

Universitas

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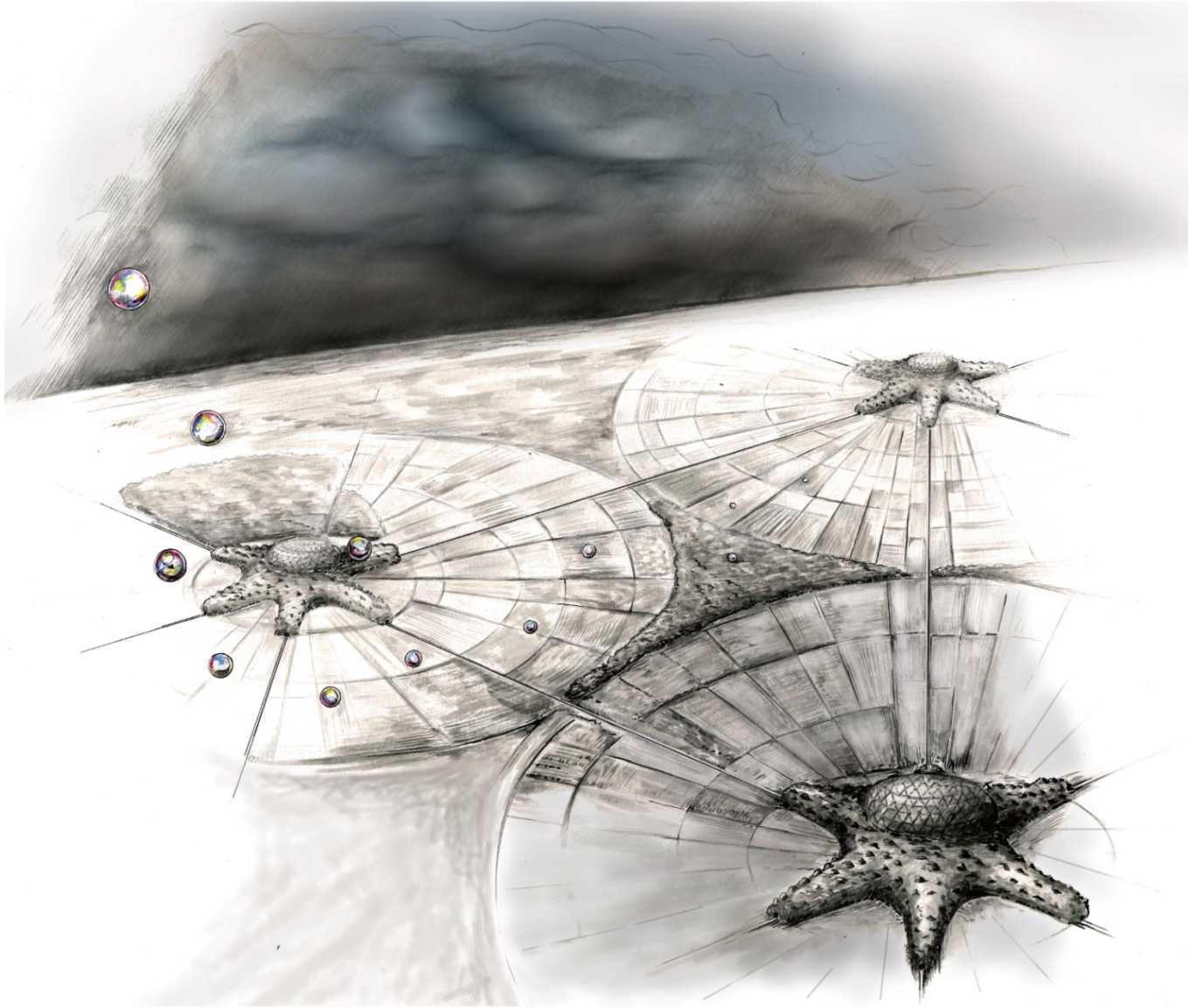
Solarpunk aesthetics

H.Bottlefield

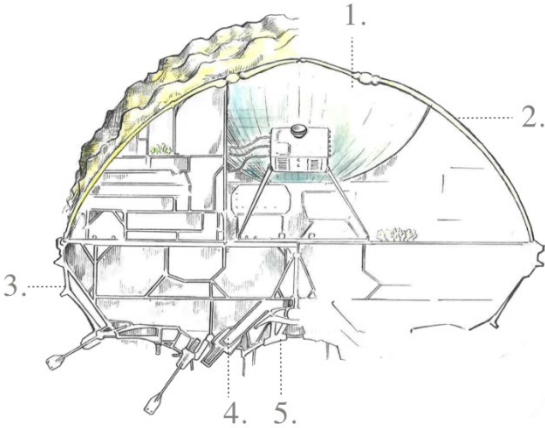
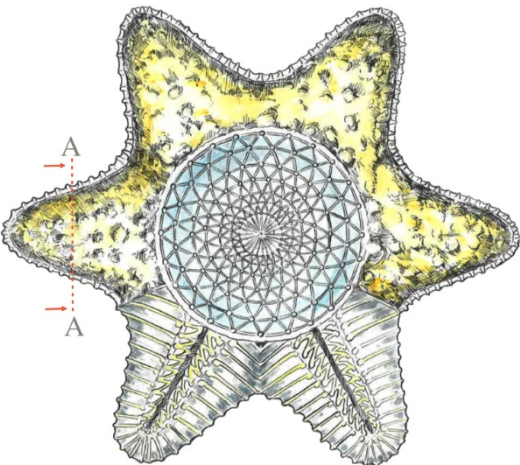
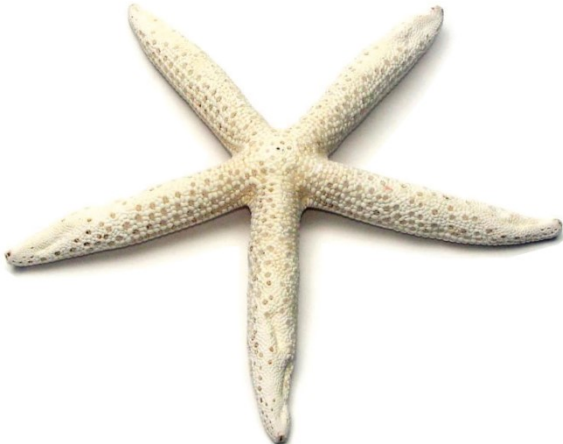
Auteur: Dustin Jacobus
Coverontwerp: Dustin Jacobus
ISBN: 9789464051988
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1 Agricultural community

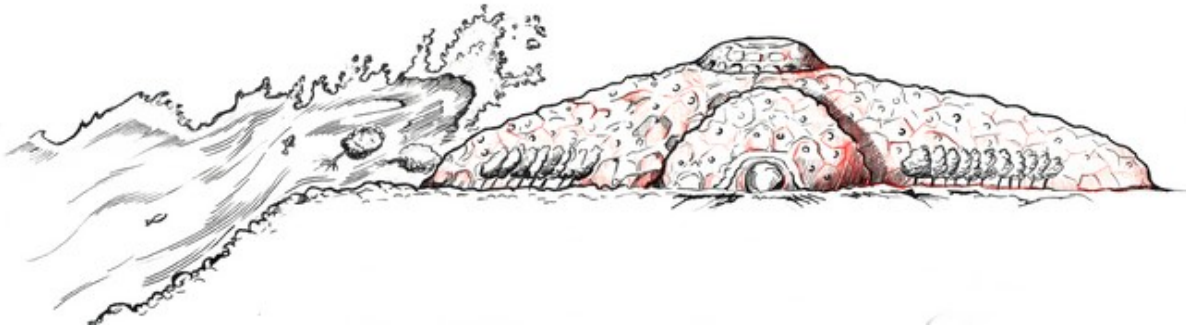
Cities of the agricultural community



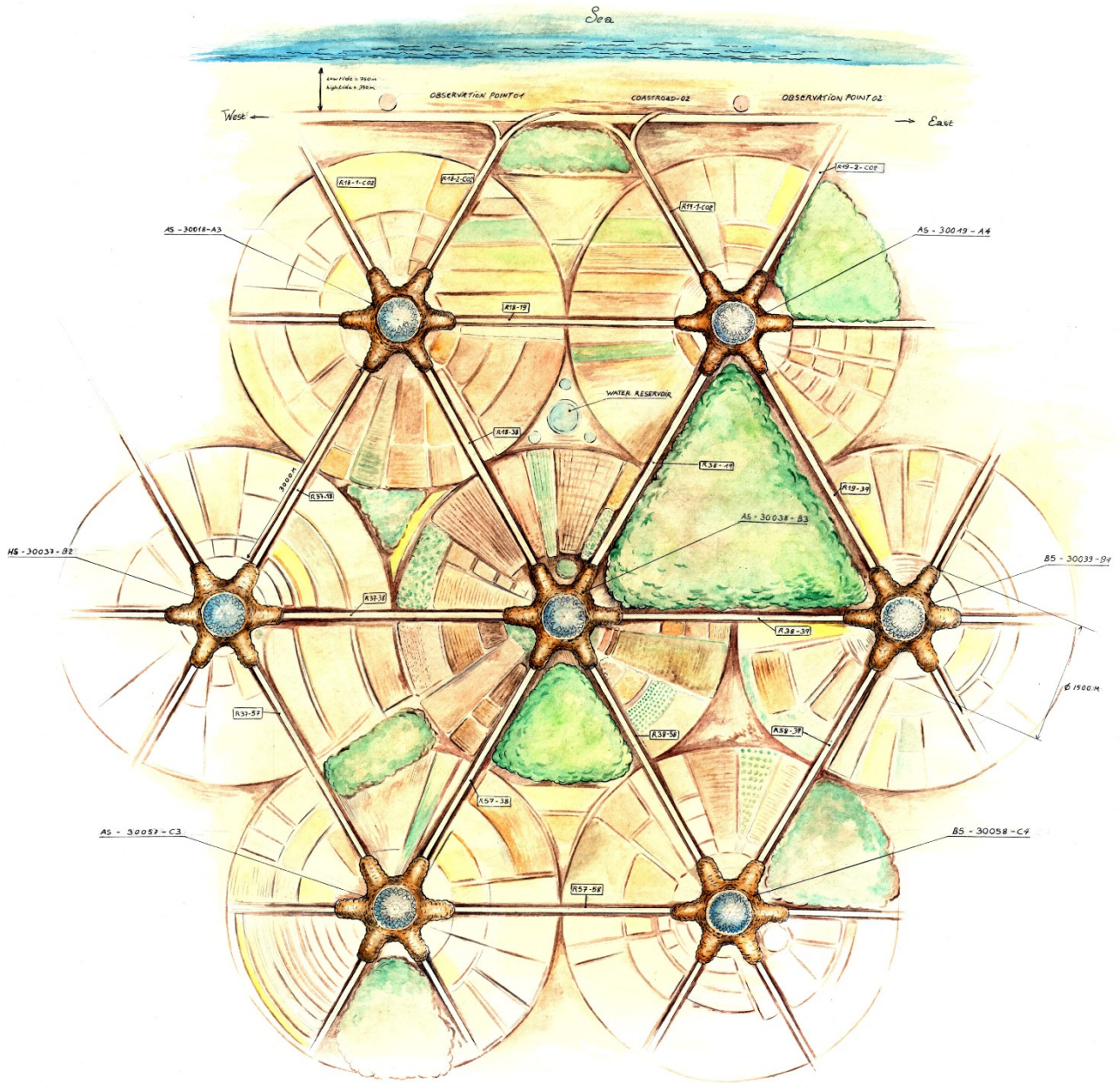
Storm and flood resistant coastal cities:



1. Dorsal plate 2. Supramarginal plate 3. Inframarginal plate 4. Ambulacral plate 5. Adambulacral plate



City plan





Kibbutz Na'an in central Israel, 1938. (Credits Zoltan Kluger/Israel GPO)

The Kibbutz and Moshav

The cooperative Moshav and the Kibbutz settlements were inspired by social-anarchistic ideologies in which the village acted as a small cooperative industrial and agricultural community.



Nahalal , aerial view (credits Zoltan Kruger)

Nahalal

The urban plan resembles city plans from the Kibbutz settlement Nahalal from the German-Jewish architect Richard Kauffmann.

Agro-robotic agriculture

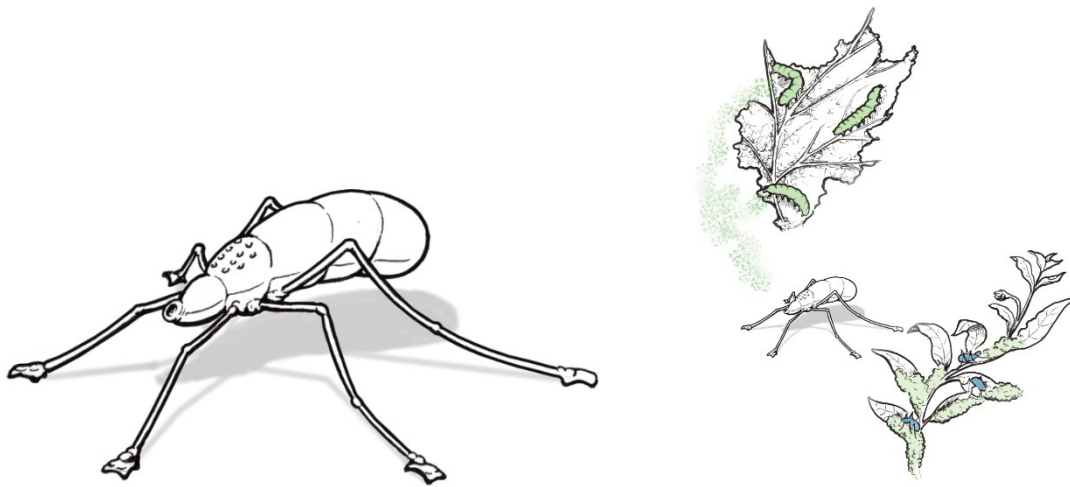


Agro-robotic ecosystems:

A new agricultural approach emerged out of the permaculture ideology. In the newly developed agro-robotic ecosystem, animals and plants live in harmony with agro-robots.

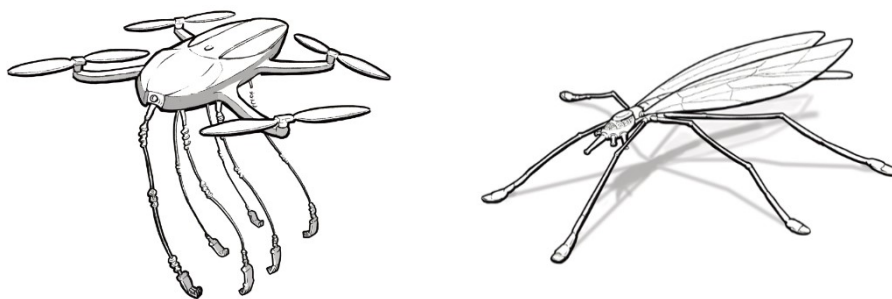
Spittlebug robot:

This small robot is designed to help protect crops against destructive pests. It detects the chemicals that are released when plants are attacked by parasites. They reduce the numbers of parasitic animals in a sustainable way. They produce a biodegradable foam that kills the parasite, but does not harm the plant.

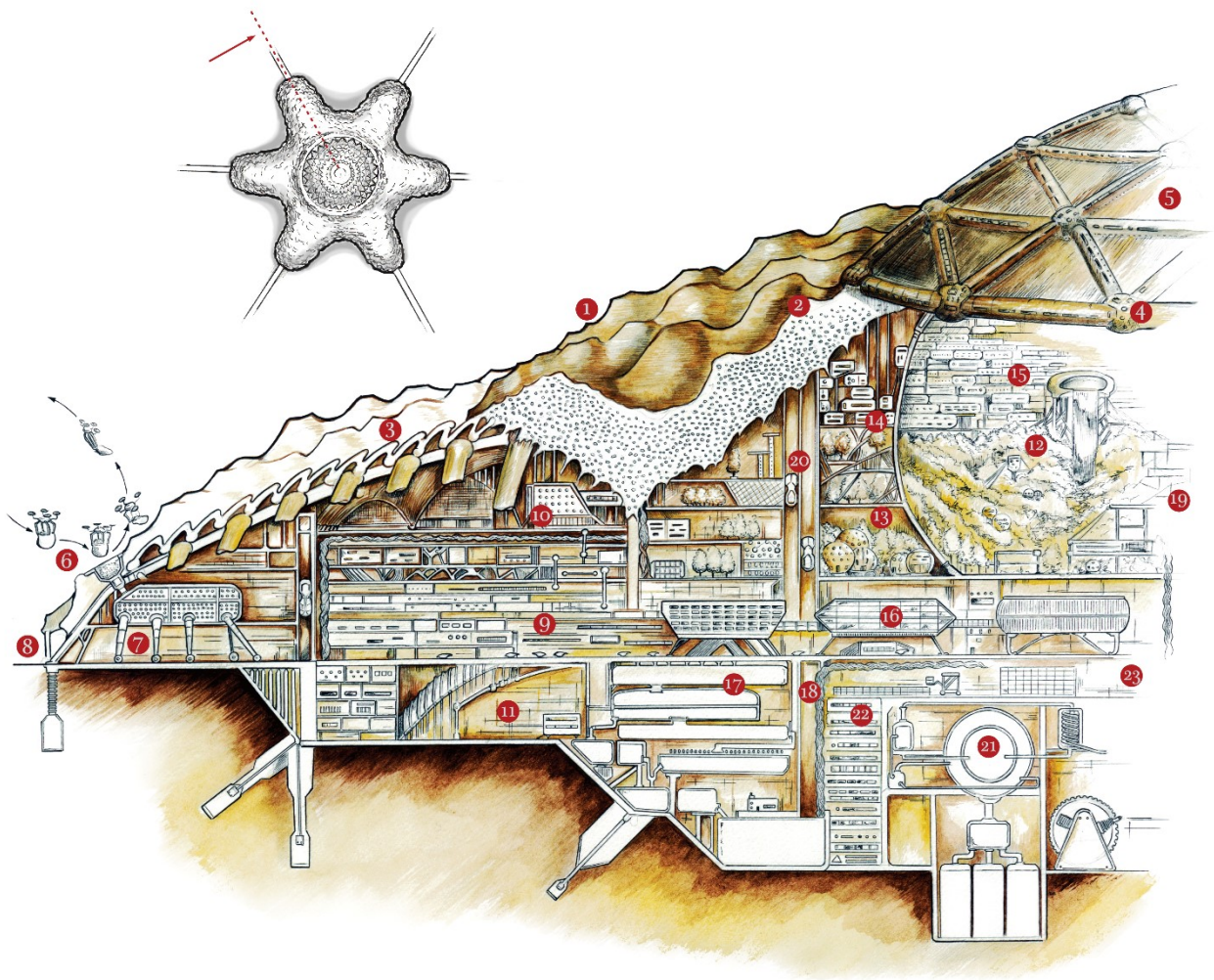


Use of drones and robots

The harvest drones (left) are programmed to pick up and transport the harvested food. The small seed-robot (right) grows seeds internally in its body and plants the seeds in the fertile soil.

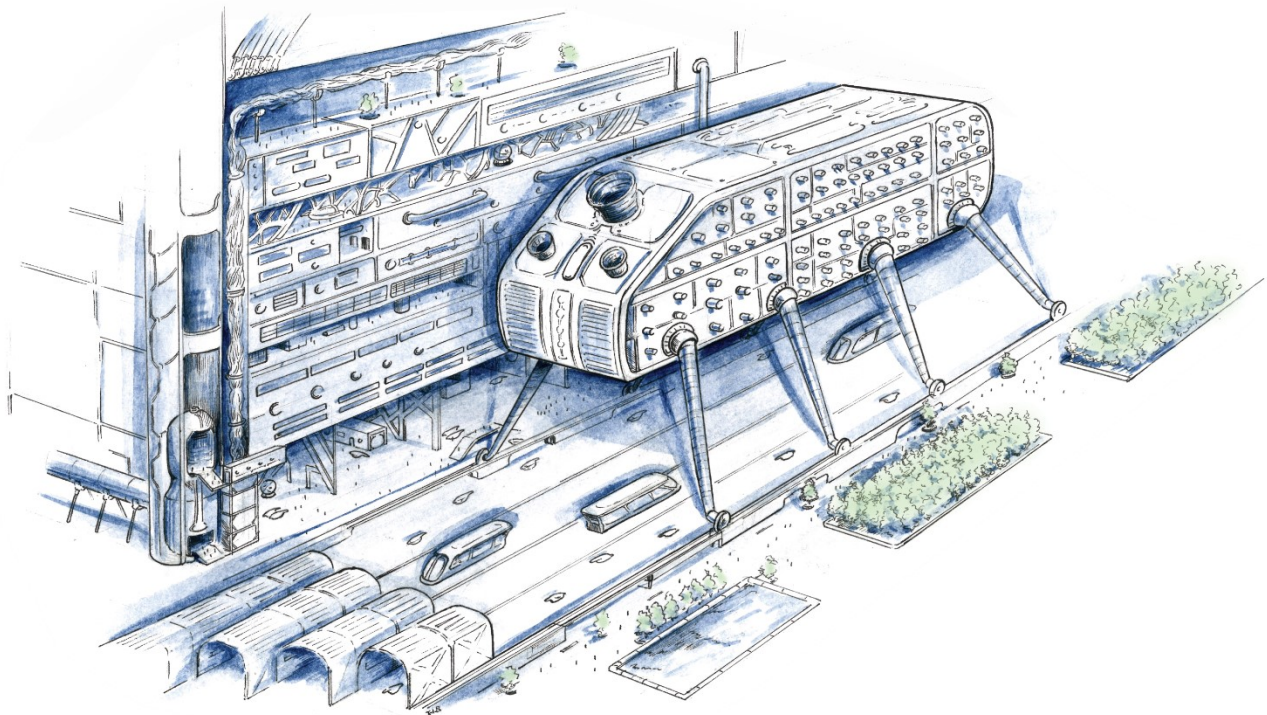


Inside a Starfish building



1. Cellular solid outer layer based on the endoskeleton of Echinoderms like the starfish.
2. The holey structure prevents cracks and fissures.
3. Structural elements of the starfish building made of carbon nanotubes material.
4. Dome structure based on Waterkeyn's Atomium (Brussels) and the Shimizu pyramid city (Tokyo).
5. Transparent roof.
6. Delivery point for the agro-drones.
7. The walking food processing unit.
8. Membrane entrance gate.
9. Export offices.
10. Cultural compartment.
11. Sports compartment.
12. Central Park.
13. Nieuwenhuys art compartment
14. Homo Ludens compartment
15. Residential zone.
16. Central VacTube station.
17. Water production center.
18. Cardiovascular water transport system.
19. Stilt houses.
20. Vertical subway.
21. Molten salt thorium fusion reactor version 3.5.
22. Technical control rooms.
23. Storage area.

The walking "food production" machine

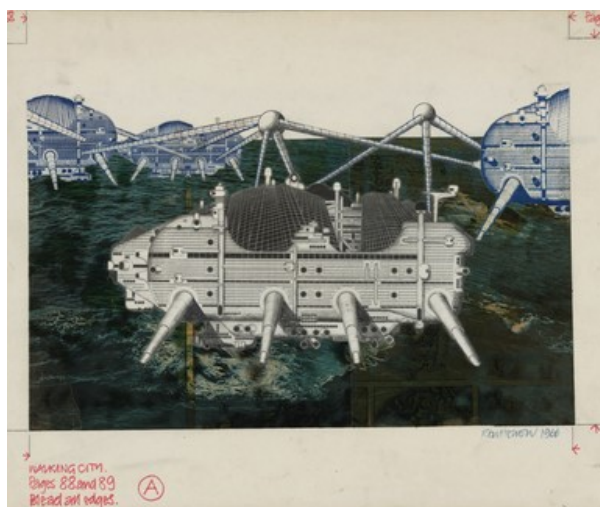
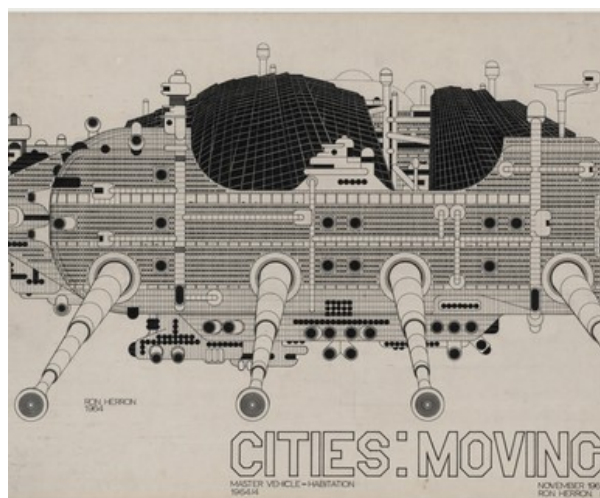


Walking food production machine:

The insect like machines, collect the harvest. Inside the huge machine, ready-to-eat meals are prepared. With its extendible arms the machine distributes the food in the city.

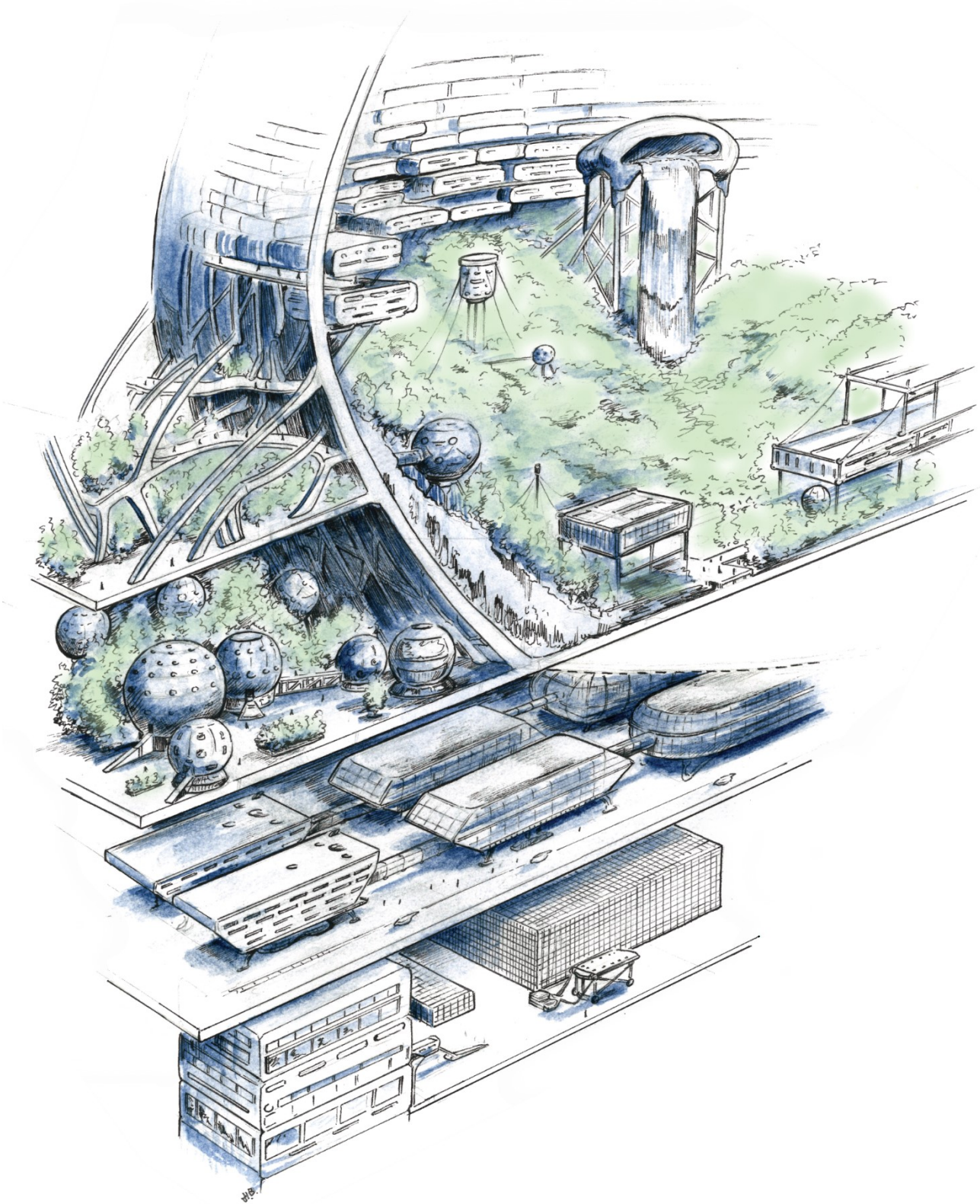
Inspiration "walking city":

This conceptual city designed by Ron Herron emerged out of the idea of indeterminacy. A city as a changing entity that could respond to inhabitants needs.



Credits pictures Ron Herron - Archigram

The central Park and the Nieuwenhuys compartments



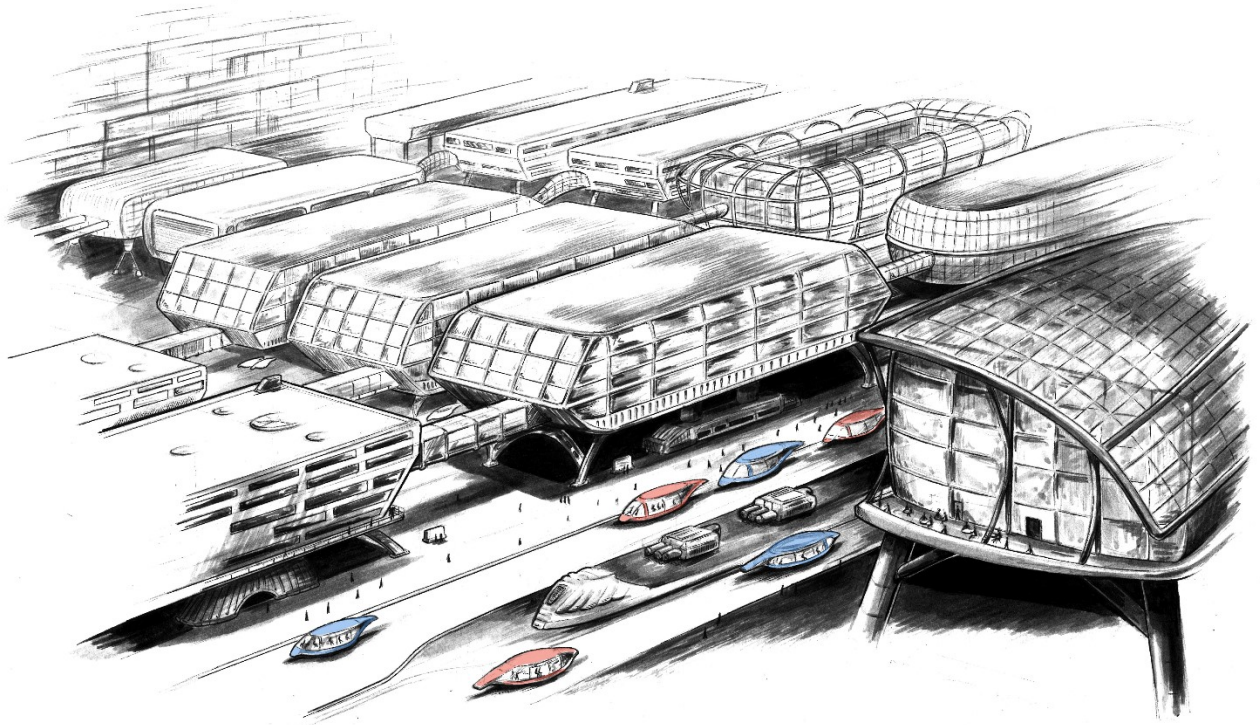
Homo Ludens:

The Nieuwenhuys compartments are created in circular patterns around the central park. The moveable circular volumes, rectangular stacked houses, spatial volumes on pillars and strange organic shapes creates the habitat where the Homo Ludens can live.

Constant Nieuwenhuys:

Constant Nieuwenhuys (1920-2005) was a Dutch visual artist. He was part of the Cobra art movement. He designed the visionary, architectural New Babylon project. A future culture in which the Homo Ludens inhabitants the world. They wander around like urban nomads and live a labor free life. The environment is created by the playfulness and activities of life itself.

