genus, species. Linnaeus included humans as the mammals we now know we are. He himself is the official 'type specimen', the reference body, of *homo sapiens*.

The idea of species shapes how we now understand our dwindling biodiversity predicament. We are in the middle of a mass extinction event. Humanity may hope to survive this in some form, together with a motley bunch of what we cling to as the most eye-catching, charismatic, symbolically appealing fellow beings. Or at minimum those species performing crucial 'ecosystem services': our infrastructure of life. Or just those that manage to make a living in the mess we are making.

Through the unit of species, the management of nature has become a matter of ticking boxes. Overall there are less and less boxes to be ticked. Meanwhile, zoos and conservationists

organize intensive breeding programs to keep some select species alive. Animals and plants and other organisms rake up value, receive attention and forms of care for representing those species that got into trouble. When species are no longer 'of least concern', they get registered as conservation dependent, near threatened, vulnerable, endangered, critically endangered, extinct in the wild, extinct.

Somehow this natural order, which we use to account for loss, to know nonhuman others, to guide experiences of encountering a zebra, a penguin, some microbe perhaps, seems unavoidable. Species define what it means to know the natural world: to associate the right label with a particular living (or dead) being. Ever since being systematized in natural history museum collections, the way we define the ultimate ingredients of nature is not by mating ritual, song, play behavior, ecological web they are part of, or place they call home, but by identifying the generalized and abstracted type they belong too. To do so, they get their bodies cut – metaphorically and literally – into ever tinier elements: from striking features in their anatomy, to their genes, as that which defines them. Knowing nonhuman life and caring for biodiversity is caught up in practices of exploring, killing, naming, ordering and storing. What started out as *Wunderkammers* of the weird and exotic, has become institutionalized into archives of death.

## NO SPECIES?

OK, but how else then? Aren't we supposed to keep track of the abundant variety of life somehow? How can we gather data, communicate about other creatures, without clear labels? There is a biodiversity crisis to which we need to respond. Numbers of species are dwindling.

Our thinking in terms of nature as a vague outside realm set apart from humans, which can be known through naming all species, informs current debates on how we may get out of our planetary crisis. We seem caught up in the opposition between 1) technology will save us, if only we embrace an ecological version of modernity, we can finally get to know, command and control the natural world properly, on the one hand; and 2) technology is where humanity has gone wrong, the moment where seeking control and domination we have lost control due to the complexity of life and a natural world that is now irreparably pushed beyond its limits. But what if our technological situation 3) is not just one of either/or, yes/no, more technology/less technology? How to sort out good from bad technological interventions?

It may be important to realize how technologies have deluded us to believe they are merely material. If we look closer we may find they are not just physical objects imposed on a natural world independent from it, but they actively produce, and reproduce,

certain ways of knowing, ordering and labelling the variety in nature. Like the plant recognizing app on my smartphone, or the monocultures that industrial modernity produces through a range of measures from policies prescribing crop consistency to the mechanical implements for seeding and harvesting.

Do we still have time for speculations of how design could do differently? Before we can ask questions on how to save nature, how to live as part of less destructive technologies, we may want to explore how we could design different ways of relating, managing, or knowing nature. Then it would be good to unpack the elemental order, the basic conceptual infrastructure of nature, that seems to be all too self-evident.

For one thing, Linnaeus never claimed his ordering was the one and only true way to categorize life on earth. When he was hired in Amsterdam in 1735 to sort out the garden of George Clifford, a wealthy merchant and director of the VOC (the Dutch East India company), the aim was to get a systematic overview of all those plants that were being brought over from colonial exploration and trade. This helped him in his larger project to design the system of nature, together with his friend Peter Artedi, a fish taxonomizer who tragically drowned in an Amsterdam canal just when they were assembling their ordering system. As opposed to other naturalists of his time, Linnaeus acknowledged that what he proposed was based on a somewhat random choice defining his particular kingdoms and species ordering. And since Darwin we know 'species' is a moving target anyway. They are not fixed and timeless. Not God-given but ever-emergent. Still, talking about species facilitates knowledge exchange, comparison. Without labels nature would just be chaos?

