Alchimia Nova

AnneMarie Maes

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Notes

AnneMarie Maes

February 2010 – December 2012

I am a media-artist and beekeeper. I study the tight interaction and coevolution between city honeybees and urban ecosystems.

In the open air lab on the rooftop of my studio I have been creating experimental set-ups using sustainable beehives that are then augmented with sensors and sensory processing algorithms to analyse the state of the colonies, the quality of pollen and propolis and the behavior of the bees. The data of these Intelligent Beehives is made available online.

My fieldnotes provide an ongoing source of inspiration for artworks and presentations. The bodies of these fascinating insects look and function as perfect instruments, they explore their environment with their refined sensory organs and pass on information using idiosyncratic techniques for communication and they organize their complex societies in a truly democratic way. My Bee Laboratory should be seen as an open framework that helps to bring out a range of issues. It is a long-term project on the edge of art, science and technology.

Because bee populations function and evolve in accordance with the human activities developing around them, I have set out several urban test fields in the Brussels' Canal Zone. This area features diverse activities: from community gardening and urban agriculture to accidental nature, interspersed between industrial buildings, office zones and living areas.

The test sites are connected by the flight routes and foraging activities of the bees.

The honeybees reflect the health of their surrounding ecosystem and the cumulative effects of different pollutants. I use them as bio-indicators to make citizens aware of the increasingly negative effects of our life styles and methods of industrial production. The survival of the colonies depends on the flowers we plant and on the garbage and pollution we produce — and the compromised state of the bees' foraging areas is quite worrisome.

The honeybee colonies forage in a radius of 3 kilometers around their beehive. They fly on their own airborne roads back and forth from their collecting jobs and bring a sense of rural to the urban environment. I analyse the pollen that the bees bring back from their foraging trips, and compare it with existing scientific databases. With this information I can determine and map the melliferous plants in the green corridors and monitor the evolution of the plant diversity. Complex systems analysis and machine learning techniques can detect patterns to help with the determination.

Meteorological circumstances influence the bees' behaviour. A windy day makes the hive nervous, an upcoming thunderstorm makes the bees' dances wilder. Contact microphones amplify all action from the hive's frames. We can listen to the hustle and bustle inside the nest. What if a rhythm-analysis of the bees could provide for a musical score? Would it be cyclical? Wave-like, marked by the rising and falling activity. Expanding, absorbing and traversing, only to fade away in the heat of the late afternoon light?

March 2012 – April 2013

Social insects are a crucial element in our ecosystem. The study and monitoring of honeybees allow me to experiment with couplings between biology, nature and technology.

My preoccupations with honeybees come partly from a fascination with these amazing insects: bees exhibit very original solutions to the challenges that social insects face, e.g. on the level of communication and collective decision making and their remarkable collective

behavior provides inspiration and metaphors for the functioning of human society.

From the start, I wanted to set up a real collaboration with the bees. For this reason I developed *the Transparent Beehive project* (2010–2013).

The project allowed me to study the tight interaction between city honeybees and urban ecosystems, using artistic research practices and collaboration with scientists.

The Transparent Beehive is a living sculpture in the form of an observation beehive made from plexiglass, wood, aluminium and steel. It is part of a series of ecological instrumented beehives. Inside is a living bee colony that has access to the outside world through a glass pipe. The Transparent Beehive was installed for the first time on a Brussels rooftop connected to my urban garden laboratory and has since been shown in various art contexts.

The beehive is internally structured like a book, inspired by a design from 1788 by the Swiss entomologist Francis Huber. Each page consists of a wooden frame covered by an aluminium casing. Every frame is enhanced with microphones which pick up the vibrations and sounds of the hive. The real-time rendered sounds help me to track the development of the bee colony. The final – slow art – output creates a 3D sound-scan of life in the hive. Cameras inside the hive monitor the growth of the wax structures and the activity of bees. Additional sensors measure temperature, humidity, and other climatological data. This data is treated by sensory processing, pattern recognition and AI algorithms and visualized using sophisticated computer graphics algorithms in order to make the state of the colony tangible.

From *the Transparent Beehive* project, I especially like the metaphor of 'reading the development of a colony by browsing through a book.' The close reading with a wide array of microphones, cameras and sensors offered me the possibility to examine the colony as a community. Storing the data over a 12 month period provided very detailed observations and it allowed me to discover and follow long-term trends in the complex relations between the colony and its urban environment. My research was documented in various media, and the generated data was used as a point of departure in a series of artworks on bees' behaviour patterns over sustained periods of time.

Another aspect of the Transparent Beehive was to challenge how the relation between nature and technology is understood, and to work towards establishing new connections between the natural and the technological paradigms. The work was a balancing act between artistic and scientific lines of inquiry.

February 2012 – October 2014

I want to populate cities with a network of intelligent *Guerilla Beehives*. These beehives should offer a 'natural' shelter to swarming bee colonies – rather than force them into man-made square boxes. The colonies should be able to thrive without the help of a beekeeper. The main target of my *Guerilla Beehives* is pollination and thus preservation and remediation of biodiversity.

I imagine a world where biological fabrication replaces traditional manufacturing and thus where new sustainable beehives can be generated simply by growing them. The design of such beehives will be inspired by art forms from nature. I am searching the scientific literature to find the requirements for an ideal honeybee nest and I start creating physical prototypes using smart, organic and biological materials.

During a visit to Silicon Valley, I collected lots of eucalyptus seedpods in the park surrounding Stanford University. The seedpods are ±25mm tall, and their rimmed morphology inspired me to start working on the shell of my first prototype.

For my research I use an artistic explorative method to investigate whether biomaterials from the hive such as wax, propolis, honey, exoskeletons or collaborations with other microorganisms can contribute to radical new ideas for future 'intelligent' beehives.

My *Guerilla Beehives* are intended to function completely independently. I want to equip them with biodegradable sensors that make distant, non-intrusive monitoring possible. The hives therefore do not need to be opened and bees do not need to be disturbed when I monitor the colony. The audio- and visual data can be aggregated, processed and shared in real time over the internet.

Moreover I believe that some of the the sensors can be made of living technology. Biodegradable sensors will be powered by solar energy, honey batteries or microbial fuel cells and I am collaborating with scientists to make this possible. The whole system is set up as a fully organic project: cradle to cradle. If the bees decide to leave the hive in search for another home, the *Guerilla Beehive* (with its integrated electronics) will biodegrade and compost completely.

October 2014 – February 2015

The Invisible Garden: Naturalistic Observations and Hidden Memories (2014–2015) is an immersive art installation, an enclosed habitat similar to the domed cities of science fiction narratives. The work is the culmination of over a decade of research.

I was asked to realize a remake of my *Hortus Experimentalis* rooftop garden in central Brussels for the Green Light District exhibition at the former Buda textile factory in Kortrijk. The site-specific, large-scale installation focuses conceptually on artificial environments and on reversing the relation between nature and art.

My artistic practice is concerned with making invisible structures and patterns visible, revealing the unexpected magnificence that lies hidden beneath the surface of our everyday experience in nature.

The Invisible Garden is a construction in the process of transformation. I want to reveal the fleeting structures that tend to escape general notice, visualize the different connections that can be established between the elements of an ecosystem.

With *The Invisible Garden* I draw attention to the current state of our environment, the use of green spaces in our cities, and I provoke a dialogue about the different elements that make up the physical reality and speculations about the future of our urban landscape.

The Invisible Garden covered an entire 200 m² room on the first floor of the former textile factory. The installation consisted of a naturalistic garden in a windowless room, lit by uv-lights, divided into four distinct botanical zones, and with layering according to the principles of permaculture. Different plant species were carefully selected for cohabitation with respect to their edible and melliferous qualities, creating a subtle ecosystem favorable to humans and honeybees, while approximating as closely as possible the complex ecological web we find in natural environments.

With *the Invisible Garden* I framed Nature in a carefully composed construct: indoors, in a room with a rather low ceiling, without windows or ventilation, and with artificial light. The complex sensory and regulatory systems of the plants responded to the slightly-changing conditions of the building. A plant does not measure the length of the day, but it measures the length of the continuous periods of darkness. The phytochrome, the light activating sensor in plants, assures the execution of this task. A timer was scheduled to watch over the daily light exposure. I had to research about optimal light wavelengths (red/blue), ideal color range (warm/cold, yellow/blue), the prefered distance of the lightsource from the plants (intensity, full sun, half sun/shadow simulations) and an even distribution of light over the entire room.

A range of different sensors installed throughout the four zones collected climatological data on the evolution of the garden. This data was then processed and uploaded to the web in real time. The sensors kept track of the circadian rhythm of the plants. These 24-hour rhythms are related to the local environment by external cues. Light is one of the cues by which the plants synchronize their internal clocks to their environment. Plant behaviors subject to rhythms include, among others, leaf movement, growth and germination.

Visitors wandered through the four zones of the garden. The Mediterranean Section with olive trees and grasses, the Edible Forest Garden with bee-friendly trees, shrubs and ground covers, the Vegetable Garden with perennial and annual plants

and the Herb Garden with medicinal plants. A number of artworks were integrated in the garden design. A series of audio-visual poems displayed on lcd-screens served as hidden memories, as referred to in the full title of the work *'The Invisible Garden: Naturalistic Observations and Hidden Memories'*. These audiovisual memories unveil structures created by nature, structures that are often not visible unless you look at them with an artistic eye and through the technological tools of modern science.

The Invisible Garden opened-up a set of different relations to the visitors. Relations between animals and plants; between plants and technology; between ecology and public life. The artificial garden construct raised questions on the technical, social and political dimensions of green spaces. The visitors wandering around in this green haven, were confronted to consider issues on food security, the oligopoly of seed corporations, the agriculture industry and its effect on the environment and on our society at large.

The Mediterranean Garden with its dark palette of waving grasses, drew the visitors into the dimmed room. Once deeper inside the exhibition space, technical setups became visible, and a colder, more exact laboratory atmosphere emerged. Every plant was tagged with a QR-code and with the name of its donor. Scanning the QR-tag with a mobile device connected the visitor to *The OpenGreens database* where the evolution of *The Invisible Garden* — and every plant it contained — could be tracked in detailed field notes and images.

I was particularly interested in how the life of an organism – be it a plant or an animal born in this indoor garden – fits in with the other organisms. I observed everything that went on in this constructed ecosystem, how species dealt with their natural enemies. I studied the food web – the network of feeding relationships, of eating and being eaten – between the plants and the insects. I studied the decomposition of the dead leaves by fungi and bacteria. I took pictures to compare the different stages of evolution, and samples to study under my microscopes. One of my aims with this installation was to make visitors look at the world differently.

March –
June 2016

As a follow up to my former fieldwork with several observation beehive installations, I recently founded the *Laboratory for Form and Matter* (2015) to study raw materials collected by the bees. Several of my experiments on form and matter have been brought together under the label *The Raw and the Cooked*. Here I study the natural processes by which nature operates and how I can use these processes to create my own organic materials. I experiment with a range of biological components and I measure their usability for art installations and design applications, as — amongst others — the Guerilla Beehive.

I test the public's knowledge of visual perception and smells of a range of materials. I question what is natural and what is not, what is fake or what is real. I set up cycles of material interactions that form a rhythm so that arts meets nature.

I experiment with plant cellulose and with microbial cellulose to create biofabrics. Biofabrics are degradable materials whose components are derived from renewable raw supplies. These materials are composed of three basic parts: biopolymers that are produced by living organisms (e.g. agar agar, plant cellulose, gelatin, chitin, algae …), plasticizers and water. Additives give the plastics other properties as color or durability. I played with following additives: plant fibers, ground coffee, natural dyes from blackberries and beetroot, ground eggshells, spelt husks, pollen, essential oils and wax. Plant cellulose is a very important biopolymer for the creation of these new materials, because it is the most abundant organic compound on earth. An alternative is the microbial cellulose This is a form of cellulose that is produced by a symbiotic community of bacteria (the Acetobacter xylinus) and yeast cells.

The outer skin of my Guerilla Beehive prototype is made of a biofabric grown with plant cellulose: Psyllium ovata husks mixed with glycerine. This finishing looks very organic. In the fab lab, I laminated this plant-skin over the sculpted body of the beehive prototype. The result of this experiment got the nickname 'the Brain'.

While creating biofabrics in my lab, a narrative emerged from the samples and objects made out of this organic material. Some of the objects I clad with the fabric were brought from former travels in Asia and Africa, others were made in my studio.

There are the stories of *Navdanya* (the large Indian drumsticks) or *The Pharaoh's Kitchen* (the Egyptian Carob tree seed-pods) — on which I worked with bioplastics made from plants and pollen. There is *Outfit for a Medicine Man* and *The Emperor's New Clothes* — entirely grown from bacterial cellulose with addition of pearl-like plant husks. Or *The Strange Attraction of Mold* and *Memory Shape* — which are abstract paintings made with organic materials.

Other objects were chosen for their pure geometrical forms, such as the assembled Truncated Octahedrons *Prime Witness*, a combination of wax molds and 3D printed forms.

The collection of these objects radiates a kind of strangeness and has a certain mythological factor. Therefore I gave this experimental collection the title *'The Raw and The Cooked'*.

Many facets of the installation *The Raw and The Cooked* explore the boundaries between the born and the made, the animate and the inanimate, the medium and the form.

The most obvious theme in play is the age-old tension between the natural and the artificial, between the biological, the ecological and the technological. The play between nature and culture also presents itself in tensions between form and medium that underlie many of the works, tensions that underwrite the transformations and transmutations which are both seen and unseen. Transformations, for example, of coffee and fungus into cloth or skin-like membranes, transformations of malleable wax into rigid polyhedral forms. The play with traditionally oppositional categories is also apparent in the use of organic media such as gelatin and wax to produce forms found in nature (but not necessarily found in these particular media), or the use of technological means to capture the spectacular geometry of the organic — geometries rarely visible to the human eye.

Many of the objects and works can be seen as forms and systemic structures that range from the micro to the macro, from the geometric perfection of the invisible pollen grain, to the structures of communities and populations (bees, humans). In many cases, these forms and structures become fully visible, and therefore fully present, only with the aid of prosthetic devices such as electron microscopes.

Where exactly do the boundaries between nature and culture, the found and the made, between form and color, sound and vision, science and art, the organic and inorganic, or even the animate and inanimate lie?

April –
May 2016

This is the end of the anthropocene.

We imagine an ecosystem where all actors collaborate to keep up the resilience of the system. As artists, beekeepers, makers and thinkers, we collaborate with animals, plants, insects and bacteria.

We co-design Intelligent Guerilla Beehives: supportive shelters for bee swarms. In return, the bees provide us with information on the ecosystem that is hosting the Guerilla Beehive.

Driven by the intelligence, complexity and self-organisation of the Super Organism — the bee swarm — we discuss and explore in a democratic way. This is not a study of-, but a development together with 'the other organism'.

This collaboration should lead to a more diverse and thus more resilient system, post human and post anthropocentrism. Animal politics are taken into account. We go for an embodied experience, non-linear, immanent and interacting with the non-human other.

My future research looks into the sustainable fabrication of smart materials for growing Intelligent Guerilla Beehives.

I will use biomimesis as a starting point for incubating ecological thinking on matter and form.

My goal is to grow the Intelligent Guerilla Beehives from scratch, with living materials — as nature does — without producing any waste

or harmful byproducts. My research into manufacturing with nature starts at experimenting with fabrics grown from plant cellulose and from bacterial cellulose, bringing the 'in vivo' into the lab. Later, I will combine the smart skin and the intelligent form with living technology.

The whole object will behave as a bio-digital living system. Material and technology will become one entity – the living matter IS the technology. *The Guerilla Beehive* is a speculative research project that radically combines matter, form and technology.

The Guerilla Beehive is also a functional artwork, a shelter to sustain the endangered Apis mellifera species. It is not a beehive for honey production, but it aims to support the bee colonies as pollinators and guardians of biodiversity.

The biomimetic-inspired design -inspired by a pollen grain of the Fragaria vesca, the wild strawberry- is shaped upon the needs of the bees: the nest-space has the the ideal inner volume for a developing colony. I call it 'the Brain'.

The outer shell is made with organic materials and has camouflage qualities with useful biomimetic properties in respect to temperature fluctuation, humidity and ventilation. The biotextile skin is layered with a 3D printed voronoi-design in flexible bioplastic, as a support on which to add a network of small thermistors. There is a solar panel for energy provisioning, a camera for monitoring the activity of the bees and internal sensors and telecommunication equipment for uploading data. The hive is mobile and easily deployable at different spots in public space: it can be attached to the wall of a building or secured on the branch of a tree, or it can even find a place as a stand-alone sculpture on the terrace of a city apartment. Once the colony decides to leave the hive forever, the object will decompose completely.

Because bees are biomarkers due to their close relationship to their surroundings, the Guerilla Beehive is at the same time usable as a sensing device for monitoring the status of the environment by observing the behaviour of the colony.

The Guerilla Beehive project involves a strong engagement with the biological and computing sciences as well as with DIY technologies and digital fabrication. Seen from the artistic side, the object has a high tactile potential. Much is about touch and feel. The focus on organic materials is evident: the surface (or the skin) of the beehive is a place of encounter for the bees. Here, materials collected by the bees (nectar, propolis) and patterns created by the bees (the bees' dance) change into meaning. Shape and materials offer an entry point to explore the project. But the Guerilla Beehive also collects data measured by a mesh network of biosensors hidden between the inner and the outer shell of the beehive. The entrance is monitored by a camera and the processed images are sent via bluetooth to a monitor. The camera is powered by a Raspberry Pi which is hosted at the other side of the beehive, in a small 3D-printed pocket. A solar panel on top of the beehive powers the sensors. Visualisations of this data information help to explain the processes that occur in the behaviour of the bee colony.

By creating these imaginative and poetic sculptures and structures, I explore with the Guerilla Beehive project the interaction between nature and culture through the lens of art, material science and biology.

2017

"They are everywhere and they can be perceived as quite the alien intelligence; six-legged, with their numerous eyes, capacities of motion and sensation so different from our own. No wonder science fiction has been inspired by insects. But also other fields, like robotics as well as network design. Insects are more than creepy-crawly bugs; they are also a central reference point of so much of network culture, from talk of hive minds and distributed networks to algorithms that function like ant colonies; some refer to our cognitive capitalist practices as "pollen society"."
— Jussi Parikka, Insect Media: an Archaeology of Animals and Technology)

Alchimia Nova

AnneMarie Maes

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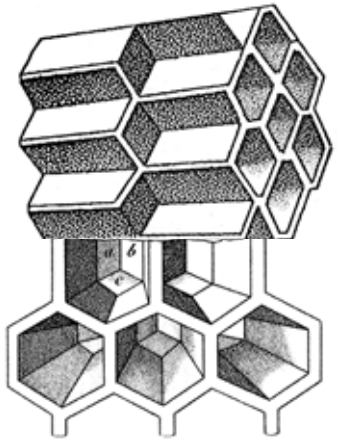
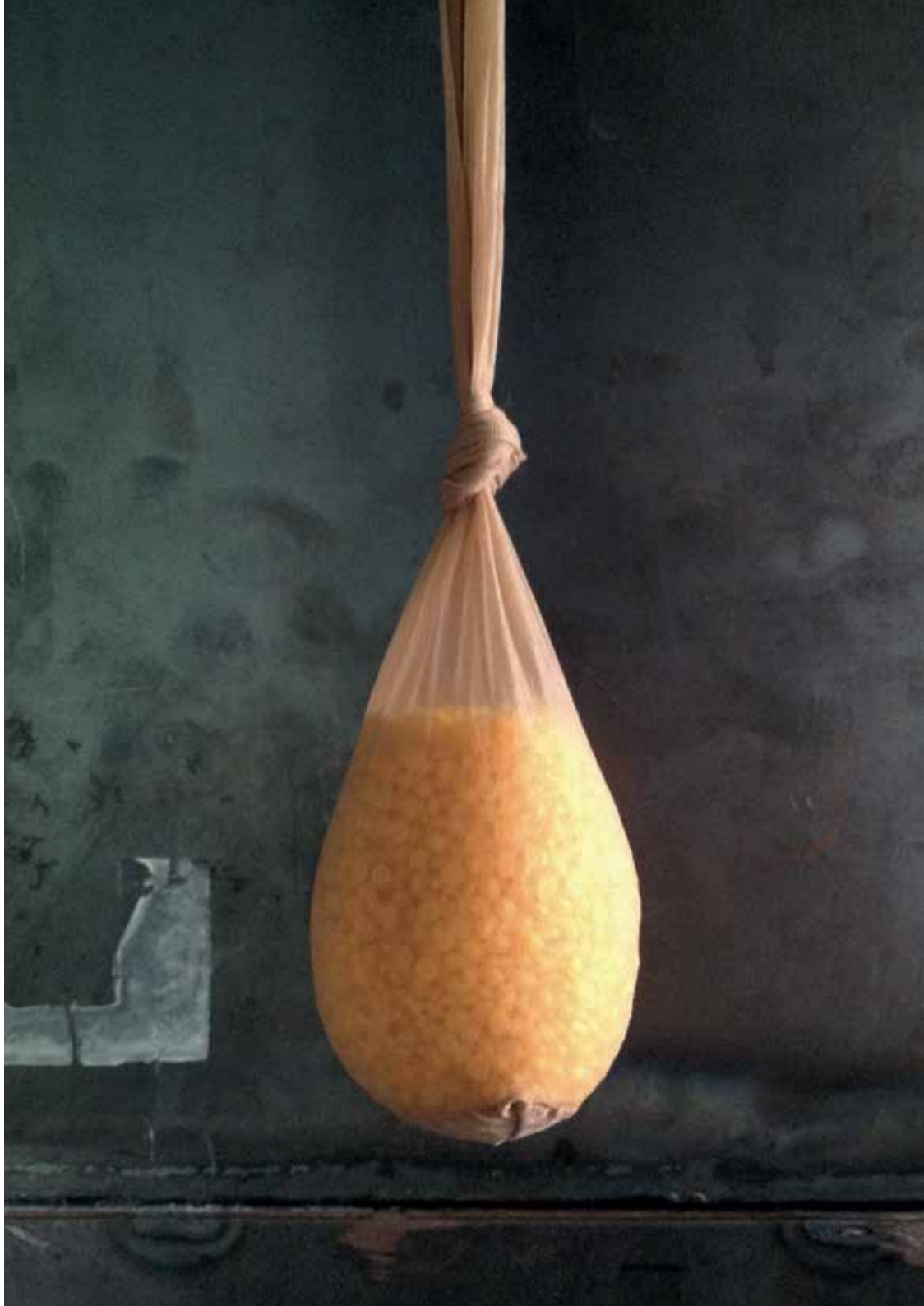
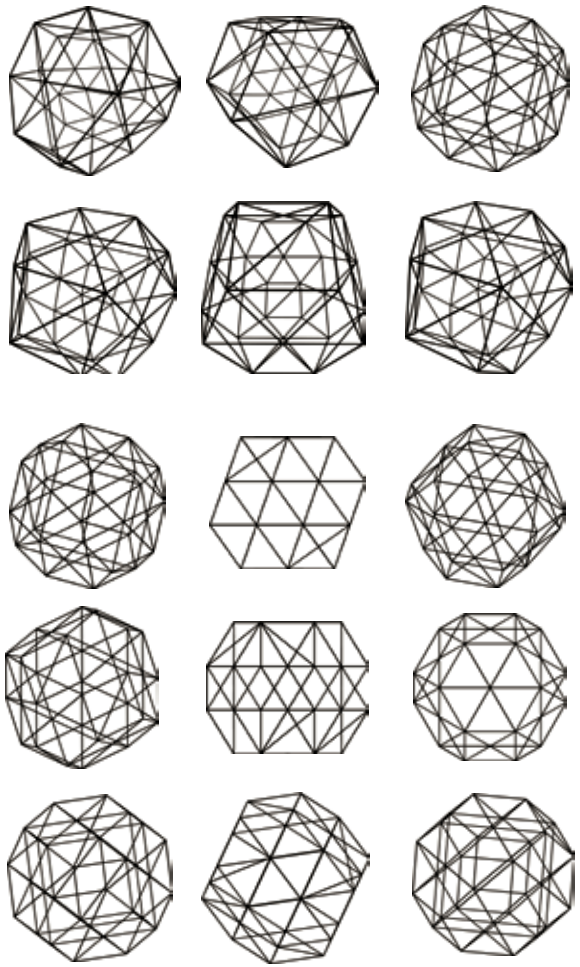


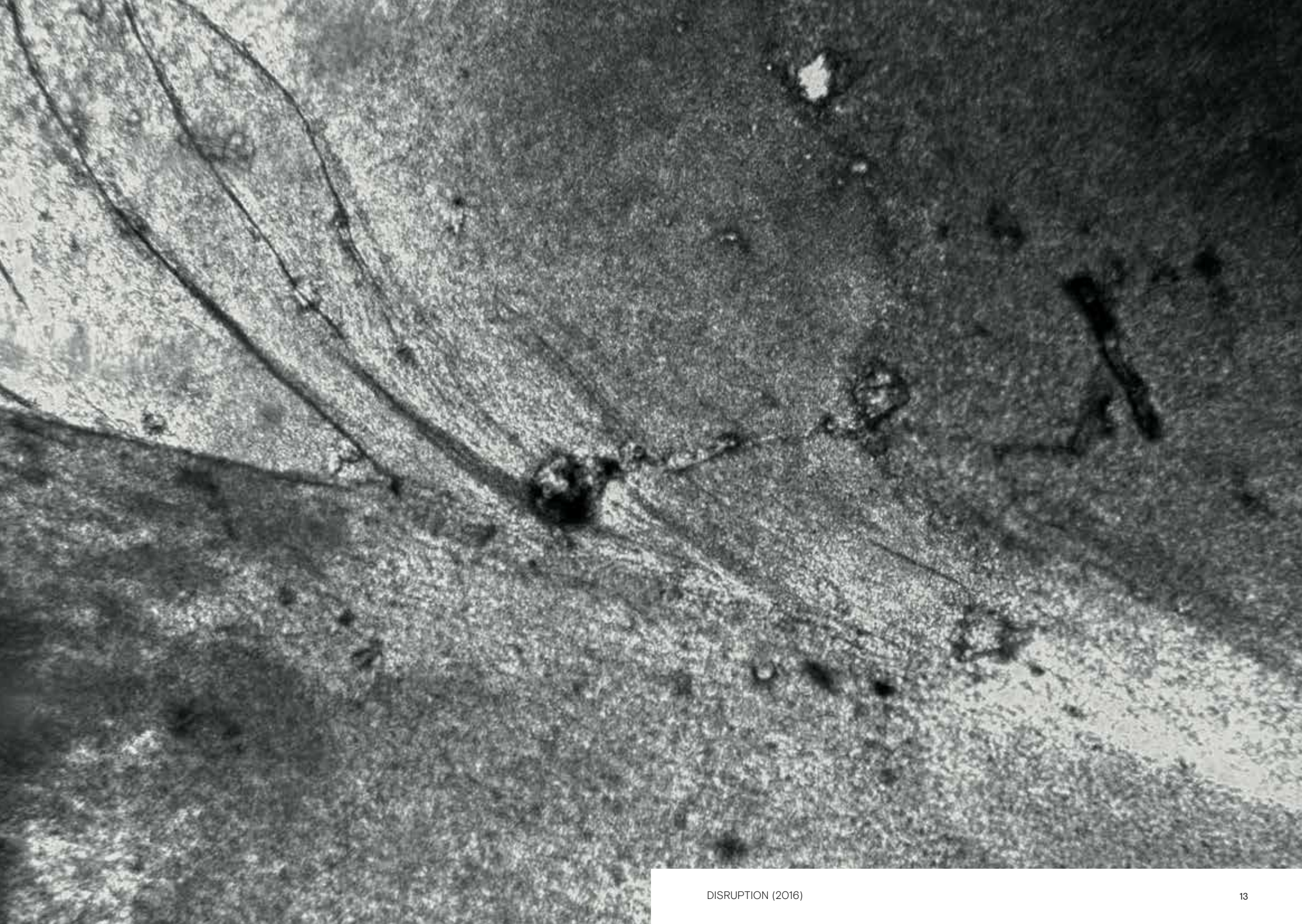
Nouvelles Observations sur les Abeilles
François Huber (1814)



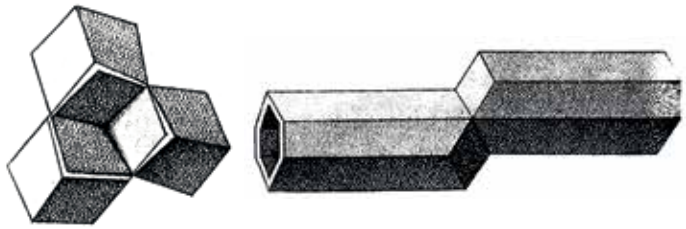


Orthographic View on a truncated octahedron (2015)