The central station



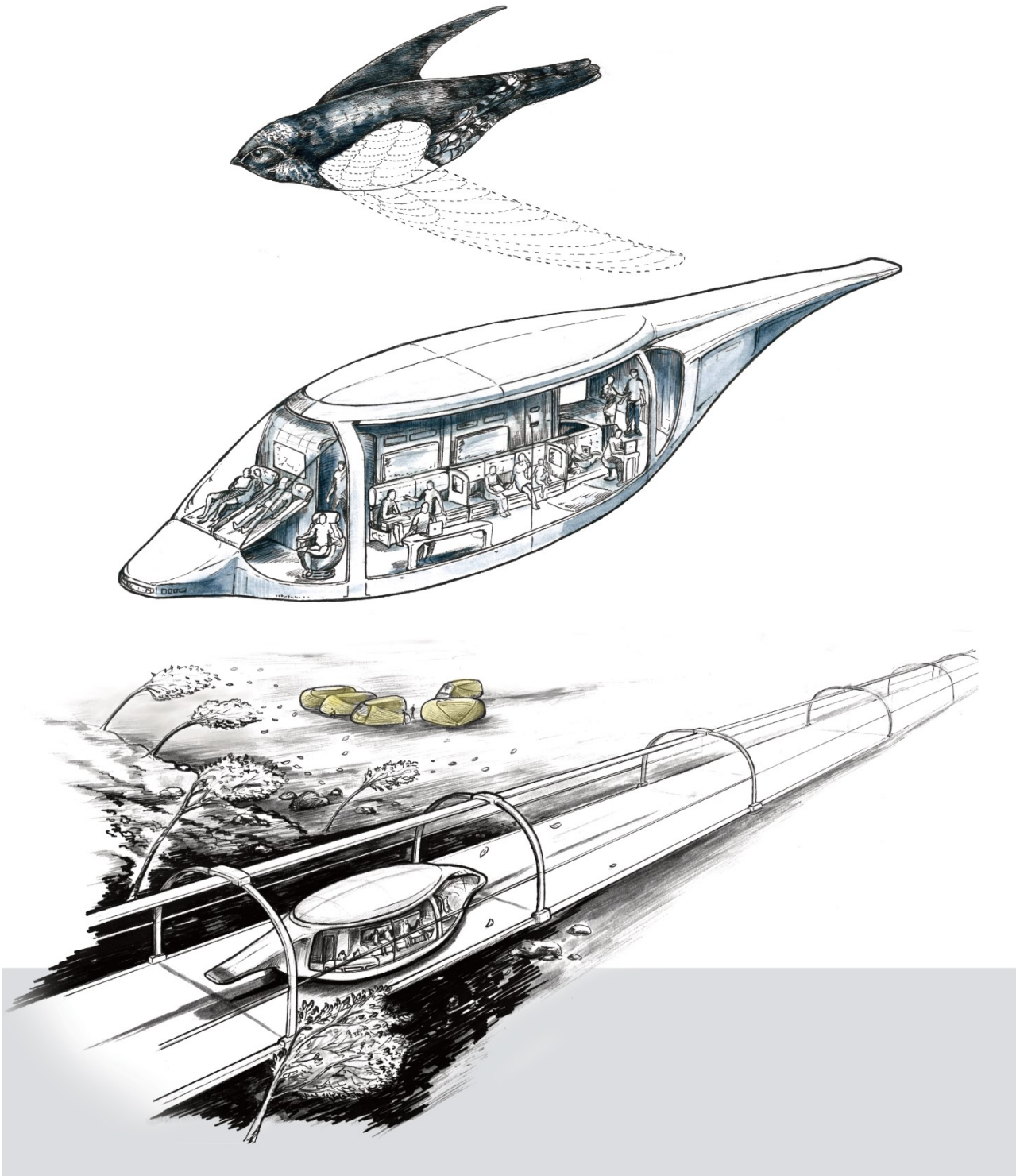
The central station:

The VacTube main station and the architecture are a spectacular homage to the 21th century architecture. The station is an excellent example of post-modern high tech architecture revivalism.

Many of the buildings are designed with a nod to Sir Norman Foster his past century designs.
Pictures found on the Wikimedia foundation site

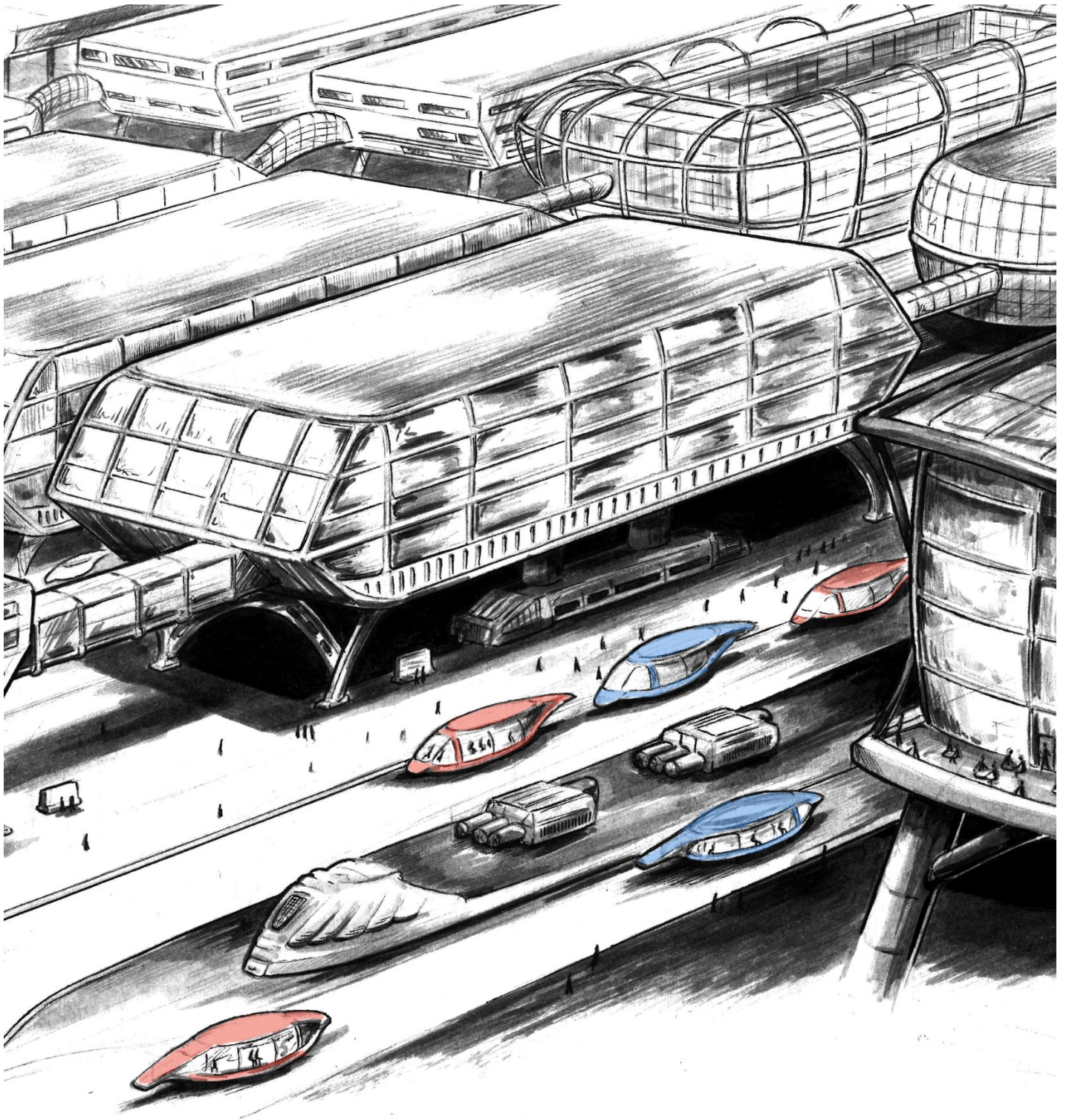


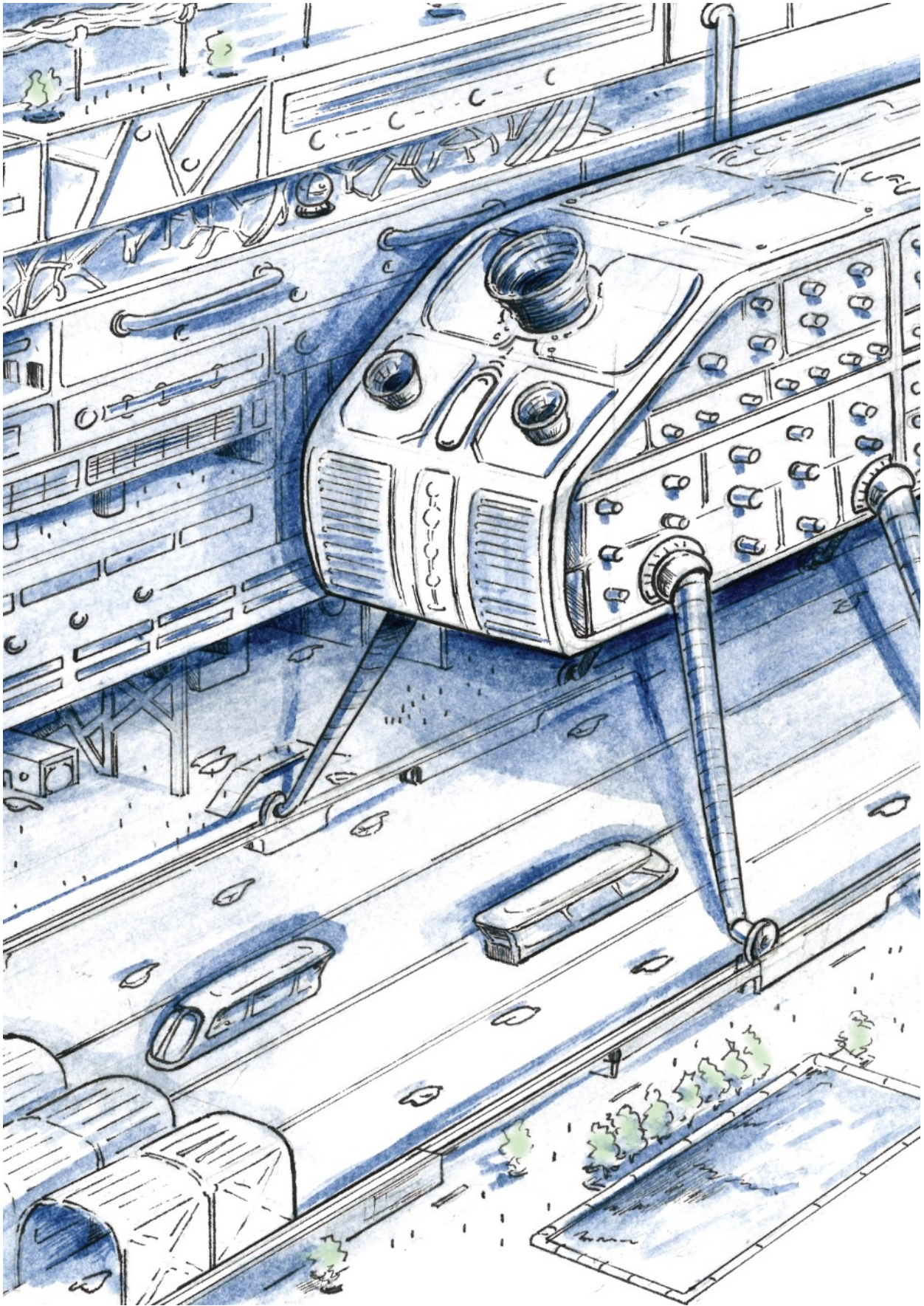
The VacTube and the Swift



VacTube:

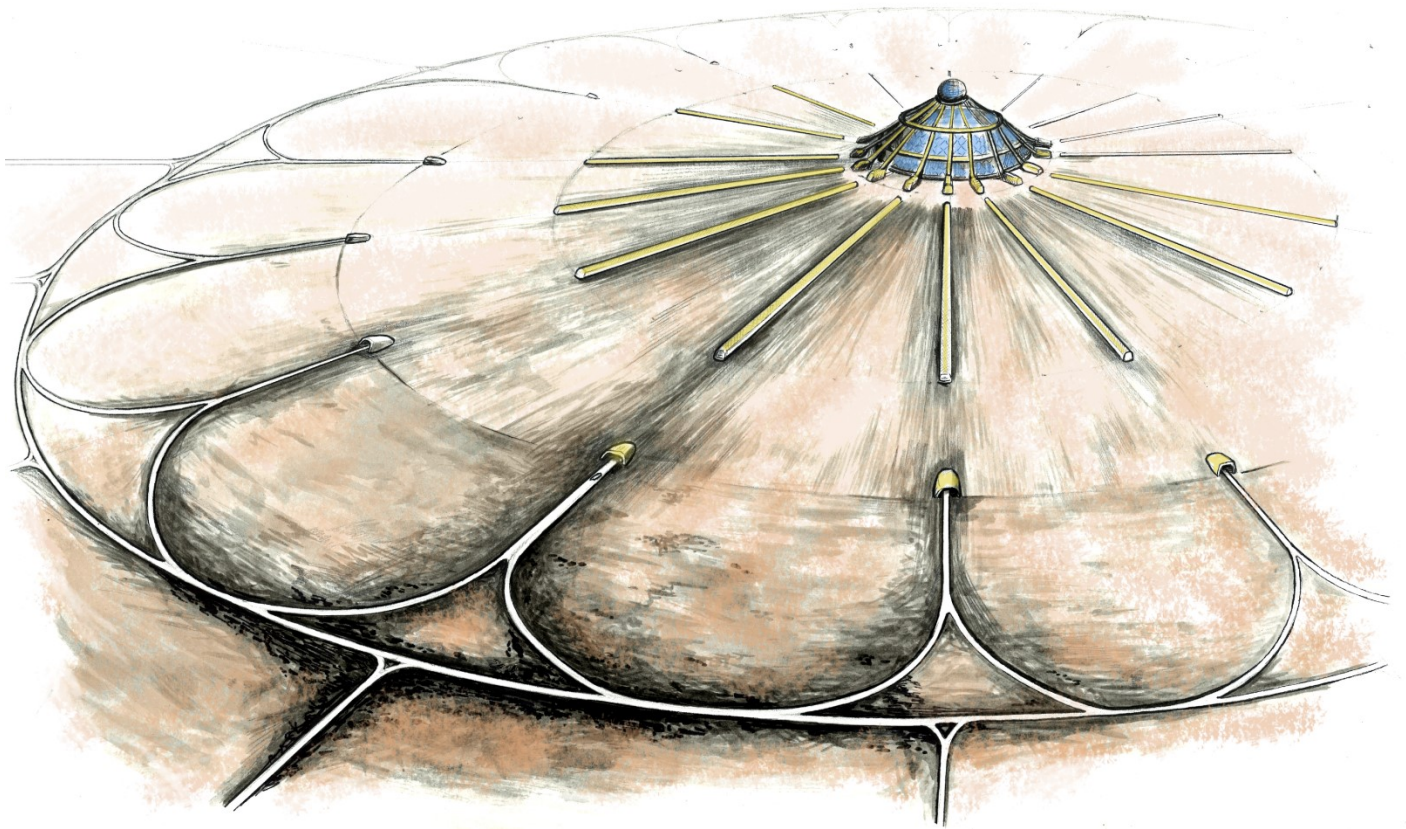
The VacTube system is a passenger and freight transport system. The system uses sealed tubes through which pods travel free from air resistance and friction at high speed. Vehicle designers made a mechanical pod version of the swift, considered the fastest bird on earth.





2 Scientific Community

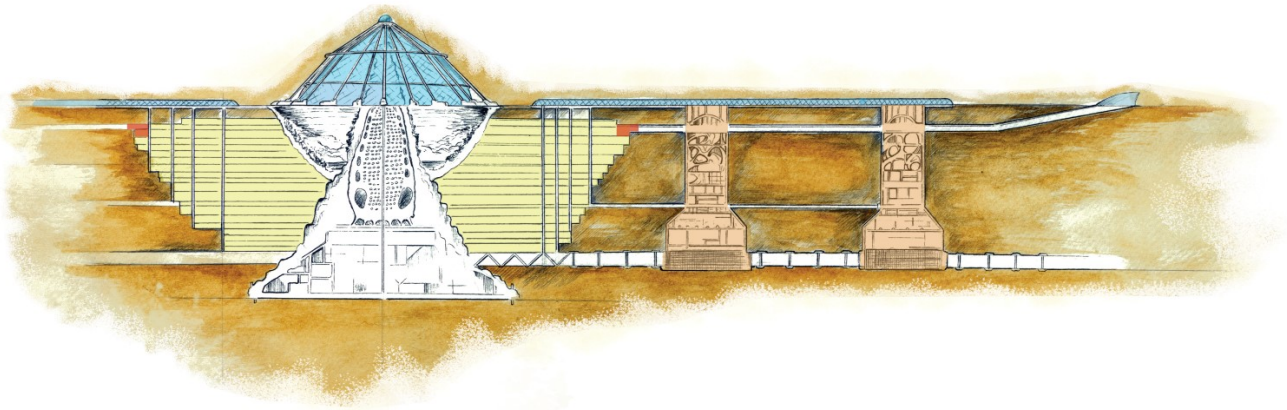
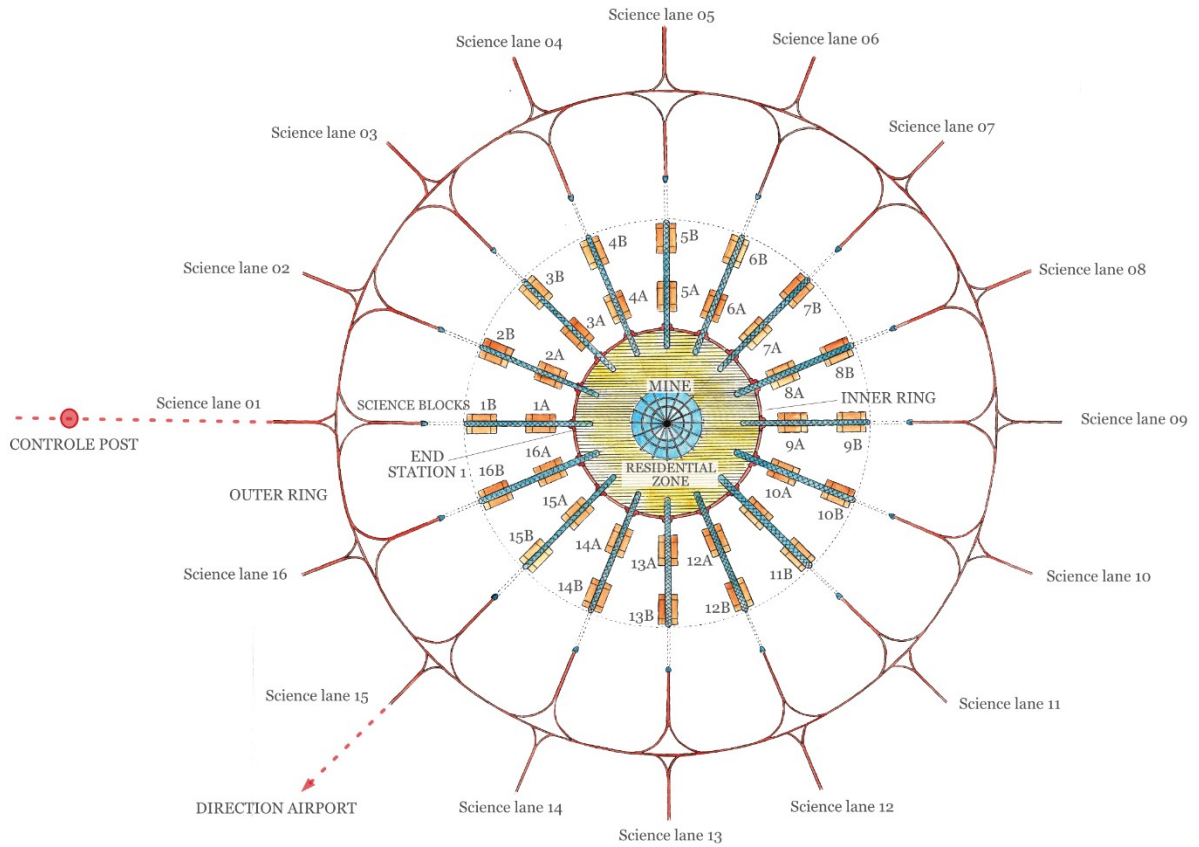
Underground cities of the Scientific community



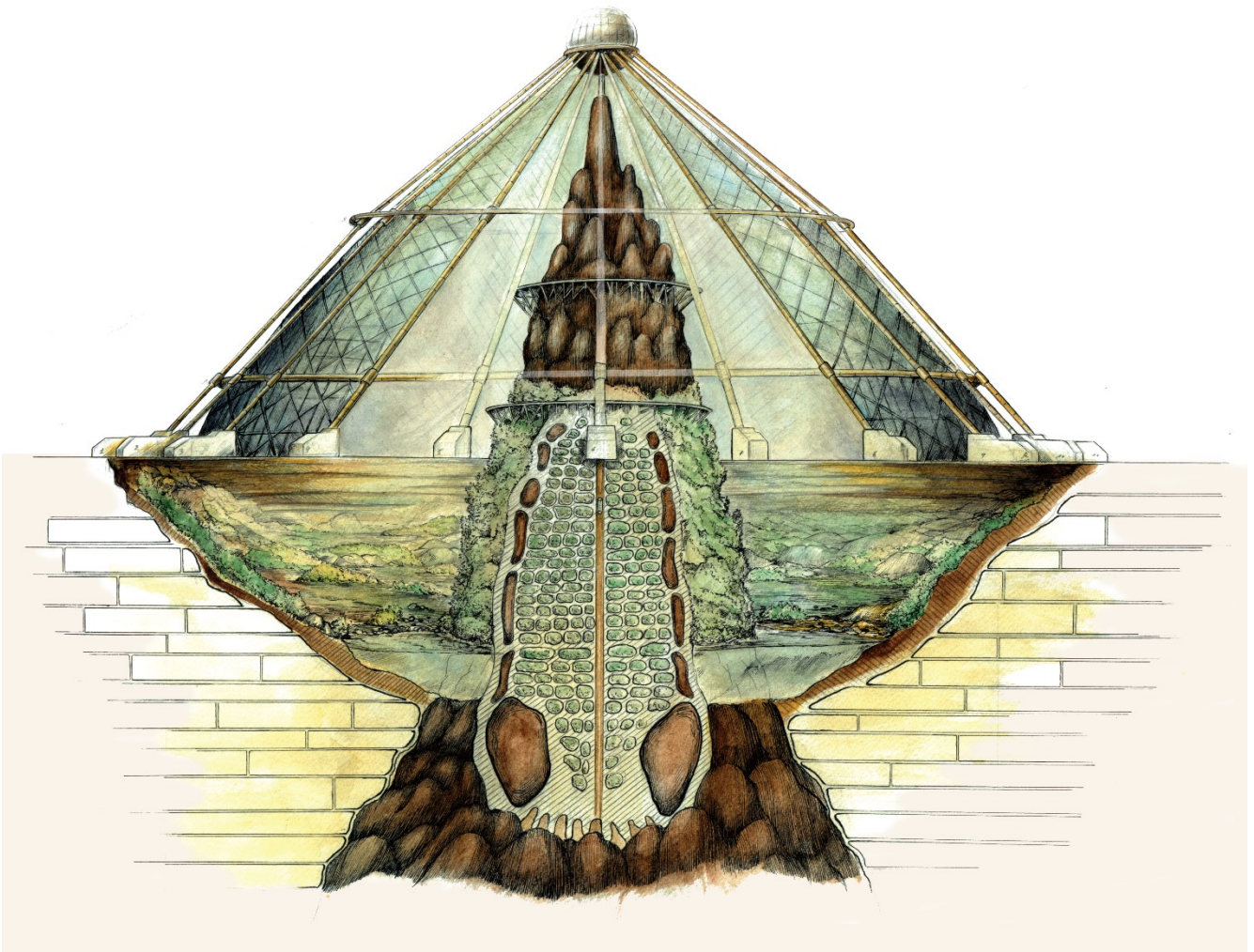
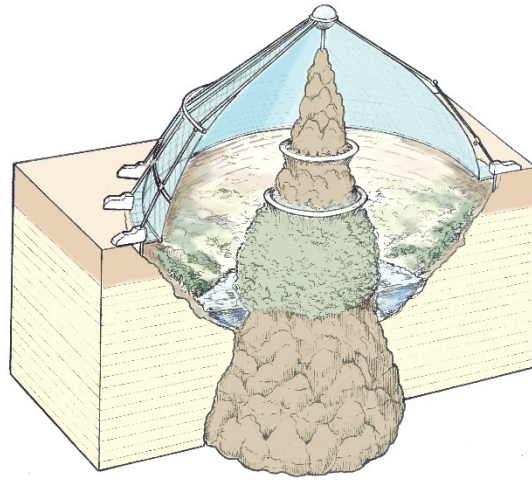
Udachny

In 2076 Udachny became the first underground city, built in and around an abandoned open pit diamond mine in Yakutia in Russia.

The city plan



The open pit mine (Udachny)

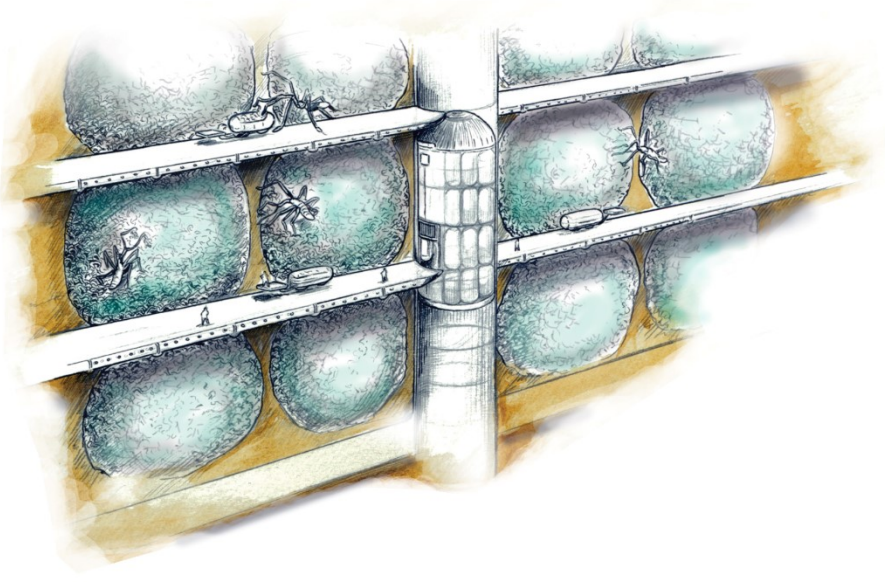
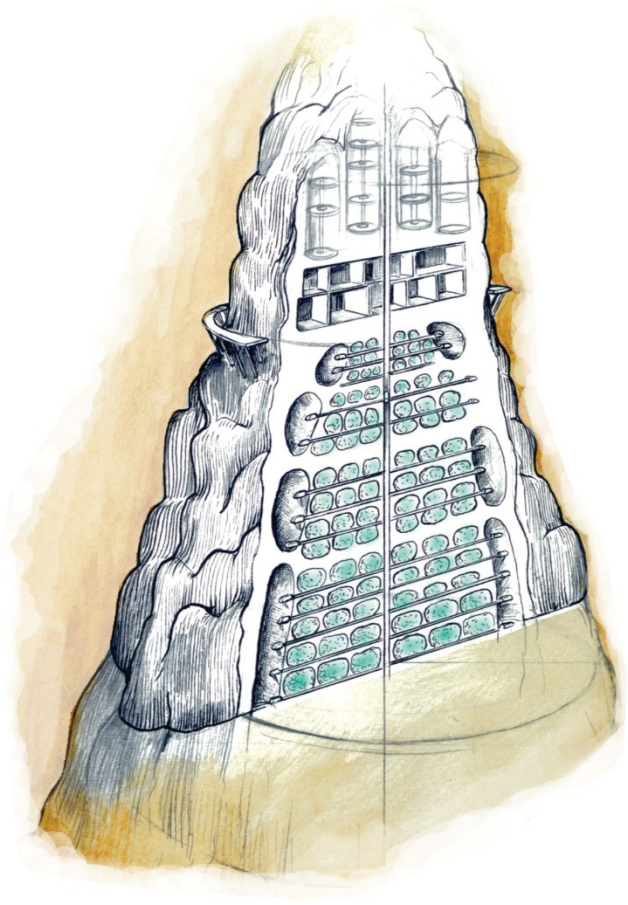


The Yuri Kalynytsj mine park

People standing on the first lookout ring are observing the many exotic birds flying around in the Kalynytsj park.



The termite tower



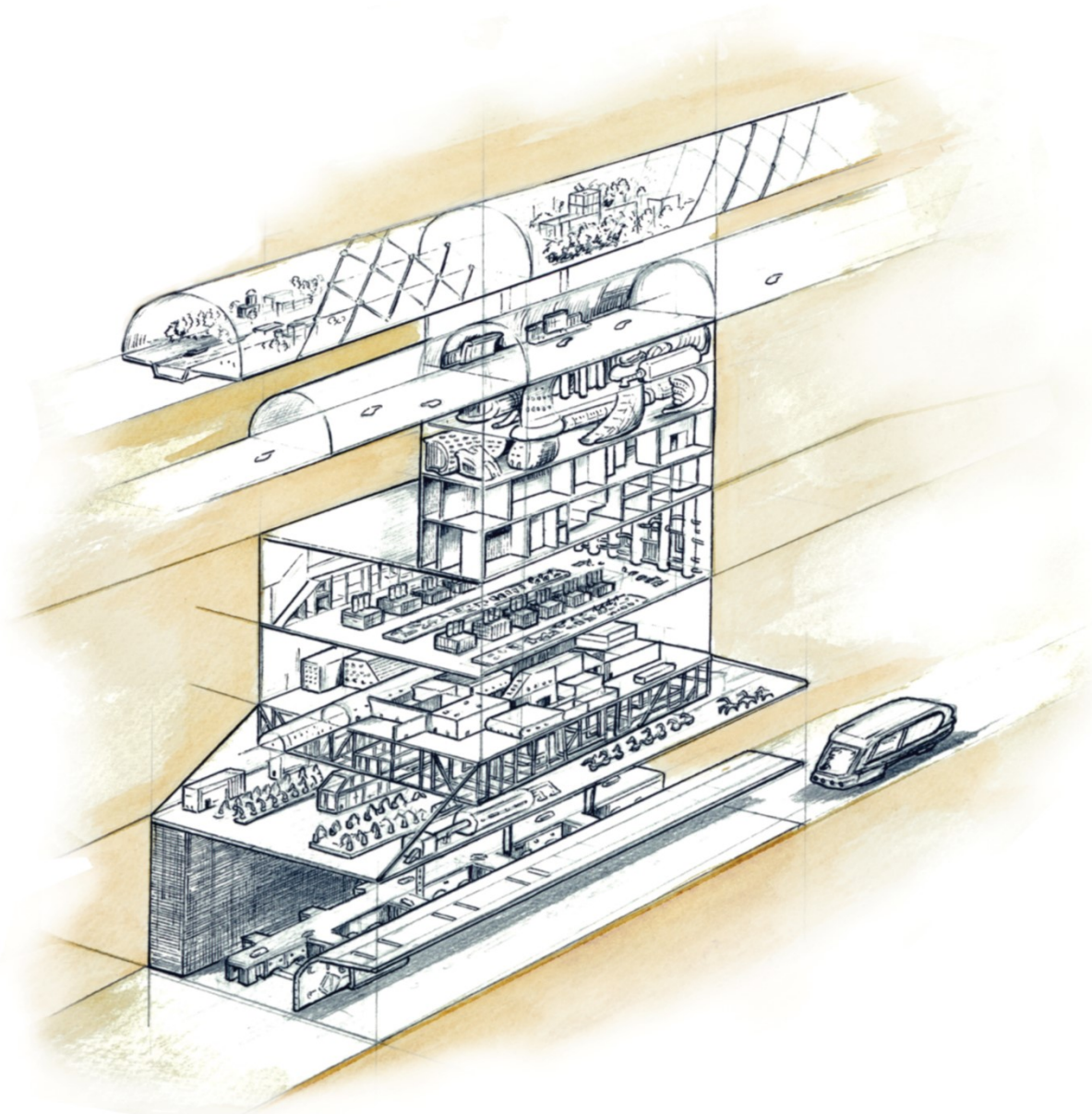
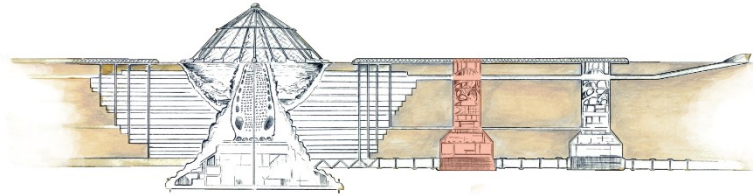
Termite mounds and fungus gardens

A termite mound has an extensive system of conduits and tunnels that serves as a ventilation system. Some of the chambers are used as fungus gardens. The termite colony eats the fungus.

The termite tower inside the open pit mine mimics a termite mound and functions as a fungus breeding garden. It counts 35 floors with gallery chambers in which fungus grows.