1 Borges' 'found' a certain Chinese encyclopedia of animals: "(a) those that belong to the emperor (b) embalmed ones (c) those that are trained (d) suckling pigs (e) mermaids (f) fabulous ones (g) stray dogs (h) those that are included in this classification (i) those that tremble as if they were mad (j) innumerable ones (k) those drawn with a very fine camel's-hair brush (l) etcetera (m) those that have just broken the flower vase (n) those that at a distance resemble flies"

2 Foucault, M. (1975). *The order of things*. Routledge.

3 Descola, P. (2013). *Beyond nature and culture*. University of Chicago Press.

We would end up in the kind of weird lists of J.L. Borges,<sup>1</sup> impossible to bring into the same logic, undercutting the very idea of a single order from which to grasp the endless multiplicity of the natural world; Or one that is especially complicated due to being muddled by relations with humans? Due to being subjected to intervention and imagination rather than just supposed to be out there without anyone doing the representing? It is those literary lists that brought Michel Foucault to his sense of arbitrariness of scientific orderings of the world.<sup>2</sup> An order that is even more questionable in places such as Amazonian rainforests with their incredible abundance of variation. There, people lived amidst a nature that, according to anthropologist Philippe Descola, was so confusing, complex and boundlessly diverse in its local manifestations, it was impossible to identify an overarching system.<sup>3</sup> The Amazonians lived in a Borges-like ecology in which the dream of total knowledge is an elusive and confusing one.

In our way of knowing, who gets to name, and thereby erase other names? Who gets to divide into basic units, promote their

particular ontology, claim the ultimate epistemological position, inscribe a colonial project and Christian theology into the fabric of life? Confronted with a messy pile of differences and similarities, we can ask pragmatically, what does it do to pursue certain modes of ordering rather than others? What is gained and what is lost following particular taxonomies and naming systems? Without a solid position from which to judge this, an obvious ur-order, we can however trace certain blind spots. The unavoidable dark corners of the orderings we propose and make happen.

4 Ditzler, L., & Driessen, C. (2022). Automating agroecology: How to design a farming robot without a monocultural mindset?. *Journal of Agricultural and Environmental Ethics*, 35(1)

We can adopt technologies oriented to reproduce monocultures of the mind, to inscribe the optimization of perfectly generic individuals which are all the same, onto our landscapes, and into the technologies such as tractors, and agricultural knowledge. Together with agricultural researcher Lenora Ditzler and her experimental pixelfarm, I have explored ways in which we could rethink how technologies of managing fields and gathering data could be imagined otherwise.<sup>4</sup> Many of the promises surrounding agricultural robots, and the automation of management of natural systems, start from the premise of, the need for, the dream of, total knowledge. Seeking to design otherwise entails then not just a move away from monocultures in favor of diversity, but the very logic of ordering species may be limiting what these technologies could be, and the types of nature they may produce.

Instead, the emphasis on naming and order produces an inordinate amount of work meant to categorize and maintain. It sometimes seems to be the only way we talk about the natural world. How to see the variety of creatures that populate our environments not just as instances of something general as that which ultimately provides meaning and value. How can we understand the care, love and interest they generate beyond them perpetuating a type, a Latin name on a red list?

Plants, microbes, fungi and animals are – or can be – so much more than just a specimen of a species: they are unique individuals, but also members of local communities, embedded in ecological relations, feeling at home in particular places, knowing how to navigate certain routes; liking and disliking particular others; they are learners, lovers, lamenters. They can be crazy, cute and cocky. Not just butterflies neatly pinned to a board.

Of course being systematic is important. But what may fall between the cracks of the order of nature could be as crucial for how we may know and care for the living environments we share across a range of lifeforms. Especially when thinking in terms of species is perhaps a delusion that mainly leads to dissecting what is left of the natural world, and storing plastinated, ethanol immersed, dried or taxidermied corpses in nineteenth century buildings.

5 Oudman, T., & Piersma, T. (2018). *De ontsnapping van de natuur: Een nieuwe kijk op kennis*. Singel Uitgeverijen.

Can we imagine other technologies, other forms of mediating natural worlds, that acknowledge the weird nature of nature – which never fits the schemes we think it would? A nature that inherently escapes<sup>5</sup> our attempts at knowing it, the ability to elude and surprise, which may be its ultimately valuable trait. Could we think of technologies of learning and categories of knowing that maintain this wondrous nature?

Let's take a closer look at Linnaeus and his system: As hiding in plain sight in the original matrix of species there may be a way out, a portal opening up to other modes of relating to our natural world.