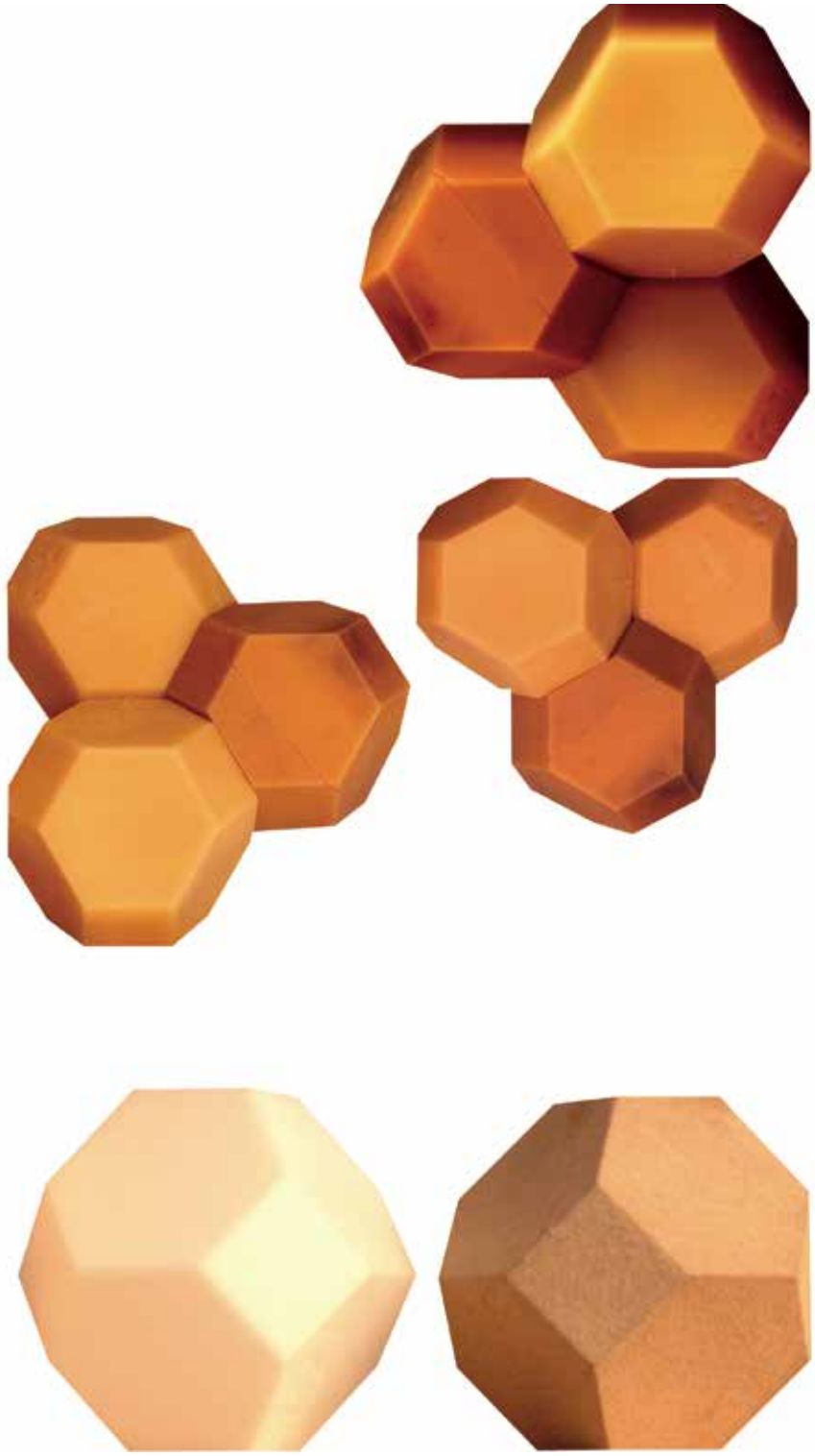
BERLO20516#1-8-STRAW (2016, detail)



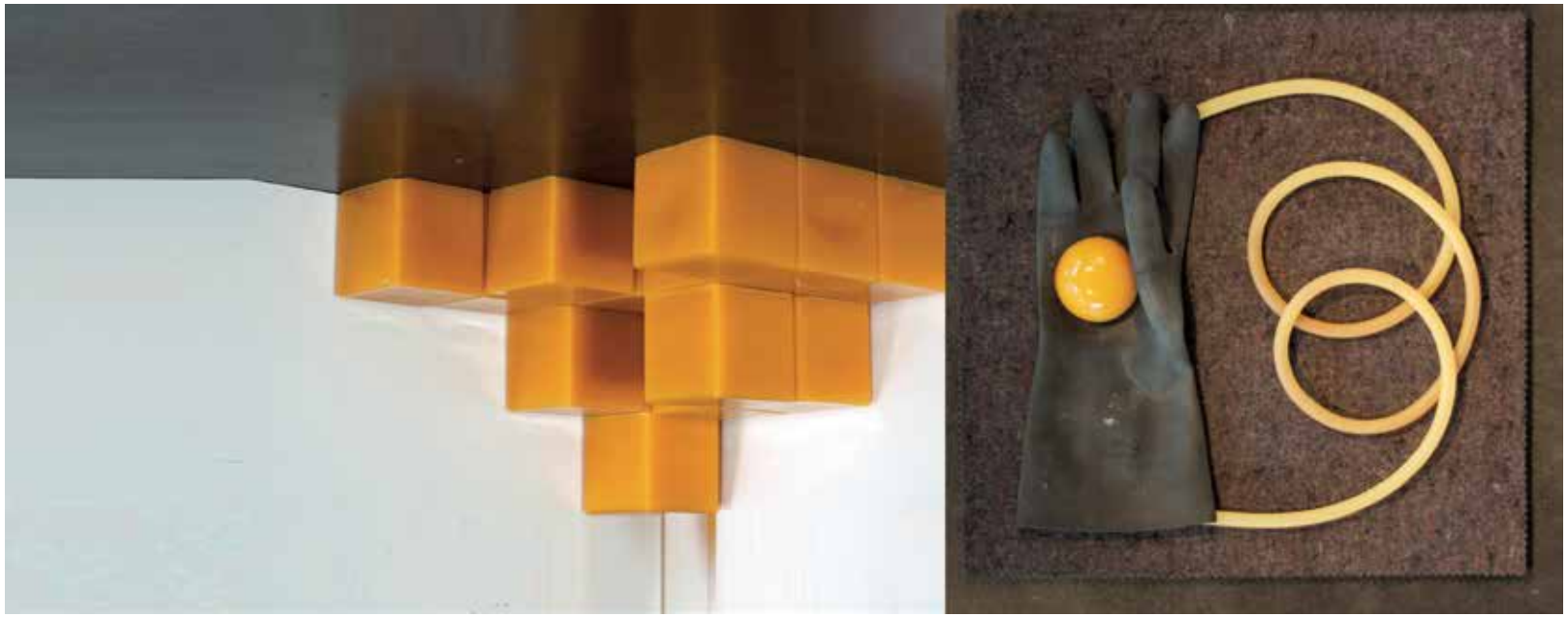
DISRUPTION (2016)

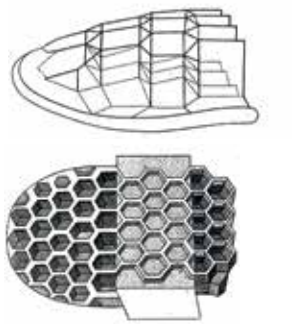


Nouvelles Observations sur les Abeilles
François Huber (1814)



FORM STUDY (hexagons) (2014)





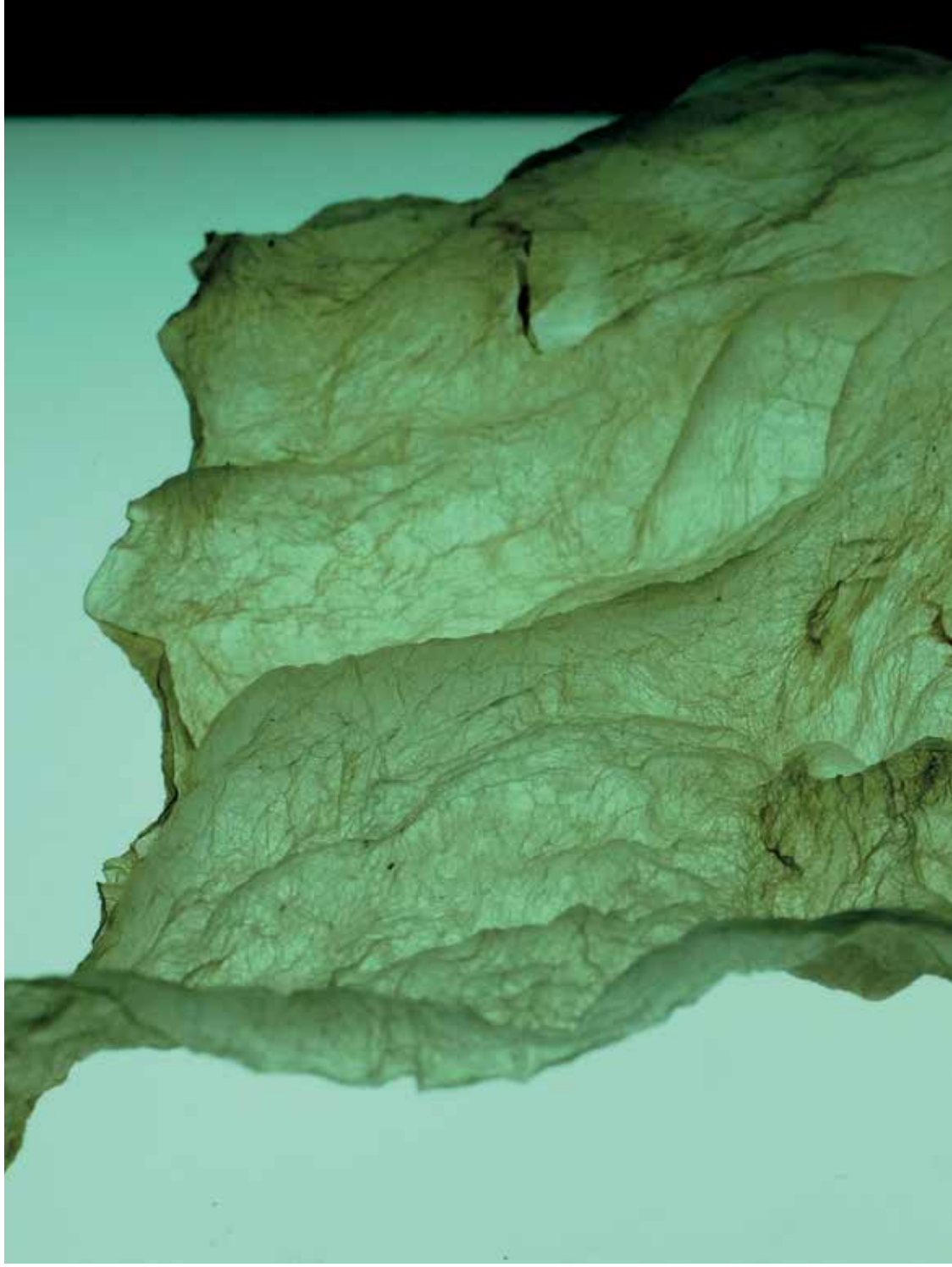
LEDA (2016) installation view

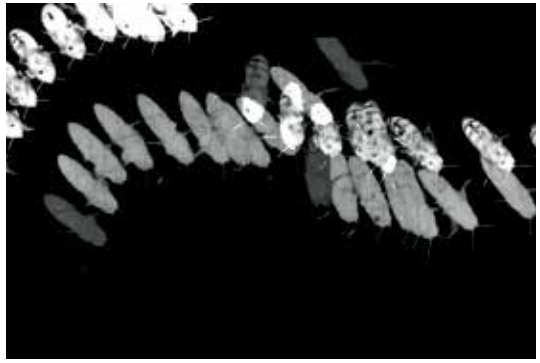
MOEBIUS (2015)

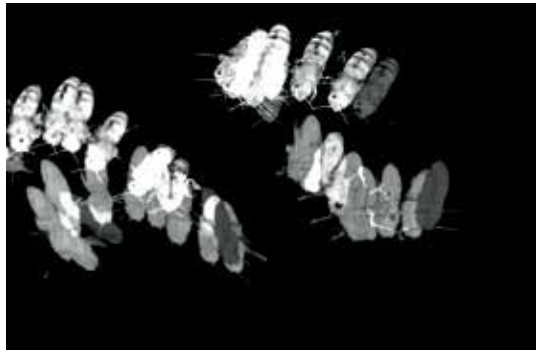
HORTUS EXPERIMENTALIS (2009 - ongoing)

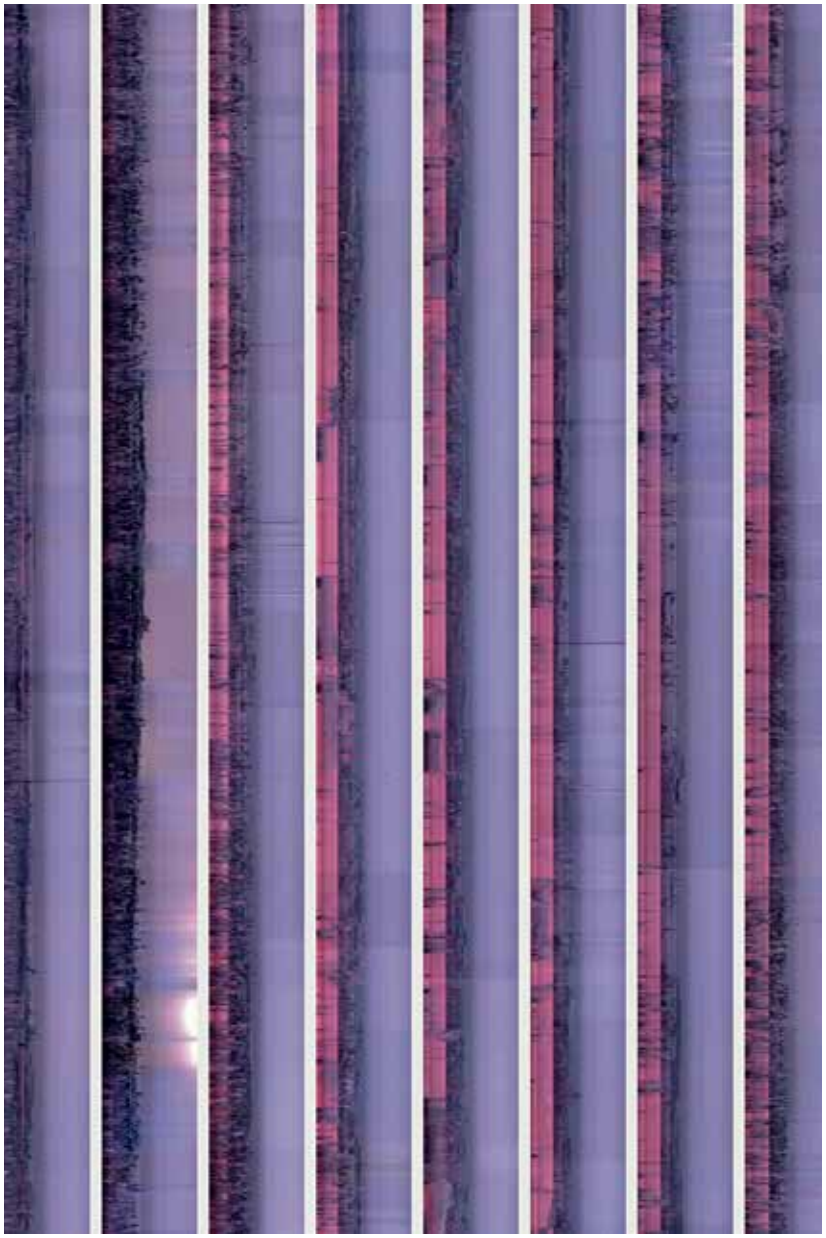
THE INVISIBLE GARDEN (2014-2015) installation view

BERLO20516#1-8-STRAW (2016)

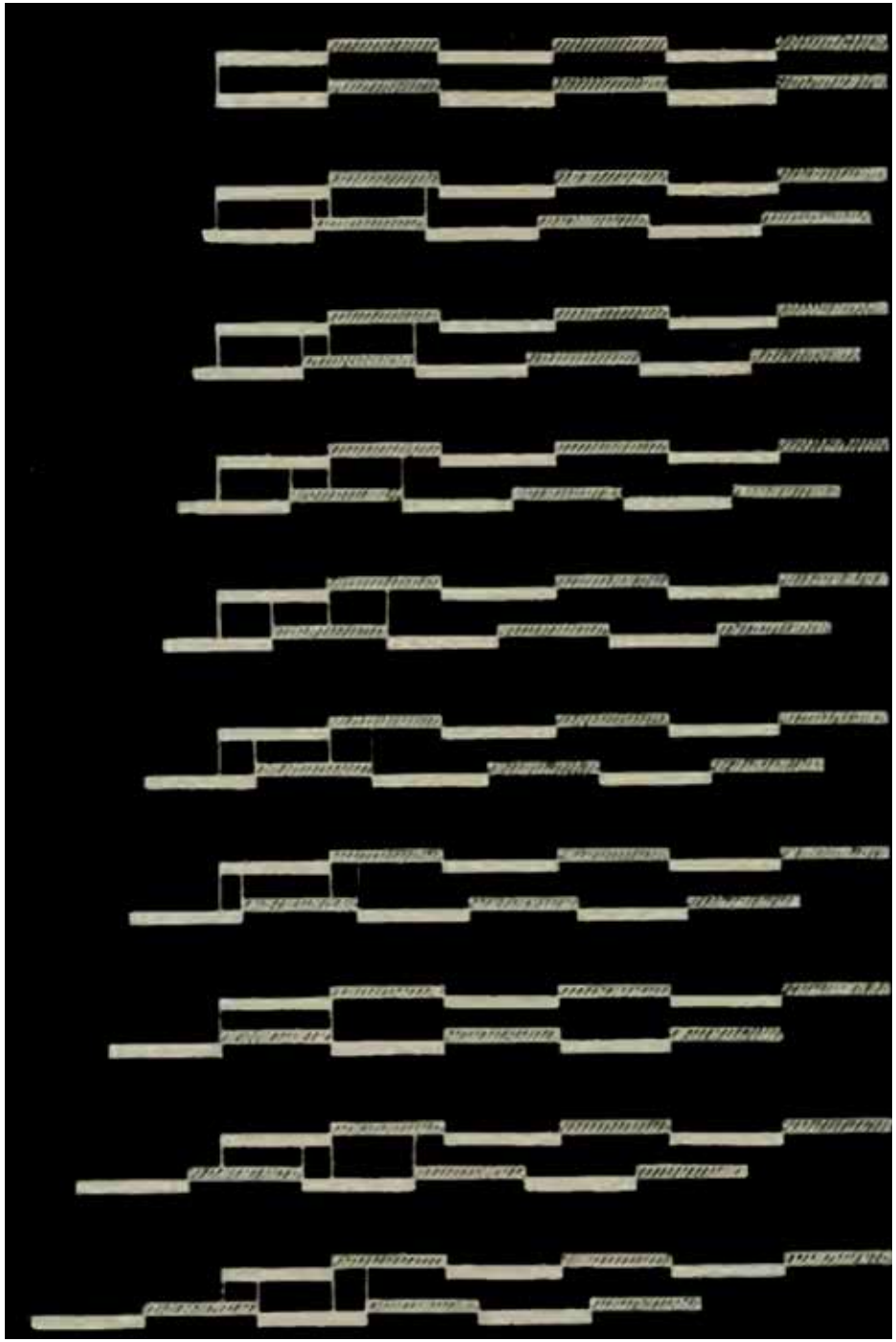


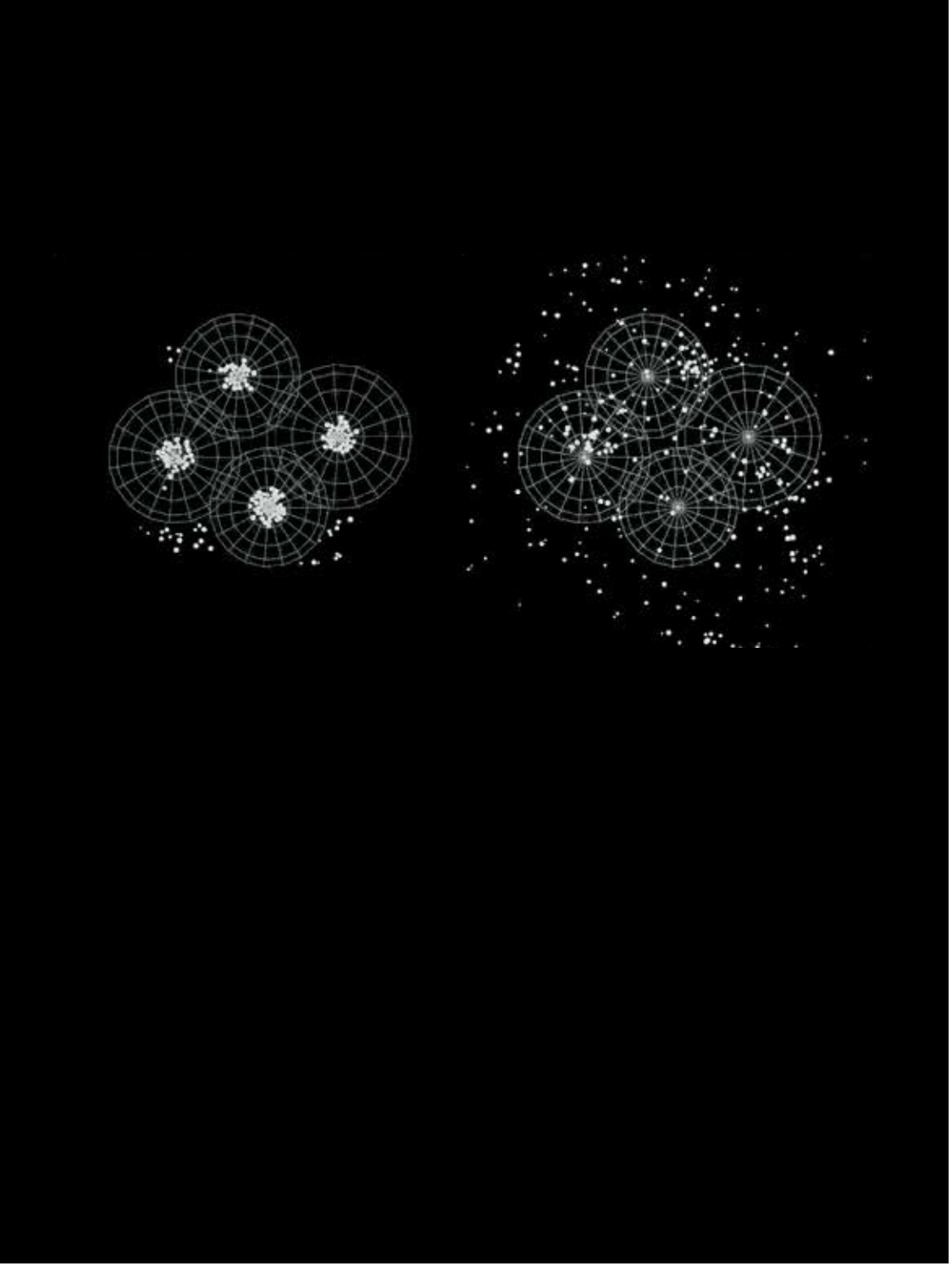


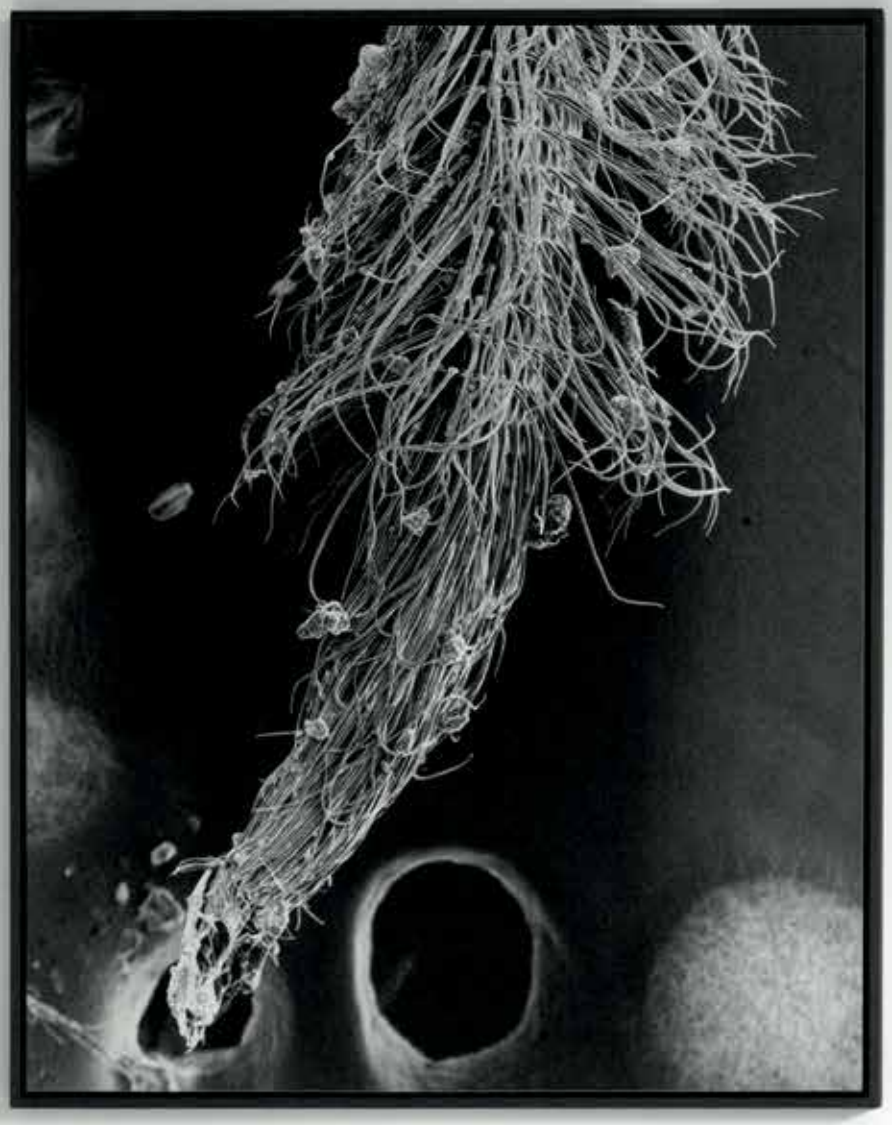


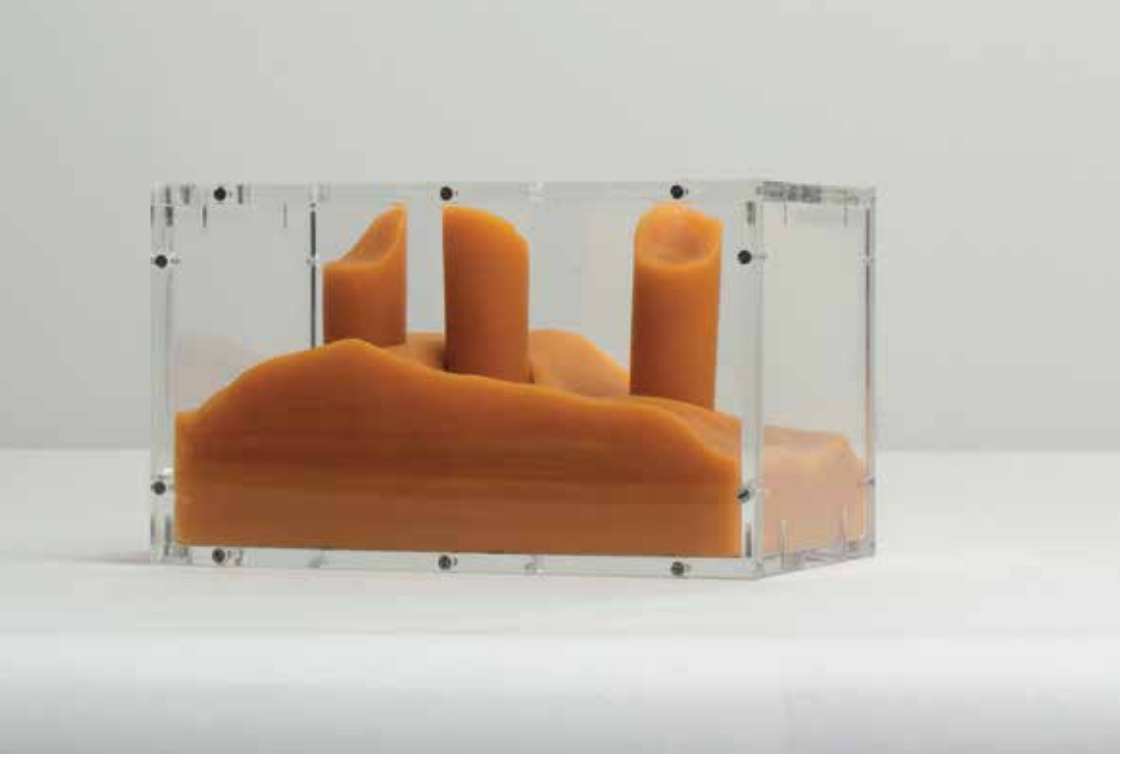


Illustriertes Lehrbuch der Bienenzucht
J.G.Beklers (1934)