Science blocks



Science blocks:

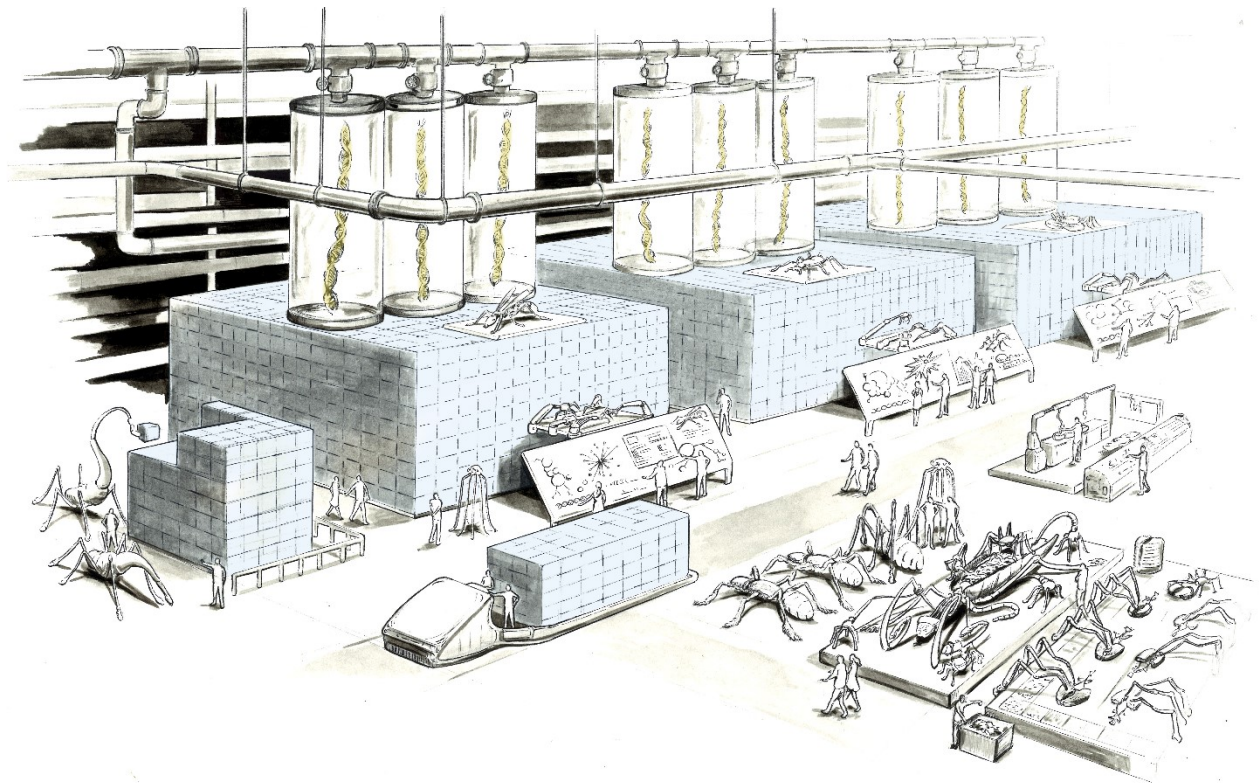
The Udachny community is well known for its research and development of robot technology. The R&D and robot production takes place inside underground facilities called science blocks.

The design department:

Each science block has its own design department. NatureLAB is a nature knowledge center. Together with the design department it forms the habitat of the Biomimicry researchers.



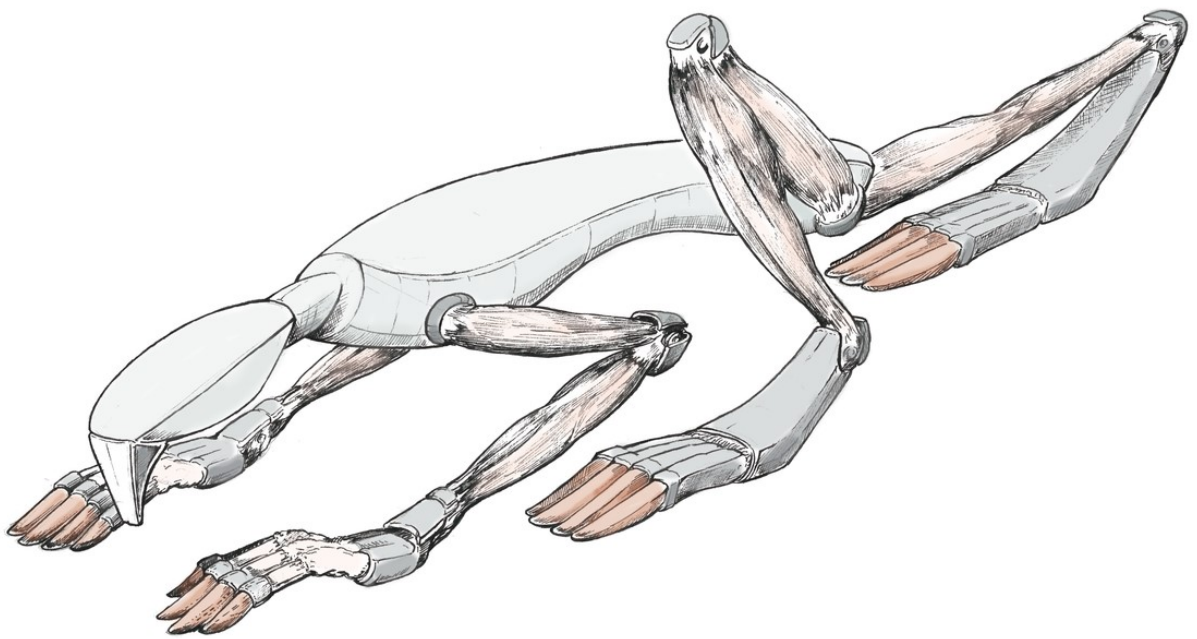
DNA-research



DNA research center

The DNA designers program the desired parameters into the robot DNA-chips. The robot designers use hologram images to visualize and test their creations. If a prototype is considered viable, it undergoes a series of physical tests. Once it is approved it passes a line of workstations where mechanical parts are added.

The digger XC4 robot



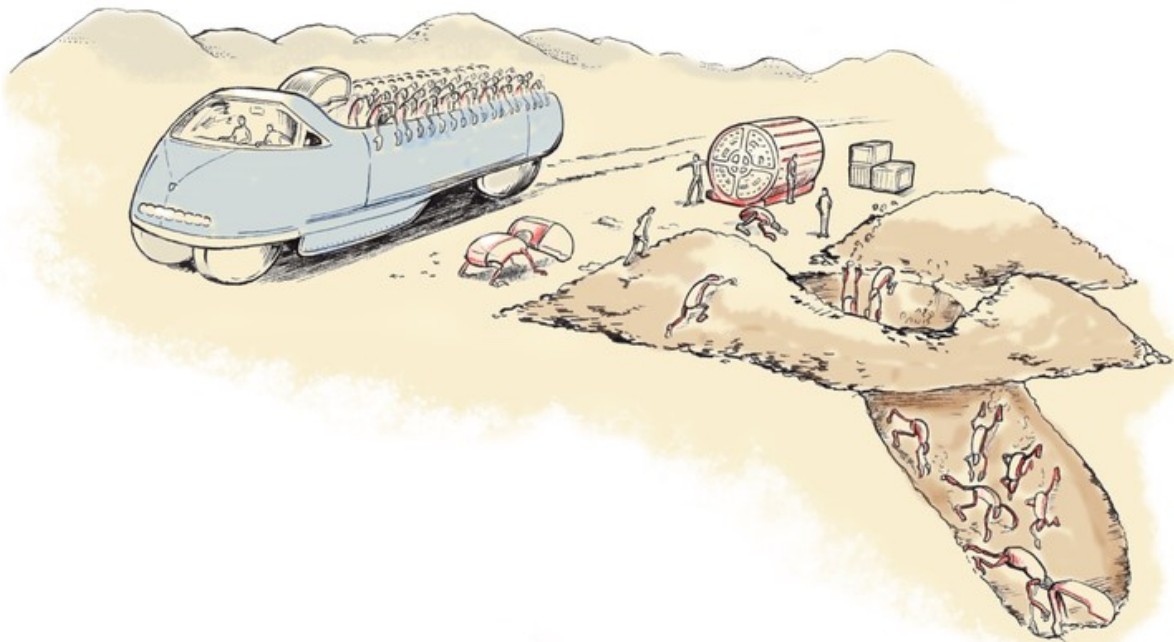
Biomimicry as a design philosophy: The digger XC4 series

In Udachny designers strictly follow the Biomimicry design principles.

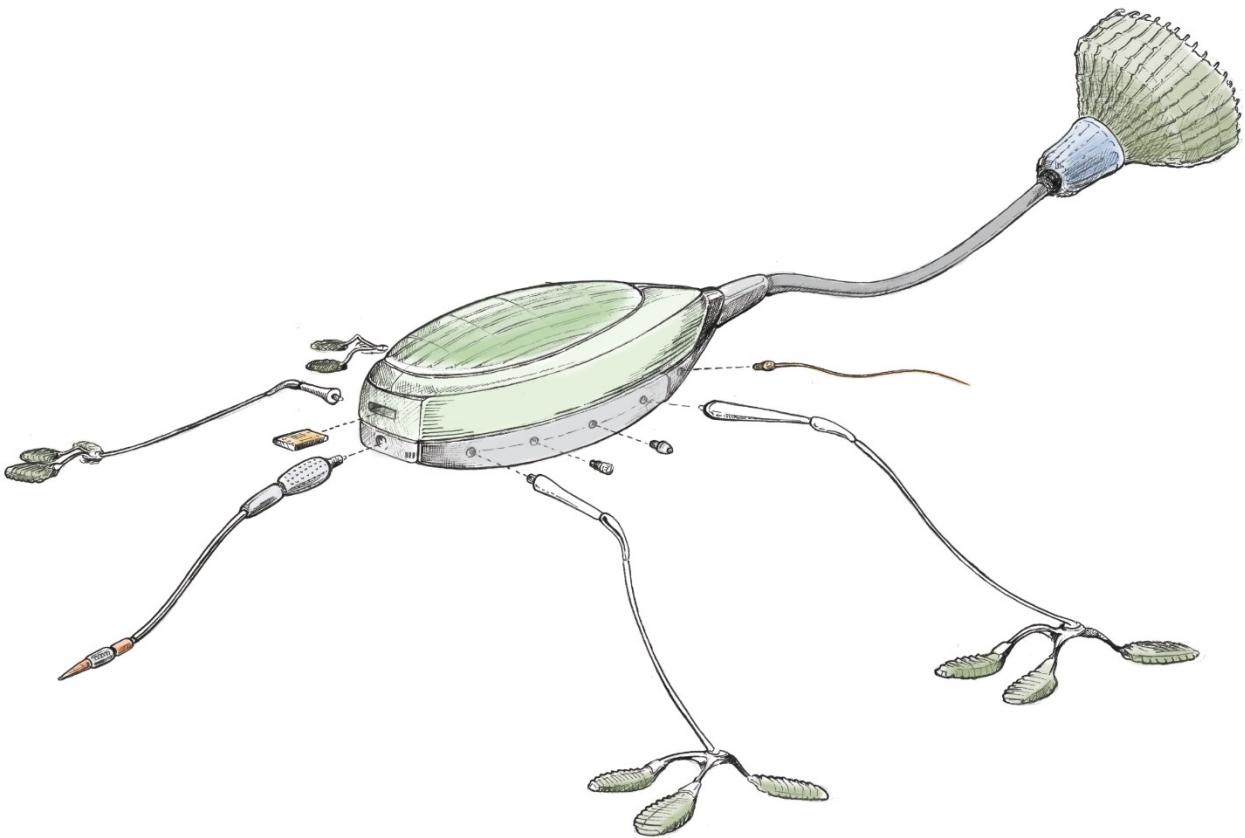
The naked mole rat: a natural digging machine



The digger XC4 series has the DNA of the naked mole rat. Multiple robots work together.



The Elysia robot



Biomimicry as a design philosophy: Elysia robot

Green sea slug

The green sea slug absorbs chloroplasts in its own cells from green plants like kelp and algae. A process called kleptoplasty. The chloroplasts are able to live inside the slug and give the slug the opportunity to convert sunlight into energy.

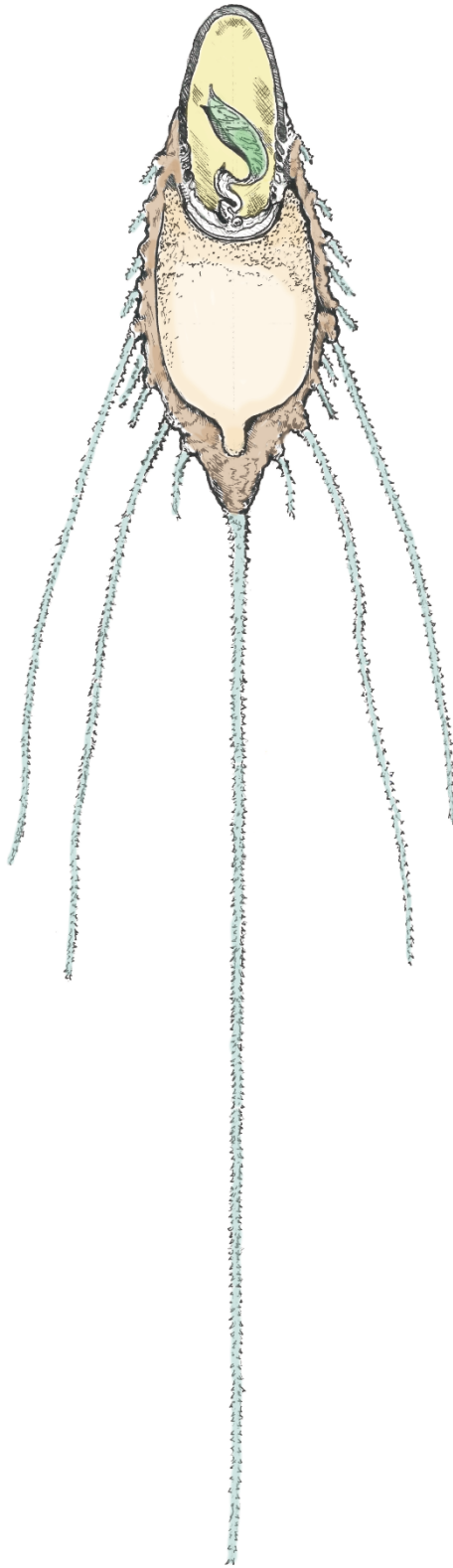


Elysia robot mimics the chloroplast trick

The Elysia robot uses the same trick, it gets its energy by eating plant waste. The robot can embed the chloroplasts in its outer layer so it becomes a photovoltaic skin. This type of garden-robot is available as a DIY package. The user can customize the robot with a diversity of tools.



Seed encapsulator



Biomimicry as a design philosophy: Seed encapsulator

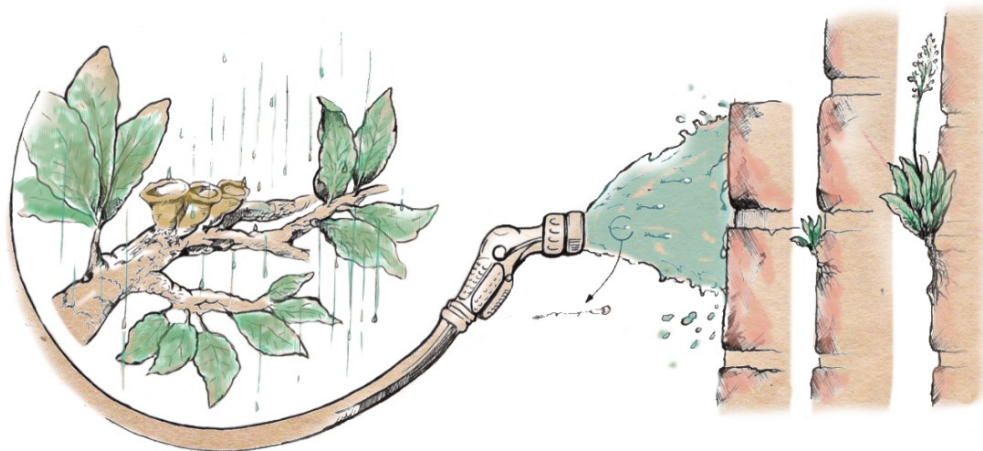
Tiny birds nest

The tiny bird's nest fungus is a small mushroom. When a drop of water falls in the tiny bird's nest a capsule with spores catapults out of the mushroom. A sticky wire unfolds and as soon as the wire reaches a branch it attaches itself to it.



Seed encapsulator

The seed encapsulator is an organic capsule that encapsulates seeds. It is used for vertical farming. In dense cities, urban farmers spray the enhanced seeds onto stone city walls. The encapsulator uses the same techniques as the tiny bird's nest to anchor itself onto the wall.

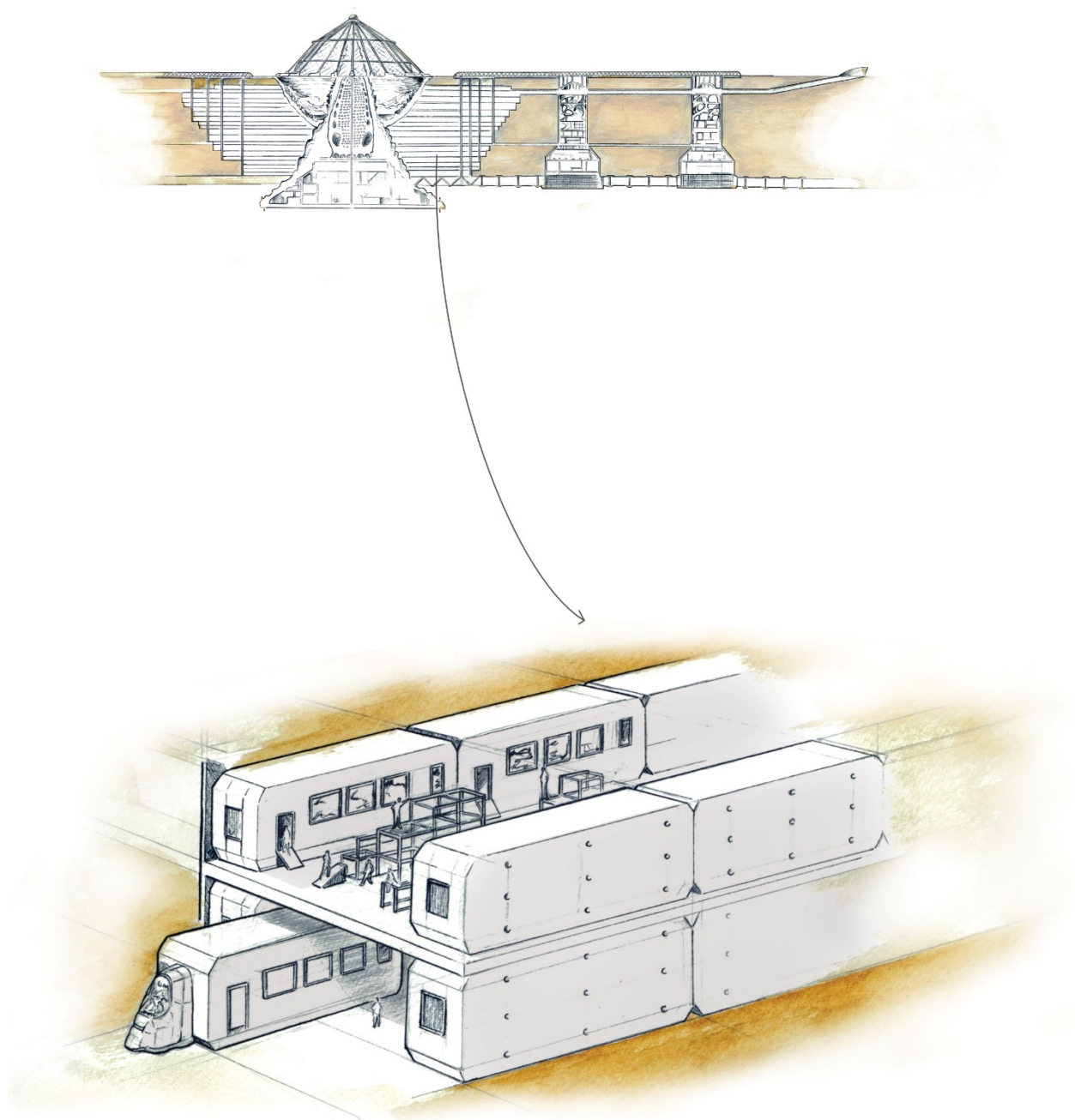


The residential zone

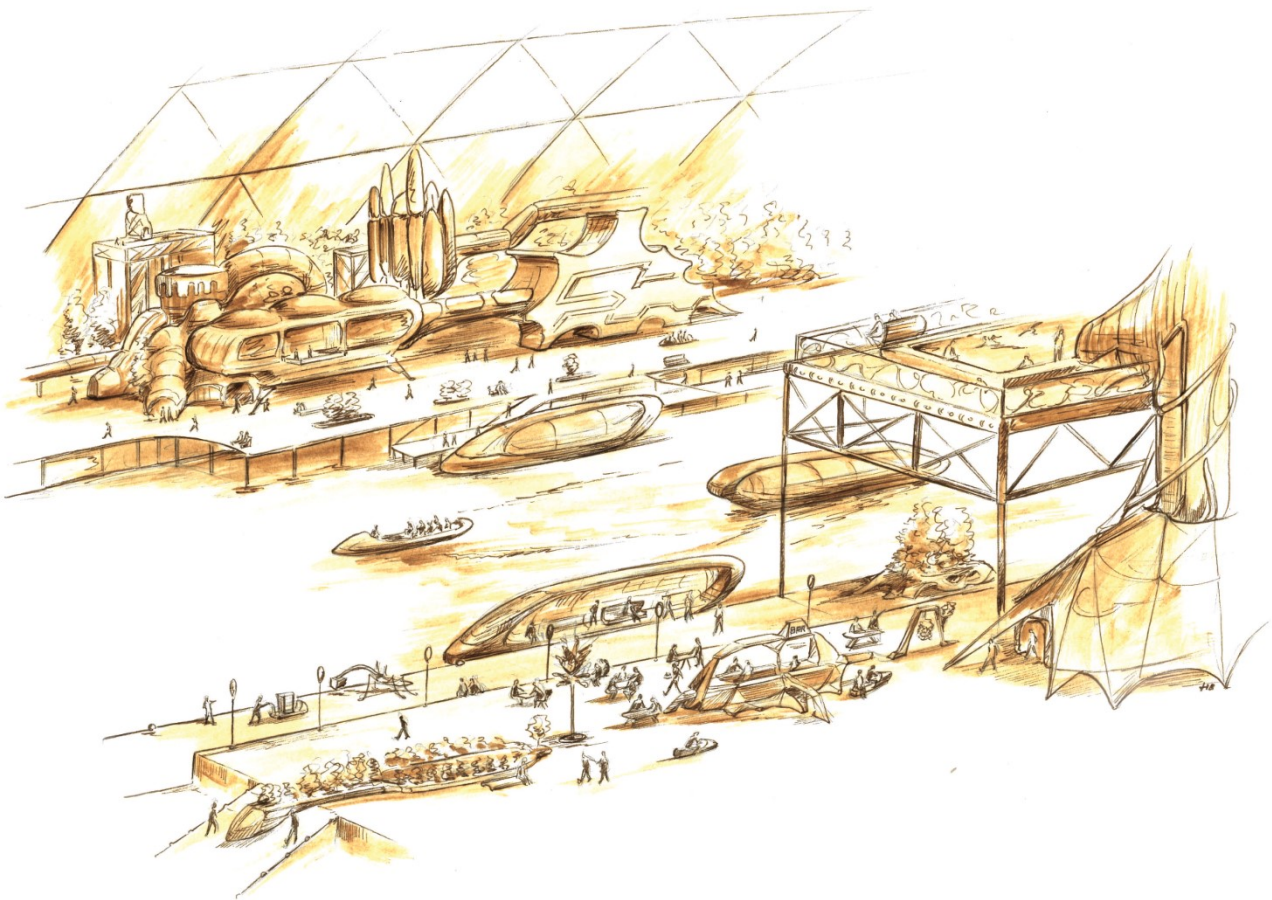


Vivid boulevards in the residential zone:

In underground shafts around the mine the residents of Udachny live in a container like house. The empty space in between the houses, is a vivid public space where people come together.

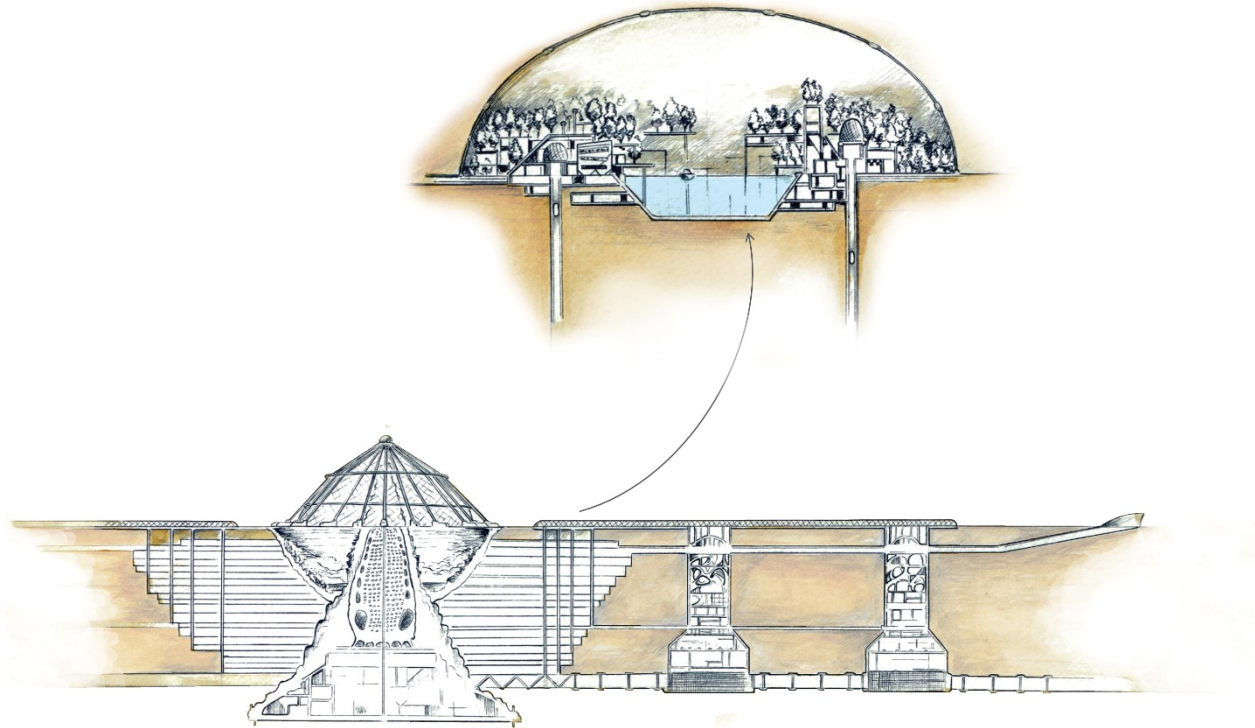


Udachny Waterways

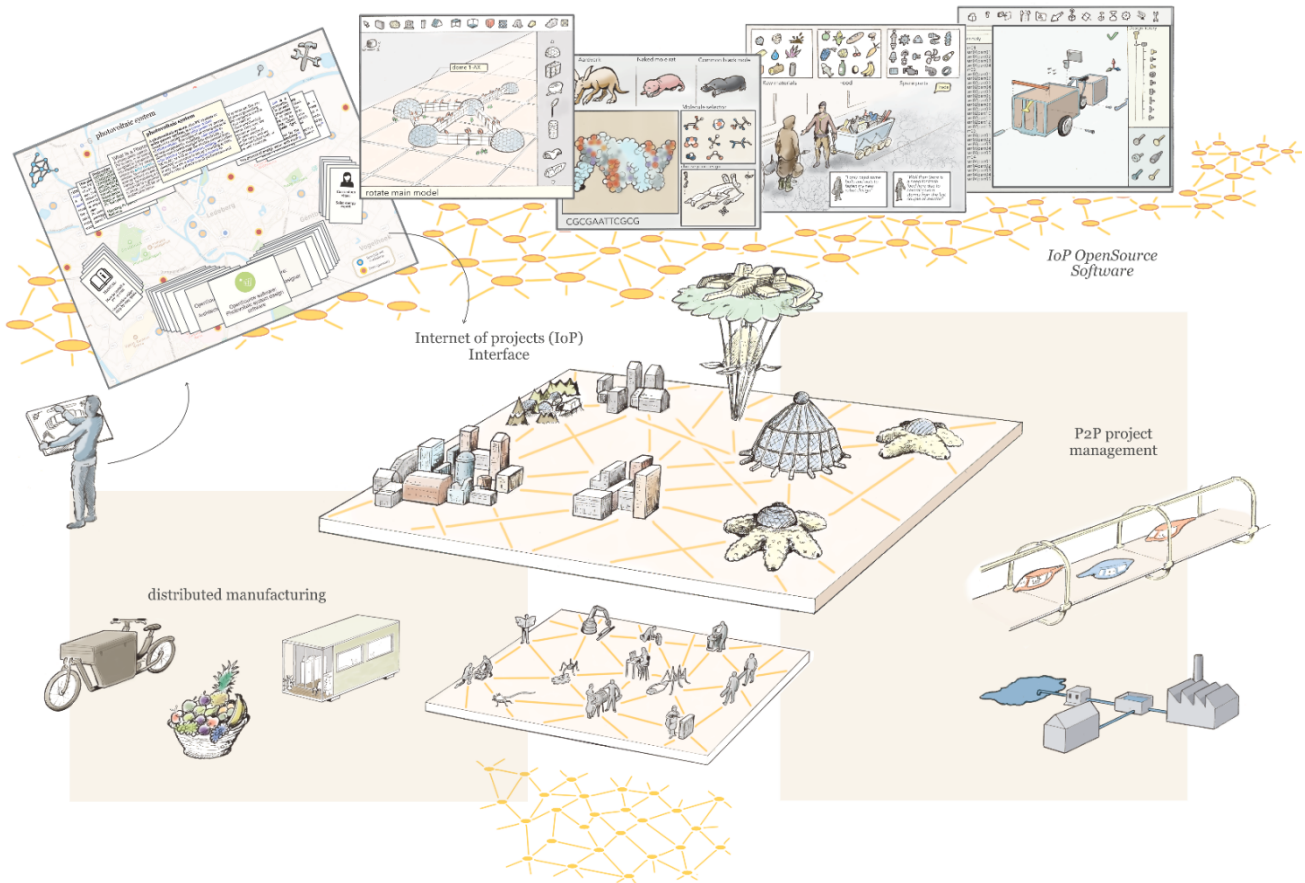


Bathing culture:

Udachny is well known for its wellness and bathing culture. The above ground artificial waterways are covered with transparent material. They connect the science blocks and the residential zone and count numerous wellness and bathing centers.



P2P manufacturing & P2P project management



P2P project management:

In Udachny a digital P2P network is used to organize scientific projects, it's called the IoP (internet of projects). The IoP finds the suited scientists, engineers, biomimicry experts and technicians for each scientific project. It organizes the resources, tools and other hardware needed to start and fulfill the project.

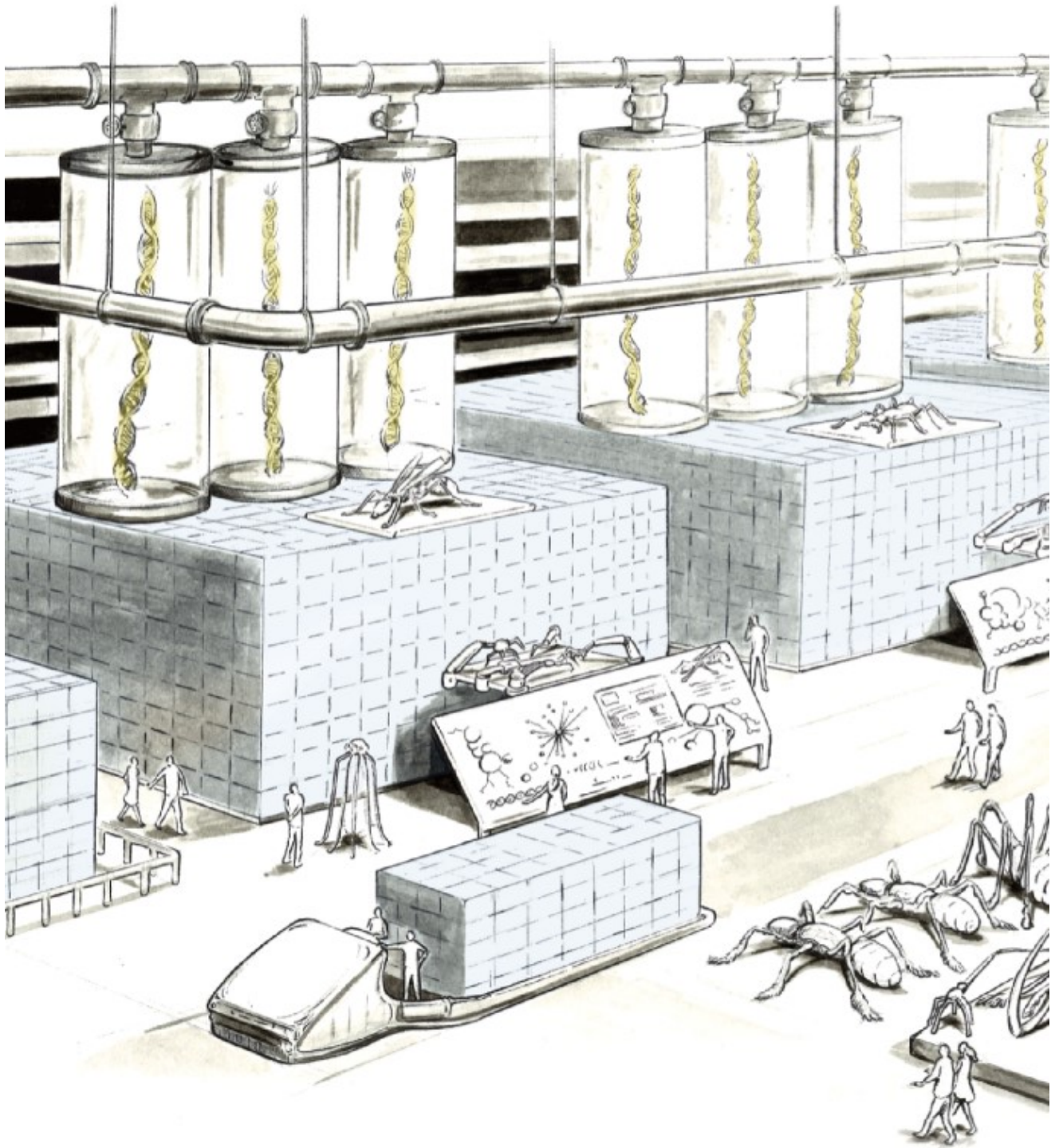
Open source software:

The IoP software database, grants its user access to a wide range of Open Source software packages.