### THE WEIRD BOX AT THE CENTER OF THE SYSTEM OF NATURE

In the first edition of his 'Systemae Naturae', Linnaeus included a weird box. Right in the middle of the famous table, centre stage in his orderly presentation of all animal life on earth, sits a strange row of confusing cases. A list of inconclusive organisms whose position in the scheme of things were hard to establish. The schematic overview of living nature had a series of question marks, speculations and peculiarities at its core.

There were those that were found to defy the Linnean categorizations, such as the South American frog that was thought to metamorphose into a fish. Several entries were mythical beings that are suspected to muddle well-known orderings by combining features of what are thought of as separate species: Unicorns he suspects to be imagined by painters. The satyr he proposes to be a species of monkey, if it exists at all. Hydra, the snake with seven heads as described in the biblical Apocalypse, he dismisses as biologically impossible. But nevertheless, he still includes it here, just in case:

“Hydra: body of a snake, with two feet, seven necks and the same number of heads, lacking wings, preserved in Hamburg, similar to the description of the Hydra of the Apocalypse of St. John chapters 12 and 13. And it is considered by very many as a true species of animal, but falsely. Nature for itself and always the similar, never naturally makes multiple heads on one body.”

For these mythical beings, the System of Nature that Linnaeus proposes is meant to help in sorting out real nature from the fraudulent, artificial, and fake. Other animals listed in the Paradoxa were described as displaying strange behaviour, such as the Pelican which was thought to feed their young with blood via a self-inflicted wound. Or to rejuvenate, like the Phoenix. Or to make an eerie ticking sound like a clock while living in walls, the death watch beetle, the *automa mortis*.

In this paradox box, dragons are still mentioned as possible creatures that one could be on the lookout for. “As long as it is not seen either living or dead, nor faithfully and perfectly described, it is called in doubt” Mythical beings, such as Sirens, echo a moment in which ancient tales and folklore are still considered as a possible source of knowledge, but now in itself insufficient to be accepted as proof of existence. Linnaeus develops a particular way of describing organisms, a genre in which spectacular behaviours and mythical roles are not enough to be granted the status of real. The new standard is meticulous bodily description, the existence of a valid specimen, and fitting into the order of nature.

In 1748, from the 6th Edition onwards, this box disappeared. All the messy subjects had been cleaned up. Did Linnaeus decide he had no need for modesty anymore? These strange creatures were now either confirmed or denied entry into the register of life. There were no more open questions or wondrous beasts in the system of nature. They had been definitively exposed as mere fictions, falsehoods, figments of imaginations of sailors/ explorers, endlessly repeated narratives of premodern times, medieval bestiaries, produced by folk tales and unsystematic observations. From that moment on, studying nature meant first and foremost making a proper inventory. Putting specimens into the right drawer cabinets.

Linnaeus announces there is no longer space for what are clearly imaginary beings derived from tall tales and unreliable sources:

6 Linnaeus, C. von. (1735) *Systema naturae*, Vol. 1; quoted in Knapp, S. (2000). What's in a name? *Nature*, 408(6808), 33-33.

“I have come to these conclusions by personally leading my pupils on wanderings through the tangled web of nature, in order that I can spur others on to an examination and explanation of nature rather than the reiteration of perceived ideas ... I shall take exception to the tales of actors and the barkings of dogs with equal measure.”<sup>6</sup>

Here Linnaeus establishes that one can only make proper sense of the ‘tangled web of nature’ when going out into the field equipped with his cataloguing approach. Examining and explaining nature is cut-off from defining animals through narratives of their behaviours. And above all, we should dismiss the voices of the animals themselves, which epitomize unreliable accounts.

### PARADOX

The meaning of the word paradox is a riddle: A paradox is 1) a contradiction, or 2) an apparent contradiction.

In the first instance, it is an expression of reality that is self-defeating, contrary to reason and logic. This paradox is an

accusation of something that is incoherent. When the world doesn't fit the model. In the second instance there's a sense that this is only seemingly so, it is us human interpreters who fail to see how it all makes sense.

Hm. So labelling something a paradox merely adds to the confusion then?

By meaning both real contradiction and only apparent contradiction, this term deeply muddles both our world and our sense of how to know it. It postpones the decision whether it's us being stupid or the world not following its own supposed logical order.