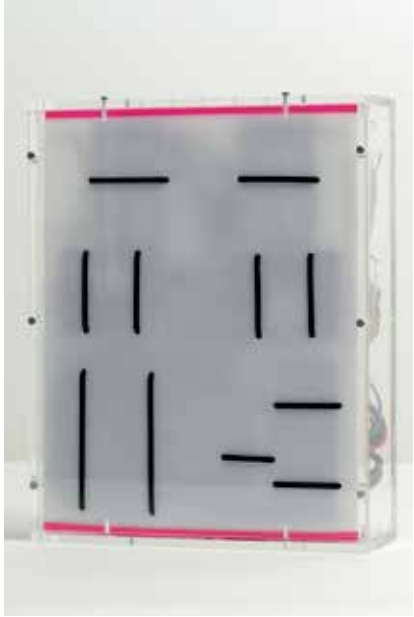




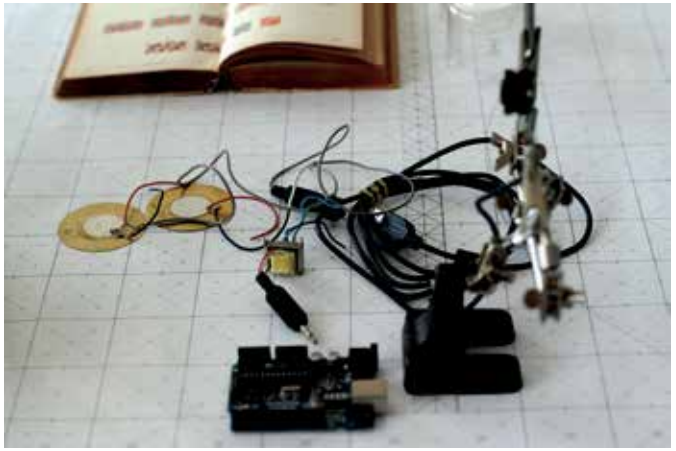




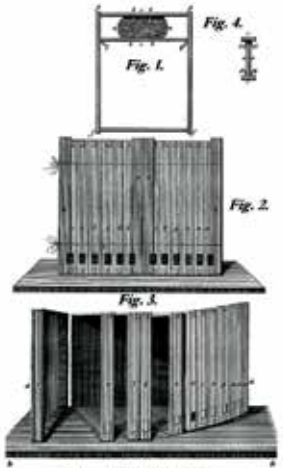
SHELTER (North | South | East | West) (2015)



THE TRANSPARENT BEEHIVE CABINETS (2013) installation view

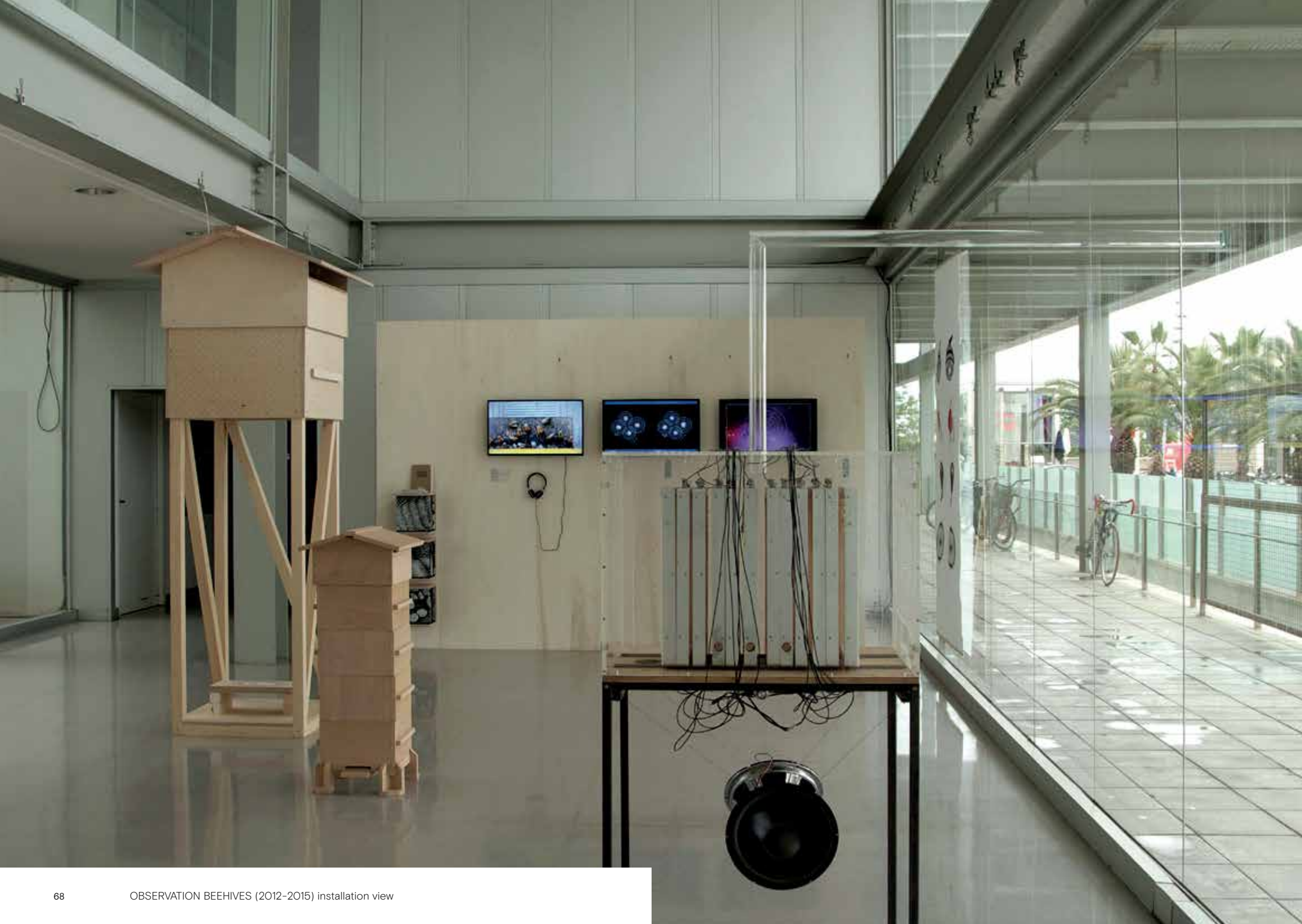


HONEY BATTERIES (2014)



Francis Huber, Original Leaf Beehive (1789)

TRANSPARENT BEEHIVE (2012 – 2013) installation view



OBSERVATION BEEHIVES (2012-2015) installation view

TRANSPARENT BEEHIVE (2012-2013) details

TRANSPARENT BEEHIVE (2012-2013) installation view

On Growth & Form

Luc Steels

AnneMarie Maes is fascinated in the processes by which Nature creates form: how bees create honeycombs in the hive, how they self-organize into swarms, how plants grow and form geometric patterns, or how bacteria and yeast collectively create material surfaces forming biofabrics. She observes and analyzes these processes, isolates them, or causes them to appear in artificial conditions, and then creates art works from this artistic research in many different media: installations, video, audio, prints, and sculptures. These art works often go beyond a pure esthetic experience, even if a sense of beauty is always there. They are intriguing because they make the viewer wonder about the natural growth processes that gave rise to them. They raise questions about the sustainability of our current life style and fabrication processes.

AnneMarie Maes is representative of a new wave of artists for which art is life and life is ecological, artists that, paradoxically, exploit the extraordinary possibilities of the most advanced information and communication technologies, and even synthetic biology, in order to connect us back to nature. This direction of work is of course not entirely new. It is the visionary 20th century artist Joseph Beuys who already in the nineteen sixties showed the need for a radically different kind of art. He argued forcefully against the wasteful use of natural resources and in favor of a social humanitarianism that tries to connect individuals back to their communities and to the ecosystems on which human life depends. Beuys lived this vision and translated it into a broad range of multi-media art works, performances, lectures, and community activism that still resonates today.

AnneMarie Maes structures her work similarly through long term projects that generate a steady stream of interventions, experiments and art works. Many of these activities take place through collectives of artists and in collaboration with scientists, in Brussels and in Barcelona.

One example is the **Open Greens Project** (started in 2008 and ongoing) that focuses on the Politics of Green Spaces in cities. The creation of the *Hortus Experimentalis*, her 'laboratory on the open fields' on a large rooftop in central Brussels, was a huge undertaking. It required solving a large range of administrative, technical and practical problems. She equipped the rooftop garden with all kinds of sensors and installed several experimental live beehives with instrumentation equipment. From this garden laboratory, data is continuously being collected and broadcast through streaming technology. Maes her art work flows naturally from the daily practice of dealing with these natural processes. She makes use of technological mediation to search for new forms of communication with the natural world.

Older work often included the participation of the public, as in the **No2pho** installation (2006-2008) where spectators shape a sound scape by moving around sound sources based on literary texts, or the **People Database project** (1998-2004) which creates multi layered life narratives triggered by found pictures, and the **Politics of Change project** (2008-2010), which documents the grassroots activism of women in India.

These projects all take a social and anthropological dimension and foreshadow the later turn towards ecology and sustainability.

The artworks collected in this book come from more recent work. Maes, an accomplished beekeeper and herbalist, designed and fabricated various experimental observation beehives, including the **Transparent Beehive** (2011–2013), the **Sound Beehive** (2014–2015) and the **Guerilla Beehive** (2015–ongoing). She also started to experiment intensely with new organic materials created through growth processes involving bacteria and yeast.

Experimental beehives as living sculptures

The Transparent Beehive is inspired by the 'leaf beehive' originally designed by the blind Swiss naturalist Francois Huber at the end of the 18th century, which looks like a book with pages for the different honeycombs. Maes has upgraded this design to a contemporary model, inspired by sliding bookshelves in a library. With this new hive, constructed from wood and aluminium with a plexiglass exterior, it is possible to see, smell and hear the activities of a live colony. The bees enter and leave the hive through a glass pipe opened to the outside world. It is installed in the art space and viewers are often stunned when experiencing, often for the first time in their life, the remarkable activities of bees and bee colonies in such close contact. The hive is enhanced with cameras, contact microphones, and other sensors and these are logged and uploaded for display and analysis.

The Sound Beehive focuses on the sound produced by bees, measured through contact microphones installed inside the hive. The data is processed and made audible to the viewer and used as well to perform statistical analysis and make soundscapes mixing electronic music and bee sounds. The Guerilla Beehive is intended to be put in unexpected urban spaces to help swarms find adequate shelters. It can be attached on an external wall of a building, in a tree, or on an appartment balcony. It is 3d-printed from natural materials and is enhanced with sensors integrated in the hives' exterior shell. The materials of the hive are biodegradable so that the shelter can decompose after usage by the colony.

A steady stream of artworks has come from these experimental hives and bee colonies. Maes has made videos from infrared recordings inside the hives, created geometric objects with the beewax coming from the colonies, produced audio-scapes based on recordings of the sound produced by bees in the hive, mapped out the flight routes of the bees and which areas they visit, took amazing microscopic views of the exterior of a bee body taken with a very high resolution scanning electron (SEM) microscope, catalogued pollen brought back by the bees and linked them to the plants where they came from, etc. It all adds up to a 'Wunderkammer', a chamber of wonders. Each object or image has an intriguing story to tell. It makes us see Nature in a new light. Maes' is carefully observing Nature using her artistic eye to highlight the remarkable forms and structures found there and performing experiments — mostly without complex scientific equipment — that bring out the beauty and sophistication of the natural world. And, like some of the early naturalists, she is also an artist that can transform these observations in stunning and intriguing imagery.

'Des arts plastiques'

Work on the Guerilla Beehive project has recently opened a new chapter in Maes her artistic research. Combining her work in the Barcelona fab lab on 3d-printing and computer-programmed fabrication, and the challenge to come up with a sustainable hive that would decompose after use, Maes started a research program to develop a shell for the hive based on organic materials, experimenting with cellulose to create a customized organic skin. The skin is formed in a growth process that can take between a few weeks to several months. This lead to further discoveries, no longer tied to experimental beehives. Maes started to experiment with adding other biomaterials to create unusual textures and unexpected colors. They include ground coffee, natural dyes from indigo and beetroot, ground eggshells, pollen, essential oils, hair of sheep, hemp fibers and of course wax from her beehives.

Through this kind of experimentation, Maes discovered a new medium for painting and sculpting. She has no absolute control over the outcome but puts biological processes in motion that create intriguing sensorial surfaces. The result has the esthetic qualities of abstract art works but invokes at the same time the spirit of Arte Povera by its appropriation of unconventional materials, its emphasis on process, its use of additional senses like smell and tactile sensing, and its attempt to move away from the overly rational, mechanistic attitudes that dominate our world.

There is at the moment an upsurge of activities on the borderline of science and art. AnneMarie Maes has been one of the pioneers in this movement, not by a superficial appropriation of scientific jargon or 'make-believe' installations but a profound engagement with scientists in biology labs and engineers in fab labs. She has been received heartily because scientists see value in her work and love the way she makes a scientific outlook accessible to a larger audience. The engineers love the unusual challenges she poses, which seem at first crazy but then lead to ideas and technologies 'out of the box'.

Barcelona 6 November, 2016

Another kind of paradigm: art as practice, art as research

Armin Medosch

> **"A bee puts to shame many an architect in the construction of her cells. But what distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality. At the end of every labour-process, we get a result that already existed in the imagination of the labourer at its commencement."**
> **— Karl Marx, *Capital*, Volume I[1]**

The Brussels based artist AnneMarie Maes has created an ecosystem in front of her apartment on the rooftop of a parking garage, with several hundred square meters filled with vegetables, salads, herbs, bushes, small trees and other plants grown in wooden containers, and also including several so called "intelligent beehives." Standing on a busy tourist street next to Brussels old corn market, one would never suspect such a rural paradise on top of this unassuming building. On the rooftop, at Urban Art Farm,[2] looking from certain perspectives, the garden appears perfectly natural, and one could easily forget to be located on top of a building in the midst of a city as the streets and the noise of the metropolis disappear. This complex ecosystem is completely artificial. Water gets collected on surrounding roofs, soil has to be renewed every few years, and electricity cables and pipes, various sensors for taking measurements and wireless networks for transmissions of data have been installed by the artist.

AnneMarie Maes work, *The Invisible Garden* (2015) was an inversion of her own rooftop garden. She created an assemblage of plants, soil, people, artefacts, scientific findings, datasets, sounds, etc. in a large scale installation in a windowless former textile factory. Her work *Foraging Fields* (2014), which focuses on her work with bees and urban corridors, has been shown at the *Fields* exhibition in Riga. The exhibitions *Waves* (2006; 2008)[3] and *Fields* (2014), both jointly curated by Rasa Smite, Raitis Smits and me, and organised by RIXC, were attempts at re-thinking the material practices of art and technology in their social context. Both exhibitions have been conceived as artistic research. *Waves* had tried to put the discourse on media art from its head on its feet by launching an investigation into the electromagnetic spectrum as a "principle medium and material of art." *Waves* conducted a questioning of the materiality of media art as a self-reflective step, continuing the legacy of modernistic avant-gardes.[4] Yet *Waves* was still open to the misunderstanding that "materialism" was mainly concerned with materiality. While this had not been the case, it could be misinterpreted in that way.

With *Fields* we strove to present a concept which was unmistakably engaged in today's social world. Our curatorial concept was based on the premise that the financial crisis of 2008 marked a deeper structural crisis[5] of the current mode of development. We formulated our invited and public calls for proposals in such a way that the social and historical question maintained a core position:

> **"Which *Fields* act as catalysts and underpin those artistic practices which offer the greatest potential for social change towards more imaginative and sustainable**

ways of living? Which pre-cursors in the last 30-40 years did exist and what can we learn from those often untold stories?"

In short, we asked which transdisciplinary art practices offered the greatest potential for desirable social change. We were looking for artworks that contained a proposition for "how we should live life differently, in a more imaginative and sustainable way." We started from the premises that all art we were looking for was post-media[6] and post-conceptual art. It was post-conceptual because it depended on having come after conceptualism — it could only become recognized as art because of conceptual art. It was post-media art because it was not tied into the legacy of any particular artform and medium such as painting, sculpture or even any new medium such as video or the computer. Each individual artistic practice was choosing its own medium as part of a practice which was transdisciplinary in a very profound way; and we assumed that art which is socially transformative will necessarily be bringing together different fields-as-in *disciplines* in imaginative ways.

We argued that the financial crisis of 2008 was not just one of the decennial crises inherent to the capitalist business cycle, but a deep, structural crisis of neoliberal information society. The artistic practices shown in *Fields* were supposed to provide us with a foreboding of a new historical era which would come after informationalism. This current paradigm, which had become implemented globally over the last 40 to 50 years, combined the neoliberal belief into the free market as a form of utopia with a financialised economy, and global logistic chains.[7] It was based on a specific form of globalisation where industrial expansion was driven by a combination of "Global Cities"[8] with outsourced production in low-wage countries, often ruled by dictatorial regimes. This type of globalization had weakened the organised working class in the former West,[9] and led to shrinking inflation adjusted real incomes in the lower and middle income strata, while the top 1% were getting richer and richer.[10] The direct cause of the 2008 crash had been that Americans had been taking out loans they could not afford, lured into taking those loans by the financial industry which had found ways of "securitizing" them by financial wizardry. To put it bluntly, working people in the USA, and increasingly also in Europe, could not "make a living" any more with their labour. This current paradigm, which is still in place, has shown to be unsustainable economically, ecologically, politically, even psychologically.

The rise of the informational paradigm had not remained unopposed. Since the 1990s, and with increasing intensity at the turn of the millennium, new political subjects formed who were united by a desire for ecological and social justice. It was against this backdrop, that after the crash of the New Economy in 2000 an ecological turn made itself increasingly felt in art and society. A wave of bio-art and eco-friendly art was matched by a more widely shared sudden fascination with urban gardening. In parallel to that but in a more reflected way, the 2000s saw a wave of people, ideas and projects that took inspiration from the digital 1990s and began looking at new types of cooperative practices inherent to so called free software and the digital commons and how those could be transferred from the digital field into other domains. Ideas, initially developed around the notion of the digital commons, were now flowing in the other direction, making the commons in all shapes a central topos of fine arts, software, media arts, and social activism.

AnneMarie Maes has been on the forefront of those developments, with her own rooftop garden, and with several urban garden projects in Brussels, many of which are located alongside a canal and former industrial area forming an urban corridor[11] where also many artist's studios happen to be located, one of them the project space of the group Okno, an interdisciplinary collective co-founded by Maes together with Guy van Belle. Okno's activity over the past 10 years contained many seeds of Maes' current projects, bringing together wireless citizen's networks, open source technologies and ecological, community oriented practices.

The Invisible Garden (2015) is a culmination of 10 years of work and research, by forming a complete replica of AnneMarie Maes' rooftop garden Hortus Experimentalis in a windowless exhibition space. Divided into four distinct ecological zones, the garden, with real plants and a functioning ecosystem, respects the basic principles of Permaculture. This large and complex installation presents itself as an oasis in the urban landscape inviting people inside the "Green light district." It is also reminiscent of the closed or walled gardens of the late middle ages, early Renaissance. Maes informs on her website[12] that close to where her urban garden is located now, 500 years ago nuns were already cultivating all kinds of medicinal herbs in the Regularissenklooster Jericho.[13] While Maes avoids any referencing of Christian mythology, it is worth mentioning that at the time the "hortus conclusus," the *enclosed garden*, was very popular in art and was charged with Christian symbolism. During Renaissance, gardens were constructed following neo-Platonic, Hermeticist principles, according to which the enclosed garden was a microcosm that reflected the macrocosm.[14] Transcendence and spiritual renewal could be achieved by entering the inner sanctum.

As Silvia Federici[15] has shown, the medieval herbal garden contained a specific type of female knowledge which was fought bitterly by the up and coming, male dominated scientific revolution. According to Federici, the prosecution of women as witches was part of a campaign to establish male science against earlier forms of knowledge, in particular female knowledge with regard to the reproduction of life.[16] According to feminist science studies, the rise of male, patriarchal science was based on a particular construction of nature as dead, life-less matter. In the Cartesian conception of science, nature had to become purified from all myths and symbolisms to become the object of science. This process is now being reversed from within science, argues philosopher of science Isabelle Stengers. As physics is meeting the boundaries created by its own purely rational and mathematical methods, interpretation, narrative and aesthetics become once more part of scientific reasoning.[17]

Maes does not present herself as a scientist, but her work nevertheless contributes, as a research based practice, to a discourse that strives to find a more socially balanced role of science and technology in society. She understands herself primarily as an artist who is driven by aesthetic concerns. *The Invisible Garden* communicates through the senses and through aesthetics. According to philosophical aesthetics in the tradition of German Idealism,[18] this is the true domain of

the artist, operating on an intermediate layer between the material and the conceptual layer, between the senses and the intellect.

The viewer, immersed in this artificial indoor garden, can through the contemplation of beauty make numerous discoveries. The surface appearances offer entry points to the discovery of manifold relationships: between different plants, between plants and their environment, and between plants and society. The work, which on the surface creates a little paradise without making any strong political statement, reveals itself to be entirely political by tapping into topics such as food-security, the oligopolies of seed companies and more generally by exposing what industrial agriculture does to nature and society. The reception of the work starts on an aesthetic layer, but then for the viewer, through gaining a deeper understanding of relationships created within the field aesthetics of the work, new fields of possible actions open up. The work creates a fully functioning ecosystem which is a mirror world to current spectacular capitalism. As I have argued in my keynote speech on the occasion of the opening of the Fields exhibition, *The Broken Mirror*,[19] art's historical function has been to provide a mirror to society. But this is not just like an optical mirror which produces an inverted image. There can be several ways in which art can be understood as a mirror. One way is based on the autonomy of art that developed in the late 18th century, and became more fully realized together with the rise of the bourgeoisie in the course of the 19th century. Art became autonomous, it stood outside utilitarian relations of production.

As Herbert Marcuse argued, the autonomy of art existed in a complex interplay with the rise of the bourgeoisie to political power and cultural hegemony. The bourgeois revolutions of 1789 and 1848 needed the working classes in order to be successful. Those revolutions therefore came with a promise of universal emancipation. After the mission was accomplished this turned soon out to be an empty promise, as women and workers still found themselves politically disenfranchised. Yet symbolically, the bourgeoisie could not give up its utopian promise of an egalitarian society. Utopia was thus pushed into the realm of art, where the autonomy of art provided a protected space. According to Marcuse, even the most apolitical art, by providing aesthetic sensations of a high quality and being, in principle available to all, contained a utopian "promesse de bonheur" for the repressed strata of society.

In *Eros and Civilization*, Marcuse, bringing together a reading of Marx with a reading of Freud, argued that the price for the building of civilization was the repression of libidinal forces.[20] Through art, this can partly be reversed, argued Marcuse. Art can offer an outlook at a world beyond alienation, but within the Eurocentric bourgeois conception of art, this happens within art only. The historical avant-gardes, but also the postwar neo-avant-gardes and post-conceptual art have tried to change that, reconnecting art with life.

AnneMarie Maes' joins in the legacy of postwar neo-avant-gardes such as the New Tendencies[21] in Europe and E.A.T. in the USA. Their overall approach, while informed from many areas, can be called "constructive." Starting in the 1950s, fully flourishing by the mid 1960s, those artists re-connected with the historic avant-gardes, in particular Constructivism, Bauhaus, and the Dutch De Stijl group, and also including aspects of Dada, but did so under new social historical conditions of the postwar economic boom. They adopted new materials from industry and provided new ways of perceiving the world through artistic research and by using concepts and instruments of science and technology.[22] As "last avant-gardes,"[23] their work was tied into the modernistic idea of universal emancipation.

Maes however, identifies less with those artists than with what came immediately thereafter, the critical art practices that defined the 1970s, citing Joseph Beuys, Gordon Matta-Clark, Lygia Clark and Ana Mendieta as key influences. Those practices, known under names such as conceptual art, land art, body art and feminist art, were repeating the gesture of the historical avant-garde,[24] breaking through the barrier between art and life, but with a key difference. Their practice no longer contained the promise of a utopian future. It was based in the here and now, and informed by the sensibilities of the '68 generation, their work turned to the critical deconstruction of grand narratives of modernity. Maes' work continues aspects of both the constructive and post-conceptual line of work.

The mirror world created by AnneMarie Maes' *Invisible Garden* offers at least temporarily a place from where to gain a critical perspective on society. It offers a space from where the overcoming of the current contradictions of capital can be contemplated in exemplary form. The philosophical foundations for this have been provided by young Karl Marx who developed a philosophy of history based on things considered natural becoming human. Central to this idea of history was a complex understanding of the notion of alienation.[25]

The well-known key political aspect of alienation is related to the appropriation of surplus labour by capital. The product of labour is taken away from the producers and becomes a commodity which then confronts the worker as "something alien and outside of him."[26] This contains the seed of what Marx would later define as commodity fetishism,[27] when those things that we have created, are now perceived to exist outside us, and threaten to dominate us.[28] In capitalist relations of production, living labour is reduced to a mere production factor. Rather than facilitating the fulfilment of our innermost drives, the labour process itself becomes denigrated, pure coercion, something which is endured only because of the need of earning money to survive. But although it is alienated labour it also creates "objective" realisations of human potential. For Marx, labour was the self-realisation of man who applied her or his skills to objects of nature. "Hence," wrote Marx, "nature as it comes to be through industry, even though in an *estranged* form, is true *anthropological* nature."[29] Labour as self-creation, as the realization of a potential, goes to the heart of a Marxist aesthetic theory. According to Marx, artistic production does not just produce works but also creates a more richly developed "*human* sensibility, a musical ear, an eye for beauty of form — in short, senses capable of human gratification, senses confirming themselves as essential powers of men."[30]

Women and men objectify themselves through labour, through the creation of objects. Yet this process of production does not just satisfy needs that are already given but essentially produces those needs in the viewer. A work of art does not just satisfy an aesthetic sense that already exists, but increases the capacity to be sensual. Good music produces our musical ear, it increases our capacity to listen. Marx conceived of this form of "production"

not just as something individual but on the level of the species being. What counts as true for the senses, also counts true for "the so-called mental senses — the practical senses (will, love, etc.) — in a word, human *sense* — the humanness of senses ..." Thus, Marx concludes "the forming of the five senses is a labour of the entire history of the world down to the present."[31]

Labour, in this context, should not be understood solely in individual terms, but as abstract social labour. "The whole character of the species, — it's species character — is contained in the character of its life activity, and free, conscious activity is man's species character."[32] While later the main thrust of the theoretic development was to recognize the systemic forces set in motion by the accumulation of capital, forces which are strongly heteronomic, young Marx argued as a philosopher of freedom, keen to emphasise consciousness and human agency. In a famous and often quoted passage, Marx wrote:

> "Admittedly animals also produce. They build themselves nests, dwellings, like the *bees, beavers, ants*, etc. But an animal only produces what it immediately needs for itself or its young. It produces one-sidedly, while man produces universally. ... man produces even when he is free from physical need and only truly produces in freedom therefrom."[33]

The question which Marx raises here is about life as conscious activity. Are human people masters of their own history? Or are they exposed to some blind systemic forces, with their fate determined from outside?

Paraphrasing Marx, we can say that AnneMarie Maes, in the process of the self-realisation of woman, develops the potentialities slumbering in nature, and subjects the play of its forces to her own sovereign power.[34] Her practice overcomes the separations imposed by the capitalist division of labour on natural science, aesthetics and politics, but does so not on the basis of making great claims, but inside a *practice*. The notion of practice allows preventing the reification of artistic labour. This term, *reification*, as introduced by György Lukács[35] refers to the tendency of forms of artistic, scientific, cultural and intellectual labour in capitalist relations to become separated from living labour and achieve the status of a thing. The result of objectification — the realisation of human potential through labour — is becoming reified, thinglike, and can thus become a commodity, just like anything else. Works of art, even though they may have been created with a host of different aims and intentions, are turned into commodities, sold on an art market. However, in advanced cognitive capitalism, reification is not only a result of market forces, but already written into the institutional system supporting art production. Those artists who do not directly produce for a market and are dependent on state subsidies, are exposed to creative industries policies which subsume art under a generic activity of innovation.

For those combined reasons, I emphasise the notion of art-as-practice, or *praxis*. The term praxis refers not simply to making and doing, but to the simultaneous development of practical, artistic and theoretic aims. It is this breadth and depth of her involvement that make AnneMarie Maes a model figure of an ecological artist. By claiming her as a model figure I do not idolize her as an individual human being and artist. I introduce this notion in order to avoid a viewpoint that merely looks at the results, as reified objects for sale on the market, and high-lights instead the type of practice, as a model for others to emulate.

Leonardo da Vinci is often quoted as a kind of model figure for the artist-scientist. Philosopher of science Isabelle Stengers is also working with the notion of a model or "marker"[36] figure as a type of scientist. What should be avoided is to assign the wrong markers. According to the philosopher Heinz Paetzold, Leonardo is often presented like another Newton in artistic guise. Yet in reality, Leonardo remained outside the functional principles of modern analytic science, and his mode of research was fundamentally one that went through visual perception, analogy and morphology, making him not a Newton of the arts but closer to the line that went from Goethe to Paul Klee.[37] And this may be understood less than a criticism and rather as a compliment.

The Invisible Garden creates a complex ecosystem which also implies different social relations in which she invites her audiences to participate. It creates a model world, and realizes in ideal form a promise of a better world where human labour and natural artefacts are brought together in ways which point to a world beyond alienation. The mirror-world that she creates is an antithesis to the world of material production. This antithesis is not created by "going back" to nature or imagining an Arcadia of urban gardening, but by creating networks of relationships between people, natural objects and objects created by technology and science.

Maes' artistic research is based on a radical epistemological pluralism of the "anything goes" type working at an advanced end of art and science, art and technology, but without fetishizing either of it. Her practice, a constant life-activity which realises itself through artistic research, the creation of new ecological networks, and by offering different forms and types of cooperation, marks her out as a model figure for an ecological artist. Work such as *The Invisible Garden* participates in a discourse of city versus countryside, of nature versus artifice. The Renaissance enclosed garden emerged at a time when modernity began and the city increasingly asserted its rule over the countryside. Now, in post-industrial societies, the countryside returns to the city, and society is in the process of finding a new balance between city and countryside.