Distributed manufacturing:

Many of the new robots get produced directly inside Udachny. All the design data are open so the same robots can be reproduced elsewhere.





3 Sea & trade community

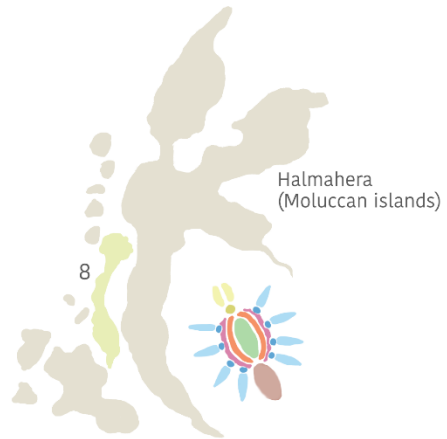
The trade community



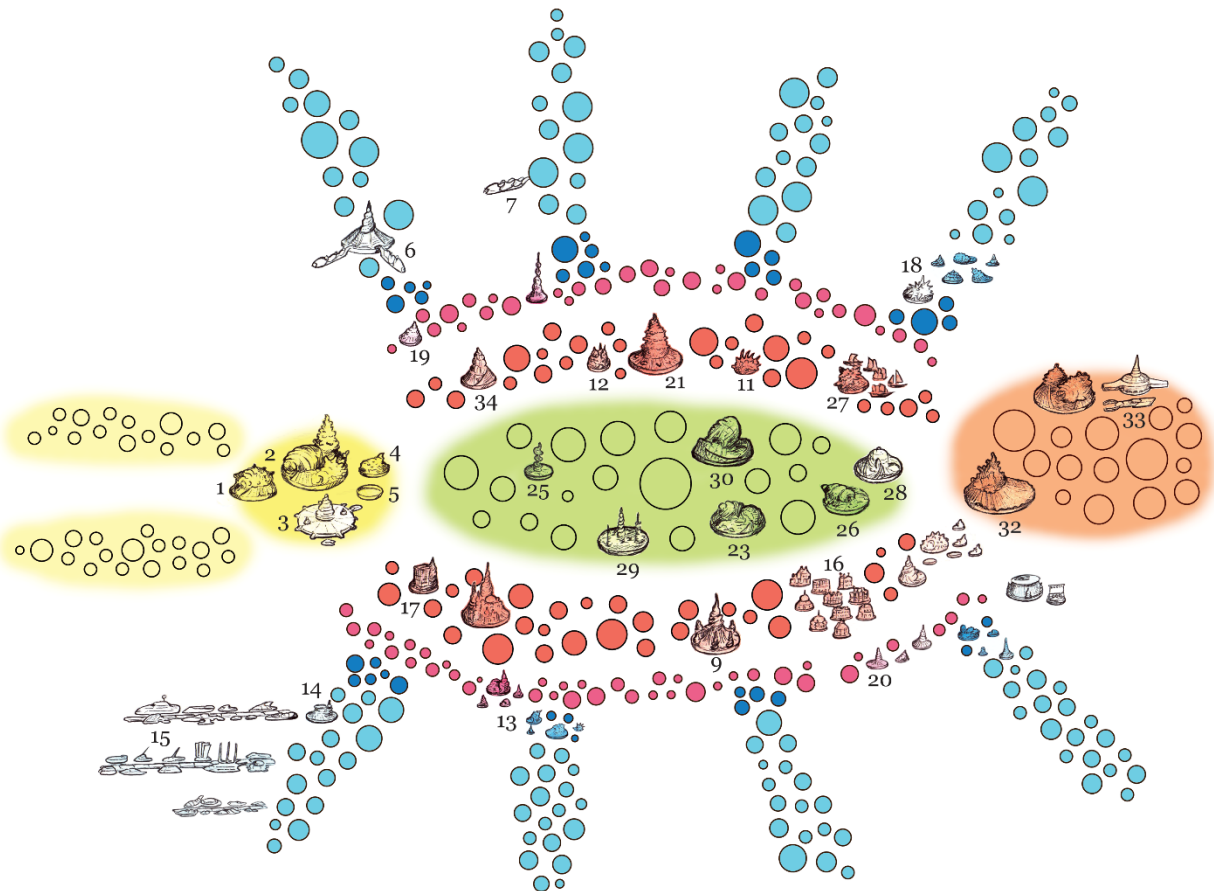
The Purple Fleet: The floating city

The Purple Fleet is the capital city of the trade community. The city is located near Halmahera Island (part of the Moluccan Islands). The purple fleet is a floating city. The city is divided into different zones, each with its specific function. If the weather conditions become hostile the city can move to more quiet waters.

The city plan

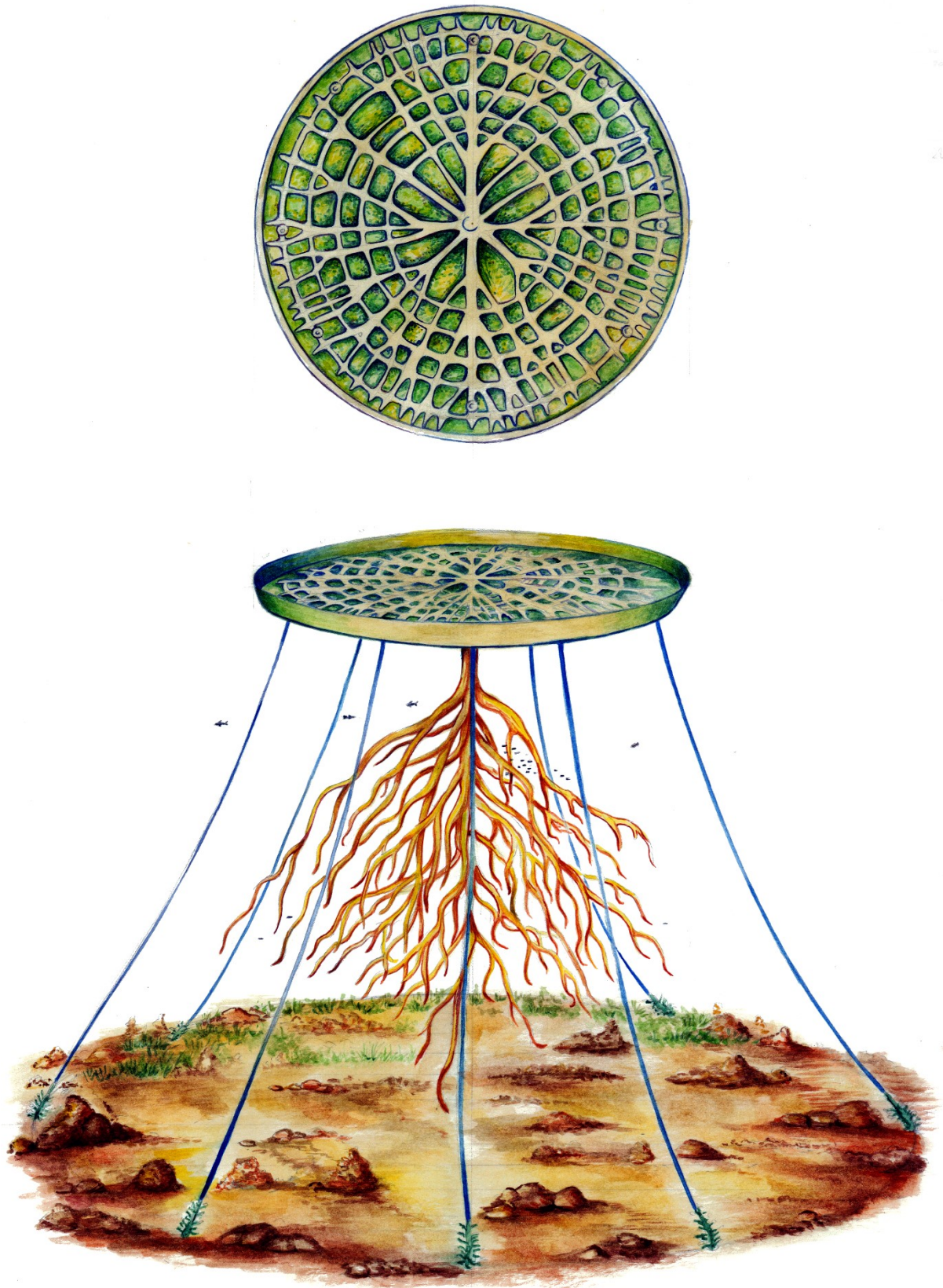


- | | |
|---|--|
| ● Residential zone | ● Service zone |
| ● Park and recreational zone | ● Harbor administration |
| ● City administration | ● Visitor and tourist centre |
| ● Harbor | ● Industrial zone |



- 1) Welcome Platform
- 2) Educational Platform
- 3) Water-bus station
- 4) Artificial Growth Center
- 5) Victoria Amazonica Platform
- 6) HQ Harbor Purple Fleet
- 7) Raybot Center
- 8) Floating food islands
- 9) Langkwani city palace
- 10) Sultan Palace:
oldest palace of The Purple Fleet
- 11) Cremia treasure room:
A collection of trade relics
- 12) Golden shell palace
- 13) Muarankang fish market
- 14) Harbor registration office
- 15) Harbor for unregistered ships
- 16) Little Venice:
Old Venice palaces rebuilt
- 17) Roosevelt Hilton Hotel
- 18) Beverage quay
- 19) Seafood Universe:
famous seafood restaurant
- 20) OmMA:
Oceano museum for Modern Art
- 21) Abu Dhabi Palace
- 22) Nomad Islands:
platforms inhabited by the nomads
- 23) Zeno festival platform
- 24) Fruit quay
- 25) Promenade platform
- 26) Sea life center
- 27) Sail museum:
The largest collection of sail ships in the world
- 28) Seaman's graves
- 29) Statue park
- 30) Tropicana park
- 31) Airport
- 32) Eel ship repair platform
- 33) Food Island production platform
- 34) The Needle

Organic floating platforms



Victoria Amazonica (picture under left and middle) :

The structure of the Victoria Amazonica leaf gives the plant its extraordinary properties to carry heavy weights. The leaves are sturdy thanks to the veins on the underside. This plant inspired botanical engineers to design a large organic platform that can carry the buildings of the Purple Fleet.



Mangrove (picture right above):

The large artificial platforms are hybrid plants. A mangrove like root system is attached underneath the platform. The root system desalinates the sea water so it becomes potable for the inhabitants of the city.

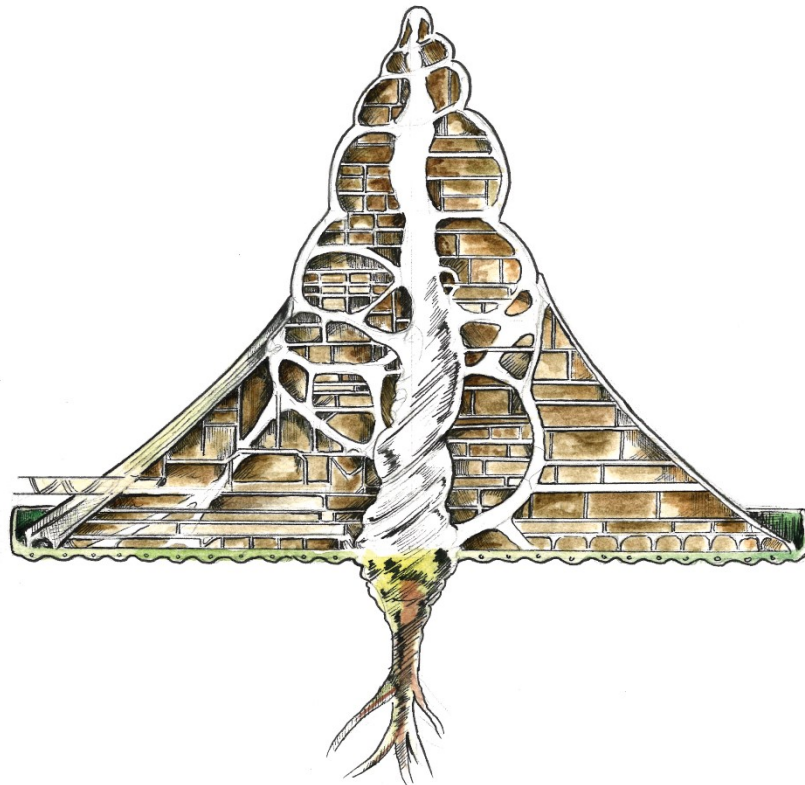
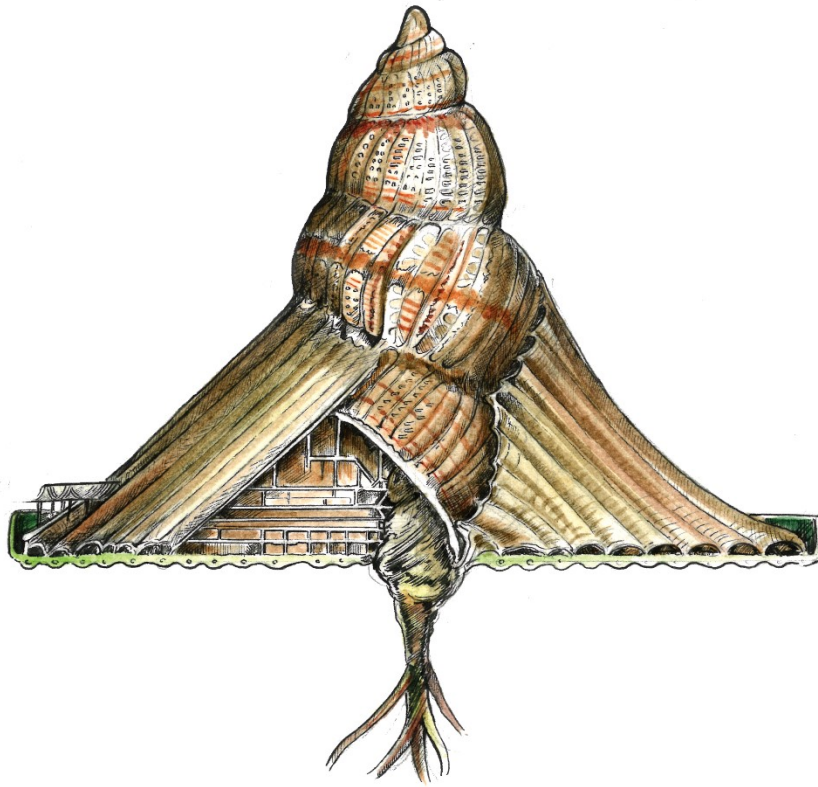


Sea palm (picture left above) - Sea Pen (picture right above):

- *Postelsia palmaeformis* or the Sea Palm grows on rocky wave-swept shores. The plant bends against the lateral forces of incoming waves. The sea palm outstretches completely and then springs back upright.
- *Ptilosarcus* or the Sea Pen has the unique ability to twist around a lengthwise axis. This type of joint is used to stand unbent on bay bottoms and rotate when facing strong currents.

The unique biomechanical properties of both plants are combined in the organically engineered cables and anchors that keep the platforms in its place.

Seashell buildings (residential zone)



Seashell buildings:

The buildings are inspired by seashell structures. The buildings mimic the organization and structure of seashells. The building material has a micro structure that gives it the needed strength, so it can resist compression forces. The buildings can grow in the same way the sea organisms can.

Parametric design:

The freeform shields are meant to protect the buildings and are designed by using parametric design principles.

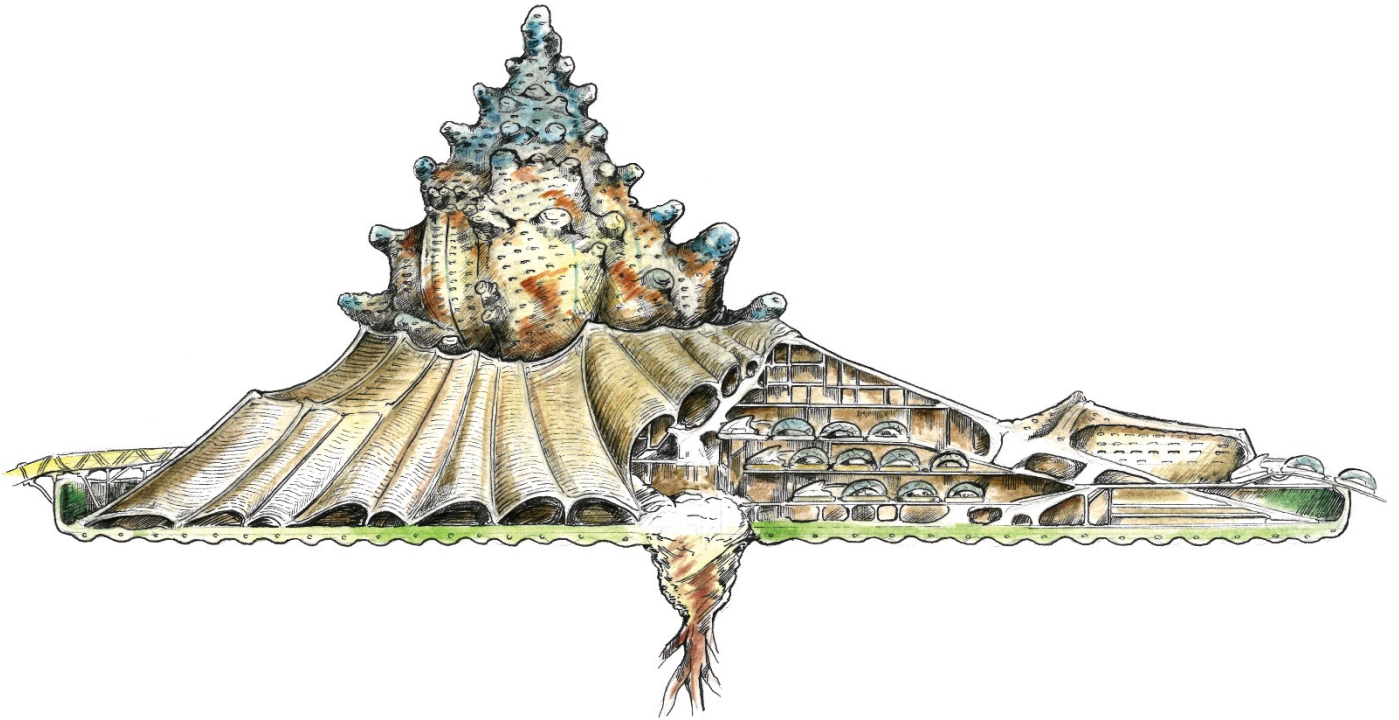


Sources parametric design pictures:

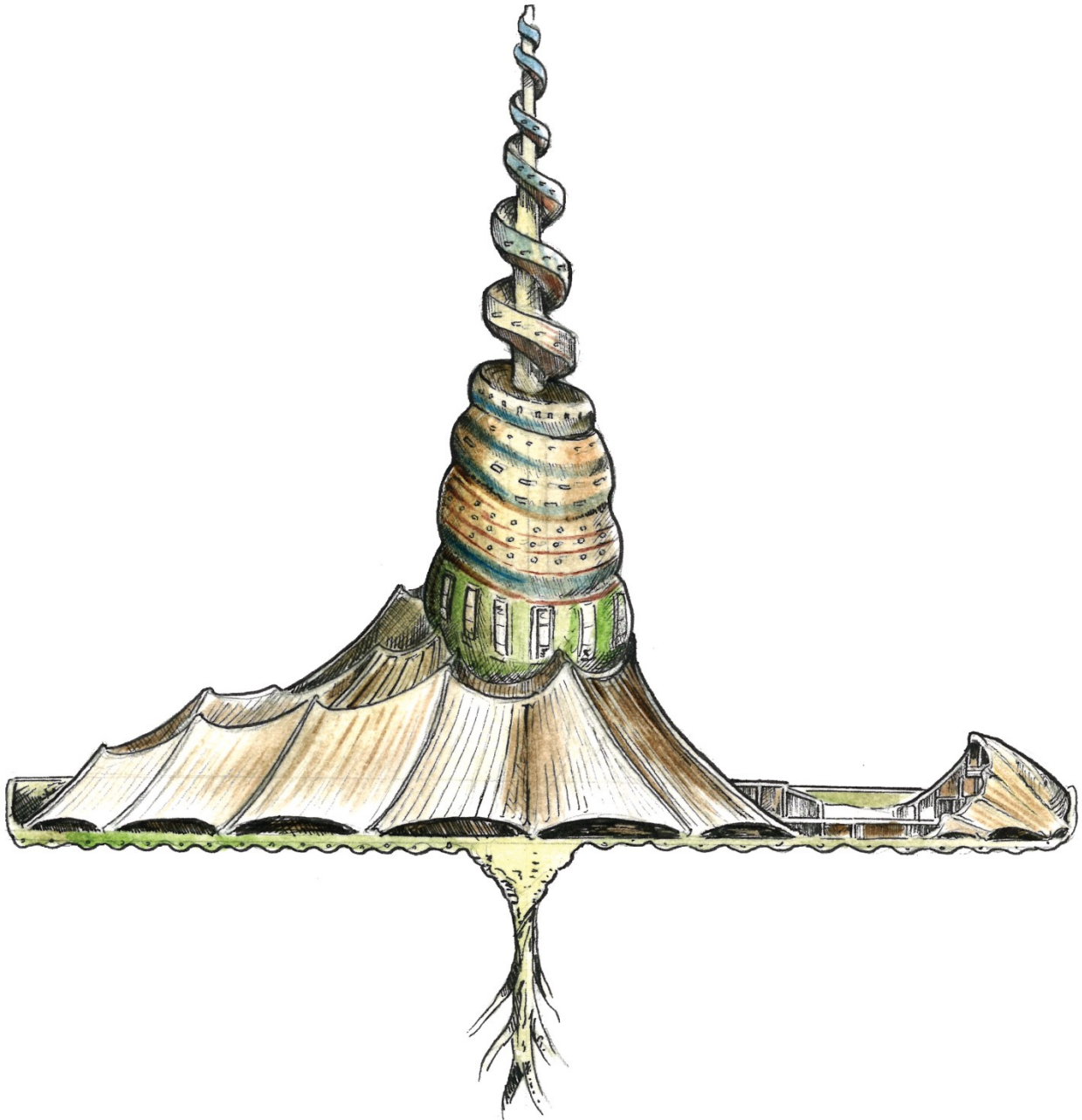
- <http://rvaloanofficer.com>

- Zaha Hadid architects (right and middle)

Eel ship repair platform (industrial zone)



The service zone

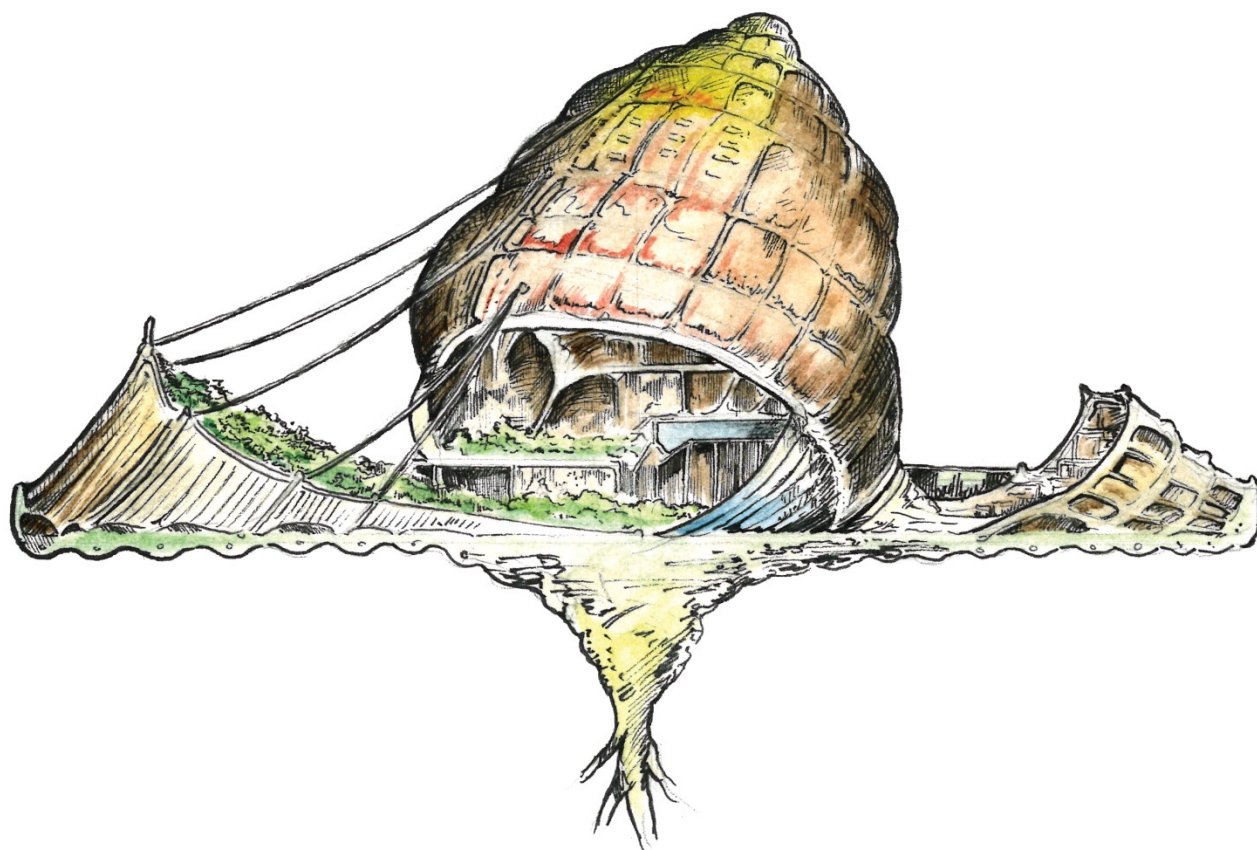


The Park zone

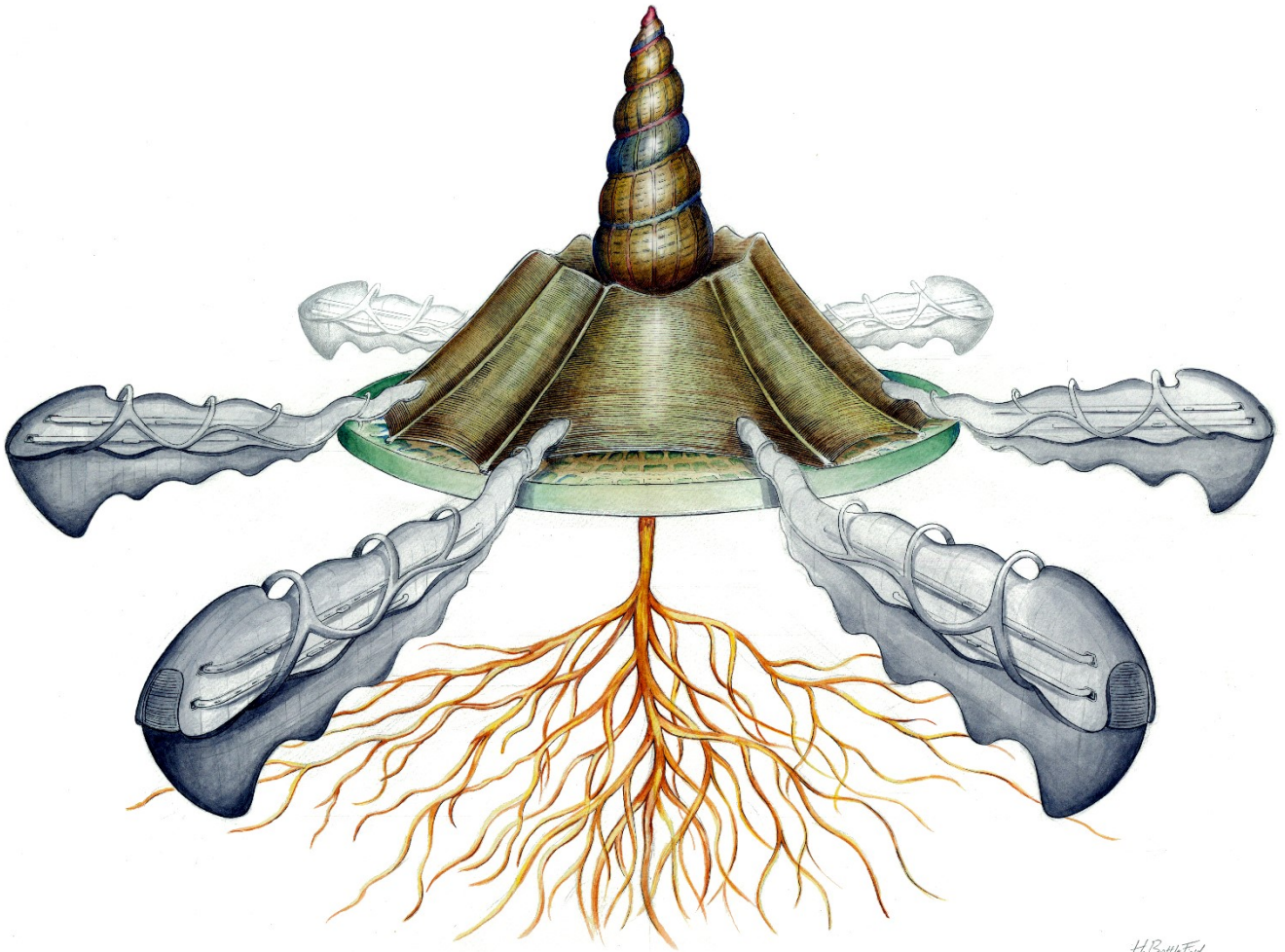


Park zone:

The central area of the Purple Fleet City is the "recreational or park zone". It counts 35 platforms with luxuriant gardens, tropical mini forests, small canals full of fish, art parks, lawns and pools.



The puller ship



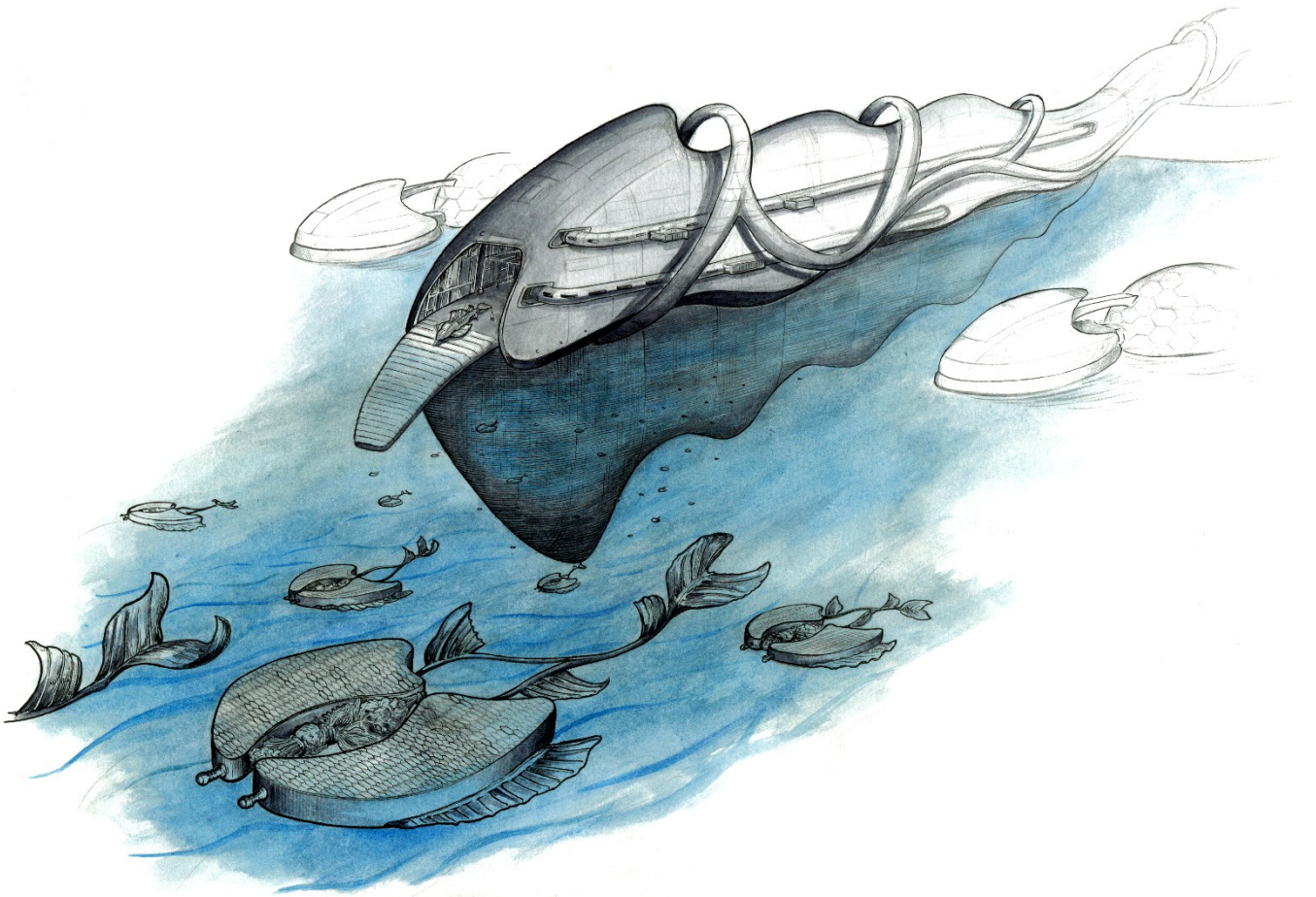
Pulling the city away:

The curvy, metallic ships, called pullers are used to pull the large platforms towards safer waters when heavy weather circumstances are threatening the city.