By using the term paradox, Linneaus put his systematizing effort under the aegis of doubt. Doubt about the assumption of an underlying order. Or doubt about incredible accounts of captains and explorers as merely adding myths.

Even when most of the creatures listed were immediately dismissed as 'fake' by Linneaus himself, the box of paradoxes offers an opening to a wondrous world that doesn't fit categorizations. It includes types of descriptions – of behaviours, relations, stories, events – that are made irrelevant in the rest of the table.

But what if every animal, every organism, is a paradox?

Today the word paradox seems mostly used by people who like to say: 'this seems contradictory – but I know the solution; there is an explanation, and one that does not unsettle the order on which the paradox sayer stands.' But is there a way of relating to the categorizing stance that does not start from this type of self confidence that the world is obviously orderable, and if not then needs to be adapted to fit our models? When the paradox, in its double meaning – as eluding our categories and perhaps requiring us to invent new systems – can be considered as a category in itself, as an option in the table, is not so mysterious at all when we assume things to be relational, processual, place and time contingent, coproduced by our very systems of knowing.

### RESTORING THE PARADOXES OF NATURE

Could we somehow retrace our steps, and go back to the time when this ordering apparatus still was riddled with paradoxes? How are we to restore this sense of wonder, how to see animals (and plants, and all the others) in light of the miraculous creatures they are?

Much art and design interventions that seek to make new relations with the natural world can be viewed as contributions to this box, at remaking this sense of wonder, at bringing the miraculous to life, to cherish the incredible/incredulous. The task then is to restore the paradoxes at the centre of the system of nature.

And thereby to dismiss a world that is presented as basically orderly, in which there are merely some (or in fact a large number of) species that are 'not yet known'. Instead, this work opens up the idea of ordering as having space for other forms of knowing, other ways of being, and becoming, other types of existence.

The point of this paradoxical restoration is not of course to fix a particular set of them. It is not to genetically modify reptiles to become fire breathing dragons, or crossbreed narwals and horses, nor to try to prove pelicans actually fed their blood to their young. Acknowledging the paradoxes at the core of how we see nature may help open up curiosity and forms of care that may get lost in our contemporary institutions built around conservation of a collection of species.

Not in order to provide the definitive overview of the complexity of nature – but to explore new questions together with a range of organisms. In the process putting ourselves, our ways of looking, controlling, caring and thinking, at stake, as up for wonder, as unavoidably paradoxical.

7 The following is based on the Groote Museum presentation of the Artis residencies, conversations with the artists, as well as with Theun Karelse and further reflection together with Alice Smits.

### LET'S SEE WHAT THESE PROJECTS AT THE ARTIS GROOTE MUSEUM PRODUCED<sup>7</sup>

- 1 *Driessens and Verstappen* develop installations that recognize animals. In Artis they trained a machine learning system to identify animals; To visually identify means that what is recognized would be species defined by morphology, their striking features – which can be derived by the AI starting from a 'blank slate'; the output is confirmation of the species: Giraffe. Zebra. Or could it start to recognize individual zebras and giraffes, based on their unique 'fingerprint' coat patterns?

By placing their 'spotter' with various animals in the zoo, from meerkats to birds and goats, the machine was seeking to figure out recurring patterns. Even in this space, organized around separate species, the Artificial Intelligence had a hard time identifying species, or even delineating the animals – with their camouflage patterns – from the backgrounds. Creating blurry hybrids, newly blending organisms in their environment.

8 Rutherford, S. (2018). The Anthropocene's animal? Coywolves as feral cotravelers. *Environment and Planning E: Nature and Space*, 1(1-2), 206-223.

Nature, with or without direct human involvement, has ways of escaping the categories we propose. Sometimes by their very own 'breeding programs' as they play out in modern landscapes, such as with the controversial arrival of the 'coywolf' in North America. Over the last decades a newly hybrid mix of coyote, wolf and dog has emerged. Coyotes like to hunt in open terrain, wolves prefer forests. But combining these skills and adding a little dog DNA to feel at ease in urban environments, the coywolf seems perfectly adapted to roam the contemporary terrain.<sup>8</sup> Conservationists respond



9 Kays, R. (2015). Yes, eastern coyotes are hybrids, but the 'coywolf' is not a thing. *The Conversation*.



Roaming Presque Isle State Park in Erie, Pennsylvania. Source: Dave Inman/ flickr, CC BY-NC-ND

variously to this creature: is it a threat to wolves, as with all this hybridizing there are no pure wolves left. Is it really a new animal, or just a subspecies of coyote? In the name of nature conservation, should they be hunted, or protected?<sup>9</sup> Meanwhile the coywolves have developed their own call, a wolf's howl ending in coyote-like yipping. How should we respond to the call of this paradoxical figure emerging from a natural world that escapes categories and adapts to Anthropocene landscapes?

