1. TIK IDEAS

1.6. THINKING OF THE GARDEN, AND ITS POSSIBLE REPRESENTATIONS

1.6.1. DEFINITION OF A NON-GARDEN LIKE OPEN GREENS

1.6.1.a. TRAVELLING THROUGH OPENGREENS

TRAVELLING THROUGH OPENGREENS

The Time Inventors' Kabinet connects local OpenGreens in an international network of experimental gardens where artists work with natural processes.
These gardening situations serve especially to look into microsociological and ecological systems related to time as starting points for the development of new artistic practices. The OpenGreens allow us to study the implementation of contemporary art in an ecological context and to observe and draw content from eco-data and natural patterns and processes.
Using media technology and electronics as research tools in these shared laboratories, data from various ecosystems are collected over a period of time. The artistic output of this data collection process will be the creation of electronic interfaces that will then be used to reinterpret the data to explore time-related poetics such as synchronicity and irregularity through electronics, and of developing a common language about time.

The synonyms for an OpenGreen are many: the experimental Hortus, the OpenAir Laboratorium, the Vivarium, the Kabinet of Wonders. But all OpenGreens are zones where culture and nature overlap and where these two enter into a symbiotic relationship with research and experimentation.
In the OpenGreens, the Time Inventors document the beauty of nature in data. They classify and archive their notes and findings in OpenGreens databases. They compare and develop concepts, interpret complex biotic shapes and research repetitive natural patterns. They connect nature with media art.

There are architectural models that are made after biomimesis of e.g. hexagonal honeycomb cells; data are extracted from plant-connected sensors and are converted into algorithms that generate abstract visualizations. Analogue or digital approaches: the Time Inventors make use of a diversity of methods to study the art forms in nature.

But, how can the OpenGreens' evolution be visualized or made audible in artworks? Can the gardens' (a)biotic organisms' processes provide new artistic environments or new forms of representations of 'the artificial/nature'? How can art and technology today present a different view on nature?

During the TIK-time of the project, artists delve into the matter and with the mutual aid of scientists and engineers they open an investigation that may lead into some unexpected artistic results.

The Brussels OpenGreens have a strong urban embedment. In two related urban rooftop gardens artists carry out long-term observations on the growth, blossoming and decay of plants exposed to natural elements such as wind, sun, rain and pollution in an urban context. The close monitoring of social insects, in this case several colonies of city honeybees, is an important part of the study.
These urban OpenGreens are artifiial environments, hybrids of nature and culture. They are set up to research different bottom-up approaches for designing green human environments that have the diversity of natural ecosystems.
The OpenGreens database keeps accurate track of the monitoring of these ecosystems. Technology is inserted in the gardens and allows the gardeners to take a closer look at biotic matter. The harvest is about collecting data of any kind, both on a micro garden level and on a macro city level, and using the data for organic and media applications.

All Time Inventors interested in monitoring their city gardens or urban edgelands and compare their observations are invited to become contributors to the OpenGreens database.
Everybody is free to use the open data format in the OpenGreens database (xml) for their personal artistic projects.

The Greens' Golden Ratio

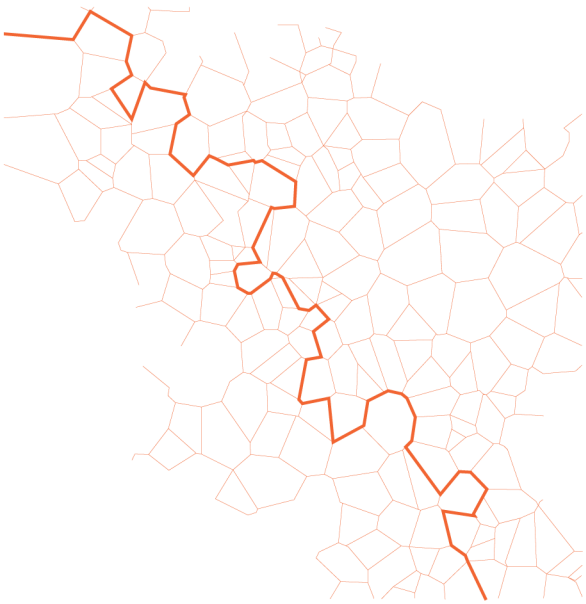
In the past, science tried to capture the understanding of nature in mathematics. Biologists, artists, musicians and architects, philosophers and mathematicians have pondered and debated the ubiquity of the golden section in nature. TIK's Time Inventors and Gardeners extend their study on this preliminary research.