Underwater ship:

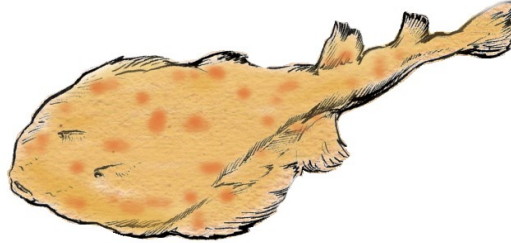
Underneath the ship's surface a spectacular form reveals itself. The surface consists out of thousands of small rectangular sections (called docking stations). Each section is an entrance for the Raybots (an AUR or Autonomous Underwater Robot).

Raybots



Fish with electric organs

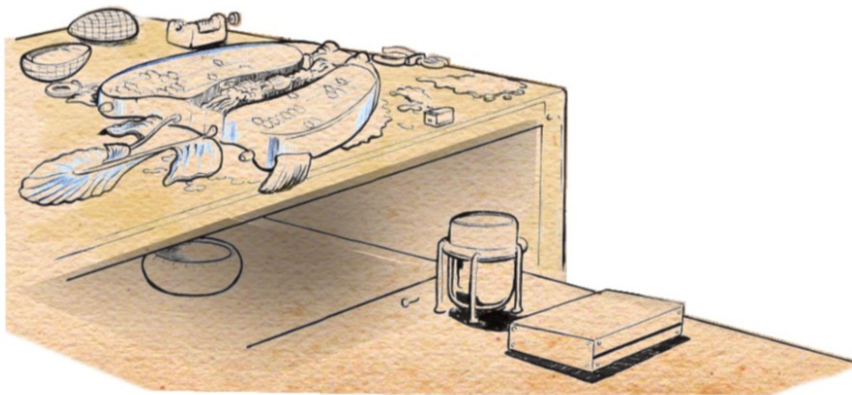
Some fish like the electric ray or torpedo ray have electric organs composed of electro plaques. The fish uses this peculiar organ to create a jolt of up to 200 volts to kill prey.



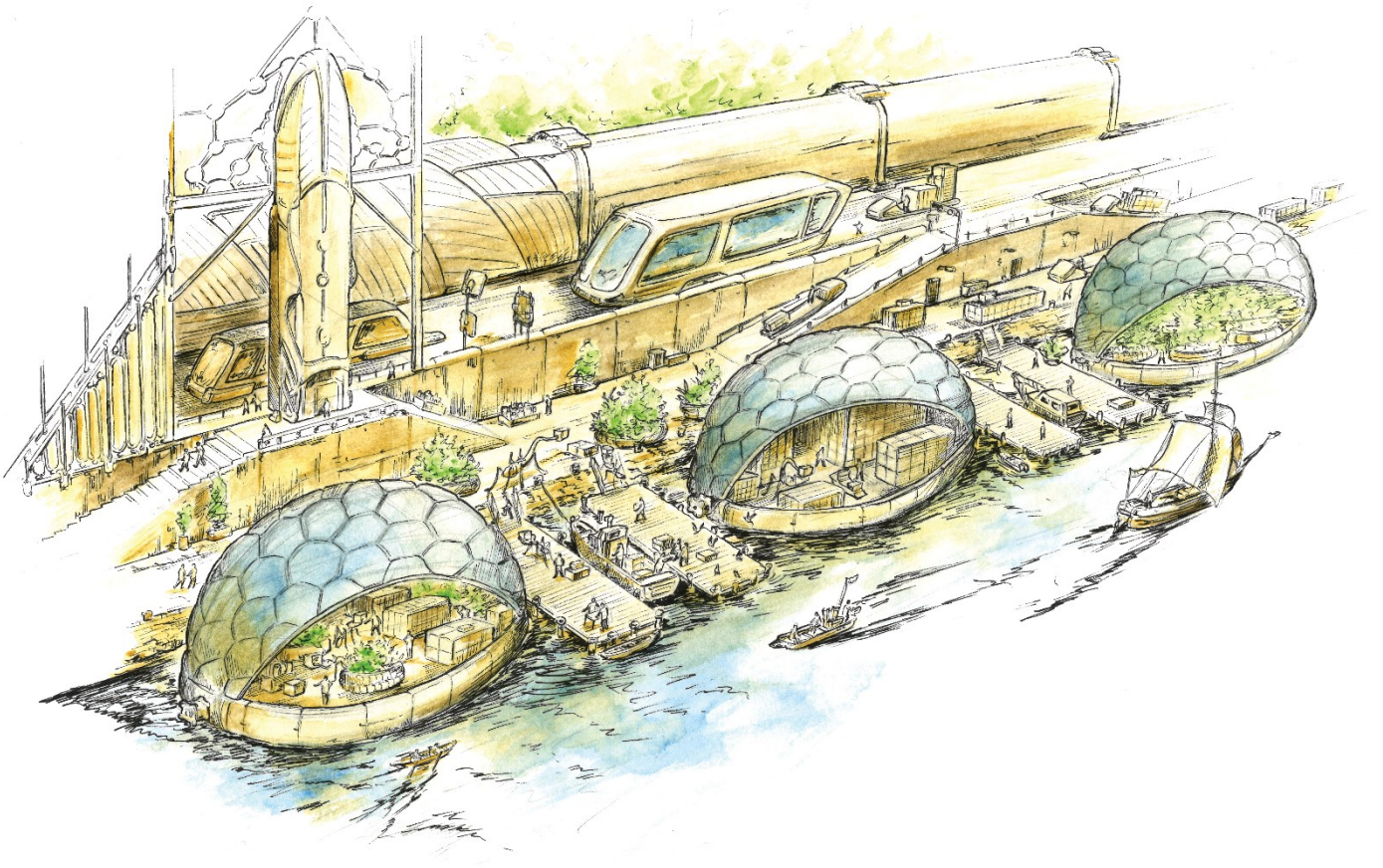
The Raybot

The torpedo ray inspired robot designers to develop the "Raybot". A robot that lives independently in the seas. It forages krill or zooplankton and eats algae and kelp. It transforms its food into energy and stores it in a series of batteries. Once all batteries are fully charged it swims back to the puller. There it clicks in the docking station to transfer the stored energy.

The robot is initially invented to explore the unknown depths of the sea. A task they still fulfill.

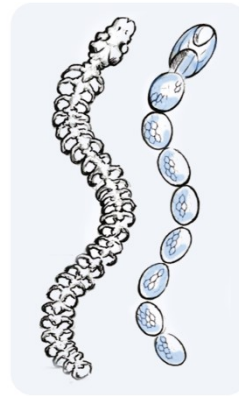


Eel ship harbor

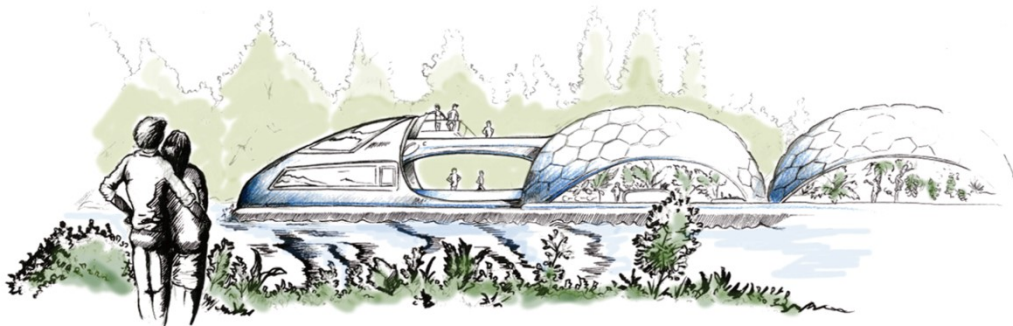
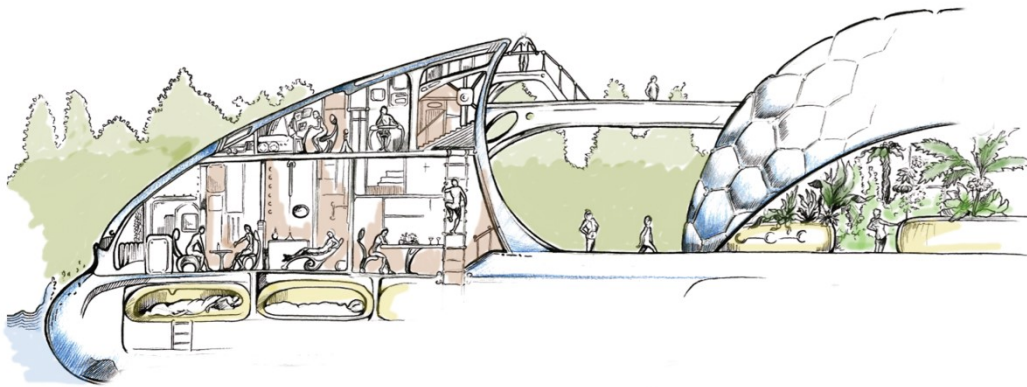


Biomimicry: the eel and the lamprey

A very ancient energy efficient method of locomotion among water dwellers is the lateral wriggle, a wave travels from the head to the tail while it increases in amplitude. Aquatic animals like eels and lampreys use this swimming motion.



This trade ship is composed of a puller at the front that pulls a long line of cargo units. It mimics the undulating swim technique from the eel and the lamprey. When the ship reaches a harbor it can leave the modular cargo units temporary behind. The cargo can easily be detached or reattached to the eel ship.

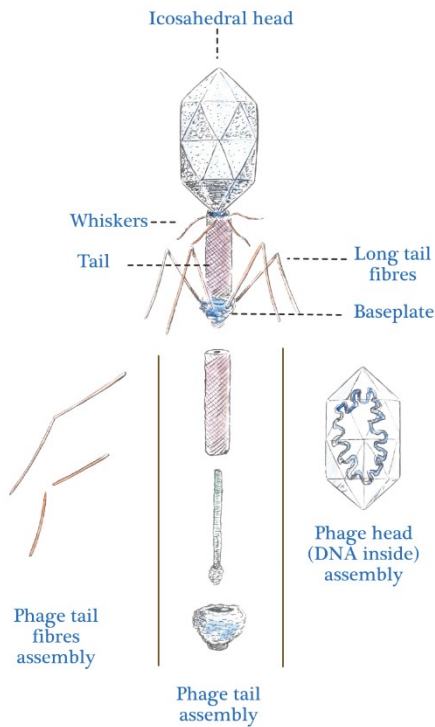


Ocean forests



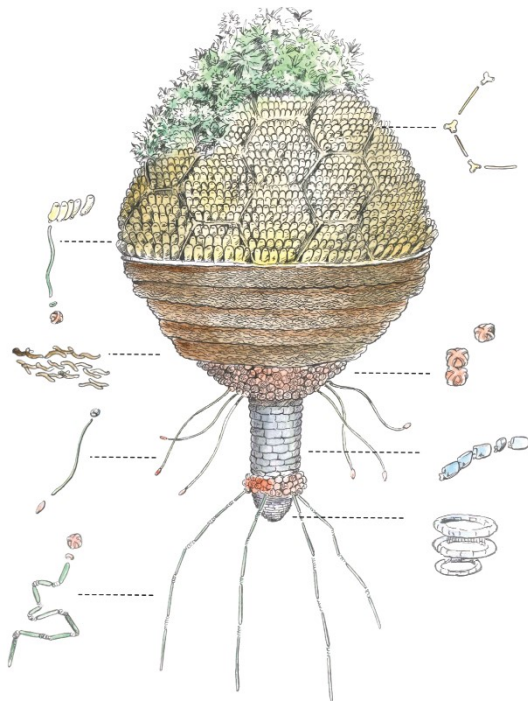
Ocean forests

Each food island is covered with vegetables and fruit-bearing plants. Thousands of these floating islands form a vast ocean forest that provides food to the Purple fleet.



Biomimicry: Virus

The bacteriophage T4 virus served as the inspiration for the floating islands. After infiltrating an E. Coli cell, the virus self-assembles. Separate sets of proteins self-assemble to form all the necessary components of the virus.



Self-assembly

The virus inspired designers to develop a range of self-assembling materials that can form an organized complex structure. By bringing the materials into an aquatic environment small-scale interactions occur that lead to an equilibrium and a final form (the food island).

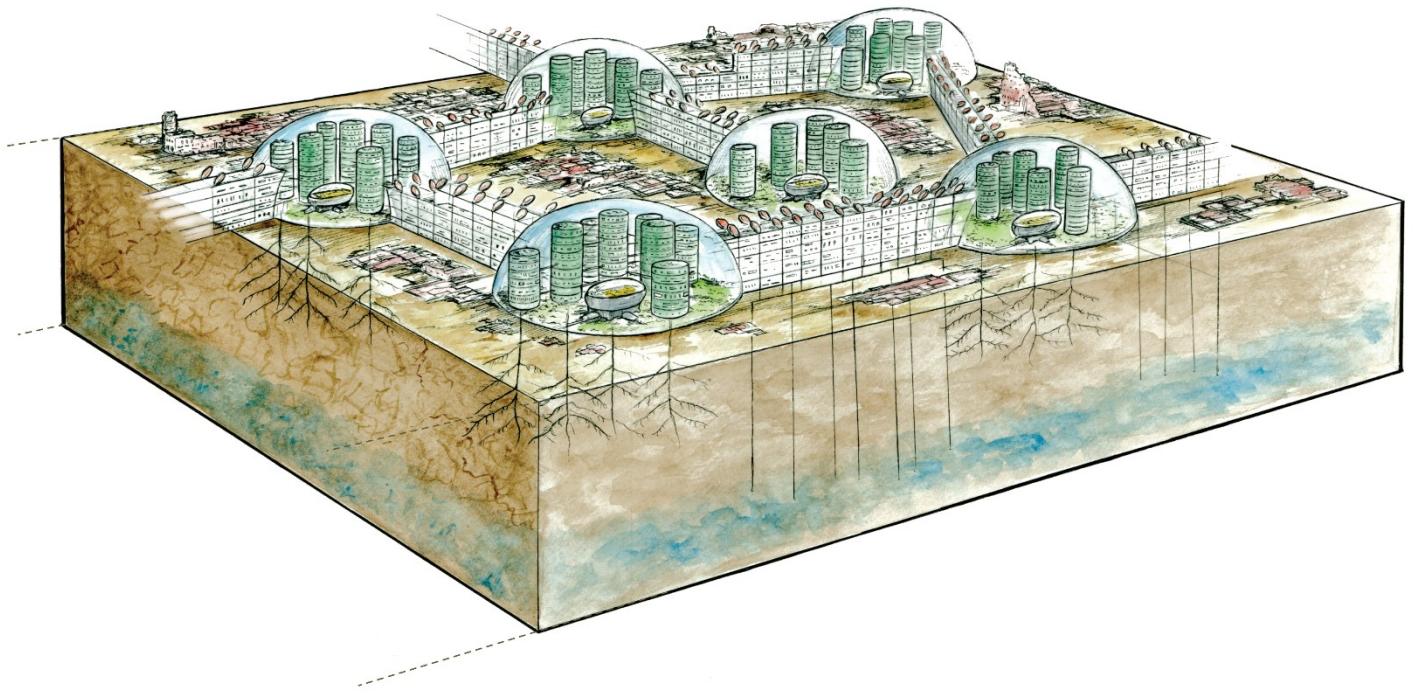
The yellowish "eggs" carry seeds of plants that immediately start to grow. The long tail ensures stability and the fibrous tentacles absorb nutrients out of the sea water.





4 Knowledge communities

Phoenix dome capital of the knowledge community



Organic city built on the ruins of Phoenix (Arizona)

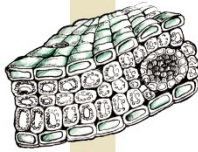
Phoenix dome is the capital of the knowledge community. The city counts several city districts, built inside geodesic domes.

It's the hometown of renowned thinkers, inventors, philosophers, authors and other influential speakers.



Leaves from green plants:

The architecture of the cities is based on the complex photosynthesis process.



Cross section of a leaf:

The mesophyll cells, found inside a plants leaf, contain the most chloroplasts.



Chlorophyll:

In the mesophyll cell you will find the pigment chlorophyll, important to convert light into energy.



Thylakoids:

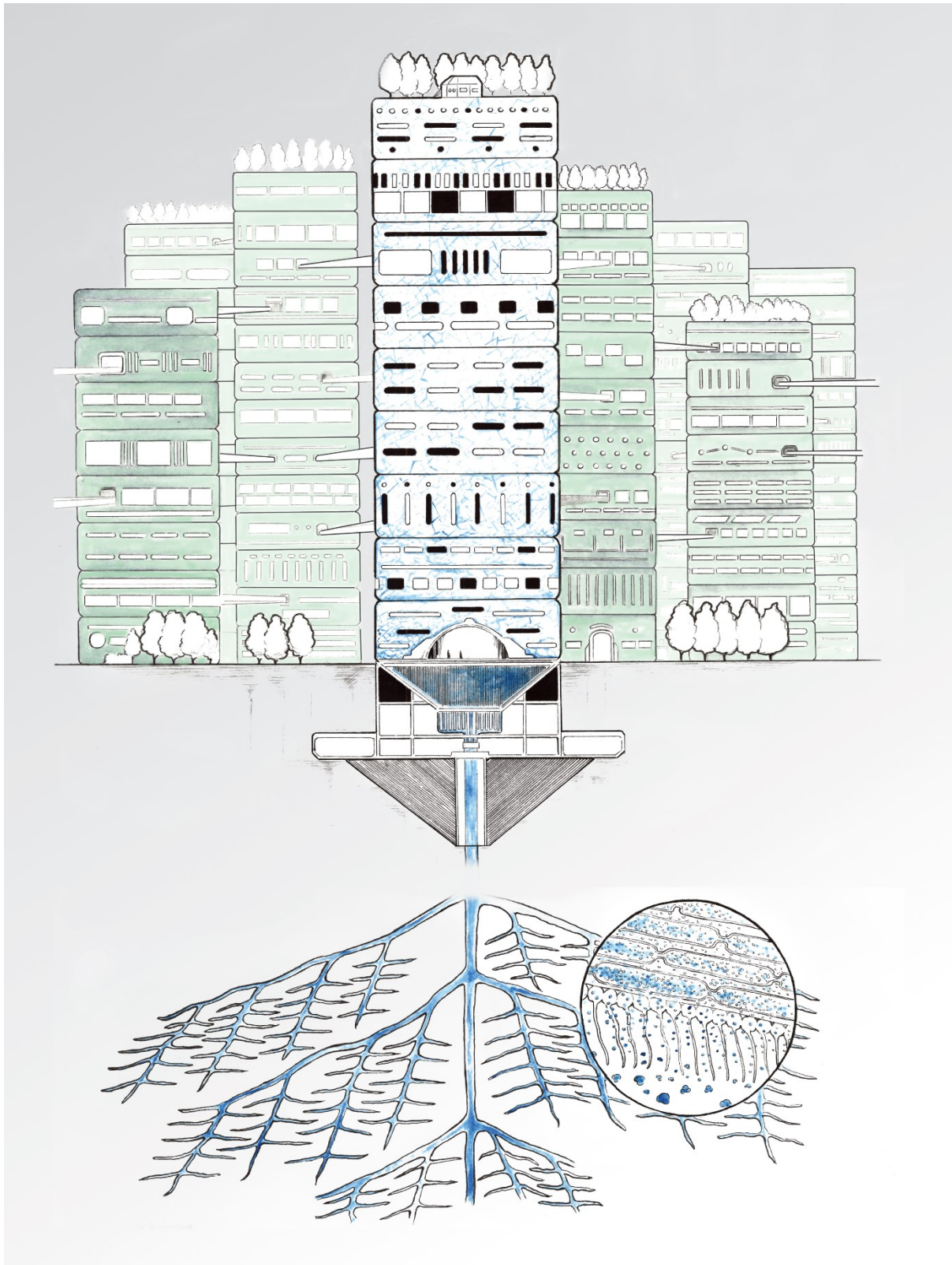
The architecture of the chloroplast consists of stacked membranes called thylakoids.



Biomimicry: city design

This micro structure inspired the architecture of Phoenix dome. The geodesic dome represents the chloroplast and the residential towers resemble the thylakoid membranes inside chloroplasts.

Thylakoid towers



Thylakoid towers

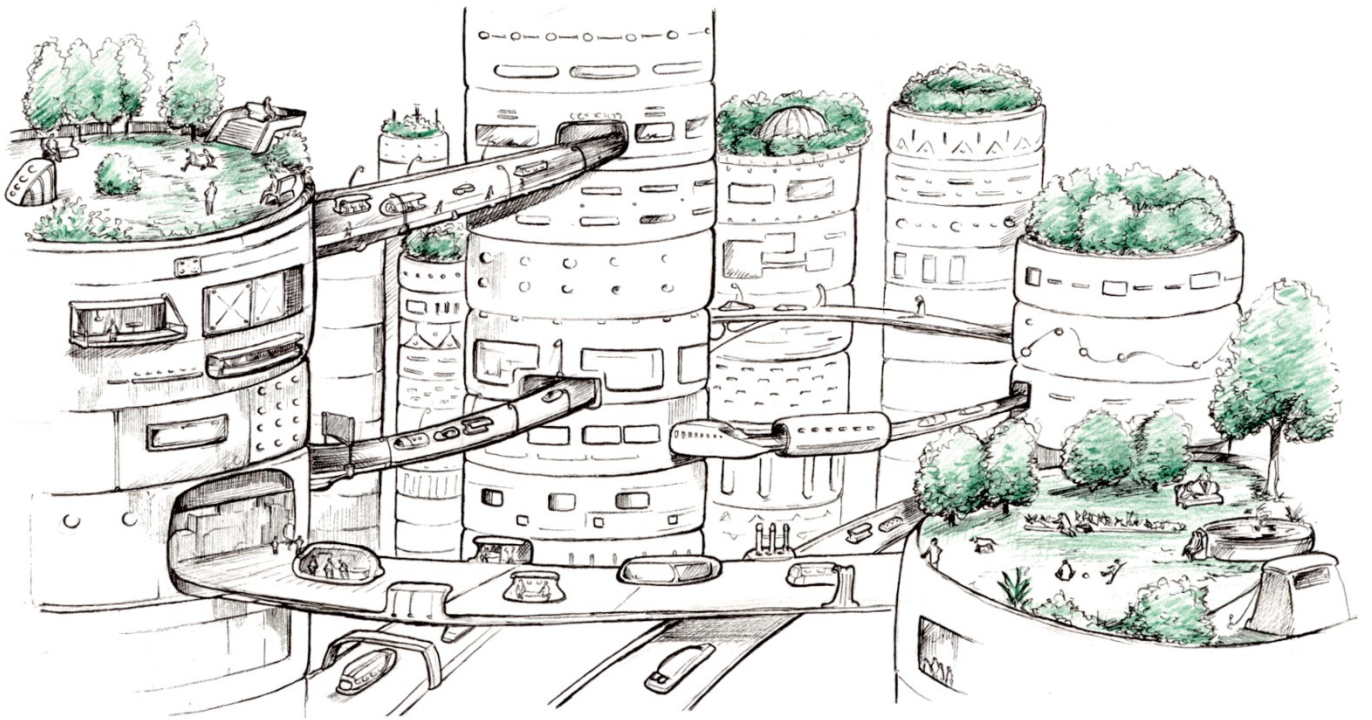
The towers inside the large geodesic domes are shaped just like the microscopic thylakoids inside chloroplasts. The towers are used to facilitate the hundreds of courses organized in Phoenix dome.

Water distribution

Phoenix dome uses an organic water distribution system. Each tower has an organic root. The controlled growth process makes it possible for engineers to steer the root till it reaches aquifers at deeper ground levels.

Thousands of small branches absorb water. Inside the root system capillary forces push the water upwards. During this upward movement the water gets filtered and becomes potable.

Airways



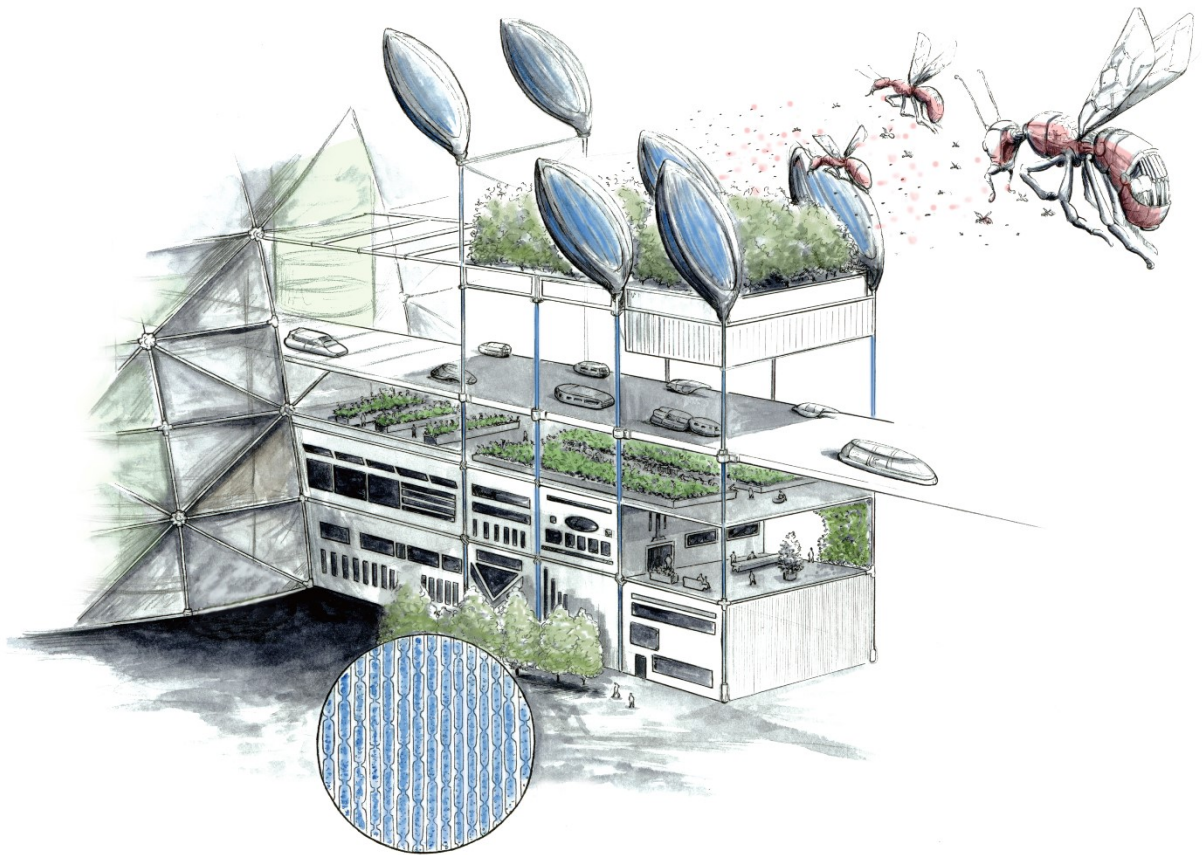
Airways

There are no roads or motorized vehicles to be found on the ground level, only walking paths. The airways are bridges connecting the different thylakoid towers. Small hydrogen fueled vehicles use the Airways to transport people from tower to tower. Inside the towers there is an elevator system to transport vehicles up or downwards.

Parks on the rooftop level

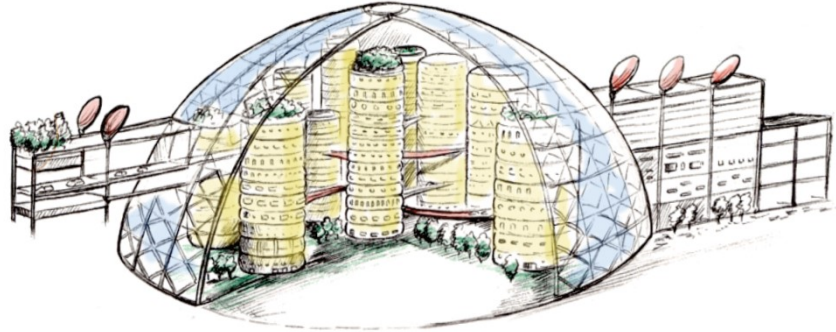
Residents use the rooftop parks and gardens from the thylakoid towers for leisure and agriculture.

The grid



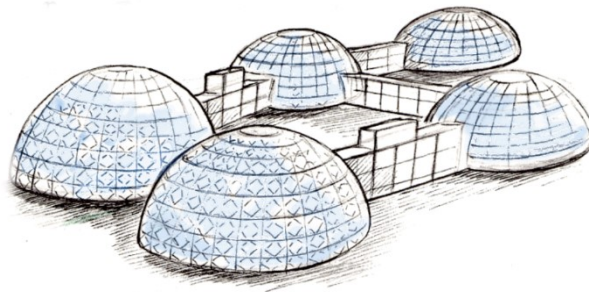
The grid

The domes are connected through the grid. An infrastructural maze to enable transport from dome to dome. The space is also used to house hotels, bars, restaurants and small vegetable gardens.



Self-organizing city

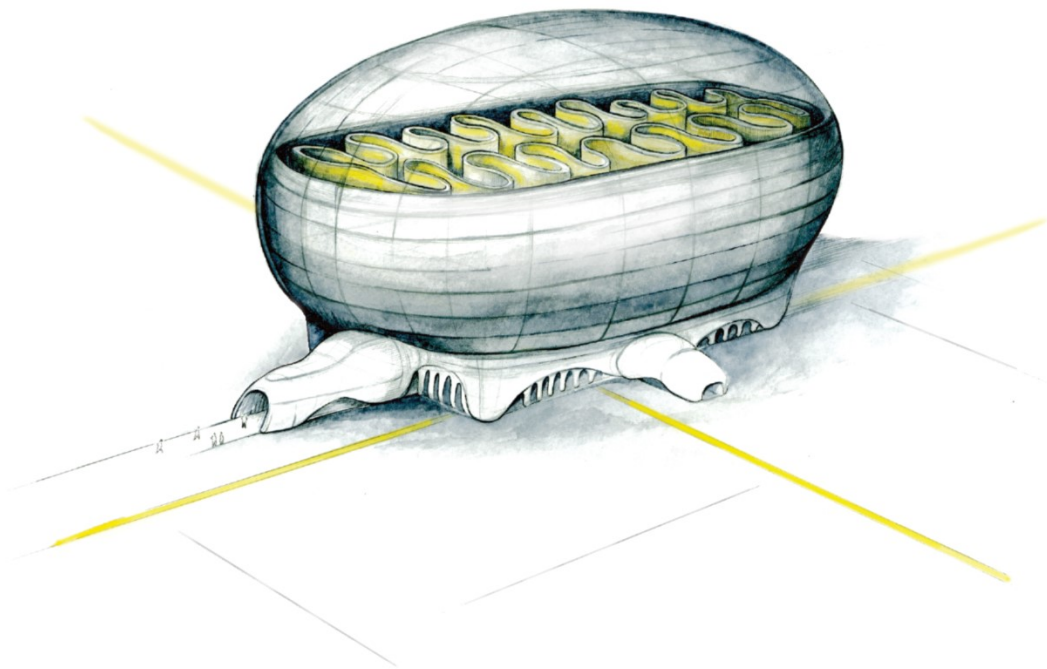
The grid is based on an architectural vision developed by a Finish architect, Marco Casagrande. He developed the paracity concept. The city is to be seen as a bio-urban organism that is growing on the principles of Open Form.



Biomimicry: Frigate bird

The grid has its own independent water distribution system. A system with flexible water sacks is used. An organic pipe (or root) uses capillary forces to suck up water from aquifers. The sack fills itself with drinking water. The sack mimics the gular sac from frigate birds.

The Mitochondrion hydrogen plant



Mitochondrion

Phoenix dome is built with photovoltaic materials. The surplus of solar energy they generate is used in the hydrogen production plants called the mitochondria. It has a similar architecture as the mitochondrion organelle found in most eukaryotic cells. The solar energy is used to evoke an electrochemical reaction at the surface of the membranes. This electrochemical reaction causes the water to split and to produce hydrogen.