2 *Antti Tenetz* - works on wild wolves. To him this is a culturally central species, especially in a place where they are abundant such as Finland, and induce fear. In Artis, Antti was confronted with a new type of wolf – the perhaps non-wild. Faced with wolves in the zoo, how to understand these creatures? One could wonder, is this then really a wolf, a representative, a member of the species? How to answer this question? One way is to see what the wolves think.

The Artis caretaker that Antti worked with is very aware “Wolves are very good hearers, smellers; they hear my keys in my pocket; but they’re not as good as wild ones. We try to make tracks for them; but they won’t be as good as in the wild.” Wolves, for Antti, are more than individual animals – but a “field of force” that influences everything. Wolves are categorizing other beings as well. But to them, it is humans that are paradoxes. Antti: “Wolves watch you constantly, unsure whether you’re prey or predator” They recognize humans it seems, but generate ambiguity of how as humans we may consider our position and role. “The pack was playful with me, having what to us comes across as dog-like behaviour; but when they get behind you ..and you suddenly turn around, it appears as if they feel like you are on to them.... You need to respect they are wild animals; They get used to human presence, but still are wild beings;”

In Artis they may seem fairly harmless, tamed, playful – but watch your back... as soon as you leave them and their attack position from view – they may get you. With Antti's take on these wolves, we can see how the concepts we use (wild, playful, tame), these schemas of specifying the nature of these animals, do not merely function as a qualifier for a particular wolf species, but more than that indicate a hard to grasp atmosphere. We are not looking at individuals but force fields.

3 *Ivan Henriques* – seeks to collaborate with microbes, plants and bacteria. Sifting through Micropia's archive of microorganisms, he was looking for mutualistic relationships. All organisms somehow benefit from the lives of others. Some of these relations are so intimate, they unsettle the idea of separate species, and make you wonder how they commu-

nicate. How do those plants that themselves don't photosynthesize connect to their partners?

An urge is growing to understand communications that exist between, or within, this living organism that is multiple. How to build, or curate relations? Learning how to make visible what we cannot see, that happens in between. Ivan made an entangled tour around the invisibilities that happen in between the animals. Does the little bird eating ticks from the back of the zebra ask permission, or is invited?

From his experiences growing up in Brazil, Ivan knows how are eat fruits from the tree in which to ucans nest, who feed on eggs of are. Knowing of all kinds of relations, involves integrating indigenous with scientific knowledges.

Ivan set out to make a composition of three different microorganisms together with Nele de Klerk from Micropia. The key was to find a common media where they could live. One has to be careful not to get one to overpopulate, looking at finding a balance.

But this is not just a matter of numbers. We need to let go of the idea of nature as material, as objects, which tends to inform the technologies we make to know and manipulate nature as a passive resource. How to tell the stories, the strange temporalities of these entangled creatures? Nature appears in them as relations, as process.

For his installation, Ivan had to create sensors for each of these works – “very sensitive devices, whereby you become aware of the electrons flowing inside my/every body. With plants, microbes, we are dealing with millivoltages, this tiny voltage; With more and more people working in a biotech environment, sensors are developed further, since we have to when we want to understand the world.”

When nature is a *question* of signals between closely entangled organisms, can technologies be rebuilt to orient to relations rather than isolating and optimizing individual species? Mutualist creatures such as lichen turned out to consist not of two but three different organisms, which cannot survive on their own, but somehow find each other in a single collaborative organism. With symbiotic relations as the central unit of nature, the question of species boundaries dissolves.