The phyllotaxis, the patterns of leaf growth, of many of the plants point to the so-called Fibonacci sequence. The relation of the numbers in the sequence expresses the Golden Ratio proportions. Several famous botanists studied in depth the importance of this kind of growth and forms in nature.
Another recurrent intriguing shape in the gardens is the Voronoi pattern. Take a close look at the fat leaves of a cactus, the seed head of a sunflower, the hairy leaf of the Salvia Sclarea: one does not need a magnifying glass to discover the semi-mathematical designs that are often sources of inspiration for artistic visualizations. The cells of the honeycomb are also structured along a Voronoi pattern. The only difference is that the honeycomb cells are composed along very regular intervals compared to the cell division in a plant leaf.

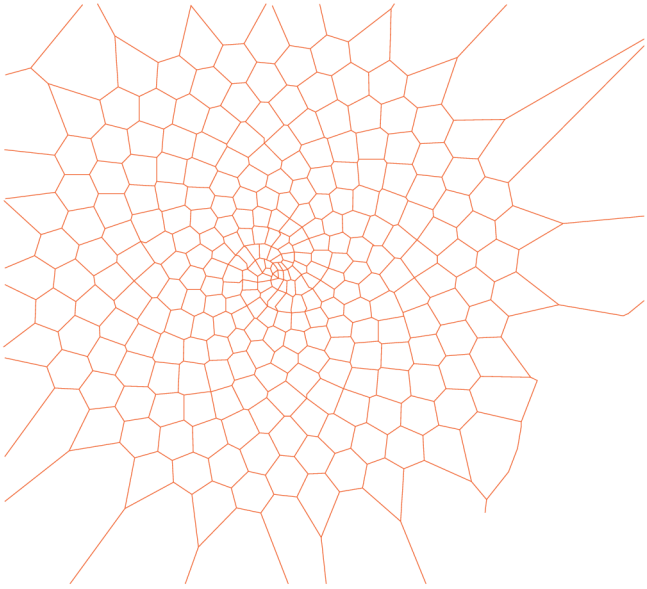
FIBONACCI

We could make use of the data of a Voronoi diagram to render the mobility of plants through the OpenGreens, and even through the city, in an abstract pixellated visualization. How fast do the seedlings move away from the mother plant? How do they spread out in the gardens over time? Which ingenious path do they design?
We started to document the complex travels of e.g. Salvia Pratensis, Agastache Foeniculum and Verbena Officinalis in the OpenGreens database.
The observations of plants in the Brussels rooftop gardens can be compared to observations of plants in gardens with other geographical and ecological conditions, e.g. the Czech countryside or an urban edgeland such as Thurn and Taxis. The concept of the OpenGreens database allows for the immediate comparison between plant behaviour - in this case the spreading or the 'plant travel'- in the different gardens described in the database.
The data gathering from the different gardens and the collaboration between gardeners are crucial to build the database. The virtual cross-fertilization between the gardens in the different geographic regions creates a test bed for the development of artistic conceptions. The OpenGreens database is not a scientific, but an artistic research tool that can possibly and hopefully provide a basis for further creative elaboration.