Robot and insect ecosystem map



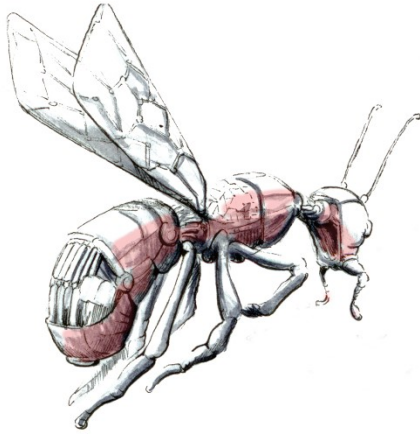
- | | | |
|--------------------|--------------------------------|--------------------------------|
| 1. Robot bee | 14. Sun bird | 27. Ensign wasp |
| 2. Brazil nut | 15. Lady bug larva | 28. Rough stink bug |
| 3. Orchid bee | 16. Harvest bug | 29. black soldier fly |
| 4. Orchids | 17. Ox beetle | 30. Bumble bee |
| 5. Cocoa tree | 18. Jagged ambush bug | 31. Egg plant |
| 6. Chocolate midge | 19. Ecosystem drone | 32. Fruit trees |
| 7. Blow fly | 20. Green lynx spider | 33. Cicada killer wasp |
| 8. Mango | 21. Hawk moth | 34. Horned assassin bug |
| 9. Hover fly larva | 22. Shiitake spawn inseminator | 35. Gig wasp |
| 10. Eyed elater | 23. Butterfly | 36. Fig tree |
| 11. Wheel bug | 24. Giant water bug | 37. Spiny orb weaver |
| 12. Braconid wasp | 25. Earth worm | 38. Dragonfly |
| 13. Tiger beetle | 26. Ant lion | 39. Damsel fly |
| | | 40. Caterpillar with wasp eggs |

The loss of insects due to pesticides

For decades, mankind used chemicals to control pests. Due to long-term use of herbicides and pesticides, 55% of the insect varieties got extinct.

Ecosystem science

The micro-environment of the geodesic domes is used to help restore insect populations and to reintroduce lost species. Insects, spiders and bugs, studied here, play a crucial role in controlling pest populations. The goal is to learn the role of each insect within an ecosystem. The knowledge is also used to design artificial robots with insect DNA.



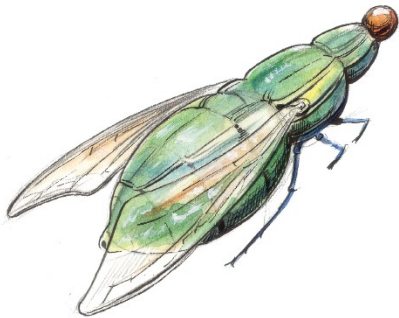
1. Robot bee

The robot bee is the no 1 pollinator and is responsible for approximately 80% of the pollination of fruits, grains and vegetables.



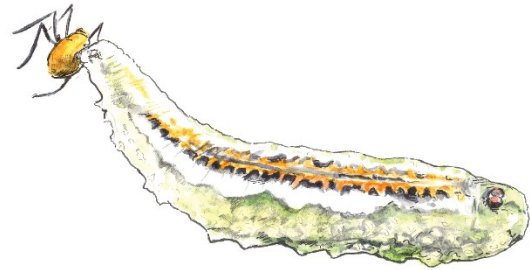
5-6. Cacao tree / Chocolate midge

This robot is constructed so it resembles the anatomy of the chocolate midge. With its tiny body, it infiltrates the cocoa flowers and helps pollinating and cultivating the precious cocoa beans.



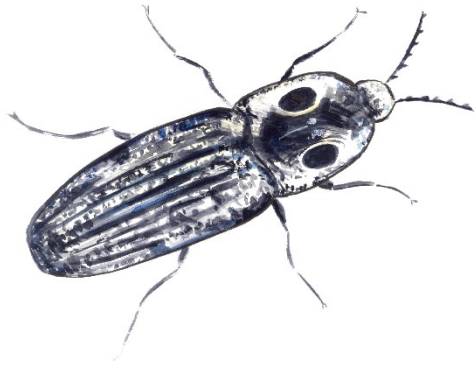
7-8. Blowfly

This robot is designed to pollinate the mango tree flowers.



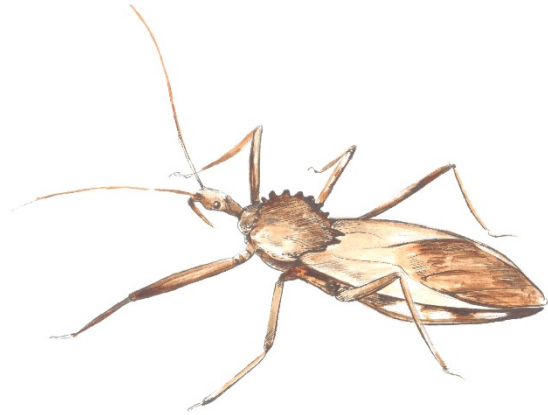
9. Larvae from the hover fly

The hover fly is beneficial because it hunts aphids. The larvae captures them with its jaws and holds them in the air to let the body content drain.



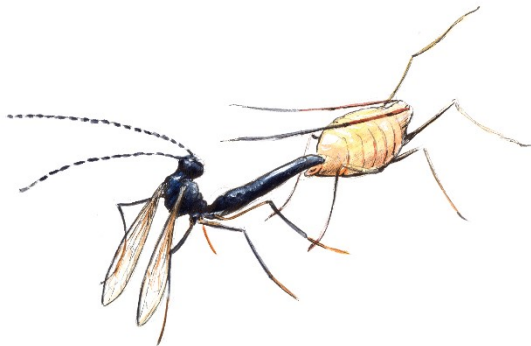
10. Eyed elater

The larvae of the eyed elater is a ferocious meat-eater that dines on many noxious larvae. For instance the larvae of the wood boring beetle.



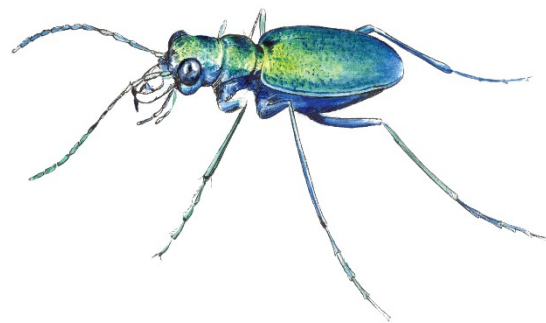
11. wheel bug

Wheel bugs are valuable because they hunt for unwanted caterpillars. They catch their prey with the long forelegs and paralyze it with a saliva they plunge into the body of their victim.



12/40. Braconid wasp / Larva

Aphids constitute a major group of crop pests. The adult female braconid wasp lays an egg in the aphid nymph. Once the egg inside the aphid hatches, the wasp larva consumes the aphid from the inside.



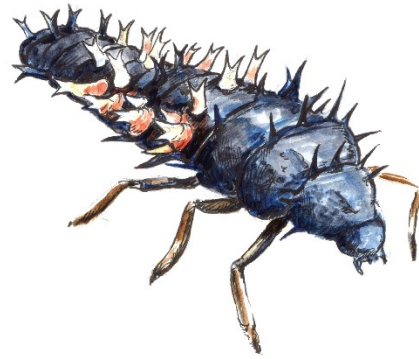
13. Tiger beetle

The tiger beetle literally waits hidden away for its prey and grabs its target just like a tiger. They can run down their target. They feed on pests and in turn they are food for other beneficial animals.



14. Sunbird bot

The sunbirds are pollinators, just like humming birds. The anatomy of the sun bird was the inspiration to design robotic bird pollinators.



15. Ladybug larva

A ladybug larva eats up to 50 to 300 aphids a day. They are the ultimate partner for pest control.



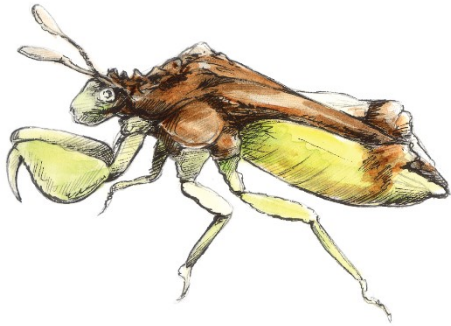
16. Harvestman

Most of the time harvestmen are sitting motionless on the upper sides of leaves waiting to ambush a soft-bodied pest insect.



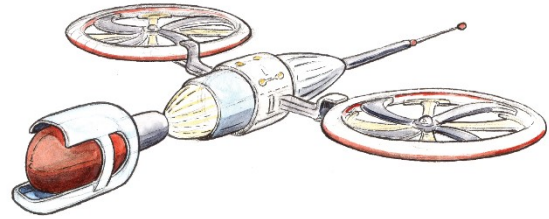
17. Ox beetle

Ox beetles are beneficial because they have a specific role in decomposing and recycling. The larvae their diet consists out of rotten wood and dead vegetation. They help to bring plant material back into the ecosystem.



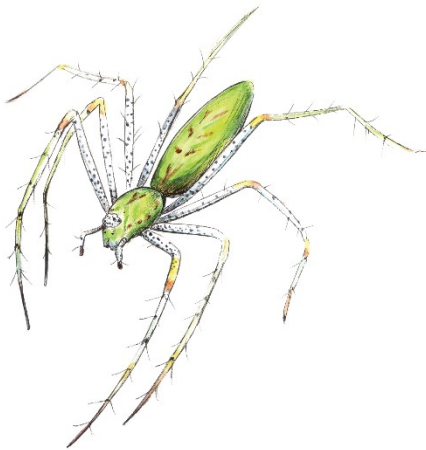
18. Jagged ambush beetle

The ambush beetle is a highly efficient garden predator. It paralyzes its victim and liquefies the body content into a soup. With a straw shaped organ it slurps the fluids out of the victim's body. It kills harmful insect species.



19. Ecosystem drone

Ecosystem drones have detectors to identify insects. They gather data and help us to understand the specific role insects have within an ecosystem.



20. Green lynx spider

Green lynx spiders feed themselves on lots of harmful pest moths.



21. Hawk moth

Most moths are nocturnal and are restricted to drinking nectar from mostly white flowers that open at night. Hawk moths are long distance flyers and bring the pollen they collected to flowers far away from where they got them.



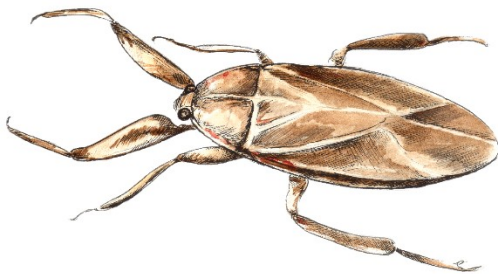
22. Robot inseminator

The small robotic inseminator holds spawn from shiitake inside its body. It infiltrates its tail inside a log and insemminates the spawn. After a while fruiting bodies rise and after a year the mushroom has colonized the log.



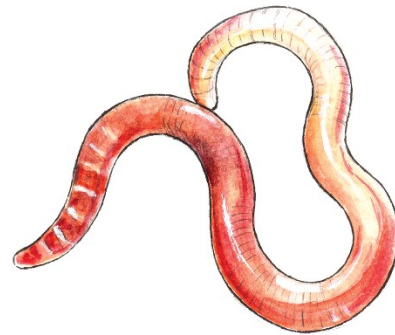
23. Butterfly

Butterflies are important pollinators. They collect pollen on their long and thin legs as they walk around the flower clusters.



24. Giant water bug

The water bug, its forelegs are tipped with hook-shaped claws to grasp and hold its prey. With the hind legs, the bug grabs a plant close to the surface and it snatches a passing prey. They eat harmful mosquito larvae.



25. Earthworm

This humble creature will maybe overlooked if one talks about beneficial critters. Earthworms aerate and loosen the soil by digging tunnels and bringing the mineral rich subsoil to the surface. The tunnels make it possible to allow oxygen to penetrate deeper, which helps beneficial soil bacteria.



26. Antlion

The ant lion in its larva stage is predatory. It constructs a conical pit where its prey got entrapped. The ant lion waits at the bottom of the pit for an insect to slip on the loose sand. Then it falls right into the jaws of the insect.



27. Ensign wasp

Ensign wasps are parasitic. The females lay an egg in a cockroach egg case and the wasp larva consumes the egg of the cockroach.



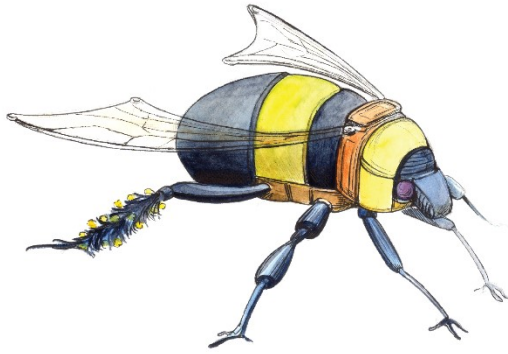
28. Rough stink bug

The excellently camouflaged rough stink bug is a beneficial predator that preys on caterpillars, plant eating larvae of beetles, adult beetles, aphids and other harmful soft-bodied insects.



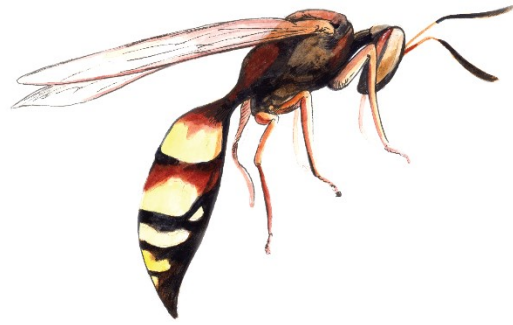
29. Black soldier fly

The larvae of the black soldier fly grow in manure. It helps to reduce the accumulation of manure. If a high population of black soldier larvae is active it discourages pest flies to lay their eggs in the manure.



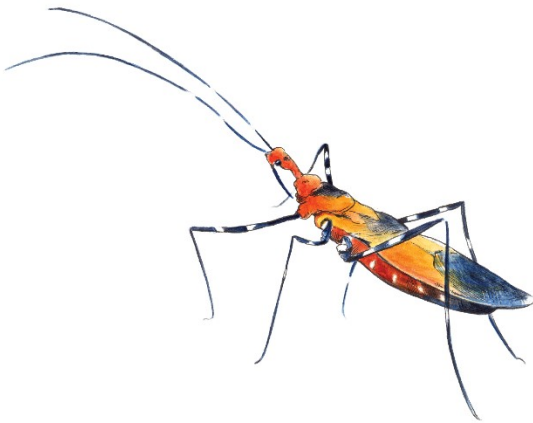
30/31/32. Bumble bee robot/mango tree/fruit trees

Bumble bees got almost completely extinct. The robot bumble bees are important pollinators for clover, alfalfa, vetch and a variety of fruits.



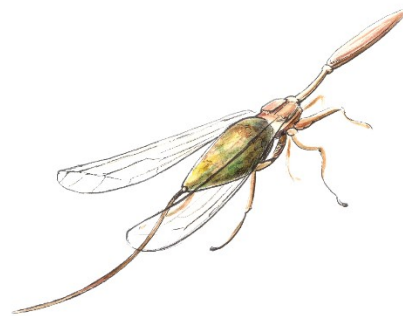
33. Cicada killer wasp

This large wasp is a beneficial insect in the control of the noisy cicadas. In the summer months female wasps fly out and search cicadas, kill them and bring them to their nest to provide food for the larvae.



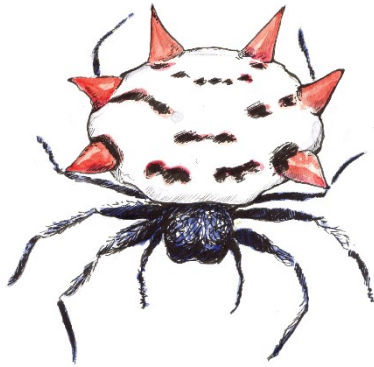
34. Horned assassin bug

The colors of the horned assassin bug mimic the colors of the milkweed bug. A bug that is harmless and taste bad. This is some clever camouflage because large predators will avoid it and preys are not alarmed if they see one. The bug uses a sharp proboscis to puncture harmful insects.



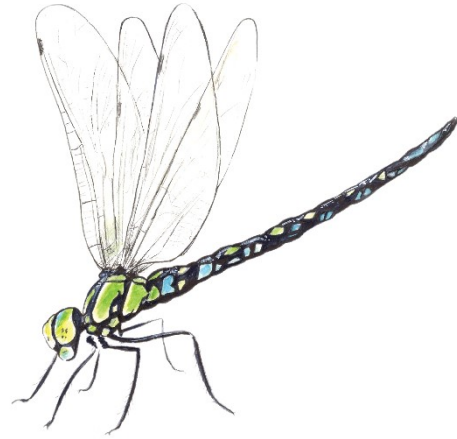
35/36. Fig wasp/Fig trees

Though fig wasps are not extinct yet, the concerns were high that this pollinator of fig trees would become extinct. An artificial version was designed that can pollinate fig fruits.



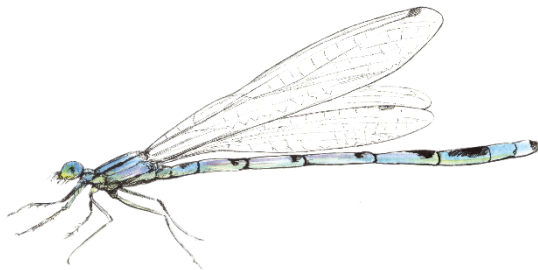
37. Spiny orb weaver

This small spider, like many other spiders, weaves small round shaped webs in shrubs and trees. Once its prey is caught in her web it determines the exact location and size of the victim and it immobilizes it. Spiders help to control the overpopulation of insects



38. Dragonfly

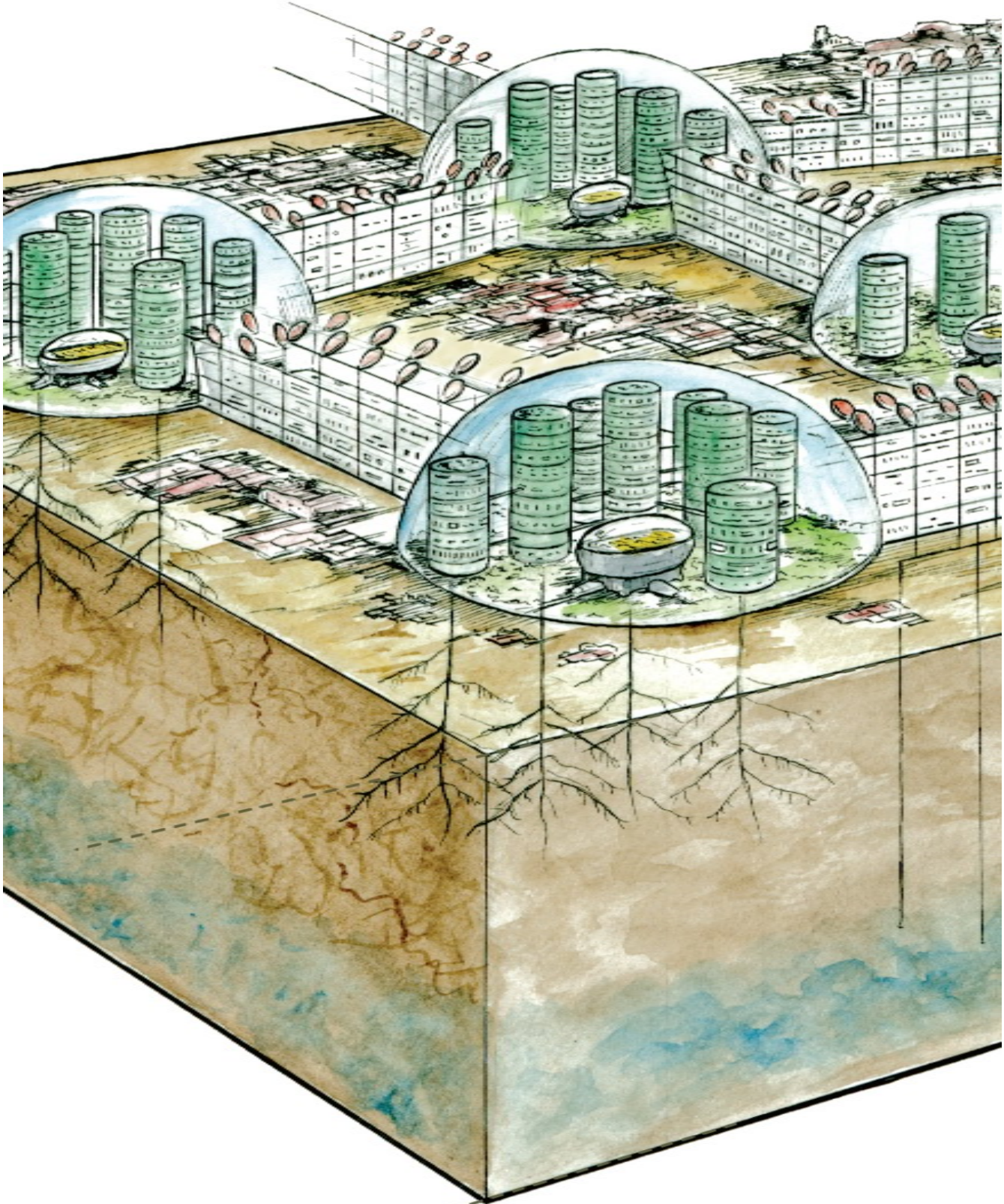
Dragonflies are fierce hunters that just like hawks have very good eyesight and great speed. In its immature stage it is an aquatic nymph that hunt mosquito larvae.



39. Damselfly

The damselfly is of the same order, "Odonata", as the dragonfly. They help control populations of harmful insects, they consume large quantities of harmful flies, mosquitoes and moths.





5 Nomad community

The nomad community



The nomad community

Nomads their main occupation is trade. They have an important role as recyclers and upcyclers and help with Rewilding operations. There are numerous different nomad settlements and tribes. Together they form the largest community on earth.

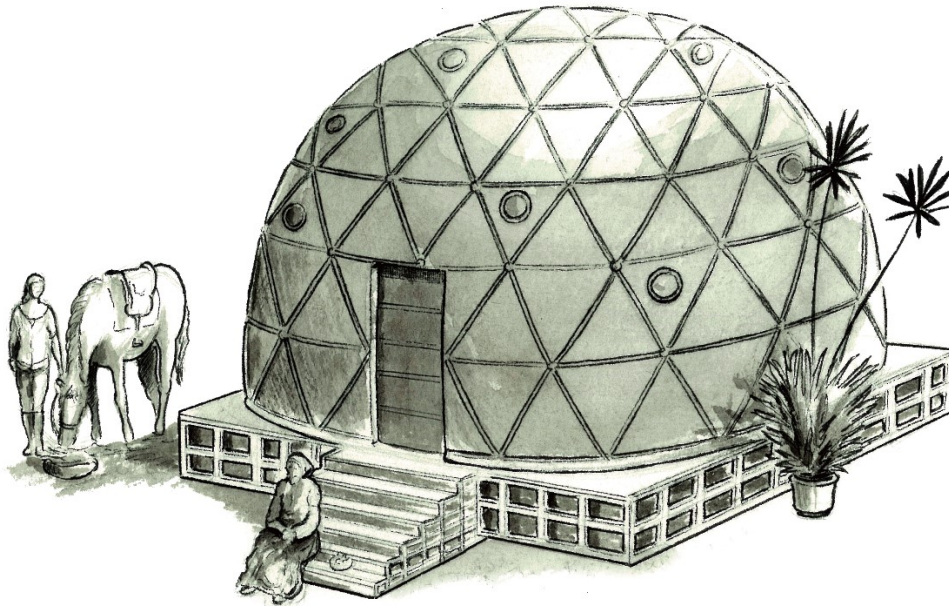
Desert nomad camp

Pictured at the left is a typical desert nomad camp. A desolated camp settlement where passing caravans can take a rest. Nomads that settle here do not stay very long.

The most important subdivisions of nomad groups:

- Nomadic mining groups
- Nomadic agricultural groups
- Nomadic consultants and diplomats
- Nomadic makers
- Nomadic market vendor groups

Nomadic mining groups



Small dome shelters

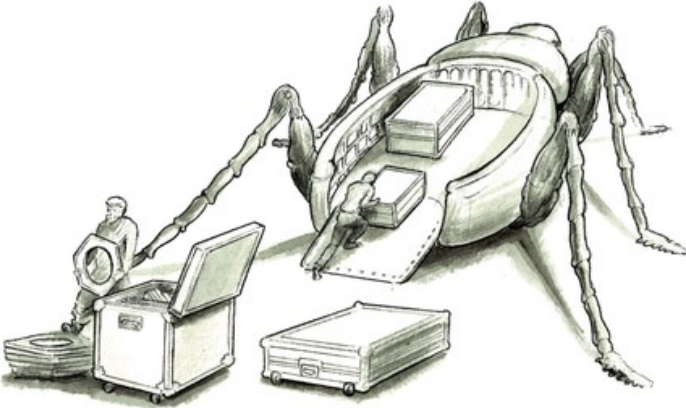
Specialized nomad groups wander through the most desolated outskirts on earth in search for minerals and raw materials. Beside tents the geodesic dome is a favorable shelter for mining nomads. They built their villages in an area they want to excavate.



Left : Dome N55 – Right : Dome Nasa

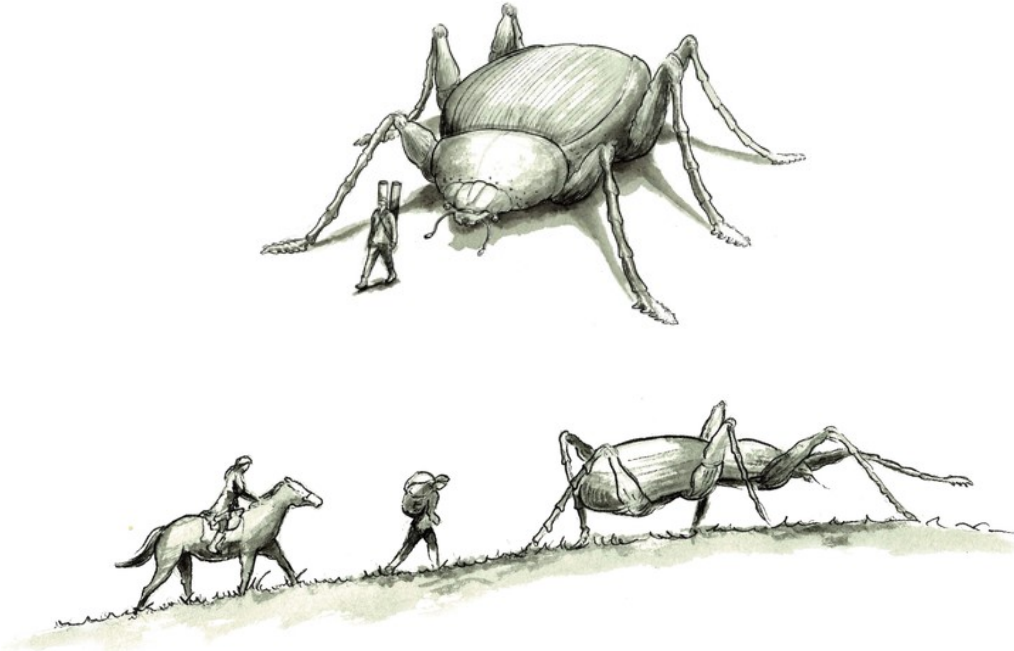
Demountable home

The dome construction can be disassembled into sets of small parts that can be stacked away in cases.



Carrier robots

The robot shown here is a carrier type. It helps the nomads to carry their luggage.



Nomadic agricultural groups

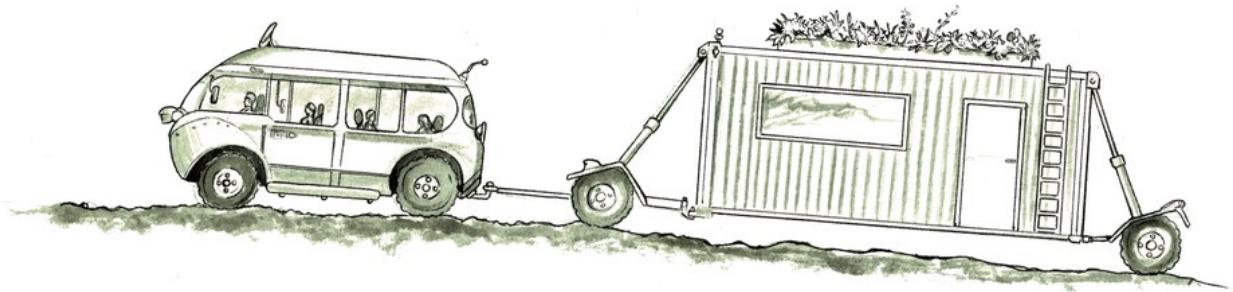


Containers

Agricultural nomadic groups travel to abandoned villages. Inside the ruins they search for useful materials they can recycle. They live in cargo trailer houses, often converted shipping containers.

CLT system

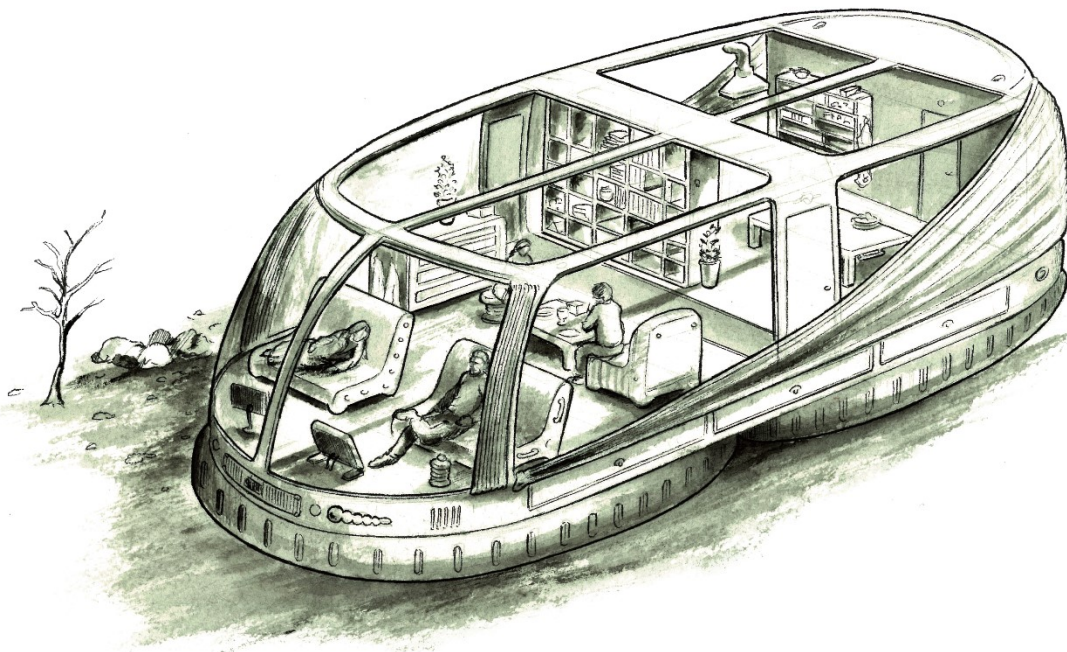
The automated CLT (Container Load Trailer) transport system is an old military technology used to transport trailers with military equipment on rough terrain. The CLT system clamps the trailer and is equipped with self-driving technology.



Nomadic consultants and diplomats

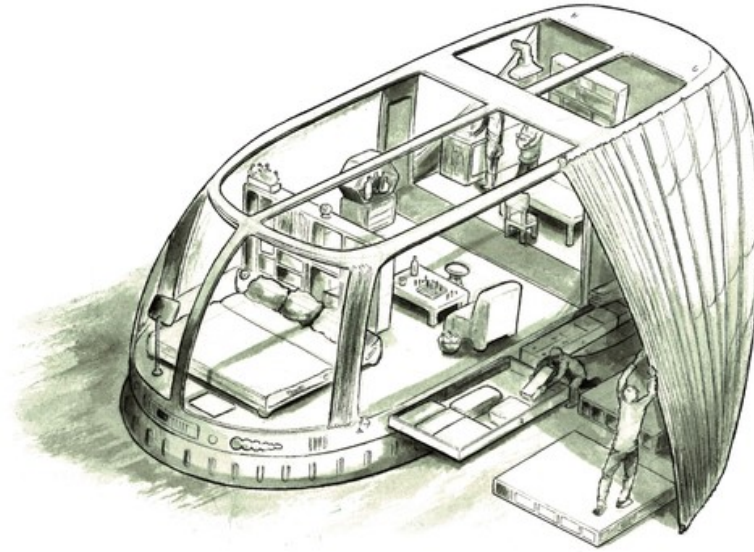
The role of the diplomat

The diplomat (or consultant) has a special position within the nomadic community. They are ambassadors for the nomadic community. They defend the rights and interests of the nomads. They negotiate trade agreements and access to resources and land.



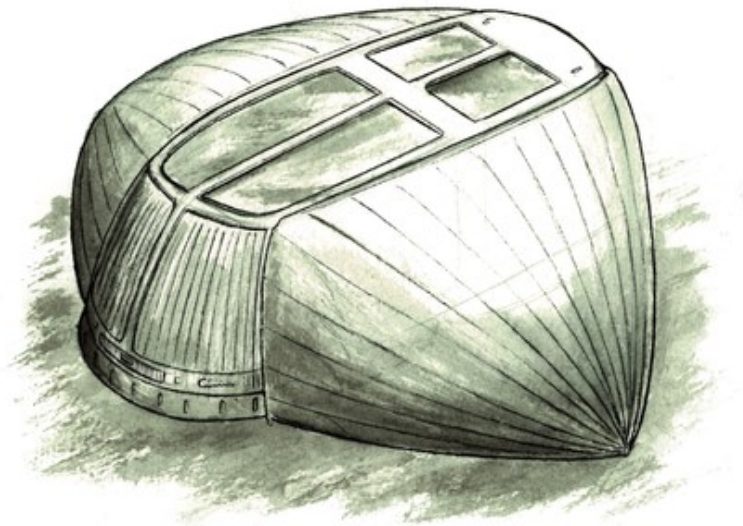
Hover cars

Diplomats travel with a hover vehicle. The hover car is levitated from the ground and floats over the surface.