Focusing on ecological relations in Western arts/sciences was pioneered by the painter and naturalist Maria Sibylla Merian, half a century before Linnaeus. She came to South America facilitated by her friend the Dutch governor of Surinam. There she depicted animals such as reptiles and insects together with the animals and the plants they interact



Maria Sibylla Merian (1647 – 1717) - Jacob Houbraken (Rijksmuseum)



Maria Sibylla Merian – 1705 - *Metamorphosis Insectorum Surinamensium*

with. The development of this ecological vision was paid for by the colonial power; local informants are mentioned in her accounts – but primarily as knowing where certain species are, not their peculiar interactions, relations and metamorphoses.

- 4 *Ian Ingram* – seeks to design interactions with animals as collaborators. By making robots that perform certain behaviours that particular species display, he creates what he calls a ‘supernormal stimulus’.

His lizard robot, a minimal lizard made of straws and a little motor, performs territorial push-ups. When successful, this robot will become lonely, chasing away its conspecifics that it aspires to resemble. But this also highlights how the species is defined by meaning making and signalling, as much as bodily reproductive compatibility. Will the robot pass on new gestures into lizard culture?



Salomon De Caus, 1615, Les raisons des forces mouvantes avec diverses machines tant utiles que plaisantes

The works of Ingram resemble early modern ‘garden automatons’ such as the one depicted here designed by hydraulic engineer and landscape architect Salomon de Caus in 1615. It was installations like these that inspired René Descartes for his infamous claim that living bodies should be understood as being mechanical, setting in motion the R&D program of imitating, emulating, and controlling nature through technoscience.

But for Ingram these biosemiotic robots do not start from scepticism regarding animal souls. The schematic reduction of nonhuman signals are intended more like inviting gestures to enter into mediated communication across species. Often the story turns out differently than initially imagined. Are the animals responding? Do these robots make us ask new questions?

In Artis, Ian set up a video camera in the habitat of the crown pigeon, to introduce that animal to the common pigeons on the streets of L.A. A budding technology to mediate between different subspecies, that may learn to connect and interact – a new role for technology not just oriented to measuring, mimicking and replacing species but for mediating and amplifying a vibrant world full of signals.

- 5 *Heather Barnett* – skips the obviously spectacular or cute, in favour of animals that we tend not to see even as individuals. Slime molds. Mycelial systems. Ants. (Super-) organisms we are not used to noticing much. Intelligence of another, more collective and distributed kind. “we are so brain oriented – obsessed with neurons.” Meanwhile Heather emphasizes how the sociality of these collectives is very different. For

instance, ants farm aphids – what is that relation like? Are they holding them as slaves? Pets? Do they manage them like a zoo? How do you speculate about the types of relations ants maintain with other organisms they are ‘farming’? What happens through labelling these relations in how we may try new forms of attuning to getting to know them: do we look differently at ants depending on how we characterize the way they manage other species?

This work also highlights how the zoo functions as a ‘framing machine’, shaping our expectations of which animals are worthwhile to watch. Can this machine be reoriented and repurposed to learn to look at the seemingly less spectacular zoo residents? Heather went looking at gorillas together with the ants in the gorilla enclosure. There she found “high drama in the gorilla house.” “There’s a weakness in the silver-back elder sons are challenging.” In contrast, with Heather we see how ants are a drama-free self-organizing sisterhood. This focus on ants turned out to be contagious. One gorilla got interested in the attention being bestowed upon something else.

Not all relations in the zoo start and end with humans. What we think species are interested in is often limited to their conspecifics. Can we design a zoo around relations between a range of different kinds of minds?

- 6 *Špela Petrič* – is a biologist and artist who normally works with plants, but in Artis she entered into an investigation into all the things that need to be done to keep plants and animals alive and well.

Through observing practices identified as caring, she studies systems and infrastructures that produce plant wellbeing and animal welfare. Much of this work in a zoo occurs ‘behind the scenes’. There is a certain opaqueness to the world behind maintaining wild animals in an urban center. How many cows or sheep do you need to feed the lions?

Guided by employees, Špela went backstage. What struck her were the everyday efforts that go into caring. She found a thousand small stories; tiny encounters to weave together an impression of the zoo. “No day is alike, there is absolutely no predictable day – exhausting, requiring resourcefulness, making do with situations.” Thijs de Zeeuw, a designer of several recent enclosures in Artis, commented how the dominant focus is on animals with big eyes and big teeth. Zoos like to talk about conservation in remote countries - but there also the people doing the day-to-day work often do not figure in the stories we tell. Their managing of the big eyed and big toothed also demands the care for the tangled webs in which these also live.