Artists such as AnneMarie Maes, but also other artists who participated in the Fields exhibition, such as Shu Lea Cheang, with *Seeds Underground* (2013–14), are offering recipes for turning cities into edible hanging gardens, by experimenting with "technologies" in the most basic sense, such as composting, and by developing social forms of self-organisation. But not just the process of urbanisation in the literal sense is reversed, the psychological clock also gets rolled back. Those aspects of our sensuous and psychic life that have become blocked by centuries of alienation can become unblocked. I am not saying that the artificial garden brings back our true self, but a different self that had been submerged under sediments of traumatic memories of the progress of industrial modernity. This, in my view, constitutes a "political" art practice, which does not have to shout out overtly political messages. The full meaning of the relationship between such a reading of political art and social animals such as humans and bees can only be understood, once we get a grasp on how the bees became so politicized.

Political Bees

In Riga, in the *Fields* exhibition, Maes showed *Foraging Fields* (2014), an assemblage of different individual works and objects, all relating to her work with bee populations. *Flightroutes part#1* (2014), part of the *Foraging Fields* installation in Riga, presents a mapping of the flight routes taken by her urban beehives. The flight routes of her bees connect several green spaces along the Brussels canal zone, among them Urban Art Farm and the Okno space, as well as further art spaces and plots of accidental nature — little pockets of uncontrolled plant and insect life. These open air laboratories are equipped with several sensors taking measurements such as air temperature, air humidity, solar radiation, rainfall and air pollution. Inside the beehives additional data are taken such as temperature and humidity. In addition to that, the dust and pollen brought back by the bees allows analysing their flight routes and the plant and flower menu that's on offer to them. The dead bees are analysed as well. Maes found the opportunity to work in a laboratory at Free University Brussels with a Scanning Electron Microscope. It offers the possibility of making 3D images with an enlargement factor up to 10.000, ideal for photographing pollen and bee-parts such as proboscis, receptors, etc.[38] A fascinating new world opened up, determining "all these trees, flowers, herbs and vegetables [which] are in and around the rooftop garden."

Through those combined activities, the artist gains access to a new image of the urban topology. The beehive acts as a bio-indicator, an extended living sensor that allows assessing the quality of life not only for bees but also for people, other animals and plants. In the Riga installation, fighting against the perception of her work as a kind of aestheticisation of urban gardening, the laboratory character of the work was emphasised. Prints of drawings of flight routes were stuck to the wall, interspersed by mini-computers, so called Raspberry Pi's, equipped with small LED screens. *Flightroutes part#1* (2014) also was a piece of data art, transmitting live-data from Brussels' canal zone to the Arsenals exhibition space in Riga. Using scientific methods of data gathering is not driven by strictly scientific concerns but by an "open social imaginary," to quote Darko Fritz.[39]

Maes conducts participatory research and in the process of doing so, has developed affective and intellectual relations with the bees. The tendency of science, inherited from Enlightenment, to make nature its lifeless subject is being reversed. The advanced scientific tools of "seeing" allow an opening of dialogue with nature. The traditional borders between categories, arranged hierarchically, become transcended. The work enables "interspecies communication." By creating affective relationships with living beings, nature becomes empowered. The process has also been documented in detail in her book *The Transparent Beehive*, *a Notebook* (2014), literally a publication of research materials, images, and texts.

Foraging Fields (2014) presented black & white photography of bees made with an electronic microscope, an early model of the so called *Guerilla Beehive* and the video object *Peephole (dancing bees)*; as well as a number of further small objects. The whole set-up was like a study room, presenting those objects next to each other and with a pedestal that could also serve as a bench, so that visitors could sit down and study things more closely. The *Guerilla Beehive* was presented as a prototype. It is based on the idea that those *Guerilla Beehives*, as physical structures, could be dispersed throughout cities to offer bee colonies places to live. The beehives are the result of careful studies, designed in such a way, that they should become self-sufficient and be able to survive without a beekeeper.

This is not in any way a matter of course in present times. Many bee colonies suffer Colony Collapse Disorder (CCD) as a result of a sum of different factors, from the weakening of the immune system of the western honeybee (contrary to the Asian or African honeybee) to the use of Neonicotinoides by farmers which are pesticides lethal to bees. Maes' work taps into key political issues of our times such as the political influence of agro-industrial companies like Bayer, Monsanto, and Syngenta. Last not least, monocultures are also a problem for bees. The economics and politics of agriculture and subsidies in the EU give preference to large fields of "mainly maize, sunflowers and wheat, which all flower at once, but a few weeks later leave nothing for the bees to survive" explained Maes in an email to me. For this reason, bees now thrive better in the city where there is more biodiversity and less dangerous pesticides than in the industrialised countryside. Maes also highlights that bees suffer stress, due to the greed of the beekeepers and the bee-industry who build their hives in such a way to constantly animate honey production. The bees, already seriously weakened by all the factors mentioned above, are made to work very hard. While an eco-beekeeper will leave the honey to the bees for winter, commercial beekeepers take away all honey and feed some sugarwater to the bees. This is a cruel irony, given that the bees have been used (or rather abused) to construct the historical meta-narrative of the benevolence of free market capitalism.

The Fable of the Bees

300 years ago Bernard Mandeville wrote *The Fable of the Bees*, where he argued that "private vice creates the publick good."[40] He compared society to a beehive and argued that all the individual bees were only following their self-interest, but that their life-activities as a combined social product created the public good, which he identified as a "prosperous and war-like nation." Mandeville's core argument was picked up by the economist and moral philosopher Adam Smith and was turned into a narrative about the power of the free, unregulated market. While the functioning of the market was based on the self-interest of sellers and buyers — i.e. private vice — the result of all that buying and selling was a more prosperous society.[41] In order for that to work, it needs an intervention from higher above, the invisible hand. Everybody only needs to act in their own interest, but because of the invisible hand — the higher intelligence inherent to the market mechanism — their selfish actions produce a wealthy national product.

Adam Smith's argument for the power of the free market was picked up in the 19th century and turned into nothing less than a utopia, argued the Hungarian-Austrian social philosopher Karl Polanyi.[42] The free market became more than just an economic idea. By becoming the essence of liberal utopia, the free market, abstracted from all other aspects of life, came to rise above society and dominate it. This was what Marx was up against when he included a lengthy quote of Mandeville in has main work:

> "It would be easier, where property is well secured, to live without money than without poor; for who would do the work? ...

> As they [the poor]. [...] The only thing then that can render the labouring man industrious, is a moderate quantity of money, for as too little will, according as his temper is, either dispirit or make him desperate, so too much will make him insolent and lazy.... From what has been said, it is manifest, that, in a free nation, where slaves are not allowed of, the surest wealth consists in a multitude of laborious poor."[43]

Marx analysed one of the paradoxes of the process of capitalist accumulation, that it produces wealth as well as poverty. "The process of accumulation itself increases, along with the capital, the mass of 'labouring poor'."[44] Accumulation depends on an industrial "reserve army" which is used as a "flexible" pressure valve to accommodate for the cycle of boom, overproduction and crisis. The crash of 2008 had occurred because neoliberal capitalism had produced a globally fragmented "multitude of laborious poor" who were unable to buy the goods which they themselves produced. But behind that economic argument always lurked an argument about what constitutes the essence of man. Adam Smith's idea about the free market and the invisible hand were based on the notion of *homo oeconomicus*, economic man, who was primarily guided by utilitarian and rational calculations for the maximisation of profit.

Seminal ethnographic work by Marcel Mauss[45] on exchange and anthropological fieldwork by many anthropologists since confirms that homo oeconomicus was a rather fictitious character who had appeared late on the world stage. The market society was a special case in human history rather than the natural state of affairs.[46] For this very reason capitalism tries to naturalize itself. The bees and other social insects are constantly instrumentalized in ideological battles which aim at proofing that capitalism is our true nature and every other political idea a dangerous diversion from it.

The comparison of insect societies with human societies naturalizes politics and instrumentalizes nature for political reasons. On one hand, social relations, although they belong to the domain of politics and are thus changeable by conscious human action, become naturalized as if they were the subject of positivist natural science. On the other hand, analogies with insect societies are used polemically against democracy and workers rights. "There are no political discussions in an anthill, but yet it still functions so much better than democratic societies," the conservative argument goes. The naturalization of social mechanisms through insect metaphors is used to shut down the development of a "language of opposition."

In neoliberal information society, electronic markets are presented as anonymous beehives where insect-like swarms of algorithms do the trading. The utopia of the free market has become embodied, in ideal form, in those electronic networked markets. The political instrumentalization of bees and other social insects such as ants is particularly virulent in certain branches of computer science, where the categories of the social and the natural, of what is made and what is born have become profoundly confused.[47]

The instrumentalization of the bees forms part of the "political unconscious"[48] of our society. Through her work, Maes addresses the repressed and displaced content of an economic system, where low wages necessitate cheap food prices, which in turn are based on big agro-business which subsumes nature without recompensation.

Society can only tolerate its own alienation, by repressing its real social content, the dissociation between labour and its product, but also the dissociation from the realm of economy of other labour, which is not even recognised as that.[49]

To the same extent that cognitive and creative labour become fetishised in a knowledge economy, many other forms of labour — human labour, but also animals and nature itself — get downgraded to a very low social status, although it is actually of key importance for the production of surplus value. This is the "political unconscious" of neoliberalism, that forms of labour which are looked down upon are actually of key importance for its functioning: the labour of workers in Amazon warehouses; or the people who scan Google Books in California; but also forms of work which are not even recognized as work and thus not recompensed by society at all, such as the work of the mothers and grandmothers of young Chinese factory workers who are rearing their children for them. Female reproductive and affective labour in general are necessary to keep costs down and making profits, but are usually excluded from mainstream discourse. Globally, a gigantic industrial "reserve army" of about 80% of the world population has yet to enter the capitalist economy proper.

The bees suffer exploitation as a species, while their existence as social insects gets politicized in the wrong way. Maes, by engaging with bees on the level of species being, rolls back the fetishized scientific and commercial perspective on bees, by allowing them to exist according to their own preferences. "Once you start working with an ecological beehive," explains Maes, "you see clearly the difference. Bees become master of their hive again. They decide how fast they develop their colony, how much honey they gather and store, not the beekeeper."

As bees are intensively studied, a lot of received wisdom about them shows to be wrong. "A bee colony is not at all a hierarchical society! They are completely wrong!" the artist explains passionately, "a bee colony is a very balanced society, where the queen is ruled by the worker bees and the worker bees need the pheromones of the queen to smooth out their daily life." The bees are much more individual than it had been believed, with different bees specializing in certain tasks. Even revolution is an option: "The queen is *not* the boss. On the contrary, if the workers are not happy any more with the performance of the queen, they simply make a new queen and kill the old one."[50]

Conclusions: Art as practice

I highlighted the art of AnneMarie Maes as artistic research and as art as practice. As a model figure for an ecological artist, the self-directed life-activity of the artist comprises, for example, collecting pollen, photographing and analysing them, making measurements, taking data, seeding, planting, watering, documenting, planning, making observations. The diversity of practices is connected by ethical, aesthetic and intellectual concerns held by the artist. Through her work, she performs a socialization of plants, animals technologies and scientific artefacts. AnneMarie Maes constantly creates, with great skill, determination and dexterity, networks which connect plants, animals, sensors, real and semiotic networks, thereby creating an aesthetic of relational fields.

Through this aesthetic of relational fields viewer-participants of her work are seduced to engage more deeply with issues and become aware of the wider social significance. Her work, as an ecological and participatory practice, gives people ideas about things they might want to try themselves. It does not stop with making objects for an art market but offers resources for other people to become active themselves. Her work constitutes a "habitus"[51] that facilitates conviviality and a collective experience in the everyday. Writing and studying is a recognizable part of the artistic methodology, implicitly providing a critique of those who want to throw art back to some merely intuitive mode of production.

The work connects cultural techniques, from the neolithic revolution to the present, rolling back layers that have become forgotten and obscured through the capitalist division of labour and the alienation that goes with it. In this post-industrial era the dynamics between city and countryside are reversed, the country returns to the city. The laboratory character of her work enables those new patterns to become visible. Maes develops ideas and practices which are of much larger social significance than social gardening. Her *Invisible Garden* (2015) created an inverted utopia, a mirror to society which contains a promise of life beyond alienation. In *Foraging Fields* (2014), her "political bees" serve as a bio-indicators not only of the health of plants and bees, but show the assumptions on which the master narrative of free market capitalism was built to have been wrong. The work thus also opens up possibilities of a different social life that transcends capitalism as we know it. For all those reasons, AnneMarie Maes can be seen as a model figure of an ecological artist-researcher who contributes to the development of another kind of paradigm which is no longer confined by neoliberal information society.

Postscript

At the end of the conference that accompanied the *Fields* exhibition in Brussels, an experimental workshop session was held, titled Playing Fields. The participating artists were invited to give brief presentations of their work. We then as a group questioned the artistic concept and developed categories. This is not an attempt at sticking labels to practices but rather abut finding words for what yet remains unnamed. At the end of each artist's presentation, a number of new categories were created and people committed to writing short articles about it. In the case of AnneMarie Maes and her work *Foraging Fields*, the new category *Politics of Green Spaces* was created. You find a text by Darko Fritz about this topic in this volume.

Notes

1 Karl Marx, *Capital Volume I: A Critique of Political Economy*, trans. Ben Fowkes, vol. 1 (London: Penguin Books, 1976), 284.
2 The project is documented in detail at this website http://annemariemaes.net/research/urban-corridors/urban-artfarm-2012/
3 Armin Medosch, Rasa Šmite, and Daina Silina, eds., *Waves — Electromagnetic Waves as Material and Medium of Art. (exhib.cat. RIXC and Riga Arsenals Aug 24 - Sept. 17 2006)*, Acoustic Space 6 (Riga: RIXC, 2006).
4 Clement Greenberg, "Modernist Painting," in *Art in Theory, 1900-2000: An Anthology of Changing Ideas* (Malden, MA: Wiley-Blackwell, 2003), 773-78.
5 Peer Schouten, "Theory Talk# 13: Immanuel Wallerstein on World-Systems, the Imminent End of Capitalism and Unifying Social Science," *Theory Talks*, 2008, 2, http://www.sinsys.business.t-online.de/wallerstein_theorytalk13.pdf.
6 Armin Medosch, "Fields — an Index of Possibilities," in *Techno-Ecologies 2: Media Art Histories* (Riga: RIXC, The Centre for New Media Culture, 2014), 7-16.
7 David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford University Press, 2005).
8 Saskia Sassen, *The Global City: New York, London, Tokyo* (Princeton University Press, 2001).
9 Stanley Aronowitz and William DiFazio, *The Jobless Future: Second Edition* (Minneapolis Minn.: U of Minnesota Press, 2010).
10 Schouten, "Theory Talk# 13."
11 AnneMarie Maes has documented those developments under the tag "urban corridor project," available online: http://annemariemaes.net/category/research/urban-corridors/
12 See "Sense of the City", online, available at: http://AnneMariemaes.net/history-urbanism-sense-of-the-city/
13 http://nl.wikipedia.org/wiki/Regularissenklooster_Jericho Onze lieve Vrouw ter Rosen gheplant in Jericho
14 Aben, Rob, and Saskia de Wit. *The Enclosed Garden: History and Development of the Hortus Conclusus and Its Reintroduction Into the Present-Day Urban Landscape*. 010 Publishers, 1999. Matthews, Caitlín, and John Matthews. *Walkers Between the Worlds: The Western Mysteries from Shaman to Magus*. Inner Traditions / Bear & Co, 2004.
15 Federici, Silvia. *Caliban and the Witch: Women, the Body and Primitive Accumulation*. New York: Autonomedia, 2004.
16 It is more than just an irony that Regularissenkloster Jericho was dissolved in 1783 by Austrian emperor Joseph II., Son of Maria Theresia, one of the most thorough believers in secular Enlightenment values.
17 Stengers, Isabelle. *Cosmopolitics II*. University of Minnesota Press, 2011.
18 Heinz Paetzold, *Profile der Ästhetik: der Status von Kunst und Architektur in der Postmoderne* (Passagen, 1990).
19 "The Broken Mirror — Art after the Dreamworld of Digital Utopia," accessed June 25, 2014, http://www.thenextlayer.org/node/721.
20 Herbert Marcuse, *Eros and Civilisation: A Philosophical Inquiry Into Freud* (Ark Paperbacks, 1987).
21 Armin Medosch, "Automation, Cybernation and the Art of New Tendencies (1961-1973)" (PhD thesis, Goldsmiths, University of London, 2012), http://eprints.gold.ac.uk/6924/.
22 Margit Rosen et al., eds., *A Little-Known Story about a Movement, a Magazine and the Computer's Arrival in Art: New Tendencies and Bit International, 1961-1973* (Cambridge, Mass. and Karlsruhe, Germany: MIT Press/ZKM, 2011); Darko Fritz, "Histories of Networks and Live Meetings — Case Study: [new] Tendencies, 1961-1973 (1978)," Third International Conference on the Histories of Media Art, Science and Technology (Re:live 09, Melbourne, 2009); Edward A Shanken, "Art in the Information Age: Cybernetics, Software, Telematics, and the Conceptual Contributions of Art and Technology to Art History and Theory" (Department of Art History in the Graduate School of Duke University, 2001).
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24 Peter Bürger, *Theory of the Avant-Garde* (Minneapolis: University of Minnesota Press, 1984).
25 Karl Marx, *The Economic and Philosophic Manuscripts of 1844* (New York: Norton, 1972).
26 Ibid., 57.
27 Marx Engels Reader 216-17
28 Ibid.
29 Ibid., 76.
30 Marx, *The Economic and Philosophic Manuscripts of 1844*, 74.
31 Ibid., 74-5.
32 Ibid., 62.
33 Ibid. my emphasis.
34 Ibid., 1:283.
35 György Lukács, *History and Class Consciousness: Studies in Marxist Dialectics* (Cambridge Mass.: MIT Press, 1971).
36 Isabelle Stengers, *Cosmopolitics I*, trans. Robert Bononno (Minneapolis: Univ Of Minnesota Press, 2010).
37 Paetzold, *Profile der Ästhetik*, 35.
38 http://annemariemaes.net/works/bee-laboratory-works/pollen-series/
39 See text by Darko Fritz in this volume
40 Bernard Mandeville and F.B Kaye, *The Fable of the Bees or Private Vices, Publick Benefits* (Indianapolis: Liberty Fund, 1988).
41 Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (London: Methuen & Co., Ltd., 1904), http://www.econlib.org/library/Smith/smWNCover.html.
42 Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (Boston, MA: Beacon Press, 2012).

43 Bernard de Mandeville: “The Fable of the Bees,” 5th edition, London, 1728. Remarks, pp. 212, 213, 328.
44 Marx, *Capital Volume I: A Critique of Political Economy*, 1:765 paraphrased.
45 Marcel Mauss, *The Gift: Forms and Functions of Exchange in Archaic Societies* (New York: Norton, 1967).
46 Gareth Dale, *Karl Polanyi: The Limits of the Market* (John Wiley & Sons, 2013).
47 Kevin Kelly, *Out of Control: The New Biology of Machines, Social Systems, & the Economic World* (New York: Basic Books, 1995).
48 Fredric Jameson, *The Political Unconscious: Narrative as a Socially Symbolic Act* (Cornell University Press, 1982).
49 Robert Kurz, “Grey Is the Golden Tree of Life, Green Is Theory — The Problem of Praxis as a Recurring Theme of a Truncated Critique of Capitalism and the History of the Left,” *Libcom.org*, December 27, 2014, http://libcom.org/library/grey-golden-tree-life-green-theory-robert-kurz.
50 Interview with the author, March-April 2015
51 Pierre Bourdieu, *Outline of a theory of practice* (Cambridge, U.K.; New York: Cambridge University Press, 1977), http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=589175.

Politics of Green Spaces

Darko Fritz

Annemie Maes (Okno): *"Foraging Fields" (from the "Bee Laboratory" project)*, 2014; Shu Lea Cheang: *"Seeds Underground"*, 2013; Darko Fritz: *"200 OK" (from the series "Internet Error Messages")*, 2014.

Contemporary art practices that investigate the role of urban political economy and private-public property relations in the social production of green spaces, we may classify under the umbrella of the Politics of Green Spaces. Such art practices do 'not just create a new aesthetics' but literally get 'involved in patterns of social, scientific, and technological transformations'[1].

Using natural substances and related processes as the building blocks of art projects and dealing with broader social implications of the state of nature, the Politics of Green Spaces operate mostly both in the open air and by using a variety of technological hardware and communication systems. Such practices are rather different from those one finds in bio-art, where artists work with live tissues, bacteria, living organisms, and life processes as well, but use scientific processes such as biotechnology producing works indoors in (wet) laboratories and galleries. Instead, art laboratories of the Politics of Green Spaces operate mostly outdoors, often confronted with social reception outside of the comfort zone of galleries' and museums' art context.

In most cases, inequitable social and environmental relations invoke the Politics of Green Spaces. This term considers the relations of a variety of living organisms (humans among others: animals, mushrooms, plants, viruses etc.). As such, it expands the notion of networks of living organisms and objects in complex relationships within the post-digital paradigm (where technology is interwoven in almost all parts of contemporary world) but still related to nature that is not completely computable, and therefore accessible to 'big data' analytics.

The *Politics of Green Spaces* may point to limitations of both humans and constructs designed by humans (as technologies), e.g. as in an episode of the famous sci-fi series Star Trek: *"We are the Borg. Lower your shields and surrender your ships. We will add your biological and technological distinctiveness to our own. Your culture will adapt to service us. Resistance is futile."*[2] On the other hand, examining the notions of resistance, deconstructions and decontextualisation of power structures is yet another subject of the *Politics of Green Spaces*. Taking this enduring political agenda into consideration, the inter-relational fields of action encompass biology, zoology, horticulture, growing processes, network culture, real-time processed data, site-specific art, technology and social interaction in a wide spectrum of interests, all within the post media art discourse. Especially, drafting network culture, embedded in the vast and incomprehensible sphere that summons and communicates ALL nature (even what is not perceivable neither by human senses nor machines made by humans), we could also propose expanding the existing notion of culture into Nature Embedded Netculture. Bruno Latour urged that we — humans — must rework our thinking to conceive the existence of the "Parliament of Things"[3] whereby natural phenomena, social phenomena and

the discourse about them are not seen as separate objects to be studied by specialists, but as hybrids made and scrutinized by the public interaction of people, things and concepts. Following Latour, we could think of the possibility of conceptualizing larger networks where non-human actors resist programmed subdue frame of proportion and appear rendered by being observed in the light of processes they take part in.

Case studies

What follows is a description of three examples of art projects, selected from the group exhibition *"Fields"*[4], that will show some of the possible approaches to the *Politics of Green Spaces*, *"Foraging Fields"* (2013-14), a multi-media installation by AnneMarie Maes, *"Seeds Underground"* by Shu Lea Cheang (2013-14), and *"200 OK"* by Darko Fritz (2014).

All mentioned artworks belong to post-media art practices, and draw upon histories of advanced conceptual art practices of the 1960s and 1970s. One may see Cheang's work as an update of socially engaged video art (and communities) of the 1970s and 1980s, Fritz's installation in public space as a comment on Land art and Maes' work as part of the rich history of intersection of art and science. In other hand, all artworks take into consideration histories of media art of the 1990s and 2000s, including Internet art as a part of it.

Each artwork we may see at least at three levels: *"Foraging Fields"* by Maes acts upon bio diversity at the macro level, urban green environment at *mezzo* level and bee culture at micro level. Cheang's *"Seeds Underground"* performs the genetically modified food critique on the macro level, at *mezzo* level it gets involved with green activism and at micro level deals with Monsanto corporation. The horticulture unit *"200 OK"* by Fritz operates at macro level with a critique of technological determinism, at *mezzo* level with transgression of digital interfaces and at micro level with creating a new context for the internet error message.

"Foraging Fields" (2013-14) is a multimedia installation by Annemie Maes, presenting the interaction of bee colonies and their surroundings on different levels. The author states: 'My beehives are augmented with webcams, microphones and sensors to monitor the behavior of the colonies, whilst the surrounding ecosystem is scanned by analysis of the pollen and nectar that the bees bring back from their foraging flights. The different hives are all nodes in a distributed Guerilla Beehives network.' The installation consists of a series of artworks made during Maes' research and on-going five-year long *"Bee Laboratory"* project: *"Flightroute" (part 1 and 2)*, mapping with real-time data transmission and mapping of the surroundings; *"SEM"* — series of microscopic photographs of bees and pollen; *"Guerilla Beehives Network"* — beehive equipped with biodegradable sensors that make distant, non-intrusive monitoring possible; *"Honey Batteries"* for alternative energy production; *"Peephole (dancing bees)"* presenting a stream of images made during ten months of filming inside the beehive and *"Wax Beehive"*, a sculpture based upon bio-mimicry, made of organic beeswax, composed of more than 300 different chemical components. The hive is a system of homeostasis, a property that regulates its internal environment and tends to maintain a stable, constant condition of properties like temperature or pH. It can be either an open or closed system. As nature is polluted by industries in most countries of the so-called "first world" (that includes Belgium, where Maes operates from), it shows that the bees start to prefer the less polluted urban environment than the very polluted countryside full of pesticides, fertilizers and so on. Monitoring bees shows the state of biocoenosis[5]. That includes the broader environment with all its inhabitants, whereby humans are acting as the most influential change-makers.

Unlike military or financial research and monitoring, artistic research and monitoring provides self-reflection based on an open social imaginary. These artistic procedures create an index of possibilities for further actions which do not aim at short-term advantages or profit, but look for a long term-solution on a micro or macro scale — as politics supposes to do. Here the *Politics of Green Spaces* enables new models, which leads beyond the normative environmental policies of green political spectra.

Shu Lea Cheang goes directly into a political action with her project *"Seeds Underground"* against the genetically modified food and related industries that took over the wholesale markets worldwide. The transgenic biotechnology has been commercialized by the patent-protected corporate sectors, showing once again that industrial civilization has been built on "surplus repression" where "not only people but also animals and nature were subjected"[6]. Cheang draws upon the monopolizing tendencies of large seed producers in the USA and the attempts of the EU to draft a new seeds directive. Cheang organized a series of *"Seeds Underground Parties"*, public invitations to exchange traditional seeds and young plants in people-to-people events, with the possibility of following their development via the Internet. She is using the word "broadcast" not for distribution of signals of electronic media, but for sowing, distributing the seeds: "In the direction where the wind blows, take the handful of seeds, apply a wrist action, flick the seeds out into the field. This is the ancient way of seed broadcast."[7] Her installation *"Seeds Underground"* revisits the court case of Vernon Hugh Bowman vs. Monsanto (held in Washington, D.C 2013). Ever-replicating seeds are "transmitted by divine wind and distributed by human/machine power across the vast farmland". To propel the notion of socially engaged and activist art practices, Cheang has been working with viral bio art hacking as well.

"200 OK" by Darko Fritz is a horticultural unit made of Sesleria plants. The installation is made in a form of a low-resolution screen reading the text "200 OK". A live internet video stream shows the site of the installation embedded in natural and social (inter)actions over three months, and later available as the visual archive. *"200 OK"* is part of the *"Internet Error Messages"* series of artworks that have been developed by Fritz since 2001. Artist's statement: 'The interpretation of the work *"200 OK"* is open, and does not necessary fit into any single interpretation frame.' When an Internet browser requests a service from web server, an error might occur. A machine communicates with another machine about protocols of failed communication, thus providing the user with the insight into the problem. In particular, the message "200 OK" is a status code showing that the request has succeeded. The information returned with the response is dependent on the method used

in the request. Art historian Vesna Madžoski wrote on *"Internet Error Messages"*: "Through those actions of decontextualization of system messages, Fritz erases the illusion of their functionality; he turns them into what they actually are — ornamental screens whose purpose is to hide the holes in the system. Fritz decides to take them 'out' and put them back in an 'unnatural' natural environment, using land and flowers to replace pixels and electronic signals. (...) Those visual expressions that I dare to name the aesthetics of failure function as a constant reminder that things might and do go wrong, and the failure of a machine to fulfill its promises of bringing us perfection and eternal happiness becomes the condition of its actual existence. Stripping them off of their functionality, Fritz shows the gaping holes those messages try to hide, warning us of the ongoing processes in highly bureaucratized present-day societies to transfer all decision-making to machines as being dangerous in its essence."[8]

Instead of a Conclusion

Practices of the Politics of Green Spaces demystify the notion that nature will self-regulate into equilibrium, the myth that is still spread both within the community of scientists and among common people.

The question lingers: is resistance futile? And another one: who is asking whom?