Protected against storms

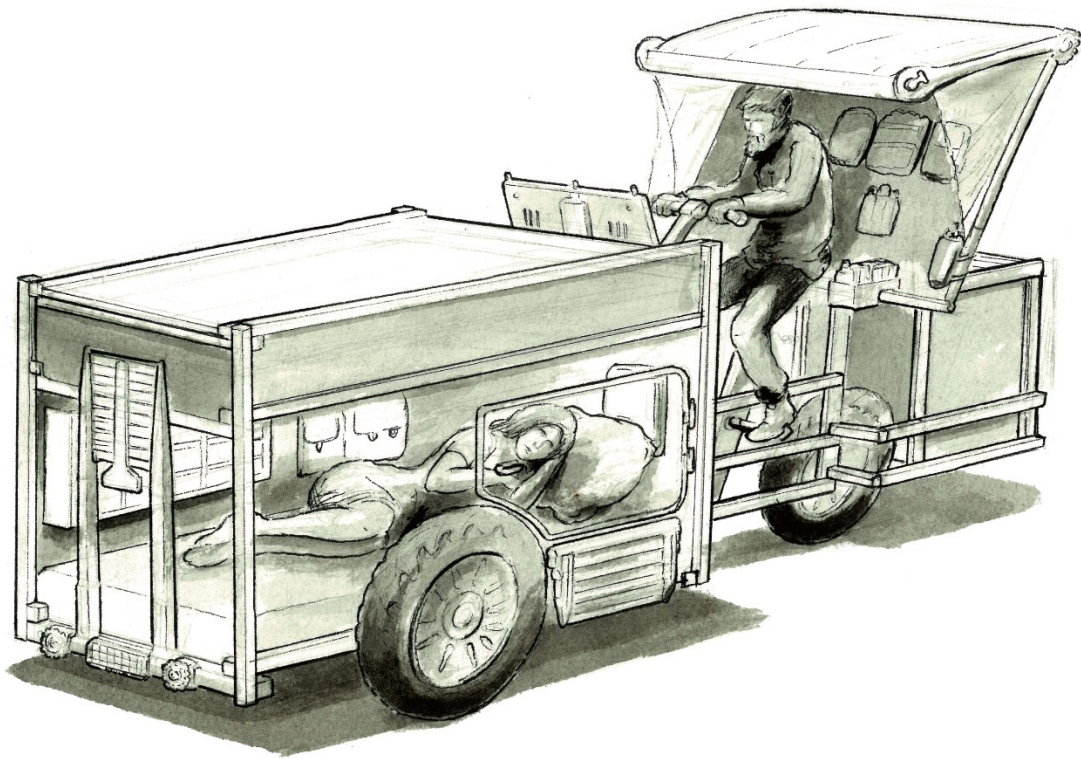
The hover car is equipped with a foldable protective shield. The design of the shield is inspired by a bird's wing. This protective shield helps against sand blizzards.



Nomadic makers

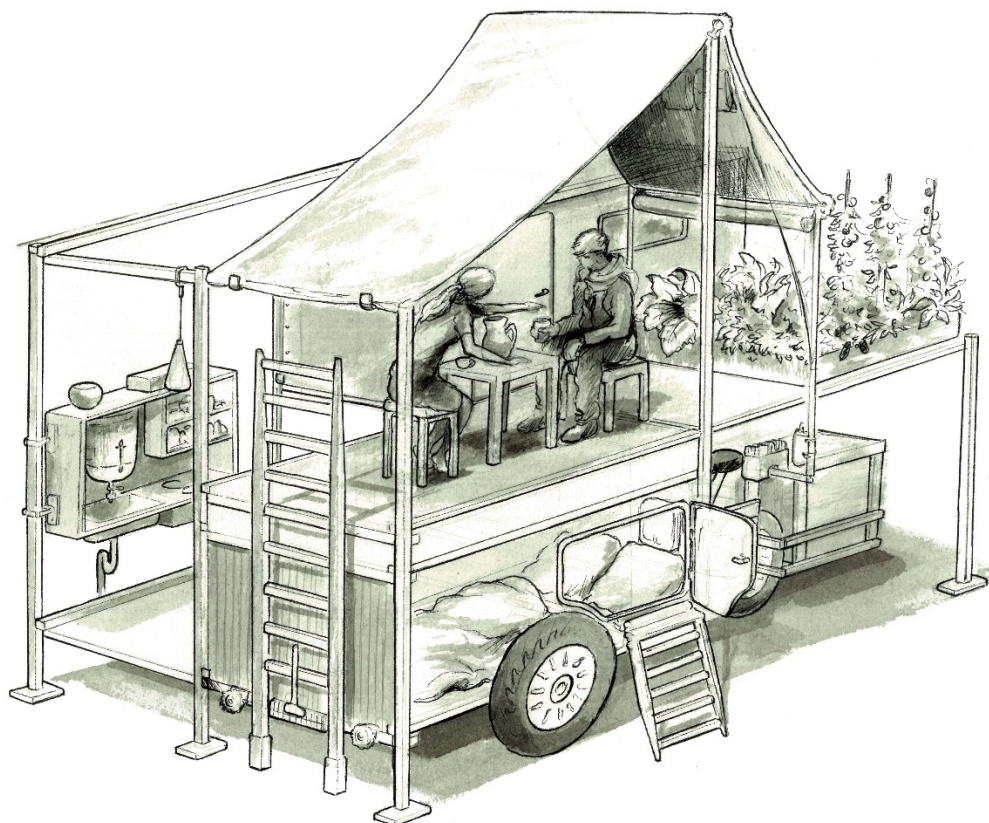
Tailor made and local production

Nomadic makers travel to large cities like the squatter cities. They are specialized in the production of tailor made products such as furniture, bicycles, robots and electrical applications. They have mobile workplaces so they can easily adapt to their environment.



E-bikes

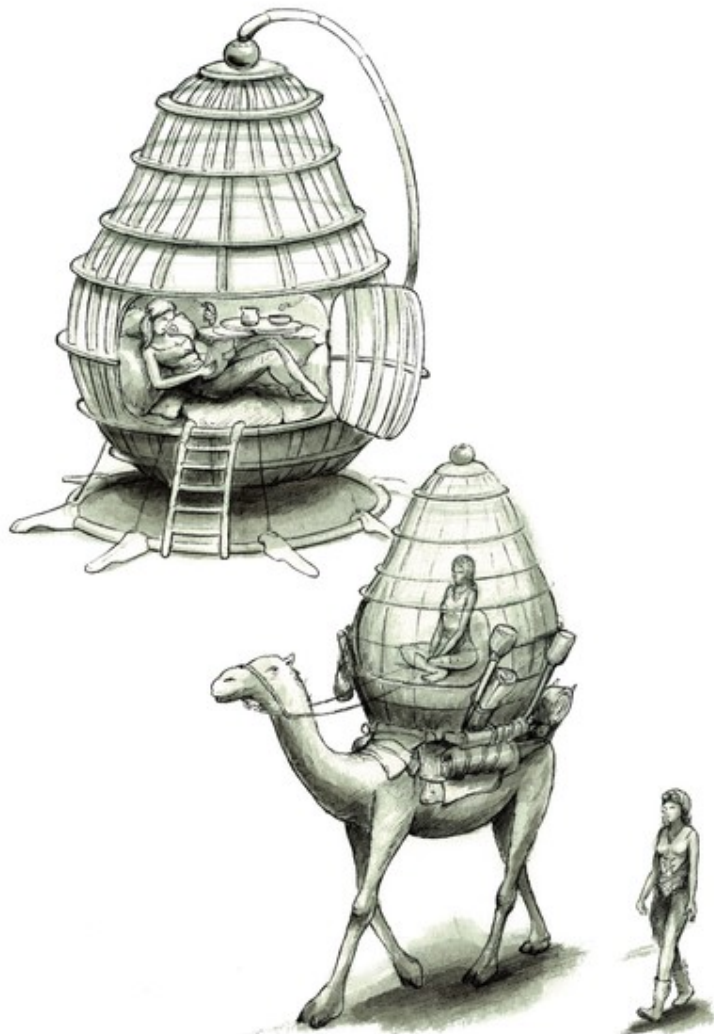
They use E-bikes to travel. They can transform their bikes into a tiny house or a workshop.



Nomadic market vendors – Soft pod tribes

Feminine nomad groups

An interesting subculture among the nomads are the soft pod tribes. These nomadic groups consist only out of women. Soft pod tribes rely on camels to travel long distances. They organize the large souk markets.

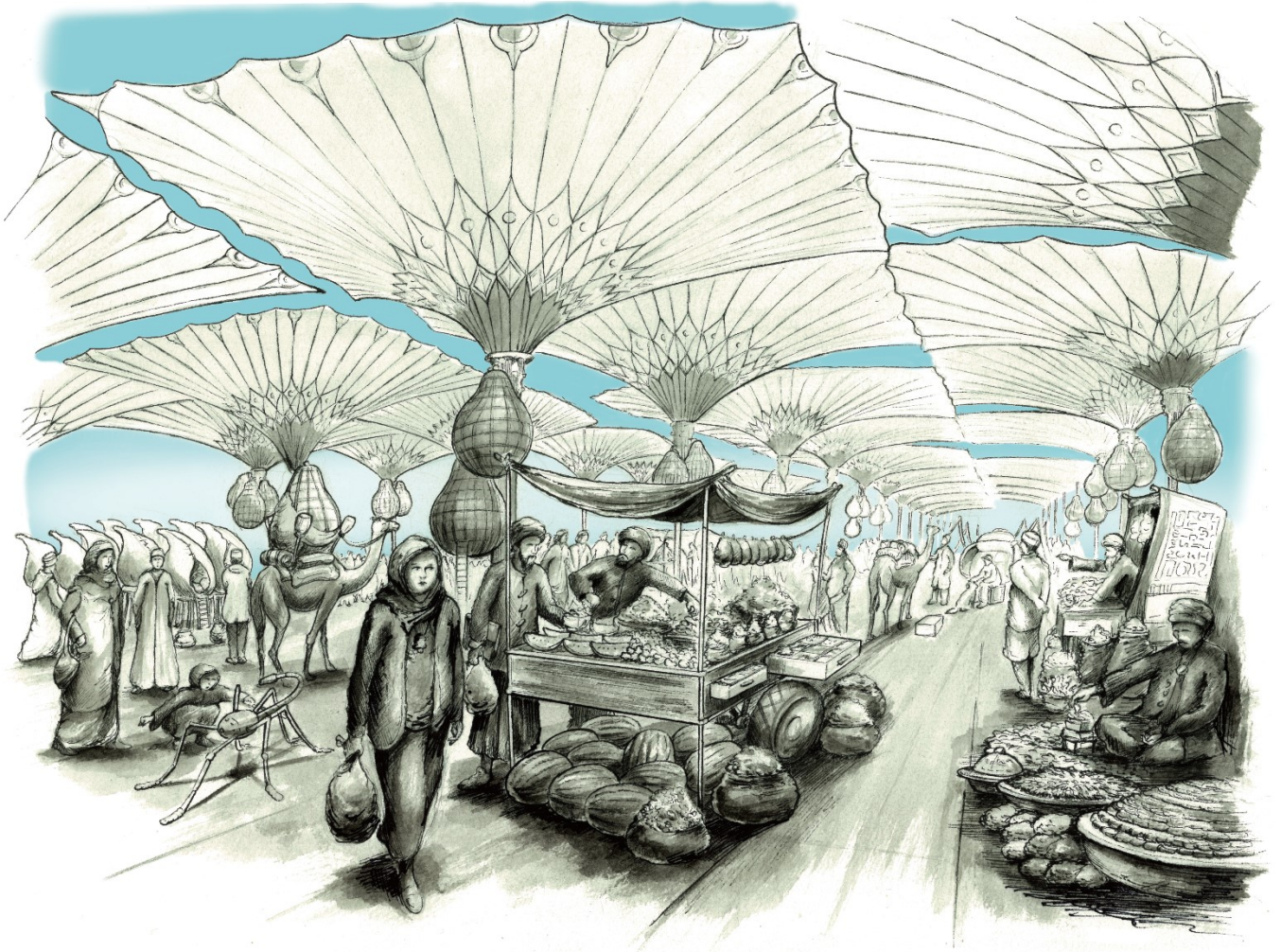


The soft pods

The name soft pod tribes is derived from the shelters they use. The women use small pods made from soft textile materials. Some are foldable just like tents and others can be installed on the back of camels. The pods are only used to sleep. All other spaces like shower halls, kitchens, dining rooms, living rooms are shared spaces. At each new camp site they rebuild them.



The souk markets



The souk markets

The souk markets are among the biggest marketplaces in the world. The large umbrella structures remind us of the umbrellas from the open square of Medina.

Medina Umbrellas inspired the soft pod tribes:



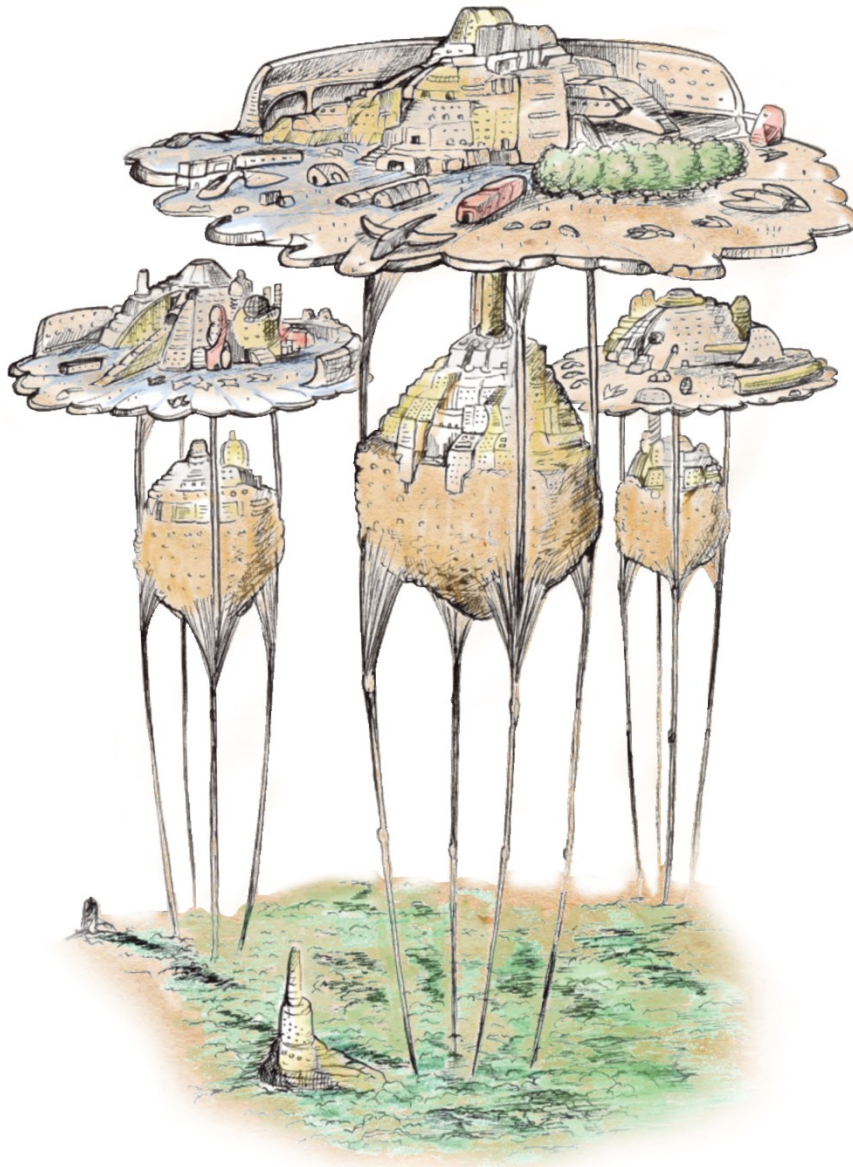
Pictures wikimedia foundation





6 The sky community

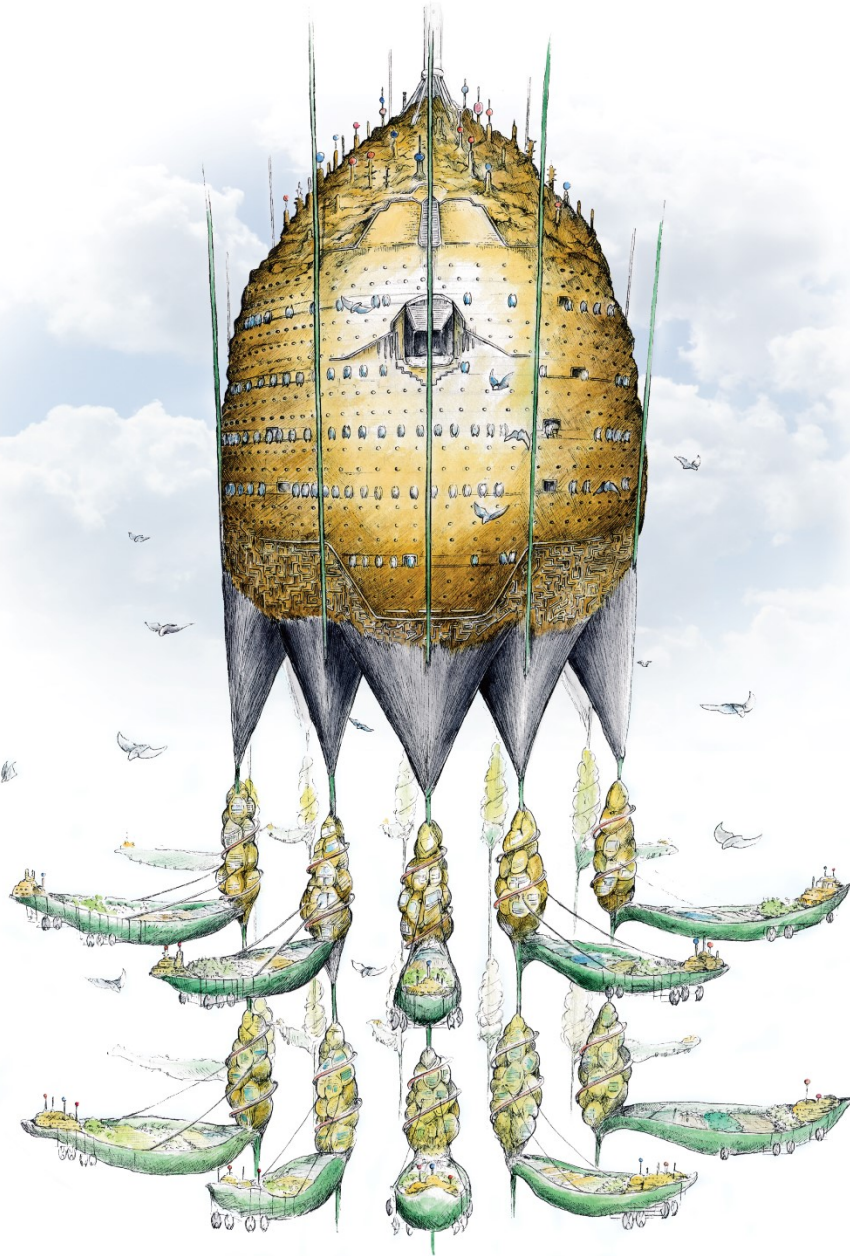
Sky cities



Sky cities at the border of the rainforests

These cities are constructed at the borders of earths remaining rainforests. Sky cities or platform cities are built on platforms made from organic material. The platforms rest on organic pillars with an extreme strength and flexibility. Their residents protect earths forests. They control the airspace traffic and they monitor the weather.

Mud houses



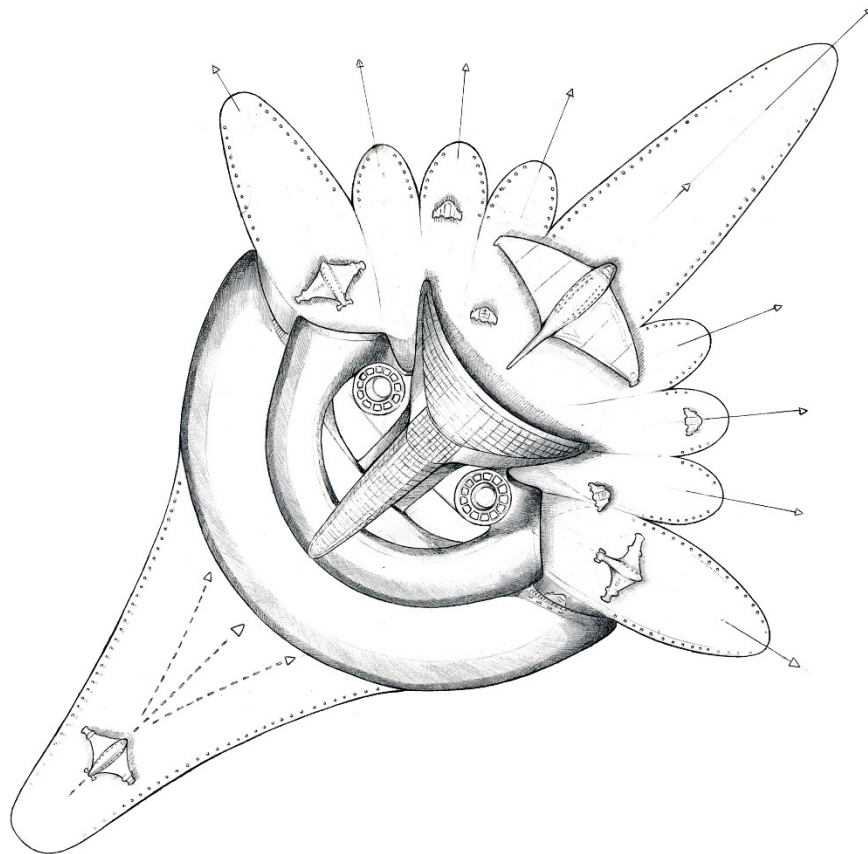
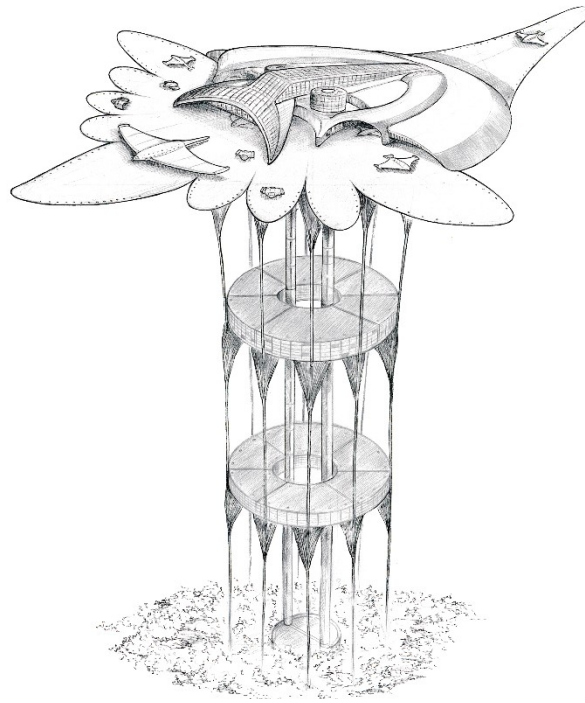
Large mud nest inspired houses

The residents live in buildings built on top of the platform and in the mud houses hanging between the long organic pillars. The architects found inspiration by studying mud nests of birds.



Author unknown

Aeroporto Amazonas Manaus



Aeroporto Amazonas Manaus

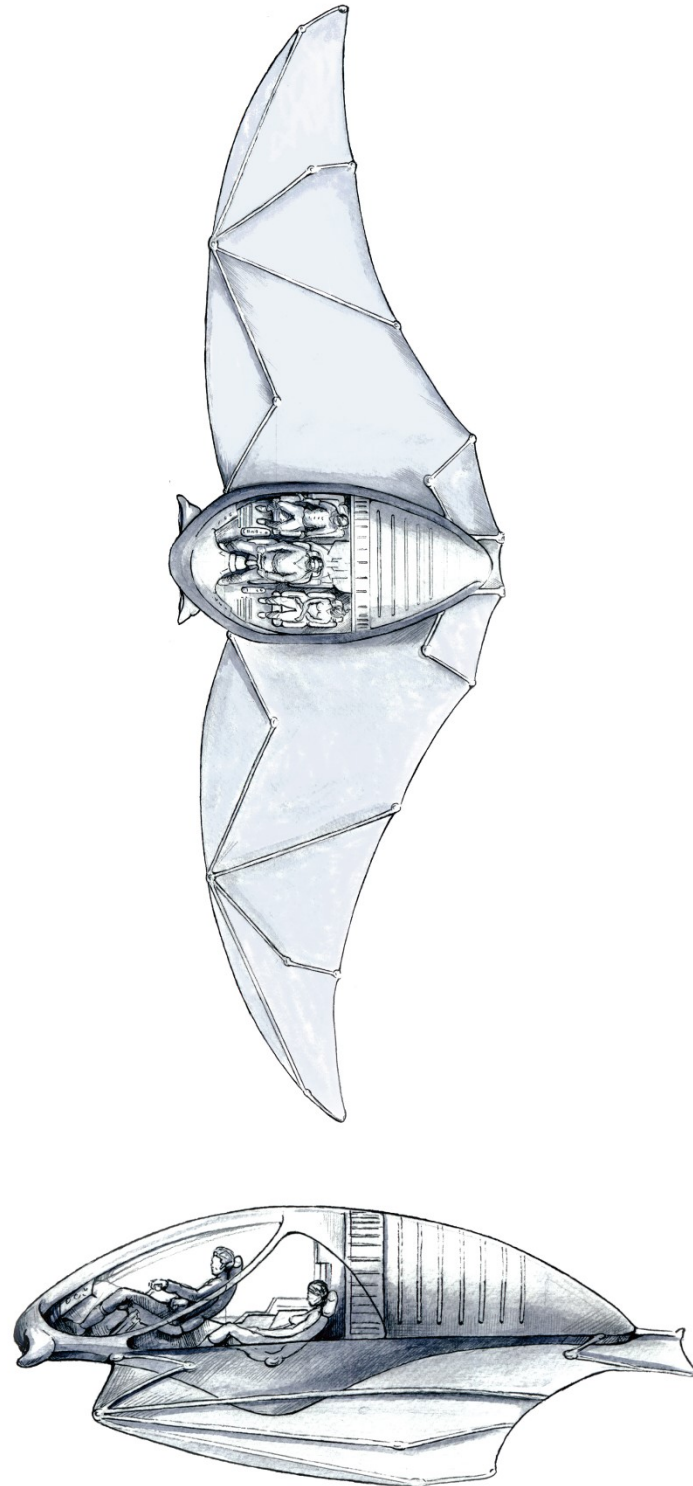
The sky community exploits almost all relevant space airports. On the left page one can see one of the largest platform airports, to be found in Manaus, former Brazil.

Virgins space port inspired the architects



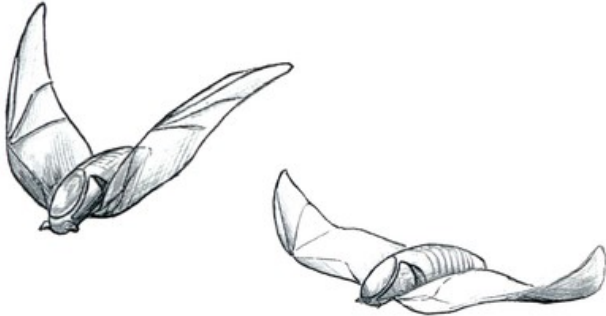
Picture: virgin space port

Chiroptera

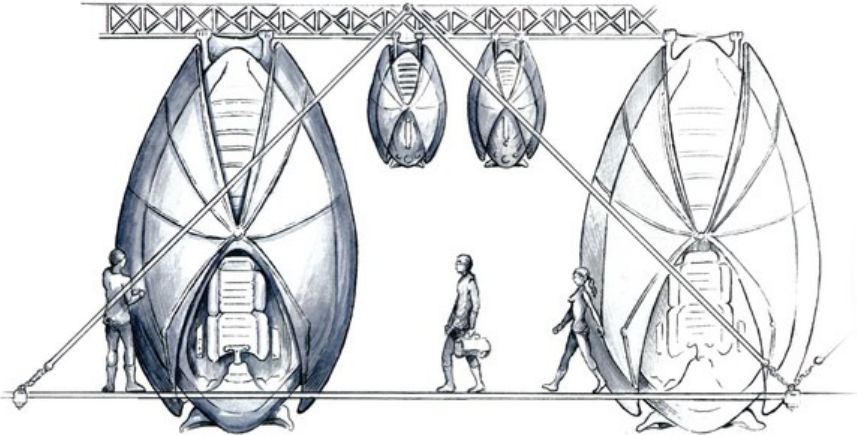
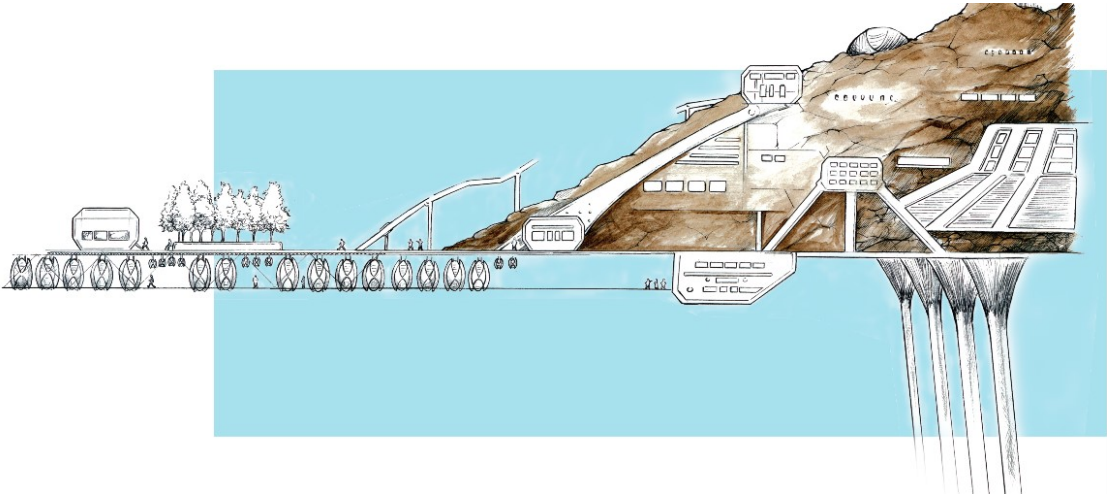


The flight of a bat

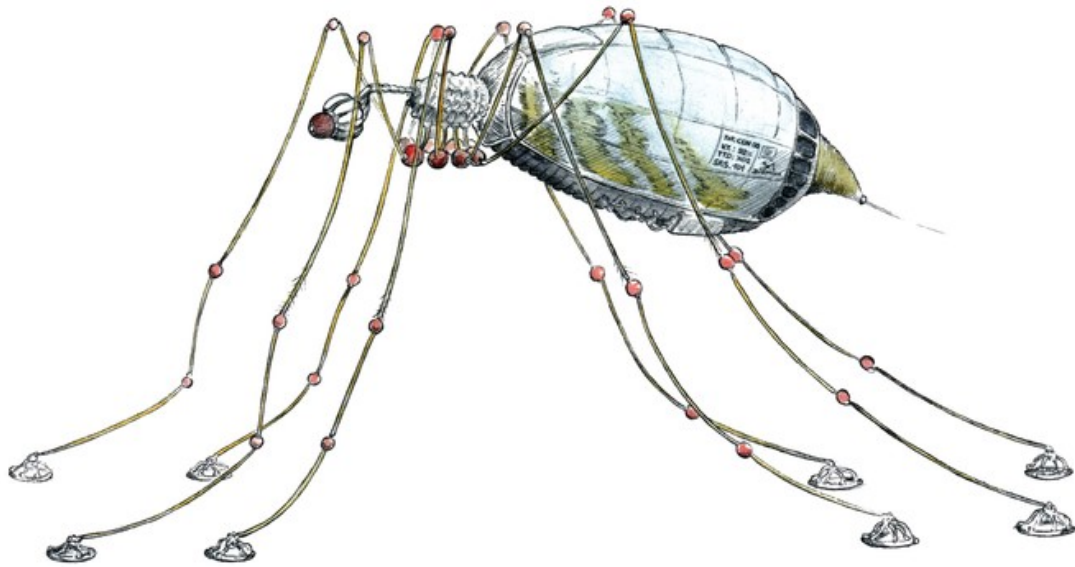
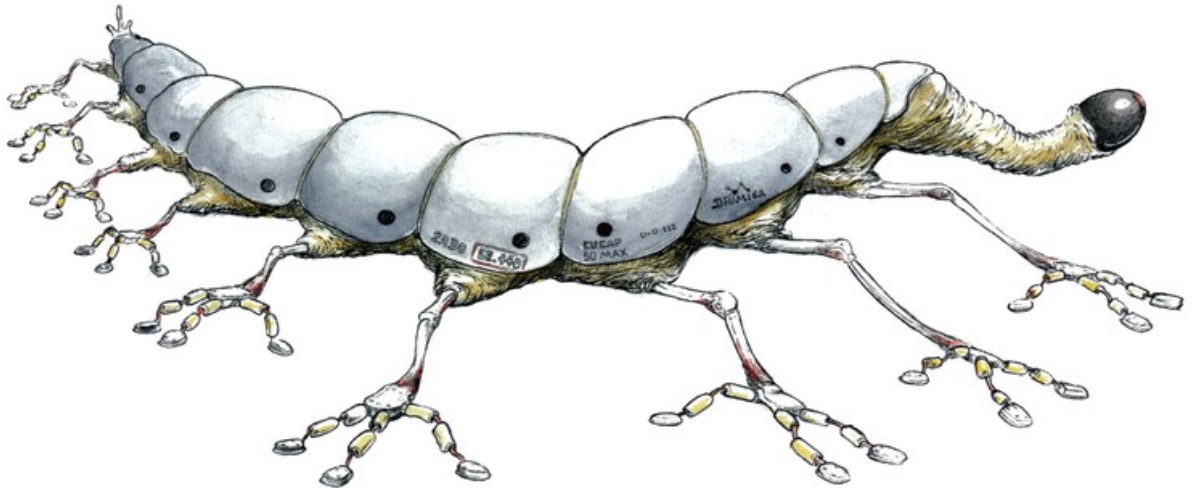
The Chiroptera is a lightweight aircraft for 3 up to 5 persons. It is the local transport system. The aircraft mimics the anatomy of a bat, and its fly technique.