10 Braverman, I. (2020). *Zooland: The institution of captivity*. Stanford University Press.

Especially as this work of care is oriented towards the idea of species as the unit to be maintained, the contemporary zoo downplays individual animals (no public name policy!) and their life histories and relations with keepers. These are relations to both keepers and animals which may be key in knowing and being motivated to care. Meanwhile this messy work of care tends to be considered a vulnerability for zoos. As Irus Braverman<sup>10</sup> in her book *Zooland: the institution of captivity* unveiled, after closing-time Orangutans are allowed to leave their naturalistic enclosures to hang out on sofas watching television.

Animals only perform as the species we expect them to represent during visitor hours – after that they just hang out as awkward, paradoxical, among themselves. Technologies here are not to control but also to entertain, to distract; an infrastructure to make life bearable, comfortable, avoiding the purity of being animal in the imagined way.

Špela's 'Performative Ethnographies' open up the spaces in all those infrastructures we have built to manage life and keep species in their enclosures: maintaining these paradoxes – our institutionalized inner-city wildlife, is hard work, requiring an enormous amount of roles, technicians, inspectors, managers, caretakers, etc. Each building relations with and between the organism under their control.

11 Thwaites, T. (2016). *GoatMan: How I took a holiday from being human*. Chronicle Books.

7 *Thomas Thwaites* – is known for his meticulous work to build a toaster 'from scratch' and to build a prosthetic extension to live like a goat among other goats in the Alps – he became a GoatMan<sup>11</sup>; an artificial 'satyr'! He was not fooling Linnaeus, nor the goats probably, being an obvious hybrid of two different kinds of animals, while walking around with an exoskeleton and prosthetic hooves. Or can this type of sustained prosthetic goat-cyborg, extended with an artificial rumen to digest grass, give rise to new myths? Do these strange behaviours produce a new human?

Thomas in Artis developed what he announced as 'a harmless car'. The car is the machine that has almost completely defined contemporary space. Most children (or people, let's not always blame children) can probably recognize more car brands than birds. The functional device that like no other mediates human relations with their environment, here Thwaites makes an attempt to render it 'harmless'. Replacing the assembly line welding robots with wicker weaving.

A monocoque chassis woven from reed twigs equipped with some old car wheels (it is a work in progress and the tires were stand ins but he is now exploring dandelion rubber tires), its functionality is in doubt. Thomas is again deliberately trying to achieve and explore the impossible, in this case a harmless

car, and in trying to build a harmless car explore the nature of our technologies and rethink design processes. It is not the final aim to have it with natural twigs as it looks now, it was just a beginning and ultimately it will somehow drive (he will continue it this summer in the Amstelpark), and perhaps have an organic engine.

Or we could say as a new urban creature it already works perfectly, as the ideal of a car in the late capitalist urban context of Amsterdam, where it gives way to a different use of space – no longer in the service of speed and control. What if the twigs start sprouting again, what if this thing comes back alive as a growing car? Will it insert its roots into the pavement? A super slow, solar-powered photosynthesizing soil-craving automobile? Rethinking the harmless car as indeed fully incapacitated but at least potentially wonderfully alive.



Autotuin, gefotografeerd voor Willemsparkweg 194 te Amsterdam op 15 september 2005; minder dan een etmaal voor vertrek naar laatste rustplaats. (cc) Muijz

In the late capitalist space of central Amsterdam, this may be the most desirable 'organic' car - a new species of sorts. The mobile version perhaps of the 'autotuin', a famous Toyota Corolla turned garden, that two decades ago was parked for several years on Willemsparkweg. Can we (Thomas) rebuild our dominant technologies from a radically different footing? Can we naturalize what we have – or do we run into the limit of what can be achieved in terms of ecologically sensible automobility?

Here stood the paradox of making nature under current regime of mobility and street use; working with rules and regulations to open up the minds of people and present alternative modes of flourishing.

## CONCLUSION: HOW TO LOOK AT NATURE?

What if all organisms are paradoxes? Can we restore the inherent – or apparent – contradictions at the center of how we see nature? Is the combination of organisms and technologies in which our lives are embedded to be seen as lively paradoxes?