VORONOI TRAJECTORY



DIGITAL VORONOI



OpenGreen Technology

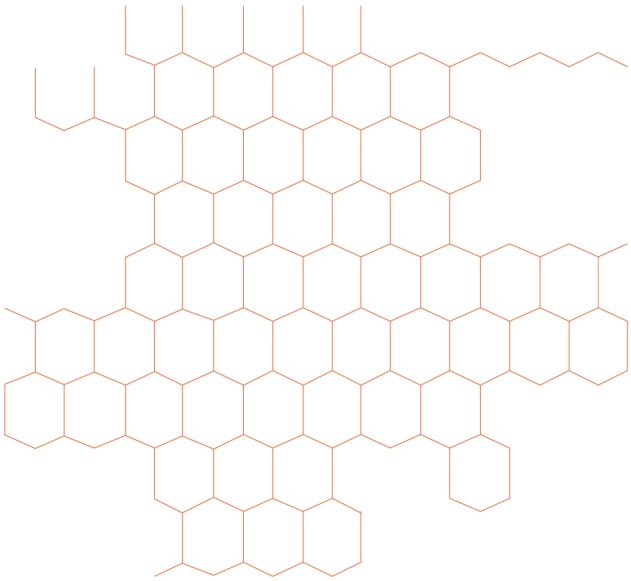
Social insects are a crucial element in the OpenGreens. Study and monitoring of the honeybees allow for experimentation with couplings between nature and technology.

History shows that beekeeping is of all times. Yet in ancient times, the bees were perceived as the female strength of nature. Not only do they produce the golden honey, appreciated for its preservation properties, but they also pollinate the flowers and therefore increase the plentifulness of nature.
In Aphrodite's honeycomb temple at Mount Eryx, the priestesses were the Melissae (the bees) and the goddess was Melissa, the Queen Bee. Aphrodite herself worshipped the bees as her sacred creatures because of their architectural capacities to create perfect hexagons.
For the Pythagoreans the hexagon was an expression of the spirit of Aphrodite, whose sacred number was six. The Pythagoreans, trying to explain the secrets of nature through geometry, made drawings starting from the sixty-degree angles of the hexagon, and extending the sides of the hexagon to the center of the next hexagon cell. This results in an endless triangular grid and it was for the Pythagoreans a revelation of the underlying symmetry of the cosmos.

A series of workshops and expert meetings are set up in the Brussels OpenGreen. These gatherings are a platform for ongoing examination of the distributed intelligence of the SuperOrganism: its behaviour, ecology and sociobiology.
Last spring, the bee colony of the TopBar Hive in Okno's rooftop garden swarmed several times. The second swarm came together under a small garden table, awaiting the finishing of the democratic decision making process of where to settle their new home. We managed to catch them before they took off and gently moved the compact swarm into the brand new observation hive.

The observation hive has windows on four sides and is equipped with different sensors, webcams and contact microphones that allow a close reading of the bees' behaviour inside the hive.
Via the webcams and through the windows the bees can be observed while communicating. On the comb, the bees' dance floor, the forager bees perform waggle dances that give information on new food sources. The comb is constructed as such that the rims of the cells form a mesh network through which low-amplitude vibrations are spread in the complete darkness of the hive. Together with the bees' body language, these vibrations play an important role in the exchange of information.
The monitoring of the bees began from the early building up of their nest. Every movement (for so far as in the field of view of the two webcams) is covered. Temperature, humidity and CO2 data in the hive are logged and linked with a timestamp to the video images, and can also be compared to similar data outside of the hive.
Related to the images, there are also the recordings of the subtle sounds of the bees running over contact microphones. These were attached inside the hive, between the comb, and outside of the hive, under the landing platform. One of the characteristics of the sensitive microphones is that they pick up and amplify all action from the surfaces on which they are attached. The hustle and bustle of the colony is therefore rendered in a performative sonification.