Notes

1 Introduction text of the Field exhibition, Riga, 2014. Curators: Rasa Smite, Raitis Smits and Armin Medosch.
2 In the graphic novel Star Trek: The Manga, the Borg resulted from an experiment in medical nanotechnology gone wrong. The Borg was designed to evoke Transhumanism. The phrase *"Resistance is futile"* became prevalent in popular culture from its use in the television show Star Trek: The Next Generation.
3 Latour, Bruno (1993), We have never been modern, Harvard University Press.
4 same as 1. See rixc.org/fields/en/exhibition
5 biological community, ecological community, coined by Karl Möbius in 1877.
6 Armin Medosch, *"The Broken Mirror – Art after the dreamworld of digital utopia"*, keynote lecture for the Fields exhibition, as delivered in Riga 16th of May 2014.
7 http://www.seedsunderground.net/index.php?mod=broadcast
8 Vesna Madžoski, Error to Mistake > Notes on the Aesthetics of Failure, in: *Darko Fritz: Archives in Progress [Projects 1987–2007]*, ed. Darko Frtiz, HDLU, Zagreb / Museum of Modern and Contemporary Art Rijeka, 2008. Available at http://www.leoalmanac.org/wp-content/uploads/2011/08/07_LEA_Vol_17_No_1_Madzoski.pdf

Il faut cultiver notre jardin … On the need for gardening

Edith Doove

Prelude

To approach the work of AnneMarie Maes, an artist working with art-science projects that evolve around nature and ecology, it seems apt to use notions of 'lines of flight' (Deleuze) or 'knots' (Ingold), alluding to respectively the bees and the rhizomatic growth of her garden, but equally to the new networks she continually ads and develops. Similarly the notion of the 'meshwork' (De Landa, Ingold) that could be described as a 3D non-linear field of energy exchanges seems important as is the idea of 'vibrant matter' (Bennett) in all of which the nonhuman is granted equal agency to the human.

The following intends to explore these notions and their authors who are strongly interconnected and to interweave several observations into a meshwork about, but also alongside Maes' work. To discover what her art is about and to communicate this by writing alongside it and follow its course like that of a river, create a parallel that sometimes leans over, intermingles and creates together. For this text I have adapted a way of working that chimes with the gradually letting go of a clear position. To ponder about a possible meaning and carry it with you, return to it, take it in a different direction.

> Field note – 10.01.2014*
> The mice are back and have eaten all the seeds of the winter rye. I am doing yet another attempt with grains… And then suddenly there are snails! Where they come from I really don't understand. Stranger even is that they – after having glided over the grains – suddenly disappear back in thin air. The compost heap also asks for intervention, a treatment of 15 days. Furthermore the weather is still very soft. The sky is bright blue and bees fly from all hives everyday. Hopefully it will not wintry in February anymore as that could be fatal for the bees …
>
> * From the fieldnotes '*Garden Timeline in Words*' (2014) by AnneMarie Maes, translation ED.

On Voltaire / Politics

Having finally settled down after being exposed to the most awful atrocities, Voltaire's Candide and company realise to their big surprise that they are not happy in their newfound peaceful situation but actually rather bored. The old lady for instance muses what is worse, to go through all the miseries they had undergone during their journeys, or to stay in this final resting place and have nothing to do. "It's a great question," said Candide.

Candide thereupon first consults the local Dervish who is however not of much help. He then turns to the 'Old Turk' who seems to be happy nurturing his garden, being unaware of all misery outside of it and Candide comes to realise after his example that rather than being idle he and his company need to work and cultivate their garden. It is the only way to render life tolerable. And so they do.

Although the 'Old Turk' cannot be bothered about what takes place in Constantinople, Voltaire's work, especially his *Traité sur la Tolérance*, has gained renewed notoriety within the context of recent political turmoil. Candide's tale can be read in a similar manner, be it in a different context, in view of ecological politics, as a certain call to return back to basics and the need for a collaborative effort.

In her preface to *Vibrant Matter — a political ecology of things* (2009) Jane Bennett states that her book is "motivated by a self-interested or conative concern for *human* survival and happiness"; she wants "to promote greener forms of human culture and more attentive encounters between people-materialities and thing-materialities." She is interested in how political responses to public problems would change were we to take the vitality of (nonhuman) bodies seriously.

Politics can, and probably must be, also about enjoyment and happiness.

Field note – 11.02.2014

Back from California and in the meantime it has been relatively warm in Brussels, lots of sun and the temperature never below zero. The garden has not changed that much. The Viburnum tinus still blooms; all its flowers are now open. The Phacelia has not grown and will probably not bloom anymore. Where the Phacelia was sown in deeper boxes it is much higher and greener than the seedlings in the lower boxes, which are more brown and red-coloured. I will mix them as green manure into the soil. The garlic – both the one I got from Guy as the one of Shu Lea – has grown a lot. There are also some Brussels sprouts and green kale. The winter rye is neither a success. After the mice had eaten most of the seeds in late autumn the seeds that I sowed in January did not catch on anymore. The mice seem to have disappeared from the conservatory – let's hope! (…). The three Kempen hives fly plenty but in the Warré hive I see currently no movement. I hope that opening the hive on 17/1 has not been fatal. But maybe they stay inside because they have enough to eat?

On Invisibility / Point of view

AnneMarie Maes called her project for the exhibition *The Green Light District* in Kortrijk 'The Invisible Garden' (2014), which alluded to the fact that it was indoors and could not be seen or even guessed at from the outside of the building it was located in. Something similar is the case with her original *Hortus Experimentalis* in Brussels of which the one in Kortrijk was a copy — it is just as invisible as it is situated high up on the rooftop of a three-storey parking lot in the centre of town where it can't be seen or even guessed at from street level.

Yet another connection to an equally invisible garden is that to the medieval cloister gardens, situated once at this exact same location in Brussels, evidence of which now hides underneath the ground and in history.

Maes indicates that it is exactly the making visible of the invisible that lies at the heart of her project. She is fascinated by hidden structures. How it is only through technology, and I would argue also through philosophy or adopting another state of mind, or point of view, that certain aspects of life can be rendered visible. Maes achieves this by integrating so-called 'hidden poetic memories' in her installation that add both a visible and an audible layer to be discovered.

In her microscope images of pollen Maes reveals yet more views that seem otherworldly. It is surprising to see how much of our daily life is unseen. We explore outer space but know precious little about our oceans. And that what is not immediately visible with the naked eye escapes our attention as well. It is of course not always a case of 'seeing' but of 'sensing' as well. Observing our relation with our surrounding world is obviously one of the oldest subjects of mankind. What fascinates Maes is the aesthetic side of nature, the beauty of the honeycomb that can be related to computational aesthetics or to architecture. This reminds me of my study of art history at the University of Leiden where various brilliant teachers in art philosophy, architecture and medieval studies pointed me to the harmony of the "music of spheres". The idea of the small in the big and the big in the small and the interconnectedness of visible and invisible worlds later became apparent in the wonderful if in the meantime somewhat dated, *Powers of Ten* movie by Charles and Ray Eames. Or in reading Peter Sloterdijk's trilogy *Sphären* (recently fully translated as *Spheres*) in which he weaves an intriguing account of the smaller and larger networks surrounding and underlying our environment.

The structure of the bees' honeycomb is indeed admirably structured with its hexagonal configuration, quite in contrast with that of our own homes. In his text 'Homes: Meshwork or Hierarchy' (1995) Manuel De Landa asks the question whether homes are planned or self-organized and extends this query also to the nonhuman realm of animals. The home territories of birds turn out to be a matter of self-organisation in "a complex interplay between male and female birds and the expressive affordances of their environment." Affordances or constraints were first introduced by psychologist William Gibson and express the way in which the environment is meaningful for the human or non-human inhabitant. Where the birds of De Landa choose to have there territory is a complex combination of internal drive and external factors — "emerging from the interaction of a non-hierarchical set of brain functions and the expressive qualities of the territorial markers themselves".

The animals that Maes describes in her field notes, whether the bees or the birds, clearly also respond to their surroundings, either in a positive or a negative way. The bees respond to the kind of beehive or available flowers and plants, the birds equally respond to the presence of potential food — dead bees, ripe grapes — and might along the way mistake the conservatory or Maes' apartment as a potential home. But there is of course also the large unseen to which they respond — the air pollution in Brussels can be quite substantial with large amounts of fine dust on bad days. The use of insecticides has diminished the world population of bees at a threatening rate. Little do people realize that without bees there will be no pollination and thus also no food. How habitable will our environment eventually be? The response of nature — both human and non-human — will probably self-organize itself towards survival, as nature in whatever form always will survive, but there will no doubt be many casualties along the way.

Field note – 22.02.2014

Worked for the first time in the garden together with David. Moved the hives: the Warré next to the Kempen, ready for monitoring of the next season. The second Kempen hive put next to the first. Even that one-meter of displacement makes it difficult for the bees to find their hive entrance! Strange that these creatures, so good in collaboration, individually have trouble responding to something so simple. We also transplanted the Rosa glauca that stood in the front next to the olive tree and put it in the back, next to the stairs that lead to the UAF. We also cleaned the conservatory, pruned the kiwi and the last grapes and David has increased some strawberry plants. Also cut the grass for the first time so that it is ready to grow with full force. The nasturtiums – that have survived the winter without dying down – already flower just as the Calendula. The buckthorn also is in bloom although two of the four cuttings that I planted last year have died. For the cardoons and artichokes this soft but relatively wet winter has been a true godsend. They look full and happy!

On Meshwork/Fluidity

In his *A Thousand Years of Nonlinear History* (1997) Manuel De Landa extends the theme he already touches on in the article mentioned above, to a wider analysis of society. The conclusion of the article was that our homes are complex mixtures of self-organized and planned components, or in other words, of hierarchies and meshworks. De Landa in his 1995 article defines hierarchies as structures in which components have been sorted out into homogenous groups, and then articulated together. "Meshworks, on the other hand, articulate heterogeneous components as such, without homogenizing." In *A Thousand Years* the notion of home is extended to a threefold analysis of the period 1000-2000 AD: geological, biological and linguistic, but the basis stays the same. In an intricate interweaving of hierarchies and meshworks everything is related — shifting one thing will eventually result in shifting another. Or as Jane Bennett states in *Vibrant Matter* (2010): "(...) in a knotted world of vibrant matter, to harm one section of the web may very well be to harm oneself."

Earthquakes are the result of tectonic plates that have been on the move for 25 million years. They were in the making all along and something similar can be said about pretty much anything else whether of human or non-human origin when one subscribes to the new materialism that philosophers like De Landa, Bennett or Serres allude to in their writing in which the human and non-human are acknowledged as existing and interacting on the same plane or level. Bennett is inspired by Deleuze's and Guattari's experiment with the idea of 'material vitalism' and equally follows Spinoza in the inherent connection between all human and nonhuman bodies due to the fact that at the basis they are made from the same substance. Bennet tries "to bear witness to the vital materialities that flow through and around us".

In his book *Being Alive* (2011) anthropologist Tim Ingold introduces his take on the meshwork via a series of chapters or 'knots' that form part of this 'texture of interwoven threads'. The meshwork rethinks the animate and develops a view in which we are no longer surrounded by an environment but are an integral part of a fluid space. It equally acknowledges the human and the non-human as existing and interacting at the same level and thus moves away from an imposing hierarchy. Ingold pulls together ethnologist Jakob Von Uexküll's theory of *Umwelt* (Environment) that is made meaningful by the organism, and Gibson's idea of affordance in which the environment is seen as a site of meaning for its inhabitants (human or non-human) via Heidegger's distinction of captivation (animal) and disclosed (human) to Deleuze's lines of flight. The difference with Latour's (initial) idea of the actor *network* theory lies in the difference between "the network as a set of interconnected points" and that of "the meshwork as an interweaving of lines" (Ingold, 2011, 64).

Michel Serres uses the meshwork in yet another way when he writes about the historical network that pulls science and the humanities back together. Latour compares his "generalized comparativism" (Serres and Latour, 1995, 77), using a non-linear approach to time, to a fly's flight pattern. As the son of "a fisherman and gravel dealer, a bargeman on the Garonne river" Serres also quite naturally recalls the river and water in general as metaphor, its whirling and streaming both up and down, for how the meshwork operates (Serres and Latour, 6). The images of turbulences, whirlpools and a liquid nature are frequently used and not only originate from his childhood memories around the river but also from Lucretius and ancient atomism in which everything flows and to which Serres returns in his *The Birth of Physics*.

Maes inadvertently relates to this idea of the fluid meshwork when she states about her project 'The Invisible Garden' that it "...reverses the relation between nature and art. The transitions between inside and outside, culture and staged nature become fluid and transitory."

For me personally Serres' interweaving of ancient and contemporary philosophy and science reads like the ideal puzzle, the perfect novel, and speaks to my inner detective. What else is a researcher in the end?

Field note – 20.04.2014

Easter. Erected the small P2P conservatory in the Urban Farm together with Luc. At the start of July we will have a P2P workshop in it in the context of the CAPS-call. Also checked whether the operation Warré/Kempen has yielded some progress for the bees. This is disappointing. The bees have build nothing in the 2nd container; the queen thus clearly sits above the devider in the Kempen container. Decided to remove the devider with Luc so that the bees can slowly descend themselves. But they don't seem to feel like it! It might that the 'old' beekeepers indeed turn out to be right after all and that bees like to stay on the already developed honeycomb instead of get to work themselves! There is nevertheless a lot of action at the entrance of the hive, and the colonies are also well developed. I'll just quietly let them follow their own plan. While checking the Warré hive I wanted to raise one honeycomb to see whether there was a lot of brood and it was so heavy that it broke at the top bar. Those top bars don't seem to be a good system. In the future I will return to using windows but then in Warré format and without wax foundation. Pay attention: with lifting the entire box the snapped piece of honeycomb of course fell down. It was full of brood and honey and I hope the queen was not on it and that she is still unscathed in the hive. Enfin – learned another lesson.

On Oeuvre/Labour

An artist's oeuvre, or work, or labour, is yet another meshwork. Or ecosystem. A garden. That slowly forms itself. As an artist's oeuvre. Or that of a writer. Or of a researcher.

As De Landa implicates in *A Thousand Years* a meshwork does not grow overnight, it is the result of a prolonged activity. The meshwork is not necessarily overly positive, nature is not kind as someone pointed out to me in a conversation on the importance of soil. The meshwork (and nature for that matter) operates in a constant exchange or inter-change with hierarchies that grow out of it and that later on is subsumed again. It is a dynamic, nonlinear system that operates both on a micro and macro level in which every action anywhere in the field eventually results in a counteraction anywhere else. The art market is not different.

As for writing as labour, this is far from a linear activity. It starts with some points, ideas that are then connected. The text is scanned up and down, revisited, readjusted, added to, (partly) erased. Until finally things seem to fall in place. It actually is quite similar to gardening it seems, not unlike the planting, replanting, redesigning that Maes describes in her field notes. When she writes "It was a good decision to replant the strawberries from the low containers to the high containers, underneath the fruit trees" this is quite analogous to me moving a sentence or a full paragraph to another place, in another combination,

closer to a quote or further away. The quotes or the field notes work like specific elements in the garden, possibly the undergrowth on which I build my arguments but they could also be the fruit trees that protect my strawberries. I garden. She writes. I notice how my writing is influenced by her field notes.

Deleuze and Guattari famously introduced the idea of assemblage in connection to a book, or more specifically their *A Thousand Plateaus* in which they also develop the idea of the rhizome, the "always in the middle, between things, interbeing, *intermezzo*." Always becoming. In the book as assemblage, or the garden for that matter, as in all things, there are lines of articulation or segmentarity, strata and territories; but also lines of flight, movements of deterritorialization and destratification. Comparative rates of flow on these lines produce phenomena of relative slowness and viscosity, or, on the contrary, of acceleration and rupture. All this, lines and measurable speeds constitutes an *assemblage*.

Although Maes would possibly see her various websites and the wiki's that accompany, illustrate or bear witness of her activity in the first place as (collaborative) work material these could equally be seen as integral to her oeuvre. The various strands that one can follow are like books in a library, ready to uncover new worlds, encyclopaedic. They are the strata and territories of the assemblage of Deleuze and Guattari, a rhizomatic growth on its own, with every entry as another potential line of flight, ready for take off. Eco points to the importance of having unread books in one's library, which makes it into a research tool into the unknown and demonstrates a curiosity for the undefined. The not yet or partly read wiki or strand in a website presents a similar richness.

It seems to me — by the way — that one of the reasons that female artists are underrepresented within the art market and art history in general is the fact that they tend to work along this way. A weaving of sorts that results in a tissue that neither in its entirety nor in its separate threads tends to reveal its meaning straight away. It can't easily be categorised or compartmentalised and thus also don't lends itself to easy marketing. It is also not necessarily interested in hierarchy or can just not be bothered. There is other work to do.

A meshwork thus cannot be read in one glance — one needs to unravel it in order to understand it, spend time with it, like with the garden, a text, an artist's work. Where De Landa writes *about* meshworks Serres writes *in* and *through* them and implicates that the philosophy that produces his writing needs time as you need to know about everything:

> Yes, a philosopher should know everything, should have lived everything and understood everything — the sciences, hard and soft, their history, but also that which is *not* science, the entire encyclopedia, with no exclusions. What underpins philosophy is not this or that partial science but the active totality of knowledge, as a totality. One only becomes a philosopher late in life — unlike scientists, who start inventing in their youth — because one must pass almost all of one's life in preparation.
> — Latour and Serres, 26-27

Like the writer, the artist. Is it not really only after so many years that one truly knows what to say? And even then …

Field note – 24.05.2014

As nobody came I thus worked on my own in the garden. Which is quite pleasurable especially if it's not too warm and the wind blows – it feels just like being at the seaside. I start to get to know the garden better. It was a good decision to replant the strawberries from the low containers to the high containers, underneath the fruit trees. The strawberries look much healthier and give beautifully red fruit that has not been eaten by the birds as it has been hidden under the larger leaves. I had put mown grass under the strawberries so that they could ripen on a nice soft bed. I also picked cherries. They were already ripe on one cherry tree – beautiful and red! I now know how I will redesign the garden next year in context of weight, low labour & low watering. I will bring at least 4 of the fruit trees from the back all the way to the front where they will stand on top of the big pillars from the floor underneath. The long vegetable container of the PermaVille boys will just have to be shortened. And further even more herbs: good for the bees and also to make teas. I will put more strawberries under the trees. In the conservatory I will keep growing tomatoes and peppers, as I like eating them! The intensive work is then limited to 1 part of the garden namely the conservatory. And the rest should be able to do it on their own! That's the plan, to be executed this autumn and next spring so that everything is ready to leave for Berlin! Tonight I will take the strawberries, cherries and basil to Radha, together with a pot of honey and a bottle of wine. We will eat a nice pasta.

On Gardening/Labour

We need to cultivate our garden, work in, on and with it. The garden is not made by one person alone. The 'Old Turk' has his daughters to help him, Candide the company of the old woman etc. The garden is a locus of several collaborations, human and non-human. In the new garden that Maes develops at various locations, inside, outside, at unexpected levels,

> "artists and urban gardeners develop new strategies for sustainable living in the city. An artistic attitude, green technology and the philosophy of permaculture present new opportunities to contribute to sustainable living."

Harry F. Wolcott argues in his book *The Art of Fieldwork* (2005) to pursue fieldwork more 'artfully' and to focus on what counts, rather than just count. A systematic work ethic is important but it needs in his view to be combined with a more artful way, paying "adequate attention to its artistic as well as its scientific potential". At the same time Wolcott thinks it's important to view fieldwork as an entity on its own, always incorporating elements of art and science by default. So it is not so much an in-between art and science as an overlapping activity.

Maes' work is fieldwork in that it moves out of the classic studio space, into her extensive rooftop garden with its beehives. Fieldwork is sometimes defined as situated "outside of a laboratory, library or workplace setting" to collect data. In a way Maes however has made her 'field' into a laboratory and one could even say, a library of sorts.

Field note – 03.06.2014

Visit by Xavier Bellès, Director of the Institute for Evolutionary Biology in Barcelona. He's totally impressed by the garden and the bee laboratory. More plans for EU projects are made. The crow family has taken possession of the garden, they are lord and master and sit on anything that is high, keeping an eye on everything and not allowing other birds (especially the pigeons) to eat the berries. Every morning the crows eat the dead bees that lie in front of the beehives in the grass. They attack pigeons and blackbirds till they are exhausted, and tear them apart.

On field notes

Connected to fieldwork is the use of field notes. As Kathleen and Billie DeWait indicate in their book *Participant*

Observation: A Guide for Fieldworkers (2011) "observations are not data unless they are recorded in some fashion for further analysis". They also observe how field notes are simultaneously data and analysis. Field notes are a product, constructed by the researcher. They are therefore inherently subjective, complex and biased as participation implies emotional involvement whereas observation requires detachment (DeWait and DeWait, 28). The observer is so much implemented that one of the respondents to Jean Jackson's survey, quoted by DeWait, claims "I am a field note", providing her with the title for her publication on 'Field notes as a Symbol of Professional Identity' (1990). The above is related to anthropological observation of the human but it is obviously also useable in an observation of the non-human, such as bees or a garden. Because of their complex identity field notes contain the fluid connection between artist and scientist that Wolcott (see *On fieldwork*) alludes to and are in that respect possibly less problematic for the artist than for the scientist as the artist is used to being subjective and the scientist is normally trained to be objective. The field notes of Maes clearly reveal her personality and her emotional involvement with her subjects, even though they are non-human. It is therefore not surprising to find the phrase "I am a field note" as a working subtitle for one of her texts.

Field note – 02.07.2014

While inspecting the garden the following strikes me: fig trees and strawberry plants are good partners. The strawberries are much thicker underneath the fig trees than at other places. The mulberry and strawberry are equally good partners. The mange touts grow very well on the wigwam structure that I made with bamboo sticks. The radishes in the P2P conservatory are growing fast and you have to pull them out fast before they grow too big (and tasteless). The zucchini 'Ronde de Nice' has finally started and is beginning to produce well after I had removed the broad beans (that wouldn't grow) from the same container. The Czar' plum tree produces extremely well. At least 300 plums, tasty sweet and delicious both stewed as directly eaten from the tree. The tomatoes in the conservatory have a lot of fruits but it takes them still just as long to ripen (despite the warm spring) as in other years. The tomato plants outside start to grow well now (early July) and the first fruit show. The teasel of last year has spread its seeds all over the roof garden. Everywhere teasels are growing wild! I don't understand how they can develop in 3 cm of lava granules without compost and it nevertheless happens. We have moved the ivy that stood in the green bags on the roof of the parking to some bottomless apple containers. It does well. The plan is to let it quietly overgrow the roof. Another plant that is omnipresent on the roof is nasturtium. It produces seeds in abundance. Once they have flowered they usually attract greenfly and wilt but the new generation is ready to follow. It is remarkable that greenfly usually appears in times of drought. I think it is related to plants that are stressed by not getting water regularly. The pumpkins have also suddenly started. It always takes a while (about 2-3 weeks) when you put pumpkin outdoors but once they take off they grow really fast. The top garden is becoming overgrown with large pumpkin leaves. The lacinato kale that was sown directly outdoors also flourishes. I hope it will hibernate so we are secured of food in autumn and winter. It does have to be continuously protected from the birds. The chard that the permaboys sowed in the conservatory is super big – much bigger than the one we had outdoors. Although it is a waste of space in the conservatory for a vegetable that can perfectly survive outdoors. The broccoli also has flower heads but they are disproportionate in comparison to the amount of leaves these plants produce. I think this might be due to the amount of horse manure in the earth of the permaboys. It will have to be compensated for next year! Best work with 'poor' vegetables such as carrots and beets and no crucifers next year in the same ground. The cardoons and artichokes are in full bloom. It would of course be possible to harvest the flower heads and eat them but the flowers are so beautiful and good for the bees and other insects that I leave them as they are. The Verbena bonariensis has spread as well and the long purple stems give extra colour to the garden as does the Calendula! The buckthorn gives this year (for the first time after 2 years of nothing) an abundant berry crop. The potatoes of the Burning Ice Festival are doing well and I am curious to see what crop they will give – after having worked with the Sarpo mira it will be a welcome change.

On the garden / Paradise

The OpenGreens site of OKNO — the artist collective co-founded by Maes in 2004 — opens with a quote by Michel Foucault from his book *Of Other Spaces* (1967) in which he makes the connection between flying or magic carpets and traditional Persian gardens (which brings us more or less back to Candide and his garden):

> … the garden is a rug onto which the whole world comes to enact its symbolic perfection, and the rug is a sort of garden that can move across space. The garden is the smallest parcel of the world and then it is the totality of the world. The garden has been a sort of happy, universalizing heterotopia since the beginnings of antiquity…

The Persian rug as an image of the world connects us also back to De Landa's text 'Homes: Meshwork or Hierarchy'. The rug is usually part of a home as is the garden, whether used indoors or outside. The rug is literally a meshwork of woven threads and symbolically a meshwork of associations. As is the garden.

Space, place, home — bees and their hives, the garden as an extension but also an equivalent of home. A habitus, in the terms of a social structure, making us think about the habitable.

Field note – 02.08.2014

The end of summer is clearly in sight. It has gone at least 2 weeks quicker than in the years before. It is still very warm. There are thunderclouds from time to time but no thunderstorms. The water will be finished again soon. The damaged WASP mote meteostation has been repaired – the solar panel cannot manage more than sending data every 30 minutes. The real wasps are arriving and the bees are looking for food. They are happy with anything they find – every wild flower is being flown at. I have sown again Phacelia in the places where I removed the potatoes and salad. In the conservatory the melon grows incredibly hard and the tomatoes and peppers are doing well. The tomatoes outside finally get ripe fruits as well – it has taken them a while. And there are plenty of pumpkins waiting. Green, orange, yellow…

Family Blackbird is again present all over the place. They are in the conservatory (I have now hung a curtain with brightly coloured plastic strips, maybe this will put them off a bit) and eat the ripe grapes. They also muck about the beehives, both for the ripe grapes as for the dead bees. Regularly a lost bird can be found indoors, today a brown redstart. And the spiders have suddenly returned in large numbers, a sign that summer is ending. I urgently need to drain the honey and start treating the bees against Varroa… Worked with Vincent yesterday on a setup for sound streaming. A shotgun microphone in front of the beehive gives a very special effect!

On language

The word 'experiment' easily causes confusion as it has a different meaning when used by an artist or a scientist. For the artist to experiment means to try, to test, to play. For the scientist this might be the same but the experiment in this case needs to be repeatable and measurable, controllable. For the artist the experiment however incorporates a certain uniqueness, a subjectivity that is related to her personality and way of doing, seeing, observing.

What is important however is that both the artist and the scientist have the 'right' to use and claim the experiment from their own point of view and that one — the experiment itself, the artist and the scientist or the outcome — is not better or more solid than the other. A mutual understanding of this aspect lies at the heart of a good art-science project. The artistic view produces knowledge that is equal to that of the scientist. Its meaning might however lie not so much in the word itself as in-between the words. Its subjectivity is a different but equally valuable kind of knowledge.

Field note – 05.08.2014

I was busy outside with the bees today. Only prepared 2 hives for winter (those next to the conservatory), it all takes a lot of time. Took honeycombs down, checked how strong the colonies are and how much they need themselves. Started the Varroa treatment. Hive 1 next to the conservatory is super strong and has a lot of frames of (still closed) brood. I will let it go into winter on one and a half box. I left them a full honey super but did take away the deviders so that they can spread their brood over the 2 boxes. Winter is still nowhere in sight! I put 3 plates of Thymovar on the lowest brood box, as there is no brood in the highest box. The 2nd colony next to the conservatory is a little less strong but has after a very slow start at the beginning of season 2014 gained strength. The colony is however too small to hibernate on 2 boxes. So I took down the honey super and hung the half filled frames in the colony next to it. This colony I will start feeding additionally with sugar water from tomorrow. This evening I still also want to do the 2 Kempen hives down in the garden. I rather do all hives at the same time and then maybe will be ready to extract the honeycombs. I cannot wait too long as the wax moth had almost struck again. I've just outwitted her! The bees are currently very restless. They have no more food, there are no more blooming flowers. They prey on anything that could be food. Robbery is in the air. As are the wasps and the wax moth.

Field note – 08.12.2014

Cleaned the roof and took away all fallen leaves. Properly secured all black cloths on the water tanks as everything was detached by the wind. I'll leave the water in the tanks with the buttons open. Still have to disconnect the pump however. Cleaned half of the conservatory: pruned the kiwi and vines and chopped the rampant butternut pumpkin for the compost. Now still the other half of the conservatory, the tomato plants. There are still green tomatoes but they will not ripen anymore. Further there are still topinambours, leek, beetroot, lacinato kale, salad, carrots, red cabbage (eaten by the pigeons). The calendula and phacelia still blossom. It has so far not yet frozen.

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The Sound Beehive Experiment

AnneMarie Maes

The Sound Beehive is part of a series of ecological instrumented beehives leading towards a fully biocompatible intelligent beehive [1]. These beehives allow me to study the tight interaction between city honeybees and urban ecosystems, using artistic research practices and in collaboration with scientists. The Sound Beehive Experiment monitors the development of a bee colony on the basis of the sounds it generates. For this purpose, we developed a beehive that is equipped with sensors, microphones and cameras. The Sound Beehive is installed in the Urban Bee Laboratory on a rooftop in the Brussels city centre. Data is streamed to central repositories and analysed using statistical techniques and graphic visualizations.

An Ethological Approach

Honeybees are bio-indicators. They provide a constant stream of information on the environment in which they forage, via their daily activity, and via the pollen and nectar they harvest. Environmental problems such as the use of pesticides can be detected by monitoring the colonies with audio and video tools and by scanning their daily activity over several years [2].

In nearly all industrialised nations, bee colonies are now threatened. The compromised state of the foraging areas for bees is worrisome. By using bees as bio-indicators and by translating the information into artworks, I make citizens aware of the increasingly negative effects of our lifestyle and methods of industrial production. I am a media artist collaborating with computer scientists and engineers to develop art-science projects. Interested in showing the hidden structures in nature, I am using innovative technological methods to probe the living world.