Machine Wilderness is an effort to move away from a simple opposition between technology and nature. I tried to interpret the artists' work in Artis under this banner as field based, interactive explorations of how we can learn to be with animals – and other organisms; without merely ticking boxes of seeing them alive in their enclosure, representing their species if only in bodily presence.

How can we develop technologies of seeing and sensing, drawing on categories of relating and emerging that don't merely confirm what we think we already know? Can we find workarounds of technologies that reduce and impose catego-

ries, that emphasize monocultures on the ground and in the mind, that reduce the possibility of emerging creatures and novel relations? The wonder seems to occur in the processes of learning with new combinations of machines, with sensors, and with people as well as animals and plants.

How can we take care of, care for, and cultivate paradoxes – as always both contradicting and only apparently contradicting our orderings and what we thought was our world. How can we invent a system of nature that is not just meant to be a system of production and extraction? How can we invent technologies that slow us down, that make us wait for growth? Technologies that help us tell new miraculous stories about the natural world in which we take part. Technologies that make us surprised, that help open us up to the wondrous core of the abundance of nature. To be in kinds of nature that liberate new beings, emerging from between the tables and matrices of what seemed fixed categories; that require us to enhance our senses. What mediating devices and spaces could we imagine to do this?

With Linnaeus, we can go back again: “on wanderings through the tangled web of nature, in order that I can spur others on to an examination and explanation of nature rather than the reiteration of perceived ideas.” But this time we no longer abide by his insistence to “take exception to the tales of actors and the barkings of dogs with equal measure.”

Instead, we can speculate with animals, plants and microorganisms, through these devices and applications, to work on new relations. Not just between individual humans and a nature that is unequivocally represented to us – but as somehow part of the ongoing facilitating and enhancing of relations across plants, animals, fungi, of whatever kind and combination. Not starting with separate individuals defined merely as members of species, but looking at each of the creatures we are tangled with in webs with a sense of wonder. We are both paradoxes.

# EPILOGUE

THEUN KARELSE AND ALICE SMITS



During Machine Wilderness over the years a returning question is: how can field experiments be shared with audiences. When a team works at a remote biological station in the arctic, or a coastal environment, there is no immediate audience, beyond those who participate, those who see documentation of it or people who hear a talk about it at a symposium.

ARTIS changes all that. It has such a unique constellation of features that are attractive from a Machine Wilderness perspective: it has diverse animals, which surely will be present in some form at specific locations, it has enormously varied biomes and beings for researchers to engage with, and it has an audience. In fact more than a million visitors a year, from all backgrounds, ages, and from a wide range of cultures.



The primary connection within the Machine Wilderness residencies at ARTIS was between the researchers working in the park and the visitors passing by. Few situations are more conducive to questions and exchange than that of the artist working on a public experiment and an unsuspecting passer-by. What this doesn't give is a deeper insight into the broader program and its ambitions. So the Machine Wilderness team and ARTIS staff developed various public moments, for artist talks, where two artists would share the 'outcomes' of their residencies. That only really started to work when we shifted those presentations to the freshly opened ARTIS Grootte Museum. Reflection and debate simply fit better in that setting than in the park itself. In the park, people are keen to see the animals, stroll around, head for the next animals that you can hear just around the corner.



To really delve into the depths of what happens when doing artistic research in a zoo, you ideally bring together those researchers and their experiments. This became the Machine Wilderness art-science fair, one of the first public programs hosted in the Grootte Museum. So there was a lot to figure out since nobody had long-term experience with the museum space that had just opened. But we envisioned it like a fair, with each artist presenting his/her/their research on a table, including students from the student-program, and to have discussions led by ARTIS staff with the participating artists. It became a very festive day, where people wandered into the East Wing of the museum, joining experiments, discussions and live demo's. Even Thomas Thwaites' "Harmless Car" was carried up the narrow winding staircases and placed in the middle of the space. It



was an amazing day, with an opening performance by Kenzo Kusuda and closed by Clemens Driessen, who adapted his presentation as an essay for this publication. Thanks to het Grootte Museum for their amazing hospitality! Thanks to all the ARTIS staff and researchers for all our insights and efforts to make this happen. Thanks to the artists for your readiness and confidence to present unfinished and ongoing research to a very broad audience. And thanks to all the many visitors that joined us.



# COLOPHON

Project lead: Theun Karelse of FoAM and Alice Smits of Zone2Source

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