HONEYCOMB



An analysis of the collected facts - many hours of video, audio and sensor-data logs - should provide us with enough information to lead to a synthesis of these data and translate them into artworks that represent the bees' behaviour over time.
Analysis of the bees' biorhythm could be approached as music when visualized as a soundscore. Would it be cyclical? Expressed in waves of action? Swelling, traversing and absorbing time, finally fading away in the heat of the late afternoon light? For instance, meteorological facts influence the bees' behaviour. A windy day makes them nervous, and an upcoming thunderstorm makes their dances even wilder.

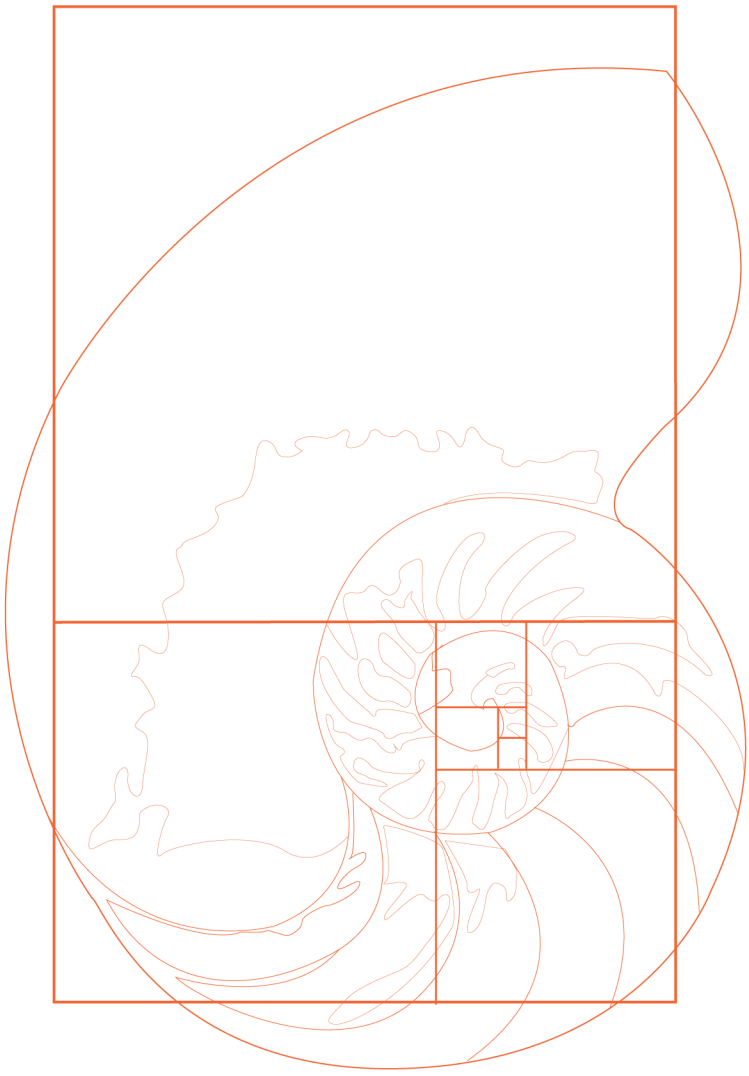
Flight Routes

The foraging areas of the honeybees are a fascinating research topic. Is it possible to reconstruct the bees' flight routes over the city and map out their food sources?
Their fast take-off from the landing platform gives us only a vague indication of the direction. Flying back on cloudy days, the small bodies struggle against headwinds and they persist to reach the hive before the rain bursts through the dark skies. Sometimes the bees just seem to be downy feathers carried by the wind streams.