To study the bees in their natural environment, following the footsteps of von Frisch and other ethologists [3], we have built a customized 'sound device'. Microphones inside the beehive enable us to continuously monitor the colony's buzz. Together with outside and inside video monitoring it forms a non-intrusive scanning device for controlling the colony's health and development. We also installed a network of temperature and humidity sensors spread throughout the beehive. The annotated video and audio data are uploaded to our open source video database [4]. All time-stamped sensor data from the lab's weather station, as well as the temperature and humidity data measured inside the beehive, are made public on the website opensensordata.net.

Instrumentation

Our custom-built audio, video and sensor device is integrated in a Warré beehive. It is a sustainable beehive in which the colony develops at its own pace. We started to customize our Warré beehive by putting electret microphones in the top cover and by attaching contact microphones in the frames of the brood box. All microphones are connected to pre-amps stored in the rooftop. They are powered by a battery that is located a few meters away from the hive to avoid the creation of electro-magnetic fields.

For recording the video images, we use Raspberry Pi computers. The Raspberry can be easily integrated in complex installations and

is equipped with a series of USB and Ethernet connections to function in a network of devices. We integrated two small high-resolution cameras in our setup; one camera to record the activity on the landing platform and a second infrared camera to registrate the activity inside the brooding box.

The analysis of the images gives us information on the relation of the bees to the environment. A beecounter is integrated in order to determine the in/out flux and detect homing problems related to pesticide contamination. The images also give us information about the pollen supply and the development of the colony related to the activity level of forager bees, fanning bees, dead bees and lazy bees on the landing platform.

Bee Activity Related to the Environment

A bee colony is very responsive to the biotopes of which it is a part. The production of honey is dependent on the flowers we grow, the plants we like, and the garbage or pollution we produce. The colony is also very sensitive to environmental variables such as outside temperature, rainfall and humidity, the wind and hours of sunshine. We therefore compare the behaviour of the bees and the development of the colony with the data from the weather station. In our rooftop field lab, we have installed a Libellium agriculture kit, including several environmental sensing devices. E.g., the hours of solar activity, as well as the soil composition, determine the nectar flow of the flowers and their visits by the bees. Nectar secretion increases as pollinators visit the flower.

We set up a database of the pollen contained in the honey of our urban bee colonies and we started to determine the pollen source. By studying the pollen in a sample of honey, it is possible to collect evidence of the geographical location and genus of the plants that the honeybees visited. As such, we start to trace green corridors through the city.

Data processing

In January 2015 we started analysing the recorded files. We scanned the soundfiles in terms of their brightness, loudness and noise level. For the analysis of the video files, we made use of motion detection via the frame difference method. The analysis of the sound files is a complex matter. We therefore use techniques of Artificial Intelligence in collaboration with the Brussels Free University. We have recorded large amounts of data in order to investigate whether we can detect patterns. All together these data give us plenty of parameters to combine and to play with, to create models and to compare different moments in time and thus to study the behaviour of the colony relative to timeline/season and environmental parameters.

A video shows a graphical rendering of AI analysis of colony behaviour combining real audio data with measurements of the microclimate inside the hive: temperature, CO2 and humidity. Another video shows 365 days of activity inside a real observation beehive, played back at high speed. The images were recorded with an infrared camera inside the hive and processed using pattern recognition, AI and computer graphics algorithms. These images offer the stunning visual experience of a bee colony in action.

To create an immersive sound installation we analysed the sound files recorded in the beehive, and presented them as an 8-channel audio installation integrated in the rooftop of a human-size beehive. *The Scaffolded Sound Beehive* is a wooden sculpture, constructed using open source digital fabrication and mounted on scaffolds of 2,5 meters high. Visitors can enter in this upscaled model of the Warré beehive and experience an auditory artistic interpretation of hive activity. We processed the recordings (made in the real beehive) using sophisticated pattern recognition algorithms and artificial intelligence analysis software, and edited the sound files by adding swirling electronic sound clusters to sonify the ebb and flow of swarm activity in the hive.

Conclusions

The Sound Beehive immersive installation was introduced during the first Renewable Futures Conference[5] in Riga, (May 2014), and has been shown at the Institute of Evolutionary Biology in Barcelona (May–June 2015), and at the AI and the Arts, exhibition for the international conference of Artificial Intelligence in Buenos Aires, Argentina (July 2015). The enormously positive response of viewers shows clearly that the presentation of scientifically inspired art can have a strong impact and raises awareness of important societal issues, and also that art-inspired science can have a fruitful positive effect to push science in new directions.

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1 Maes, A. (2013) The Transparent Beehive Notebook. Okno Brussels.
2 Michels, M. (2011) A Beehive Monitoring System Incorporating Optical Flow as a Source of Information, Masters thesis. Freie Universität Berlin.
3 von Frisch K. (1953) The Dancing Bees: An Account of the Life and Senses of the Honey Bee, Harvest Books New York.
4 http://pandora.okno.be
5 rixc.org

Bee Monitoring Workshop by AnneMarie Maes,
organized by the University of Barcelona
in the apiary of Parc de la Ciutadella, Barcelona (2012)


SONY
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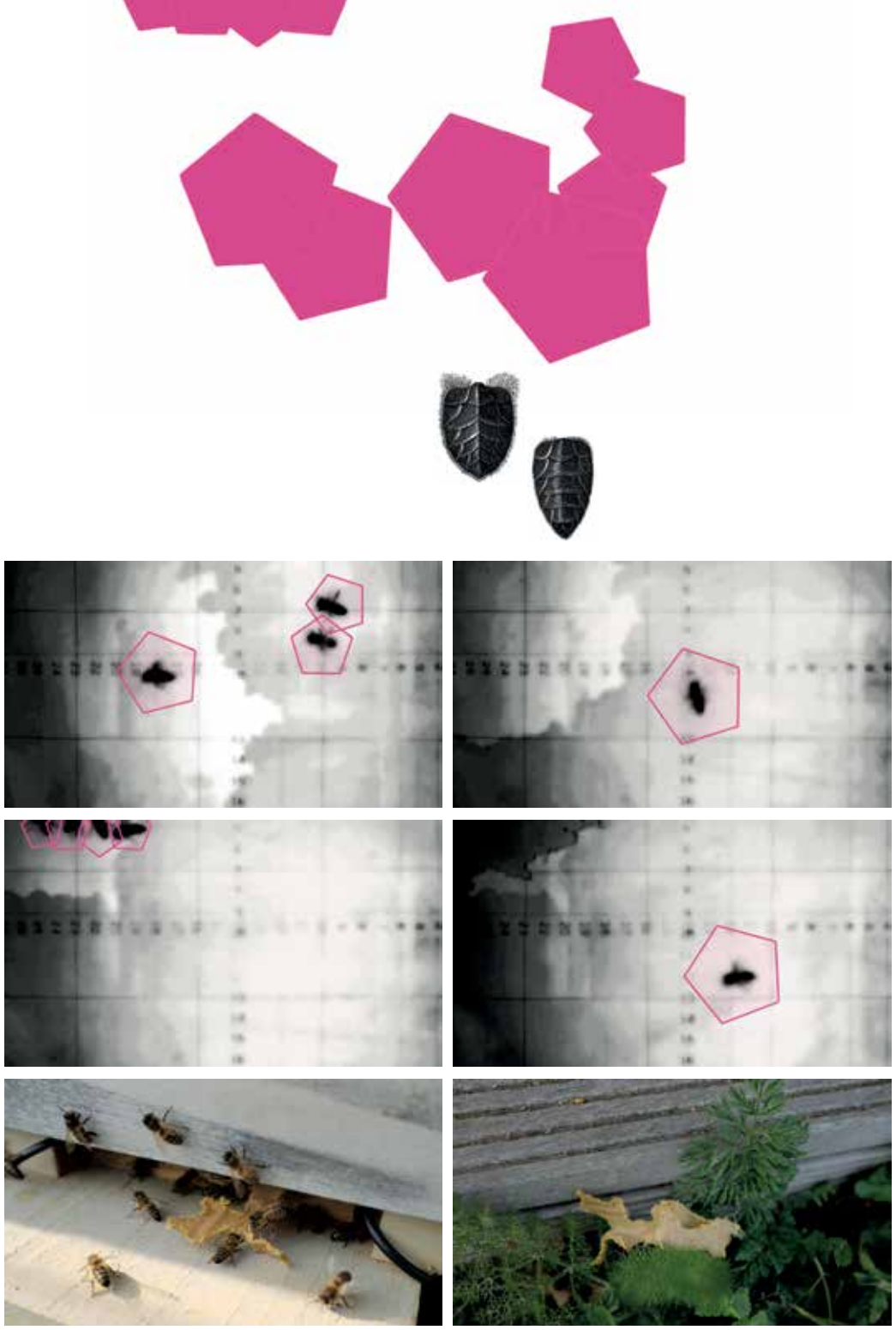
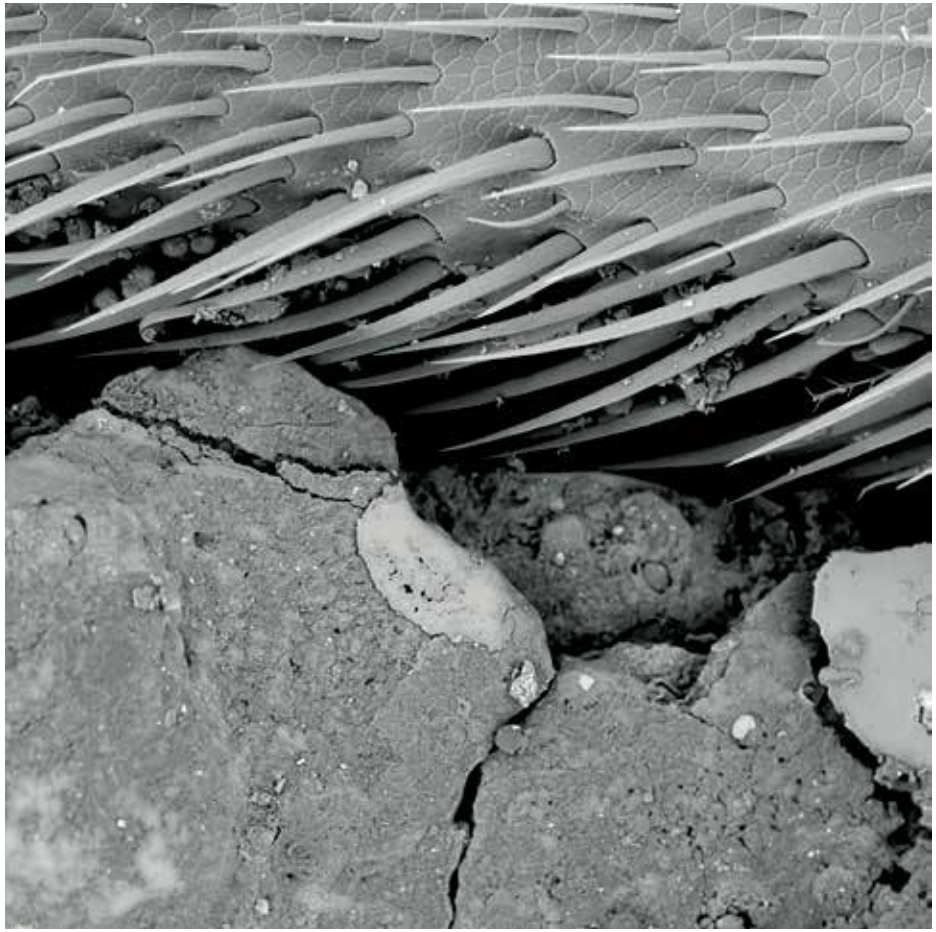
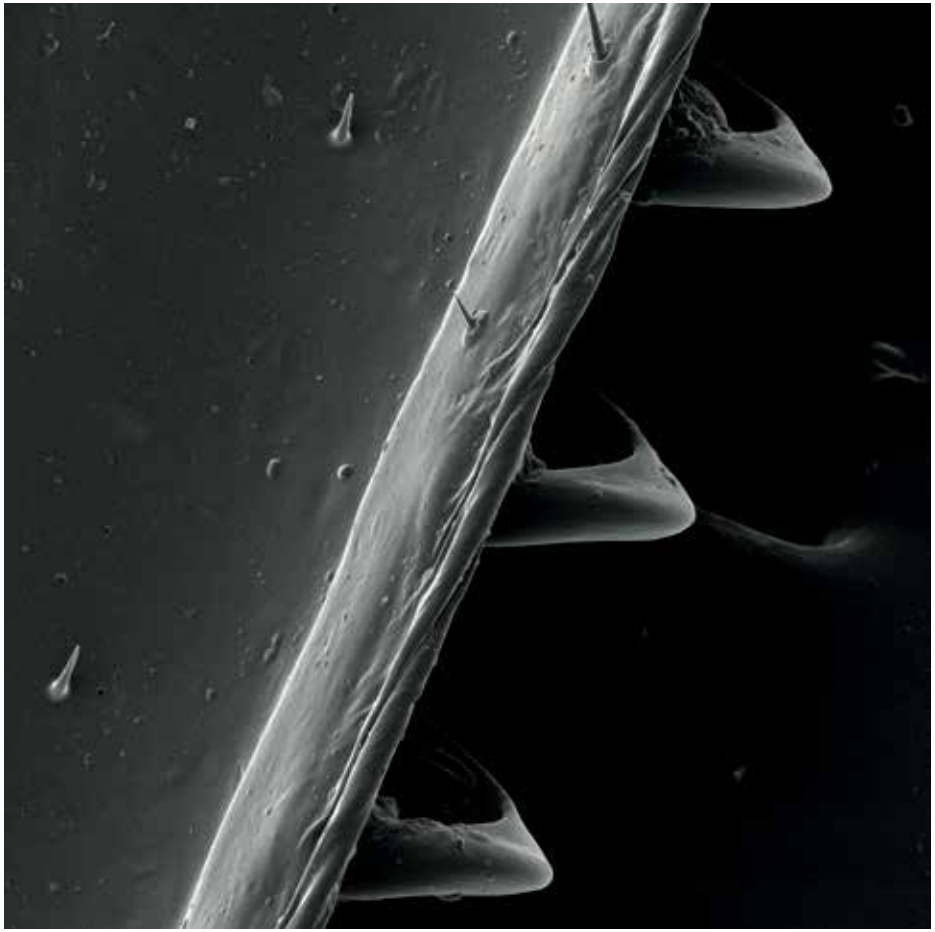
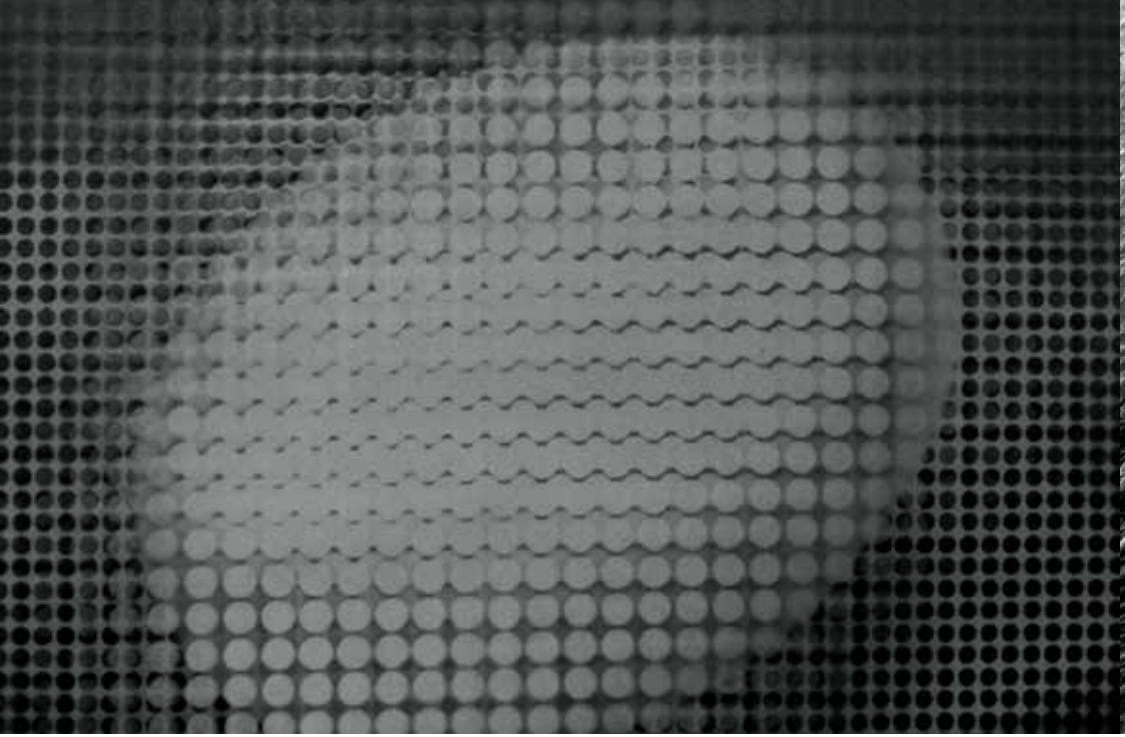
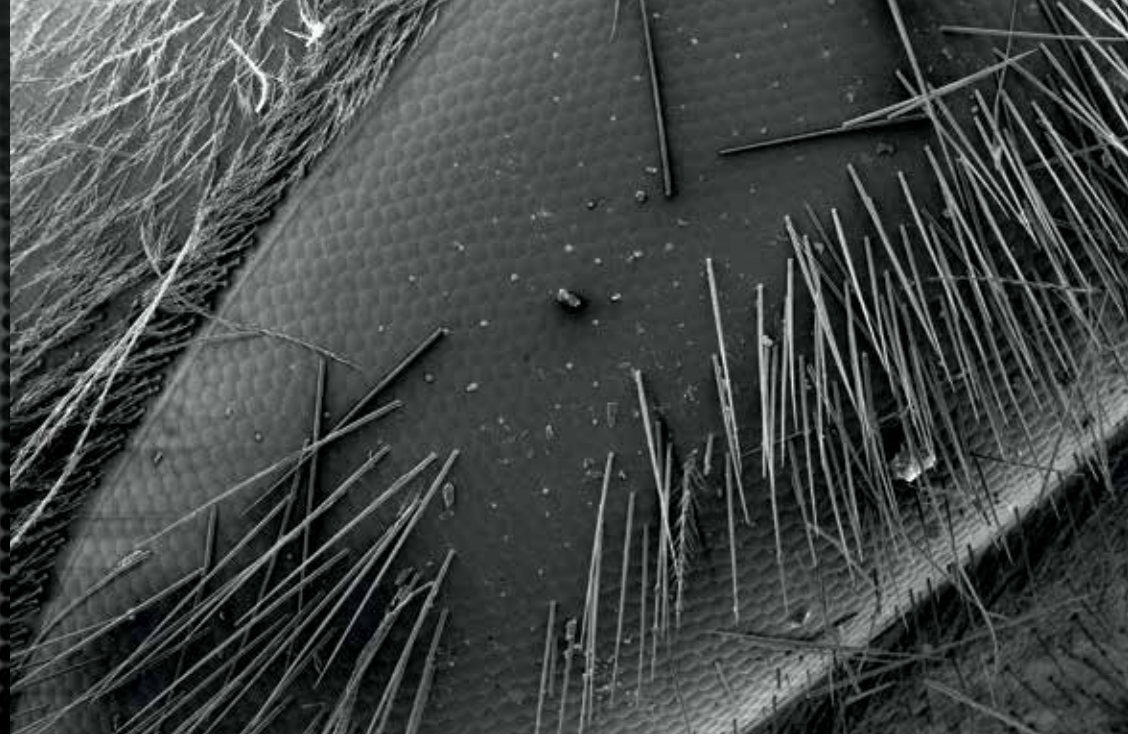




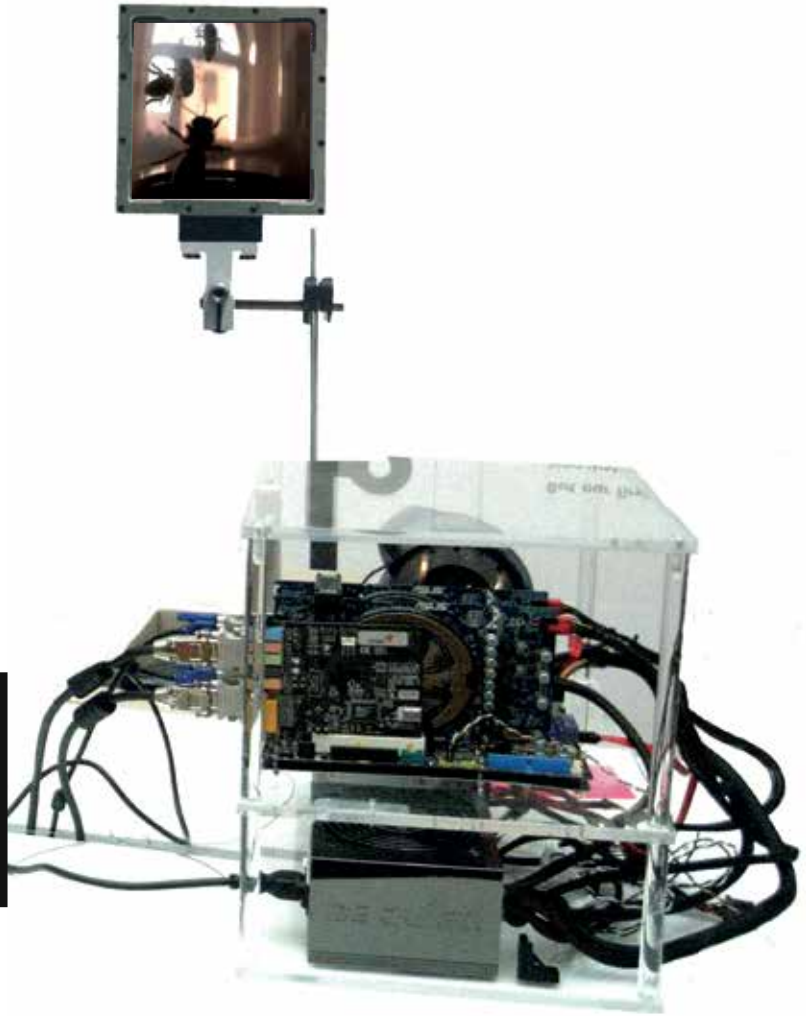




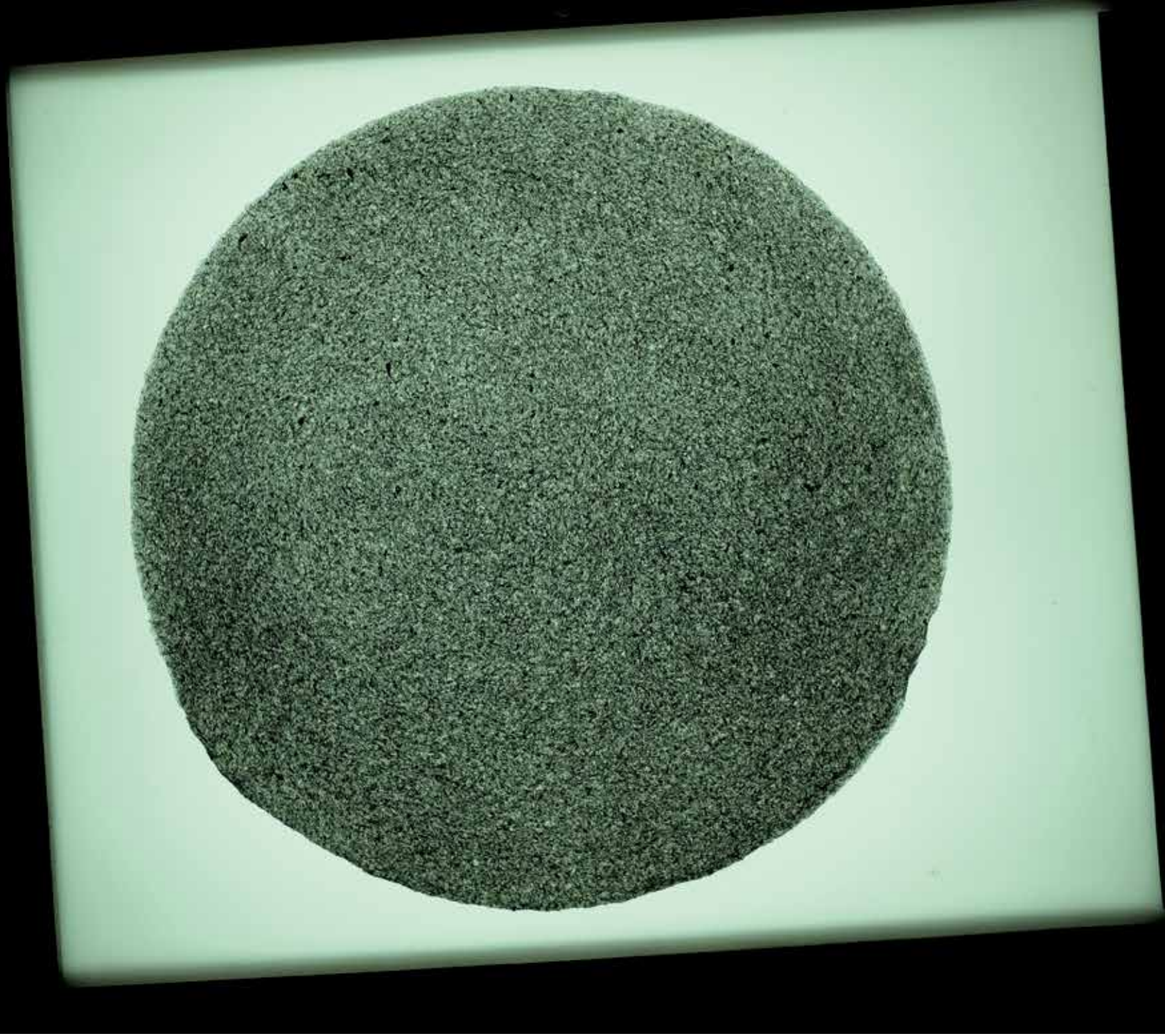
Rogelio Polesello, Red (1958-1974)

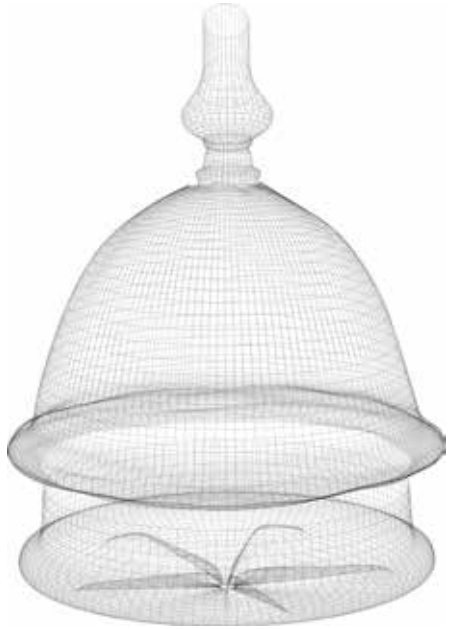


OCULUM (2015)



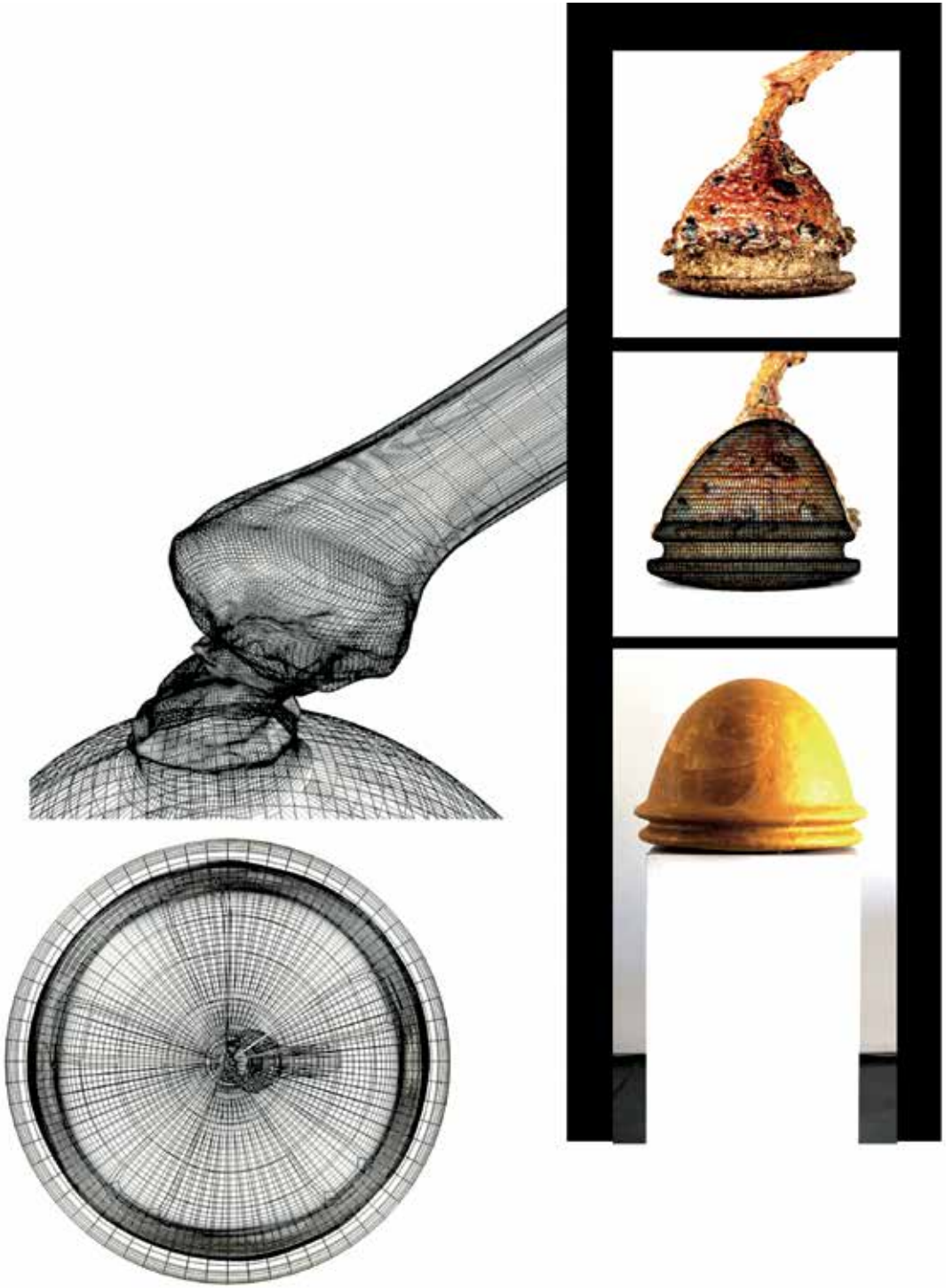
OBSERVER_2.1 (2011)



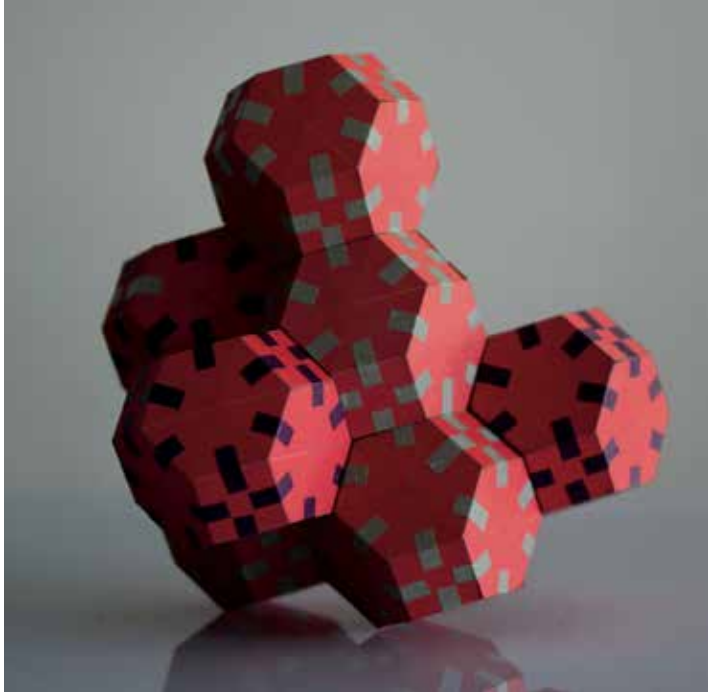


VEGETAL OBJECT (2016)

FORM STUDY (eucalyptus seedpod) (2013)

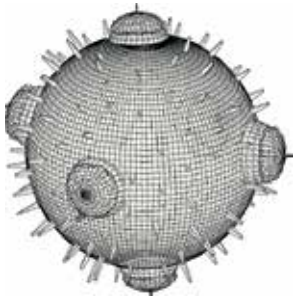


EUCALYPTUS SEEDPOD, form study with Golden Beehive (2013)

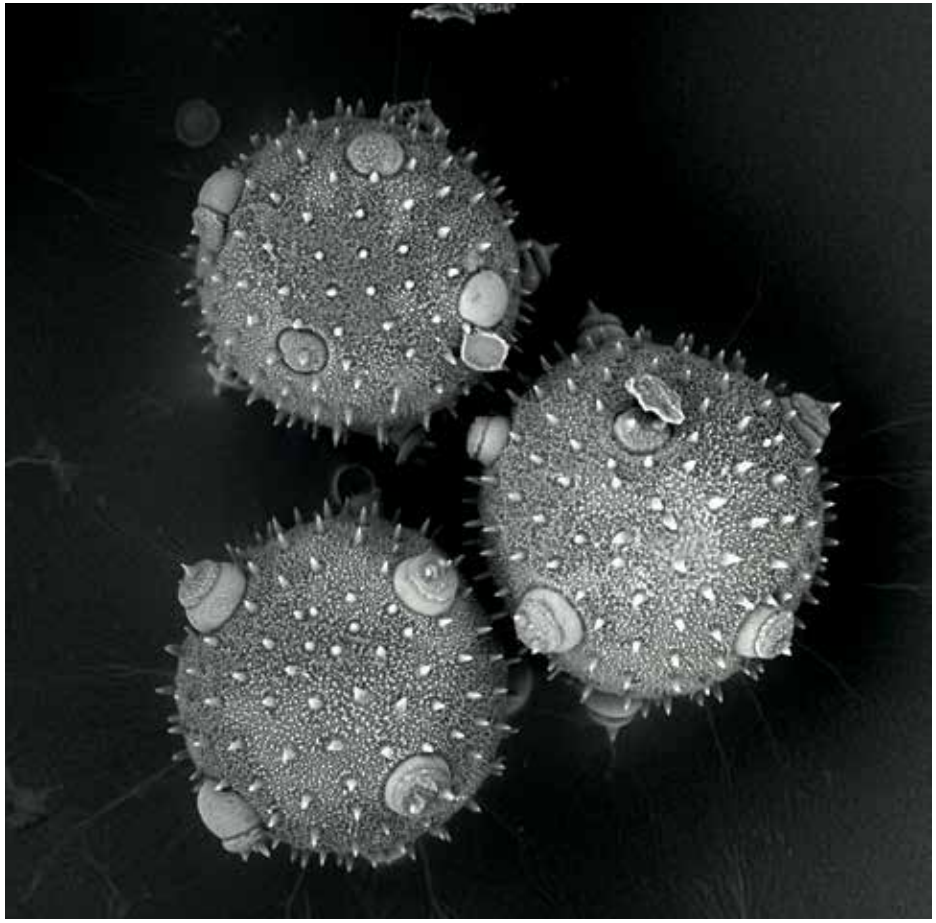


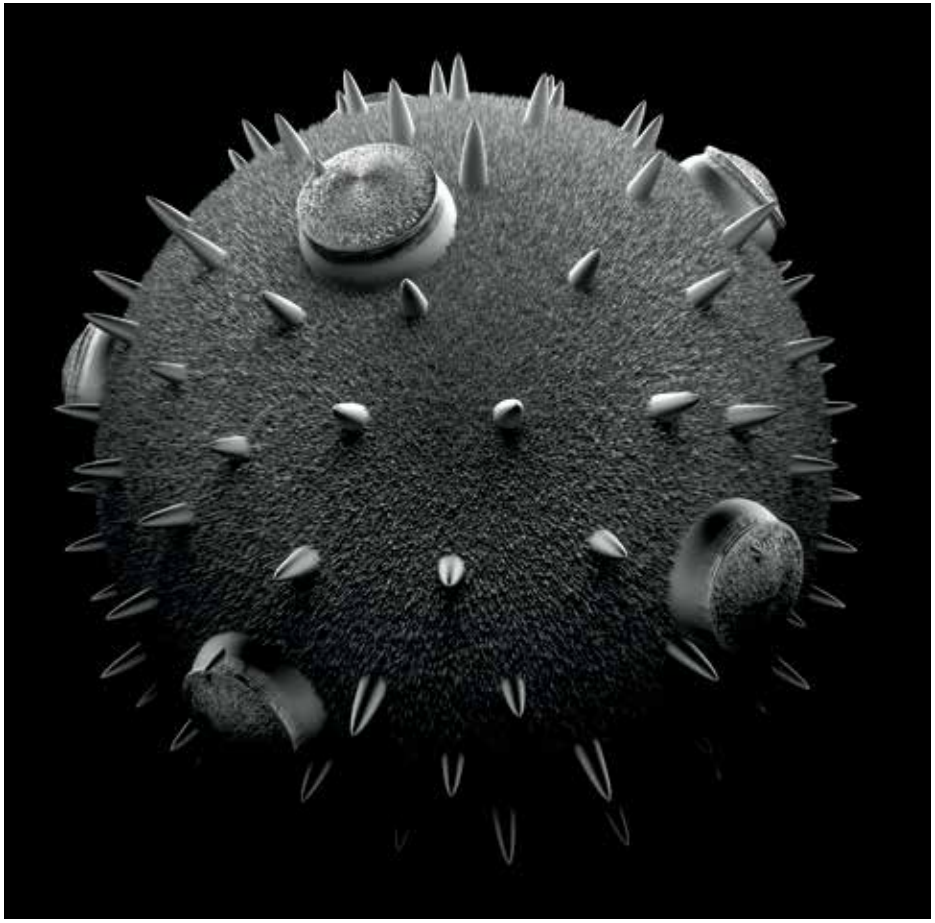
WHITE EUCALYPTUS SEEDPOD (2014)

FORM STUDY (cells) (2013



FORM STUDY (courgette pollen, black and white) (2014)



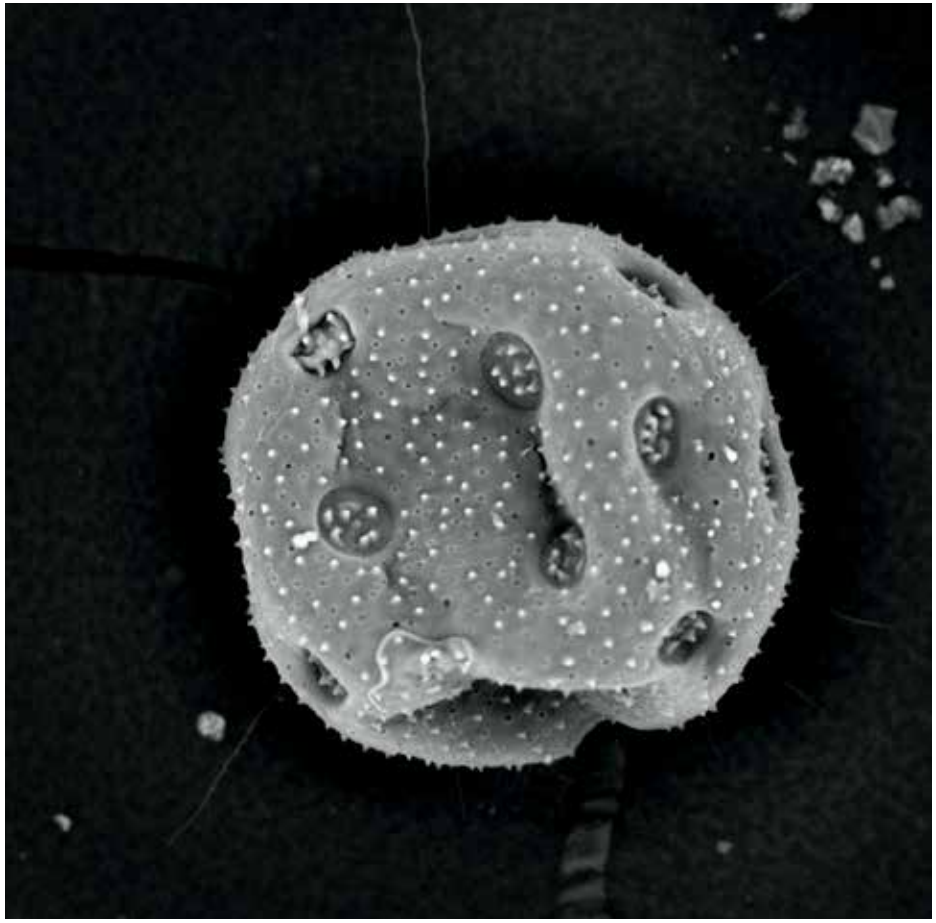


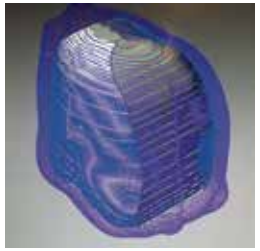
3 COURGETTE POLLEN (2013)

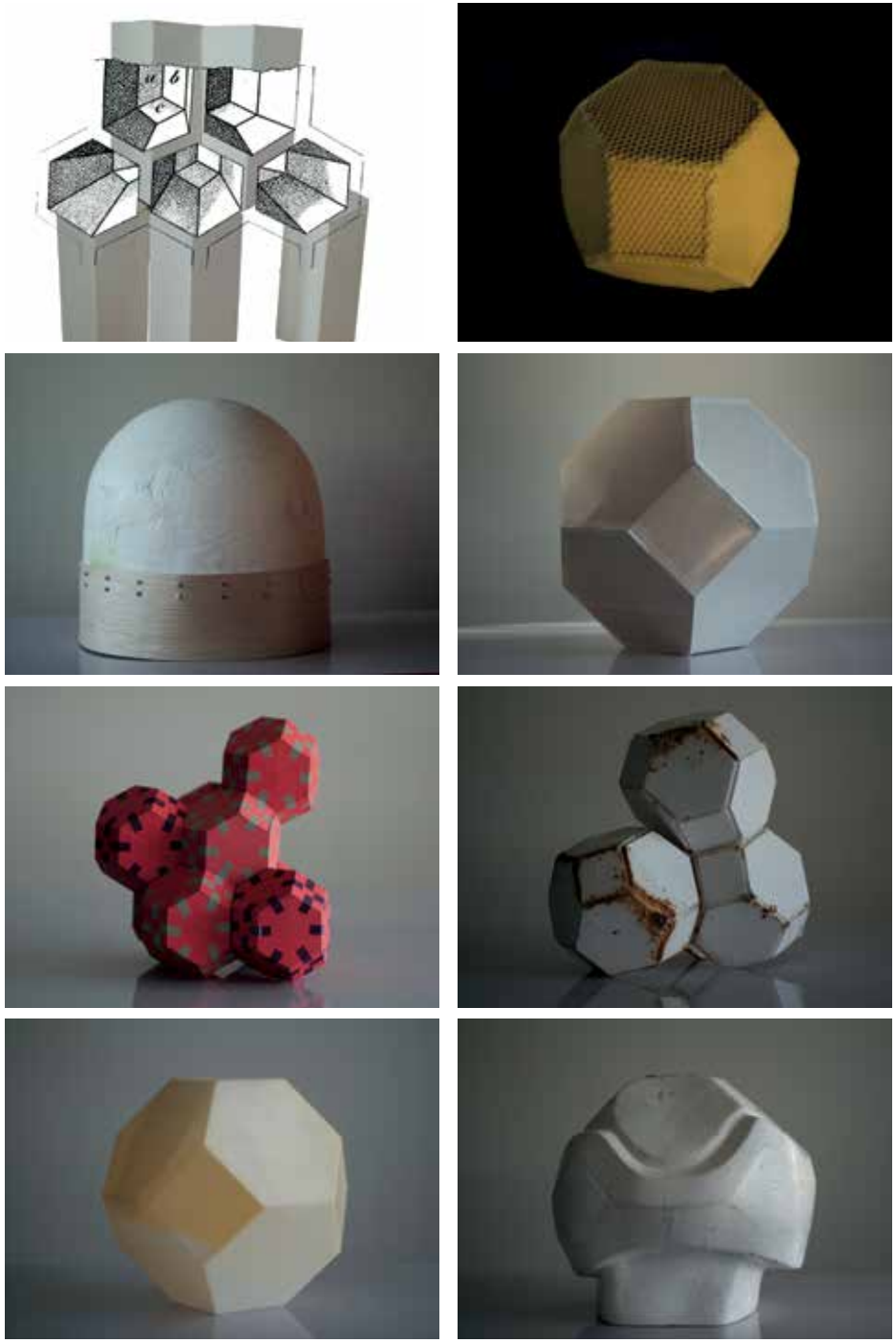
3D OBJECT (2015)

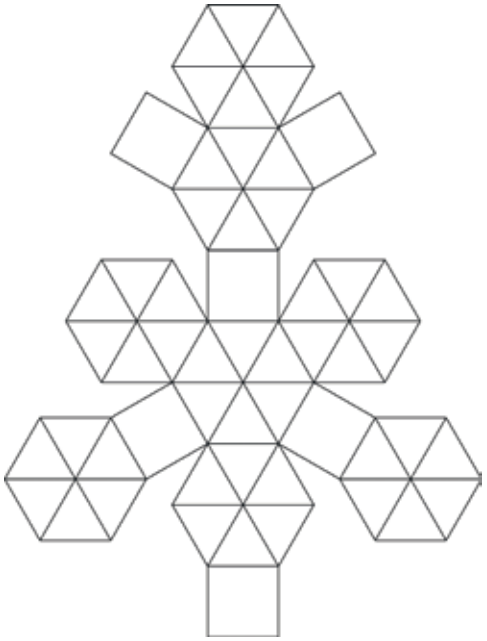
BRAIN (folk version) (2016)

BROKEN SHELL (2016)









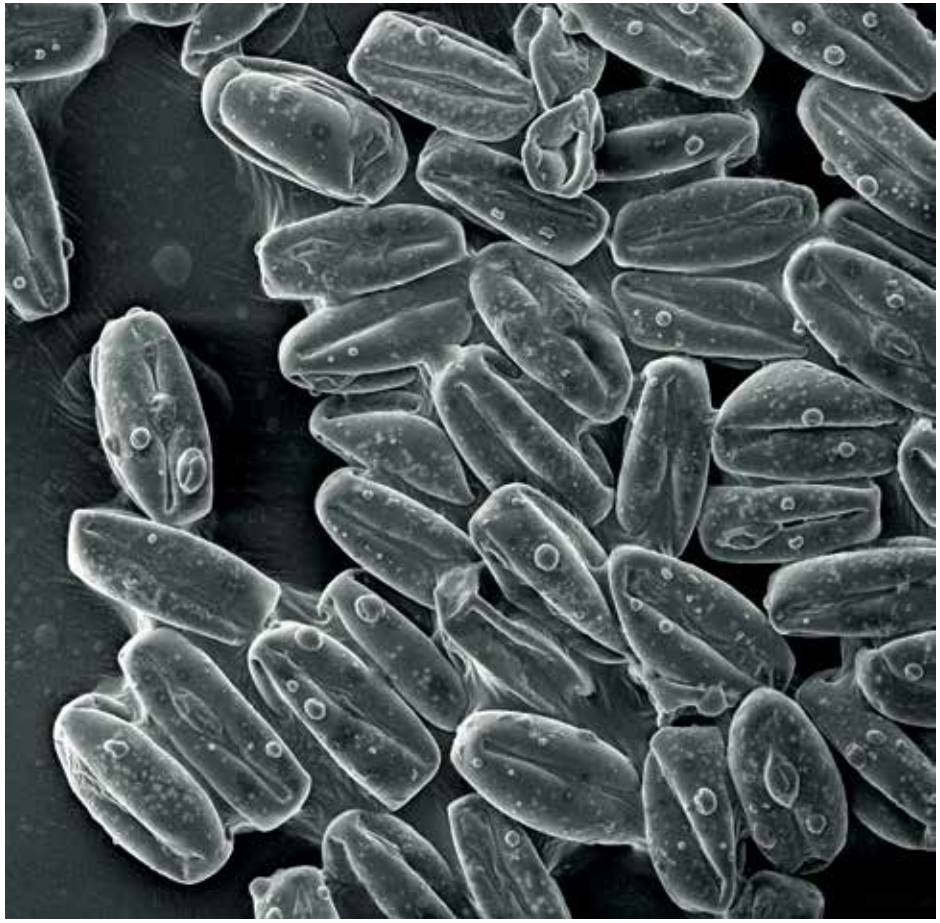
COCHINEAL (Dactylopius coccus) (2015)

TESSUTI (2016)

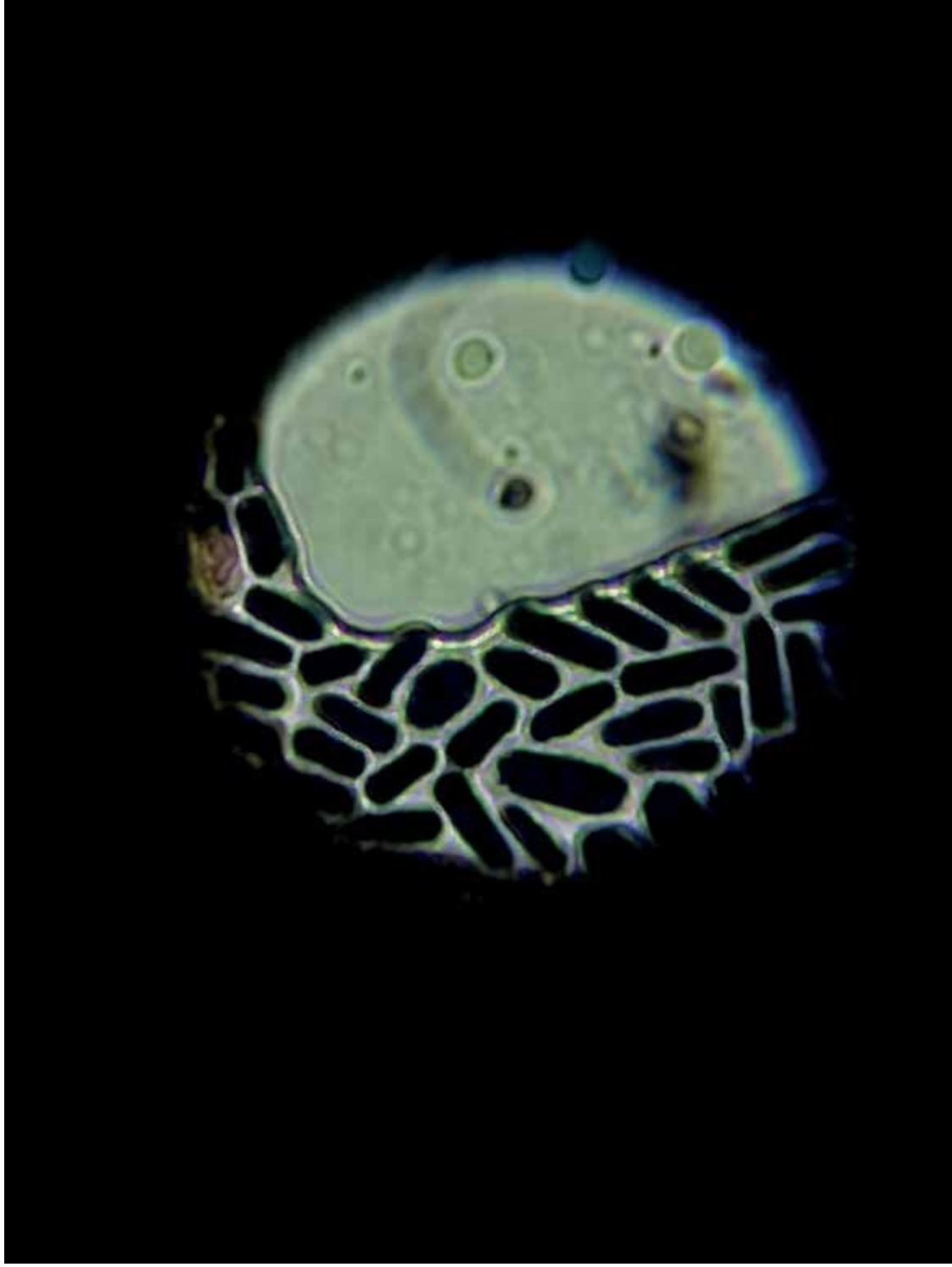
COCHINEAL (2015)

ARCHIMEDEAN SOLID (deconstructed) (2016)

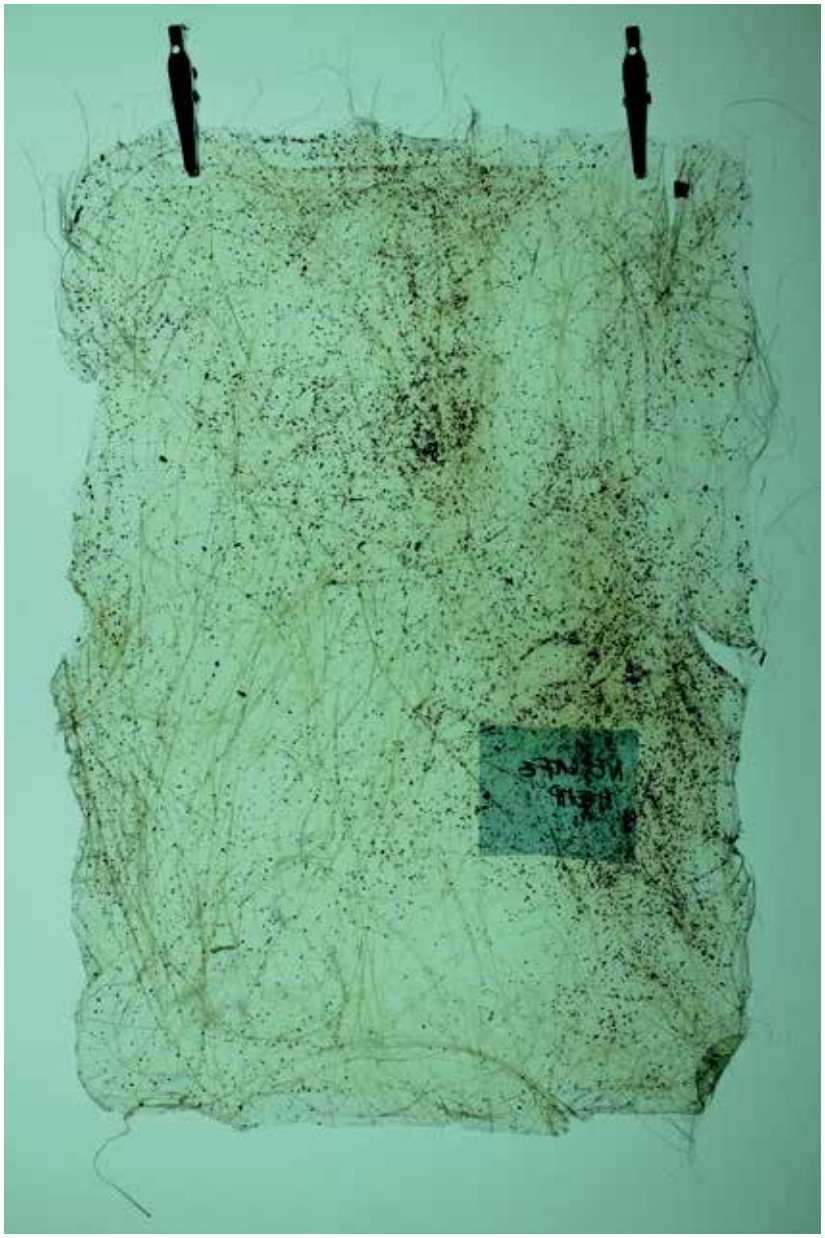
DEFIBRILLATOR FOR DYING HONEYBEES (2016)