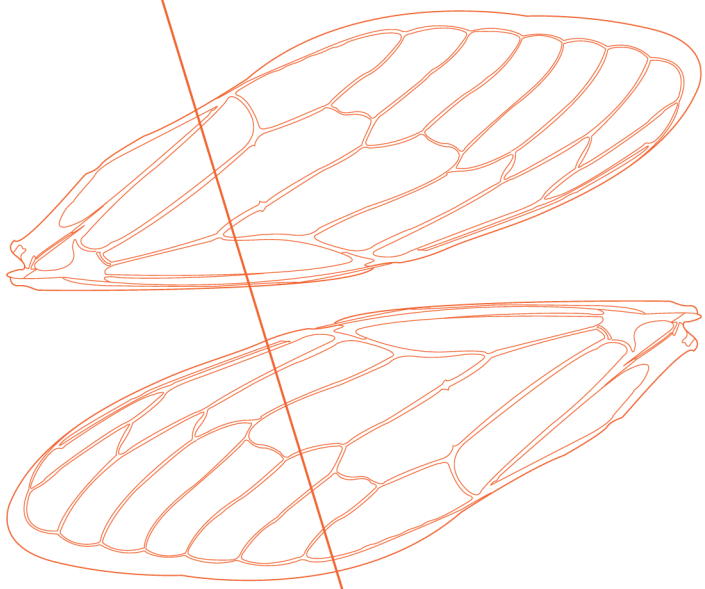
The wings of the honeybee have a very specific design and their flight mechanism is an example of delicate technology. A bee carrying a load of nectar and pollen would require a wing too large to allow it to enter many of the flowers it collects from. Therefore the honeybee is equipped with a double wing. Flying, the two parts hook together with some kind of Velcro-system. And they fold neatly into one wing when reaching the flower to collect the nectar.

A cartography of the city's green zones in a six-kilometre diameter around the hive is delineated. Which honey plants and bee trees grow in the parks and city gardens? Bee-friendly botanical walks are organized through the city center to raise awareness about the plant diversity in our urban ecosystem. Silent sound-walks along city avenues and valuable edgelands offer an unexpected range of wild herbs and flowers. And, if necessary, the city is made greener by acts of guerrilla gardening: vacant lots are bombed with seedballs filled with a flower seed mix for pollinating insects.
The next step in the development of the bee-walks is to create enhanced spectacles, a head-mounted frame with ophthalmic lenses ranging in the bee-spectrum of colors (ultraviolet but no red) so as to discover the biotic components of our cities through the faceted eyes of a honeybee.

The senses of the honeybees also deliver important information to secure other flight routes. The New York Times reports that German airports use Biodetective Honeybees to monitor air quality. The first tests were conducted at Düsseldorf International Airport, and the bees rated well.
A lab tests the bees' honey samples twice a year and looks for compounds like hydrocarbons and heavy metals. Airplane, taxi, bus and car emissions, as well as local industry contribute to poor air quality around airports.
The latest tests showed remarkably interesting results: the airport honey was comparable to honey produced in areas with no industrial activity.



WING PATTERNS



The use of bees are one way to track those toxins because their honey would have clear signs of pollution. If they use nectar from flowers produced by toxin-exposed plants, that would show up in the honey. The project is a simple way for public understanding of the effects of pollution.

Pollution, pesticides, genetically modified crops and monocultures are, in combination with parasites and pathogens, contributing factors to the disappearance of the honeybees. According to Albert Einstein, if all the bees disappeared of the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man.
Fact is that honeybee populations are declining around the world and so far there seems to be only one other way of pollinating mass numbers of plants. It involves employing people to go round with feather dusters, brushing the insides of plants with pollen. They are already doing it in parts of China to pollinate pear trees in areas where the insects are extinct.
However, the scientists of Harvard University are developing the ideal robot honeybee, called the 'robobee'. The researchers state that coordinated agile robotic insects can be used for a variety of purposes, including the autonomous pollination of a field of crops.

A pertinent question in the OpenGreens research is: Can artists make translations between biology, entomology and technology?
Don't expect a balanced answer to this issue. This topic is a source for a long debate, one that has to be conducted collaboratively among the larger group of Time Inventors. Our shared work can become a common investigation into time relations within biological and circumstantial ecologies, through the lens of aesthetics. A preliminary end point could be the process unveilings, talks and artworks at the TIK final presentation in May 2012.

ROBOBEE

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