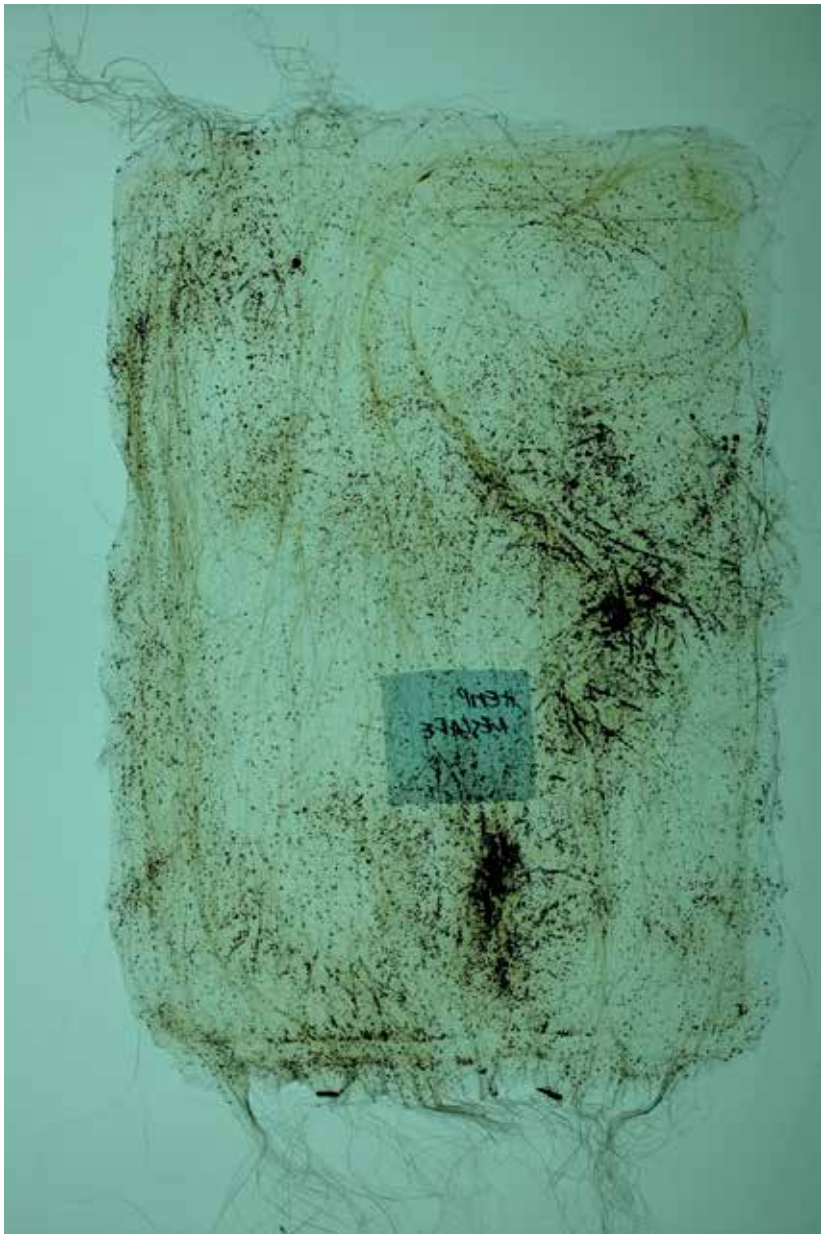


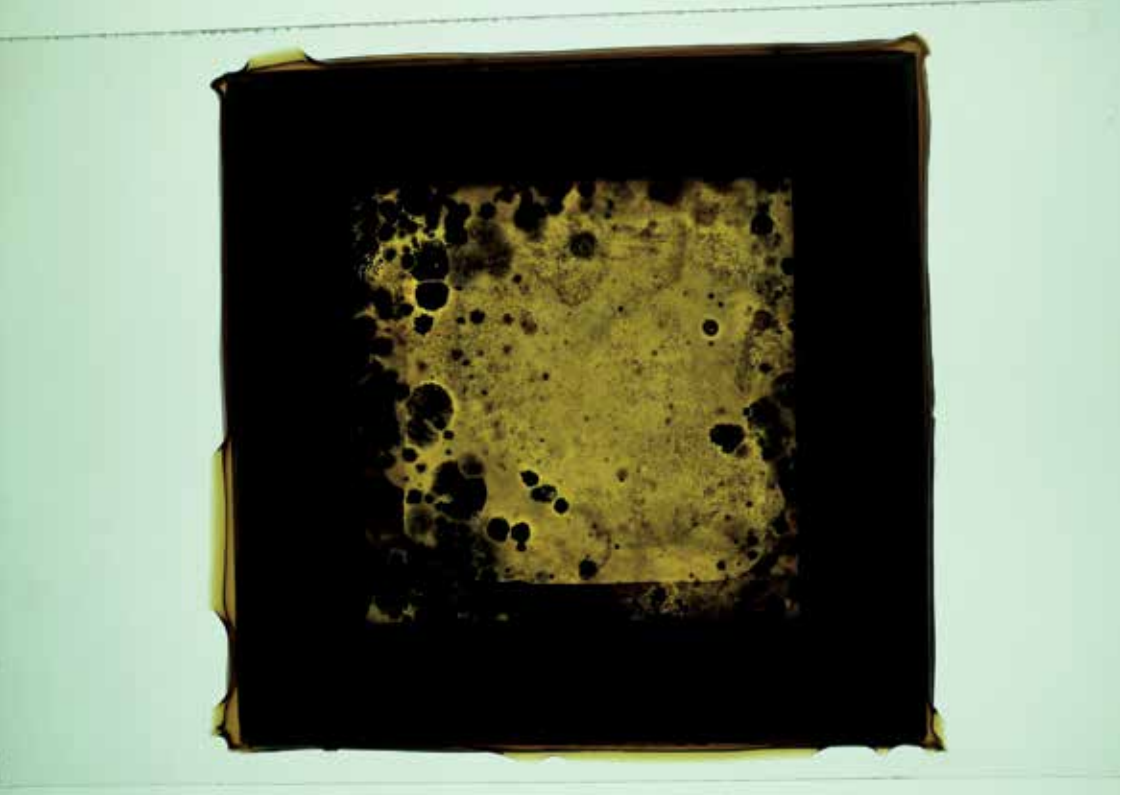
POLLEN KABINET (2014)

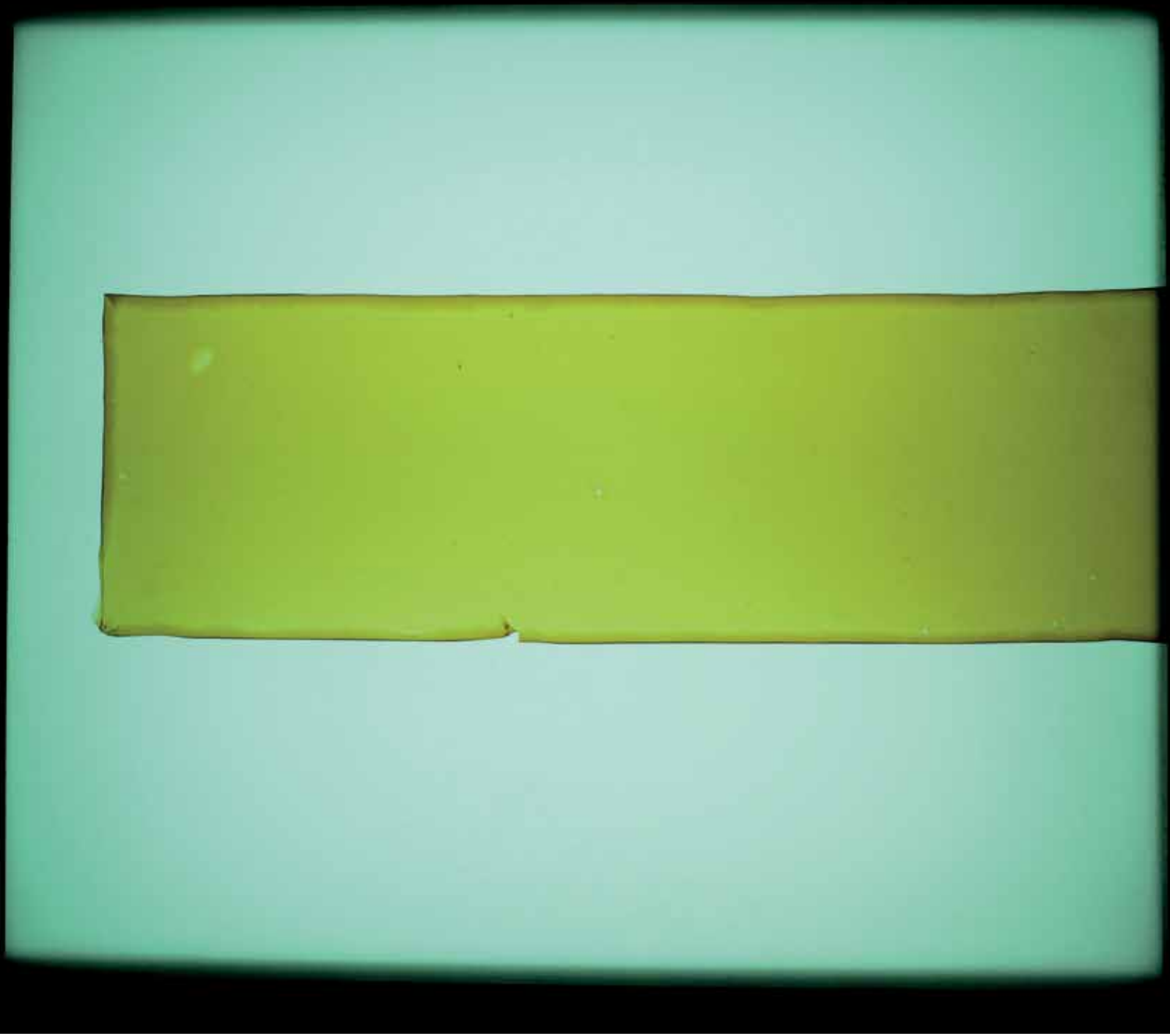


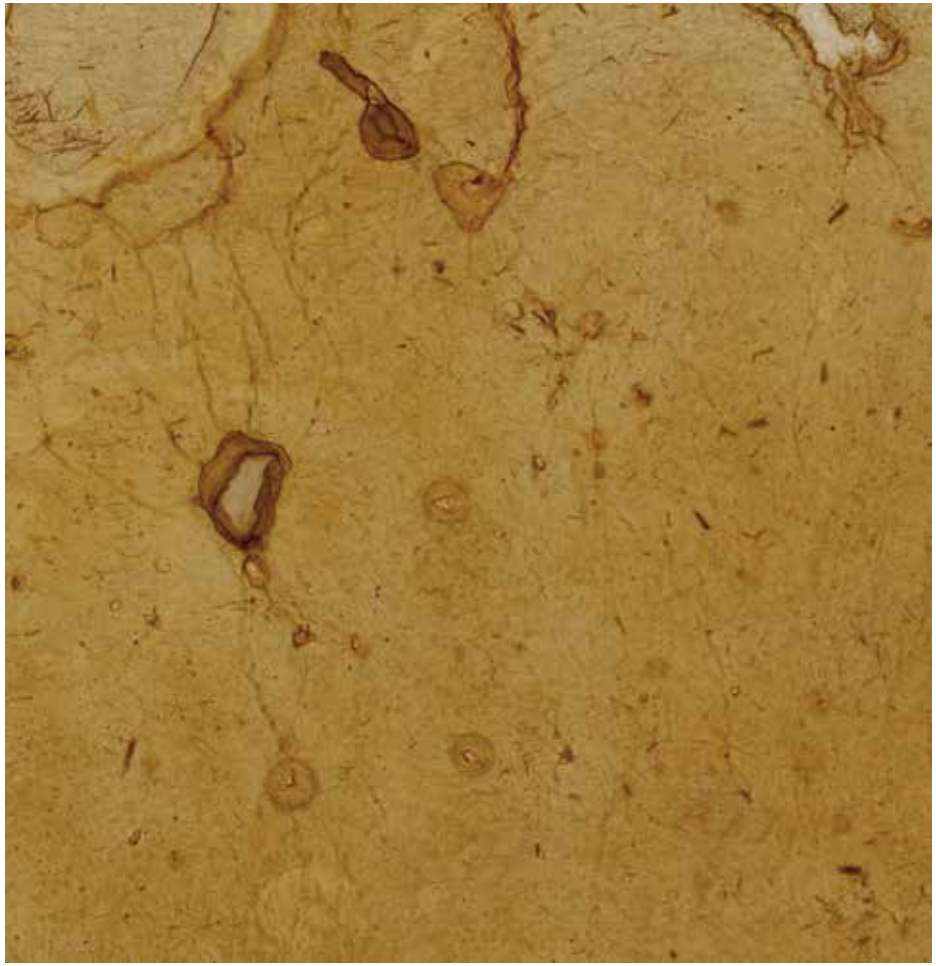
Acetobacter Xylinum Culture (2016)











THE RAW AND THE COOKED (detail) (2016)

BCN161016#3-4-HEMP

Extended Captions

p. 8 / 14 Nouvelles Observations sur les Abeilles, François Huber (1814)

9 Soft Object #3 (2015). Wax and nylon, metal. 40 × 7 × 7 cm

10 Berl020516#1-8-Straw (2016). Detail. Microbial skin, print on Hahnemühle Rag paper. 26 × 26 cm (framed)

11 Orthographic View on a Truncated Octahedron (2015). Computer drawing

13 Disruption (2016). Black and white photograph Scoby-skin under light-microscope, × 400

15 Form Study (hexagons, 2014). Construction in space with hexagons of 10 cm each, cast in different colors of beeswax, and mixed with 3D printed hexagons in polyamide and wood

16-17 Sensory Channel #9 and #11 (2015). Installation view — studio AM Brussels. Wax, felt, rubber. 80 × 40 × 15 cm

— Composition of wax blocks on wooden pedestal. 35 × 35 × 150 cm

18-19 Leda (2016) installation view at Leda Gallery Brussels. Photographs, sculpture and objects. 250 × 250 × 150 cm

21 Moebius (2015) — the action & the object. 3D printed Moebius strip in transparent resin, filled with hexagonal wax cells by the bees Installation view at the Brussels Urban Bee Laboratory, 2015. Transparent resin, beeswax, rubber. 42 × 42 × 30 cm

22-23 Hortus Experimentalis (2009–ongoing). Living Sculpture, Rooftop Garden, Laboratory on the Open Fields. Biotic and abiotic elements (animals, plants, organic material, glass, wood). Installation view Brussels, headquarters of the Urban Bee Laboratory. 3000 × 2500 cm

18 The Invisible Garden (simulation, 2014). Photo collage, *Hortus Experimentalis* layered upon a photo of the empty Buda Factory roo research for installation project (2014)

26-27 The Invisible Garden (2014–2015). Soil, plants, electronics, video and sound. 15 × 15 m. The Invisible Garden is a large-size art installation in the exhibition 'the Green Light District: the place of Nature in the city of Men'. The garden is a remake of the Edible Forest Garden, the Open Air Laboratorium created by the artist AnneMarie Maes on her rooftop in the center of Brussels. Early setup, UV light. Left: the vegetable Garden, Top Right: the Medicinal Herb Garden, Below: the Mediterranean Garden,

Not Visible: The Forest Garden. Middle: sensorbox for the tracking of climatological data in the garden. The blackboard is an interface on which the public can leave comments

28-29 The Invisible Garden (Naturalistic Observations and Hidden Memories, 2014–2015). 4 video screens are embedded in the 4 sections of the Invisible Garden, the videos 'the Stone' (9'22''), 'Crawling' (4'11''), 'the Flower' (1'18''), 'Rhizome' (5'02'') are programmed in a loop. Other integrated artworks are the Peephole Beehive (object with video in a loop) and the 8-channel audio installation 'Soundbees Anywhere, Everywhere' (15'09'' running in a loop)

30 Thoughts And Talks (2014–2015) — action. Field research at Urban Bee Lab, Brussels

32-33 Berl020516#1-8-Straw (2016). Microbial Skin, a culture of *Acetobacter xylinum* bateries and yeast cells. 30 × 20 × 0,3 cm

34 Yellow Rectangle (2014) Plexiglass, Pollen 15 × 15 × 25 cm

35 Microbial Topography (2016). Microbial Skin, a culture of Acetobacter xylinum bateries and yeast cells. 30 × 15 × 7 cm

36 Flightlines (2014) — video stills. An analysis and visualization of bee behaviour, processing the data collected during long term observation inside the beehive with infrared cameras. Documentation of the Bee Laboratory project (2010–2015)

37 Connected Open Greens (2010–2014) — database An 'Open Green' is a 'constructed' green environment, a hybrid of nature and culture. Its harvest consists of sensor data forthcoming from the long term observations of biotic and abiotic elements. The data is stored in the Open Greens Database; this repository also collects information on the contributing gardens in fieldnotes, images, videos. It is a source for the economical, political, social and ecological study of the OPEN GREENS and URBAN CORRIDORS project

38 The Sound Beehive (2014–2015) — installation view Urban Bee Lab Brussels. The Sound Beehive Experiment monitors the development of a bee colony on the basis of the sounds it generates. It is part of a series of ecological instrumented beehives leading towards a fully biocompatible intelligent beehive. These beehives allow me to study the tight interaction between city honeybees and urban ecosystems, using artistic research practices and in collaboration with scientists. Wood, electronics, bee colony — dimensions variable. Documentation of the Bee Laboratory project (2010–2015)

40 The Variation Game (2014) — video stills. High definition observation movie, filmed with an infrared camera inside the beehive. Documentation of the Bee Laboratory project (2010–2015)

41 Bee Graph Generator (2015). Prototype, Proof of Concept. Sculpture/device, metal, PVC tubes, electronics, stepper motors. The goal is to generate instant- print visualizations of the data collected with the observation beehive setup

42 Updating The Score (2011) — timeline, videostill. 365 days of infrared camera observation in the beehive. The still is a 'slitscan' visualization of the total length of the movie (11h 35') with Pandora.okno.be, an open source video database

43 Illustriertes Lehrbuch der Bienenzucht. J.G. Beklers (1934)

44-45 Collective Stratiegies #1 and #2 (2014). Mobile Guerilla Beehives, Wood, metal and rubber, plaster and cocos fibers, 150 × 50 × 40 cm. Installation view (detail) at the Latvian National Art museum, Fields exhibition (RIXC)

46 Language (in–out, 2015) — sketch on paper (after Marey) Visualization of notes collected during long term observation of a bee colony. Documentation of the Bee Laboratory project (2010–2015)

47 Pollen Database (2013–2016). Palynology — the study of pollen grains — reveals useful information on the environment. With the pollen database I compare pollen that I collect on the plants with pollen brought back by bees to the hive. Microscopy photography (SEM) and pattern recognition software are the tools used to collect, compare and exchange information about the ecosystems foraged by the honeybees. 2 media players, brushed metal case, videos. 25 × 15 × 6,5 cm

48 Moving By Numbers_ 20150401201504 09 (2015) — videostill. Visualization of data collected in the beehive. A comparison of 2 days of sensor information, sound recordings and infrared filming, processed with customized software

49 In Search For The Sublime (2015) — object. 3D printed Truncated Octahedron Polyamide, wood and magnifying glass in steel. 28 × 28 cm

50 Glossa (2015). Scanning Electron Photography (SEM). B/W print on Hahnemühle Photo Rag Paper and aluminium. 58 × 72 cm (framed)

51 Stimuli (red debris, 2015). Scanning Electron Photography (SEM). B/W print on Hahnemühle Photo Rag Paper and aluminium. 58 × 72 cm (framed)

52 Shelter (North|South|East|West) (2015). Sculpture, beeswax and plexiglass. 16 × 16 × 25 cm

54 Urbanforaging (2013–2015) — objects. Organic material, petridishes, nylon nets. 87 × 22 × 9 cm

55 Soundbox (2015) — 8-channel audio sculpture. Composition, Raspberry Pi computer, soundcards, amplifiers, speakers, wire. 40 × 32 × 10 cm + extensions (speakers and wires)

56 The Transparent Beehive Cabinets (2013). Collection of objects; documentation of the Bee Laboratory project (2010–2015). Installation view at the Scientific Inquiries exhibition — Koç University Istanbul (2013)

59 Measuring Instruments (2013). Detail. Collection of objects; documentation of the Bee Laboratory project (2010–2015). Installation view at the Scientific Inquiries exhibition — Koç University Istanbul (2013)

60 3D Object (2013). Sculpture constructed by the bees. 32 × 28 × 4 cm. Installation view (detail) at the Scientific Inquiries Exhibition — Koç exhibition Istanbul (2013–2014)

61 Golden Beehive (2013). Sculpture from beeswax. 40 × 40 × 40 cm

62-63 Honey Batteries (2014) — sculpture. Petridishes, electrical wires, led sensors, honey, lemon juice, copper and aluminium sheets, plexiglass. 25 × 15 × 15 cm

64-65 Transparent Beehive (2012–2013) — Living sculpture. Honeybee colony, felt, wood, aluminium, iron and plexiglass. DIY electronics, amplifiers and speakers. 175 × 90 × 70 cm. Installation view at the OKNO's Drying Room, TIK-festival Brussels (2012)

66 Transparent Beehive (2012–2013). Installation view at Bozar Brussels, Belgian Electronic Arts festival (2014). 175 × 90 × 70 cm. (back) Posters Brussels Bee Laboratory, each 86 × 175 cm

67 Francis Huber, Original Leaf Beehive (1789)

68-69 Observation Beehives (2012–2015). Scaffolded Sound Beehive, Sound Beehive, Transparent Beehive, video screens and SEM photo Kabinet. Documentation of the Bee Laboratory project (2010–2015), installation view at the Institute of Evolutionary Biology, Barcelona (2015)

70 Transparent Beehive (2012–2013). Detail. Frames in aluminium casing, pre-amplifiers, audiocable, honeybee colony at the entry of the plexiglass tube

71 Transparent Beehive (2012–2013). Detail. Honeybees in plexiglass tube — the connection between the Transparent Beehive and the Foraging Fileds outside

72 Transparent Beehive (2012–2013) installation view. Beekeeper and Bee colony

109 Bee Monitoring Workshop by AnneMarie Maes, organized by the University of Barcelona in the apiary of Parc de la Ciutadella, Barcelona 2012

110 Observer_3.2 (2015). Video Tower — monitors with B/W observation movies. 160 × 40 × 40 cm

111 Trail Explosion (after image, 2012) — Video.Timelapse image sequences, Infrared Photography. Loop Media player, metal frame. 25 × 15 × 6,5 cm

112-13 The Ambition Of The Territory (2015). B/W video stills from observation movies, infrared photography. Paper propolized by honeybees. 21 × 28 cm

114 Antenna (2013). Scanning Electron Microscopy (SEM), magnification × 590. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

115 Hooks (2015). Scanning Electron Microscopy (SEM), magnification × 500. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

116 Rogelio Polesello — Red, painting (1965). Argentine painter (1939–2014) known for his OP ART paintings

117 Oculum (2015). Apis mellifera Eye. Scanning Electron Microscope (SEM), magnification × 590

118 Cyborgs (2014). Bee Antenna and Bee Leg. Scanning Electron Photographs printed on duratrans. Brushed Steel lightboxes. 26 × 26 × 10 cm

119 Peephole (Dancing bees, 2011–2012). Color video 11h 35', infrared photography. Wooden box with peephole displaying a timelapse movie, 30 × 30 × 30 cm

120-21 Observer_2.1 (2011). Customized computer for 365 days of bee monitoring. Electronics, plexiglass. 50 × 50 × 40 cm

122-23 Black Circle (2016) — object. Vegetal Skin, Psylium ovata and glycerol. Diameter 31 cm

124 Vegetal Object (2016).Vegetal Skin, Psylium ovata and glycerol. 41 × 28 cm

125 Form Study (2013). Computer rendering of eucalyptus seedpod

126-27 Golden Beehive (2013). Preparative study with Eucalyptus seedpods and B/W computer renderings. Sculpture in beeswax. 40 × 40 × 36 cm

128 White Eucalyptus Seedpod (2014) — object. Ceramic 3D print. 15 × 11 cm

129 Form Study (cells, 2013) — object. Paper hexagon construction. 20 × 20 × 15 cm

130-31 Form Study (courgette pollen, black and white, 2014). Computer renderings

132 3 *Cucurbita Pepo* Pollen (2013). Scanning Electron Microscopy (SEM), magnification × 830. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

133 3D Object (after *Cucurbita pepo* pollen, 2015). High definition computer drawing. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

134 Brain (folk version) (2016). Computer drawings, study for Guerilla Beehive

135 Broken Shell (2016). Computer drawings, study for Guerilla Beehive

136 Mentha (pollen grain, 2013). Scanning Electron Microscopy (SEM), magnification × 3400. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

137 Round Object (2016). Object with vegetal skin, diameter 25 cm

138 Wrapping (2016). Laminating the Brain with vegetal skin. Documentation of the Guerilla Beehive project (2015–ongoing)

139 The Brain (2016). Documentation of the Guerilla Beehive project (2015–ongoing)

140-41 Guerilla Beehive (prototype, 2016). Sculpture. Styrofoam, Vegetal Skin, Electronics, Solar Panel, 3D printed bioplastic. 40 × 22 × 22 cm

142-43 Building Blocks (2013–2015). Form studies, model studies in different sizes and a variation of materials

144 Cochineal (*Dactylopius coccus*, 2015)

145 Tessuti (2016) — object. Documentation of the Laboratory for Form and Matter. Woven vegetal material. 30 × 20 cm

146-47 Cochineal (2015). Cacti with Cochineal (*Dactylopius coccus*), La Gomera

148 Archimedean Solid (deconstructed, 2016). Parts of a Truncated Icosahedron in vegetal skin. Documentation of the Laboratory for Form and Matter

149 Defibrillator For Dying Honeybees (2016). Vegetal material, electronics, natural rubber, wooden board. Object, 29 × 18 cm

150 Greenish-Grey P. (2015). Scanning Electron Microscopy (SEM), magnification × 1000. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

151 Red Debris P. (2015). Scanning Electron Microscopy (SEM), magnification × 2000. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

152 Pollen Kabinet (2014). SEM Photographs collected in a wooden Kabinet. 31 × 31 × 40 cm. B/W prints (each photograph 26 × 23 cm) Meranti wood, aluminium

153 *Acetobacter Xylinum* Culture (2016). Light microscope, × 800

154-55 The Emperors' New Clothes (2016). Bioplastics, coffee, caramel. Documentation of the Laboratory for Form and Matter

156 Curcuma Skin (2016) — object. Documentation of the Laboratory for Form and Matter. Microbial Skin, natural dyes. 36 × 30 cm

157 Soft Wet Object (2016). Microbial Skin in plexiglass box, 13 × 13 × 13 cm

158-59 Material Study (2016) — objects. Documentation of the Laboratory for Form and Matter. Fibres, ground coffee. Bioplastics, each 22 × 16 cm

160 Strange Attraction Of Mold (2016) — object. Wooden frame, 20 × 20 cm, bioplastic, coffee, mold. Framed in plexiglass box. 21 × 21 × 4 cm

162-63 Memory Shape (2016) — object. Documentation of the Laboratory for Form and Matter. Bioplastic, coffee, 40 × 12 cm

164 Prime Witness (2016). Documentation of growing processes

165 Scars (2016). Imprint of skins on wood. 21 × 14 cm

166 Bxl300816#2-10-Rasp (2016). Detail. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

167 Berl250316#2-10-Reg (2016). Detail. Print on Hahnemühle Photo Rag Paper. 27 × 27 cm, framed

168 The Raw And The Cooked (2016). Detail. Skins, installation view at Studio AM

169 Bcn161016#3-4-Hemp (2016). Wooden frame with microbial skin, fibres. 29,5 × 33,5 cm

170 The Raw And The Cooked (2016). Skins, installation view at Studio AM

Biographies

AnneMarie Maes is an artist and a researcher. Her work incorporates sculpture, photography, video, installation and public participation. She creates projects that stimulate the development of a more sustainable world. Her research practice combines art and science with a strong interest for DIY technologies. Her installations and long term projects — such as the Bee Laboratory, Urban Corridors or the Invisible Garden — use a range of biological, digital and traditional media, including live organisms. She makes use of technological mediation to search for new forms of communication with the natural world, to make the invisible visible.

Anne Marie Maes is the founding director of the Urban Bee Lab and the co-founder of Okno, and has for decades been a recognized leader pioneering art-science projects in Belgium, using highly original ways to bring out hidden structures in nature by constructing original technological methods to probe the living world and by translating that into artistic creations through large-scale long-term installations, photography, sculptures, workshops and books.

She has a strong international profile, having exhibited at Bozar, Brussels; Koç University Gallery, Istanbul; Borges Center, Buenos Aires; Arsenals Museum, Riga; Skolska Gallery, Prague; The Institute of Evolutionary Biology, Barcelona; The Designmuseum, Mons; Wissenschaftskolleg, Berlin; and others.
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Luc Steels is a computer scientist working in the field of artificial intelligence, specifically on language processing and learning. He is professor and founding director of the VUB Artificial Intelligence Laboratory in Brussels. He is also fellow at the Institute for Advanced Studies (ICREA) in Barcelona, associated with the Institut de Biologia Evolutiva (UPF-CSIC). Steels published a dozen books and hundreds of scientific papers in top level journals (Nature Physics, Phil. Trans. Royal Society, Behavioral and Brain Sciences, Physics of Life, etc.). He is an elected member of the Royal Flemish Academy of Science and the European Academy of Science. Steels has a strong interest in the arts. He has collaborated with artists such as Olafur Eliasson, written essays for art magazines, such as Janus or Kunstforum, and wrote the music for two operas: Casparo (premiered in Barcelona 2011 and then performed in Paris, Tokyo, and Brussels), and Fausto (fragments performed in Paris, 2016).

Armin Medosch has interrogated the intersections of art, society, and science since the mid 1980s. He has been curator of the seminal, international exhibition Telepolis (Luxembourg 1995). He has been founding editor of the award-winning international online magazine Telepolis (1996–2002). His doctoral thesis, based on a case study of the international movement New Tendencies has been rewritten and expanded into book form: New Tendencies — Art at the Threshold of the Information Revolution (1961 1978), June 2016, MIT Press. Medosch's work as an artist, curator and scholar has already had significant impact, through exhibitions such as Waves (Riga; 2006) and Fields (Riga; 2014), and many publications and conferences organised, convened or peer reviewed by him. Recently, he has founded the Technopolitics working group in Vienna. His scholarly work, took him to conferences at Haus der Kunst, Munich (2014), Reina Sofia, Madrid (2016), and Museum of Modern Art, Warsaw (2016).

Edith Doove is a writer and researcher with a background in curating, specifically interested in notions of emergence and contingency, cross and trans-disciplinary collaborations. She started curating in 1987 in Antwerp and worked as a freelance curator and art critic in Belgium until 2010 before moving to Plymouth, UK where she became a part-time PhD-candidate with Transtechnology Research at Plymouth University researching the curatorial as creative act within a trans-disciplinary context.

She curated various exhibitions and projects in non-commercial art spaces, public space, museums and commercial galleries, amongst others as director-curator of MDD — Museum Dhondt-Dhaenens (1999–2004) and curator of the first Triennial for Visual Art, Fashion & Design Super!, Hasselt (2005), deDonderdagen at deSingel, Antwerp (2006–2007), and the art-science project Parallellepipeda at Museum M, Leuven (2010). She's a regular contributor to Leonardo Reviews.

https://edithdoove.wordpress.com/

Darko Fritz is an artist, curator and researcher. Since the late 1980s, his work has revolved around a significant investigation into the use of technology in culture. It bridges the gap between contemporary art, media art and network culture, taking up topics such as the glitch, error, and surveillance. In this context, he has recently been developing horticultural units in public spaces. His curatorial work and research on New Tendencies and early digital art has earned international acclaim with exhibitions at Neue Galerie, Graz (2007), ZKM, Karlsruhe (2009) and Akbank, Istanbul (2014). In 2010 he started the research "The beginning of digital arts in the Netherlands (1955–1980)", with grants awarded by the Mondriaan Fonds. Fritz is founder and curator of the grey) (area — artspace for contemporary and media art (Korcula, Croatia) since 2006.

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