Just like bats, the Chiroptera are hanging upside down, underneath the large platforms.



Spinner bots



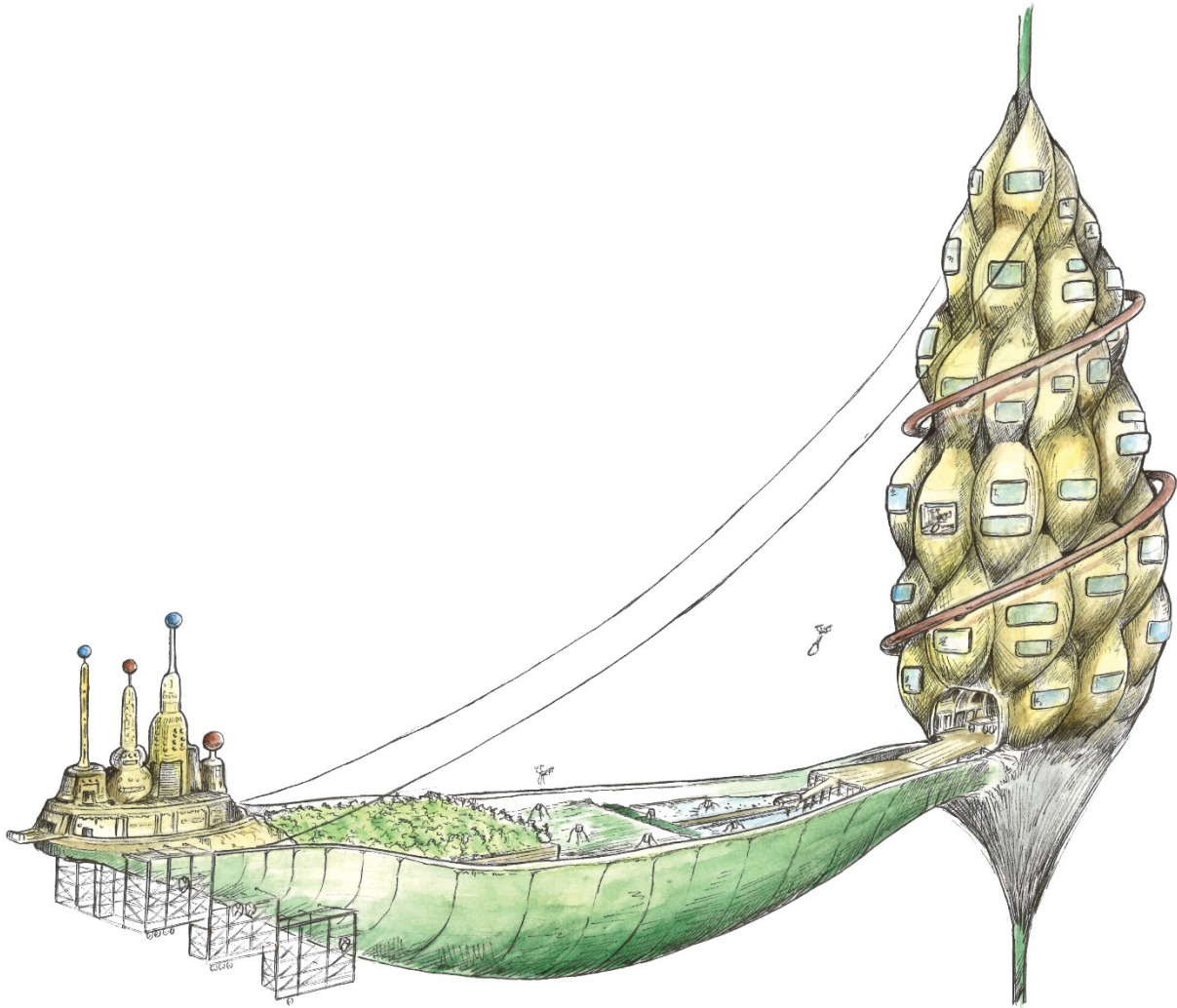
Robots maintain the platforms

The thread produced by spiders is known for its immense strength. An artificial copy of the sticky thread was designed to help constructing the platform cities. The thread is used to attach the platforms and the mud houses to the pillars.

Spinner robots that mimic creatures like spiders and silk worms are used to produce the thread. They remain on the platform and monitor the threads on flaws and execute reparations.

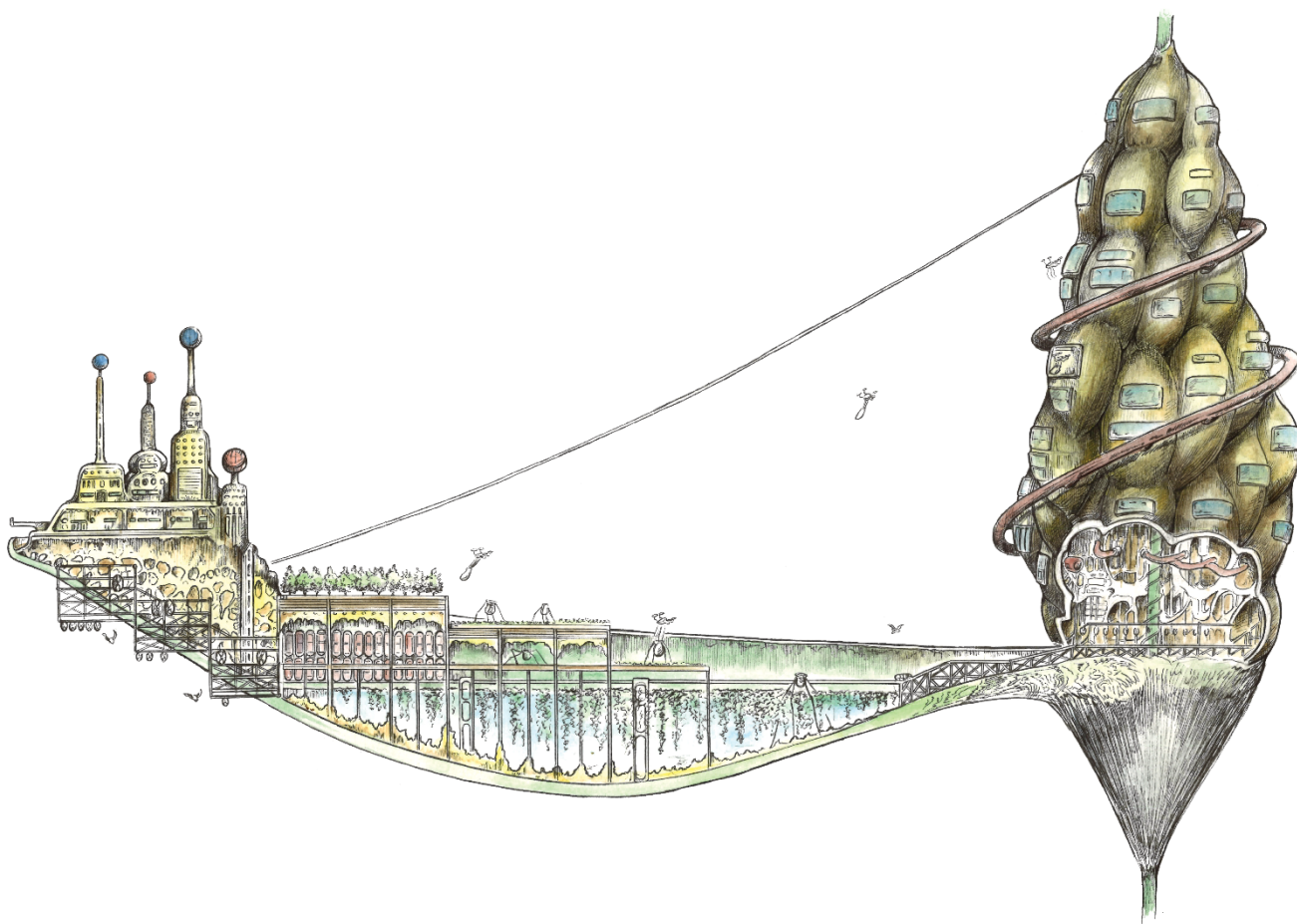


Bromeliad agriculture

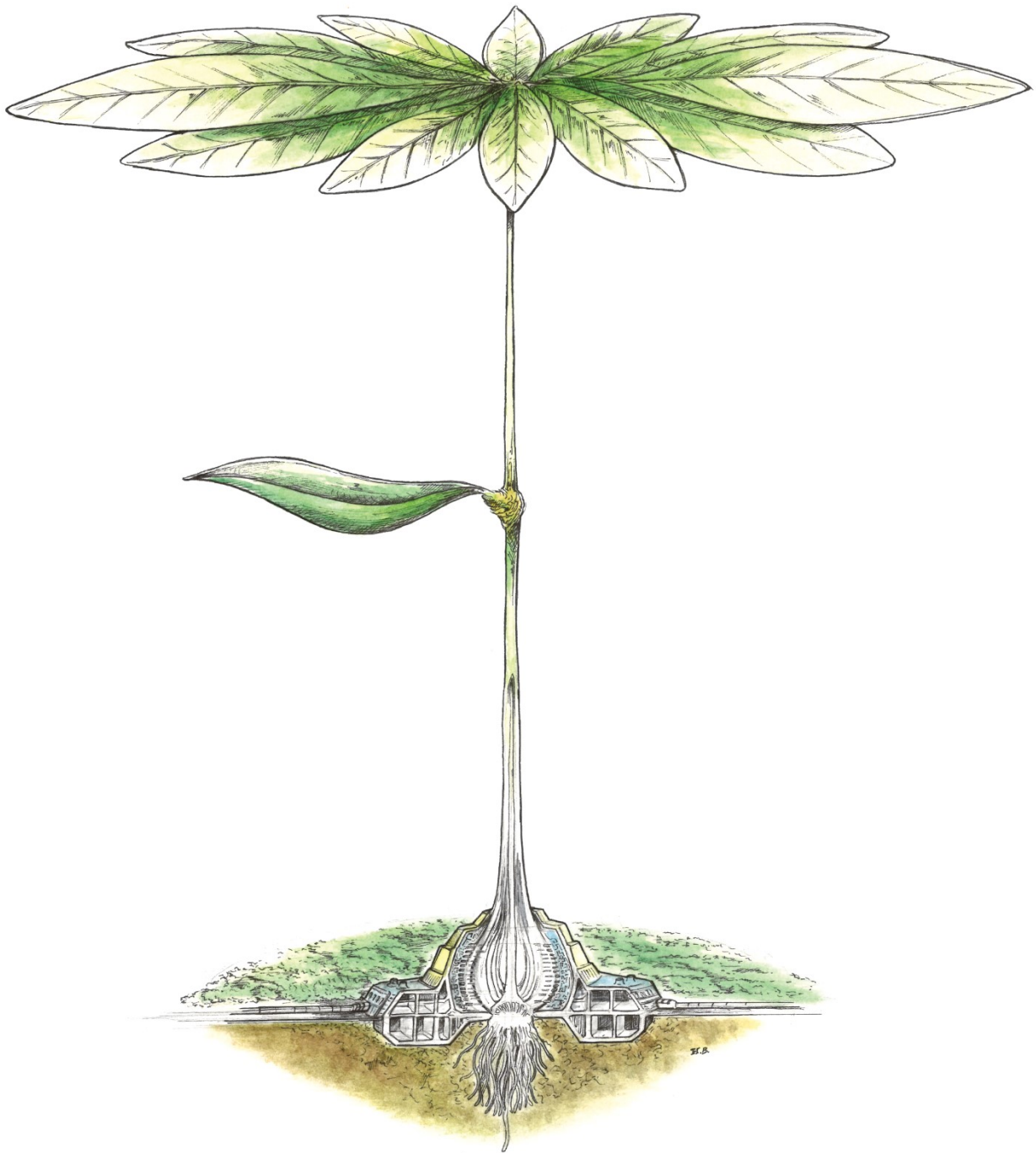


Tropical plant as inspiration

The name Bromeliad refers to a plant that grows high in the canopy of the tropical forest. The plant captures water and the tiny water pool functions as a small ecosystem. The sky cities use a similar construction to support a terrace agriculture system.



Controlled growth

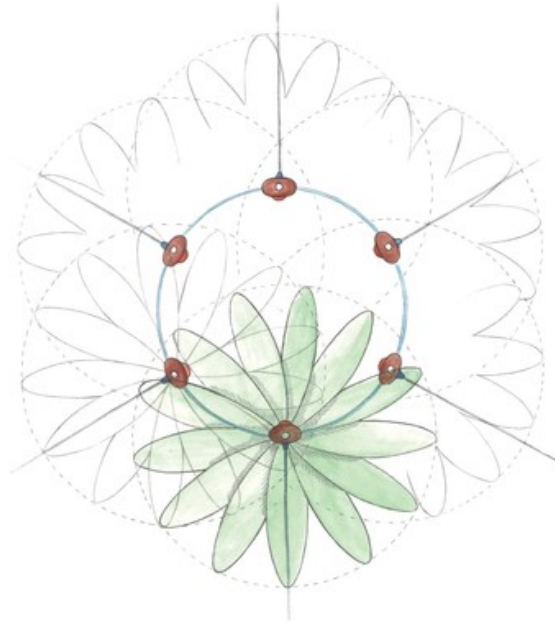


The growth control center

Several organic pillars support the platform. Each pillar grows with the aid of bio-computers. They use hormones to control rooting, stem elongating, directional growth, growth of shoots and the growth of the Bromeliad leaves. The platform consists of canopy leaves.

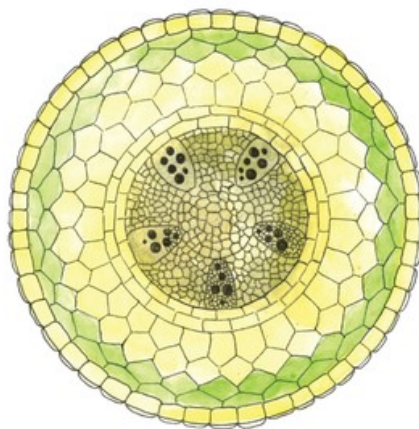
The red dots = plant growth centers

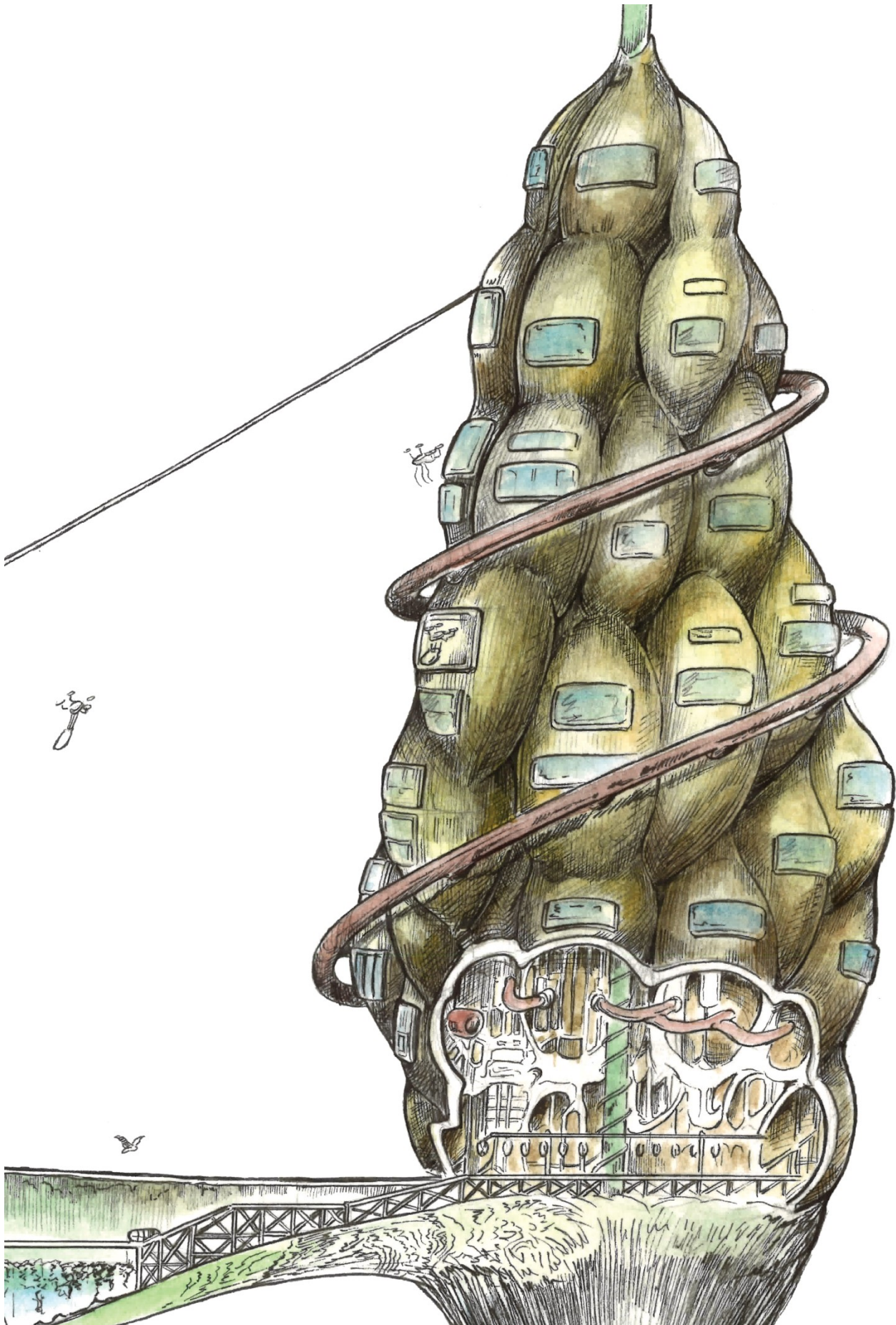
Blue lines = Vactube lines

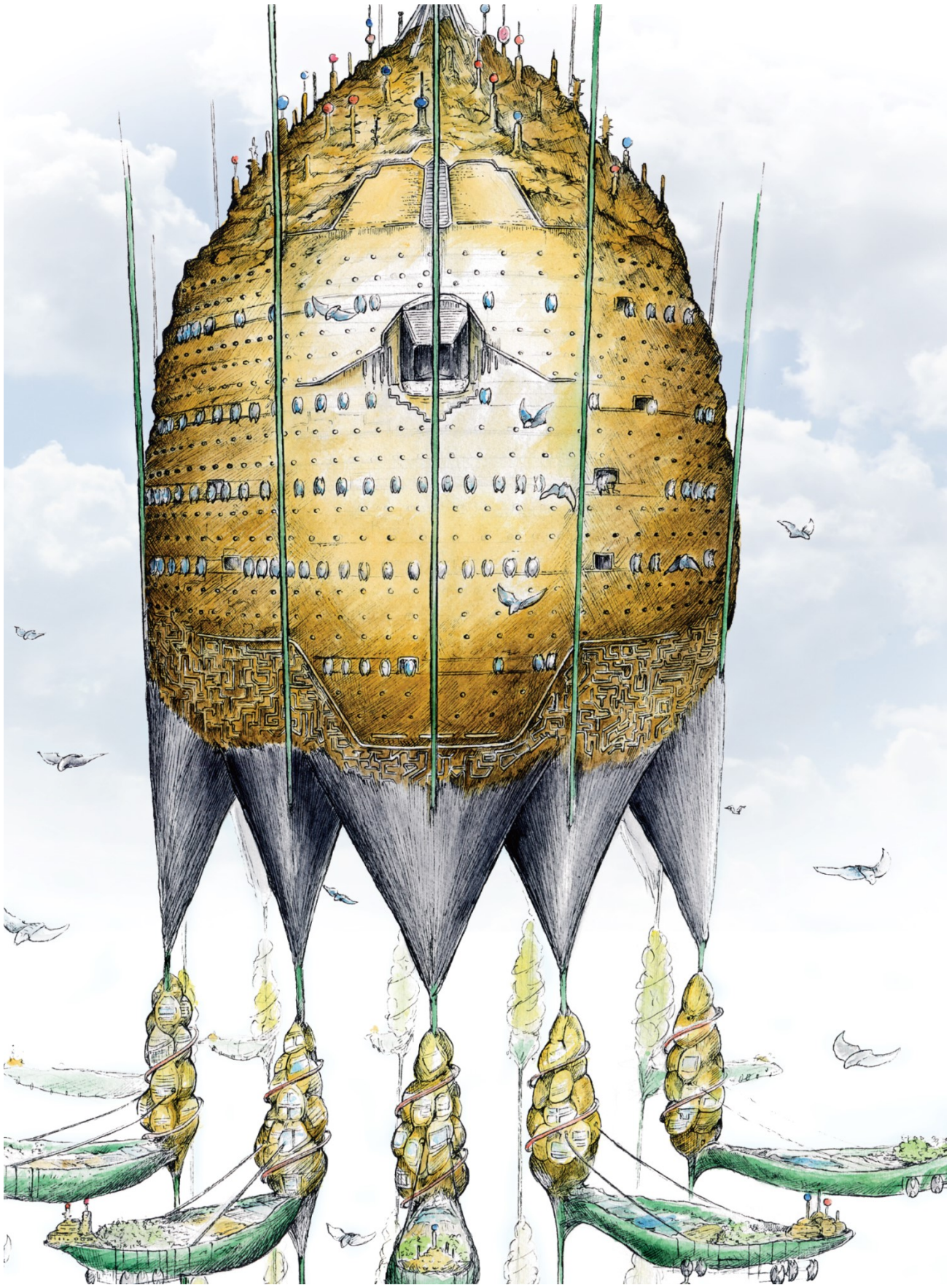


Artificial constructional plants (ACP's)

The plants used to build the platform cities are called artificial constructional plants or ACP's. They resemble natural plants, but they are genetically engineered. The cross section of the organic pillar has basically the same structure as the one of a plant stem.







7 Spiritual community

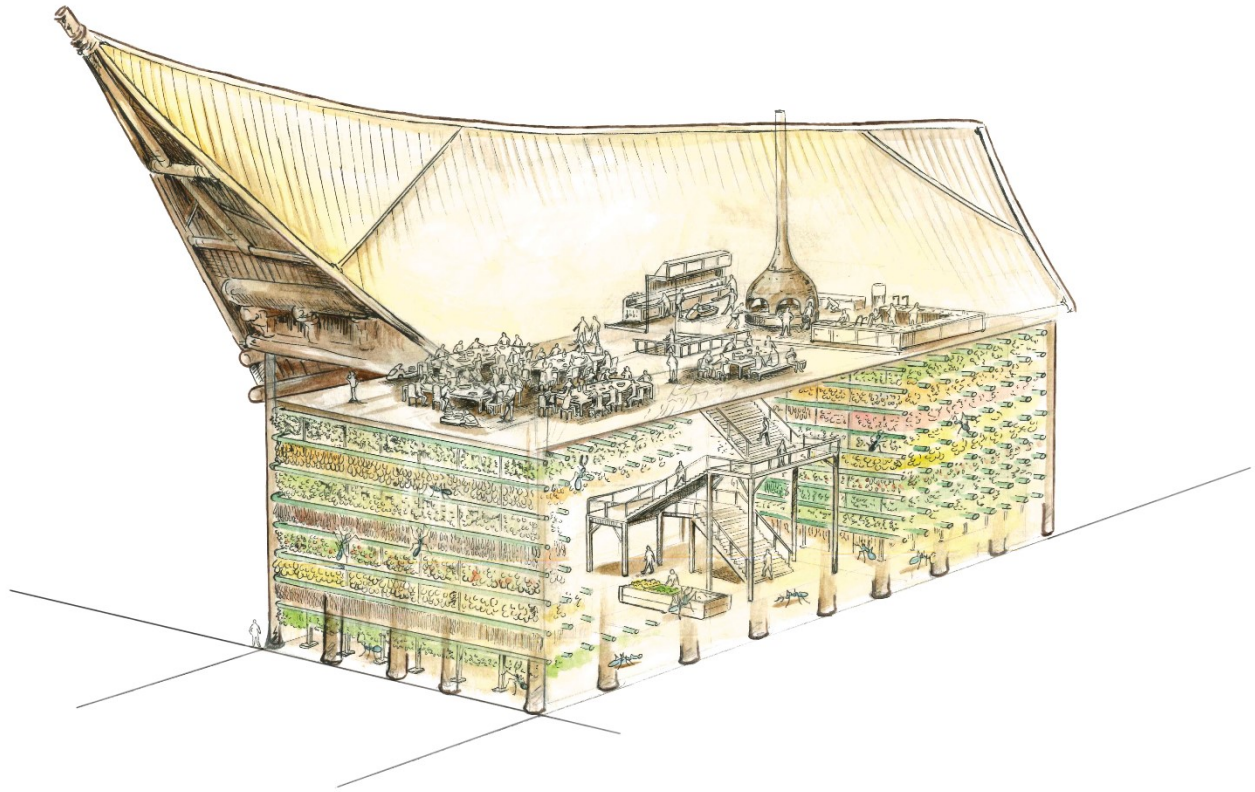
Mountain cities



Himalayan spiritual cities

The inhabitants live a more spiritual and mystical life and are therefore called the spiritual community. Many Asian architectural artifacts are reused in the architecture. Though the cities are technologically advanced.

Breeding houses and community kitchens



Tongkonan breeding house

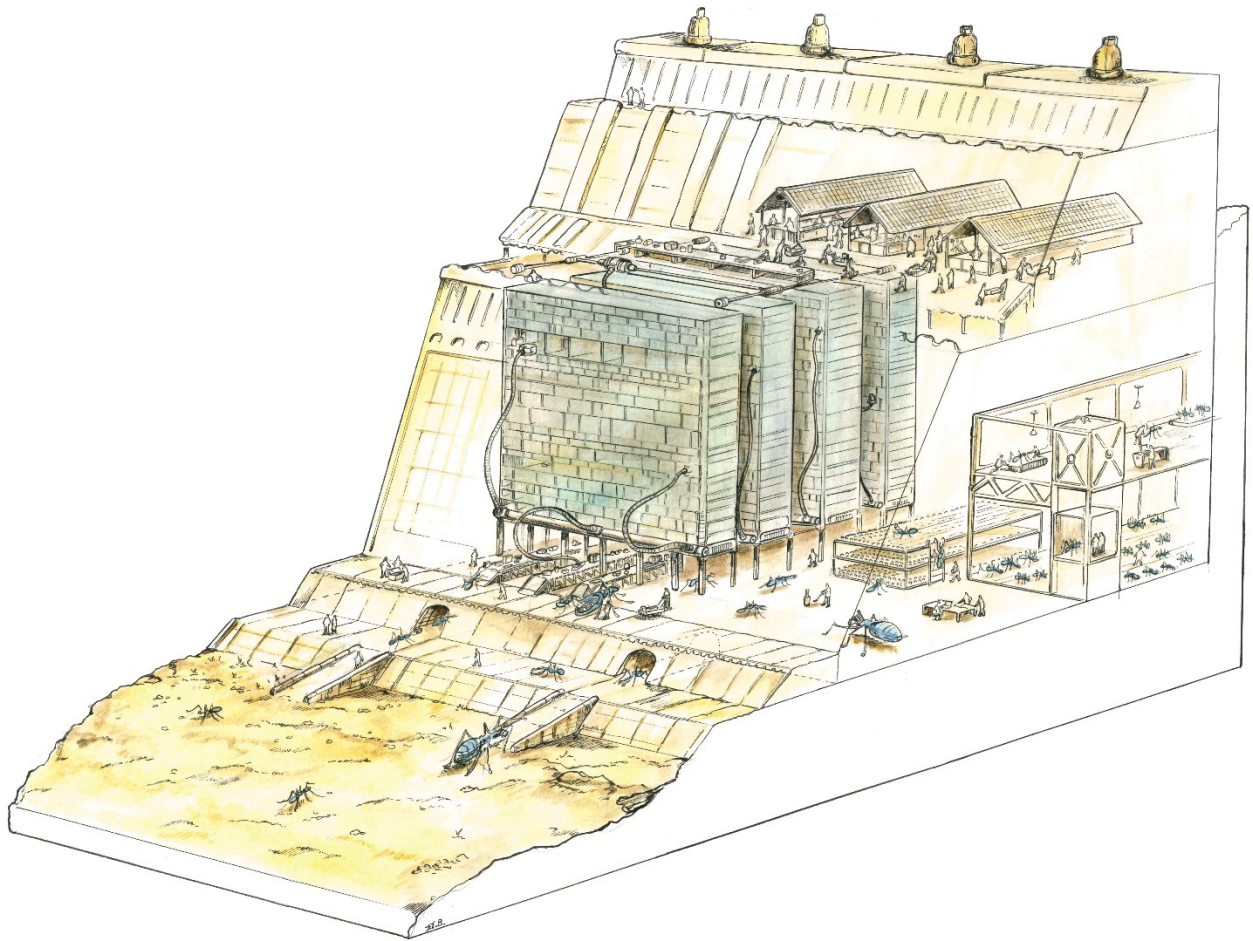
The agricultural system is a mixture between the cultivation of crops in the wild and an industrial greenhouse system. They use several breeding houses. The most common designs are based on the Tongkonan architecture. Inside a system of pipes distributes a viscous seed fluid, used to cultivate nutritious food. The upper level is used as a community kitchen. Residents of the city eat here together.

Traditional Indonesian Tongkonan house:



Pictures wikimedia foundation

The warehouse

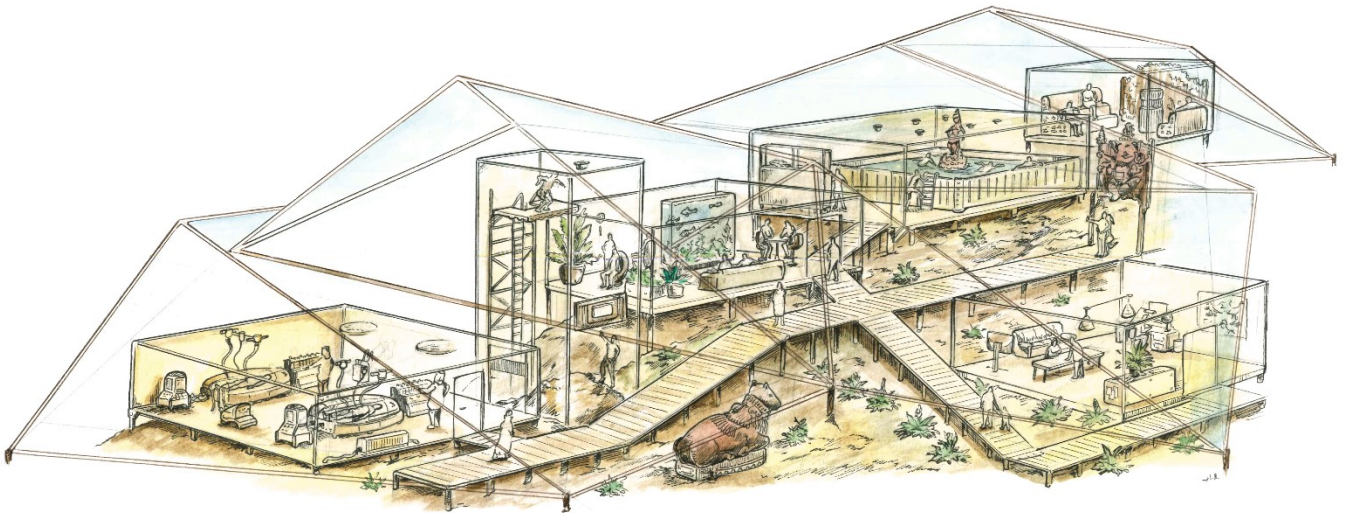


Logistic center

The spiritual community counts hundreds of small to medium sized towns stretching the Himalayas. There is not much infrastructure, no roads, airports or VacTube connections. The residents remain in their homes for the most of their life.

They get help from formicid bots. Ant robots used to move goods from one city to another. Imported products are delivered at the warehouses. Products get stocked till they end up in the marketplace on the upper floor.

Meditation and health



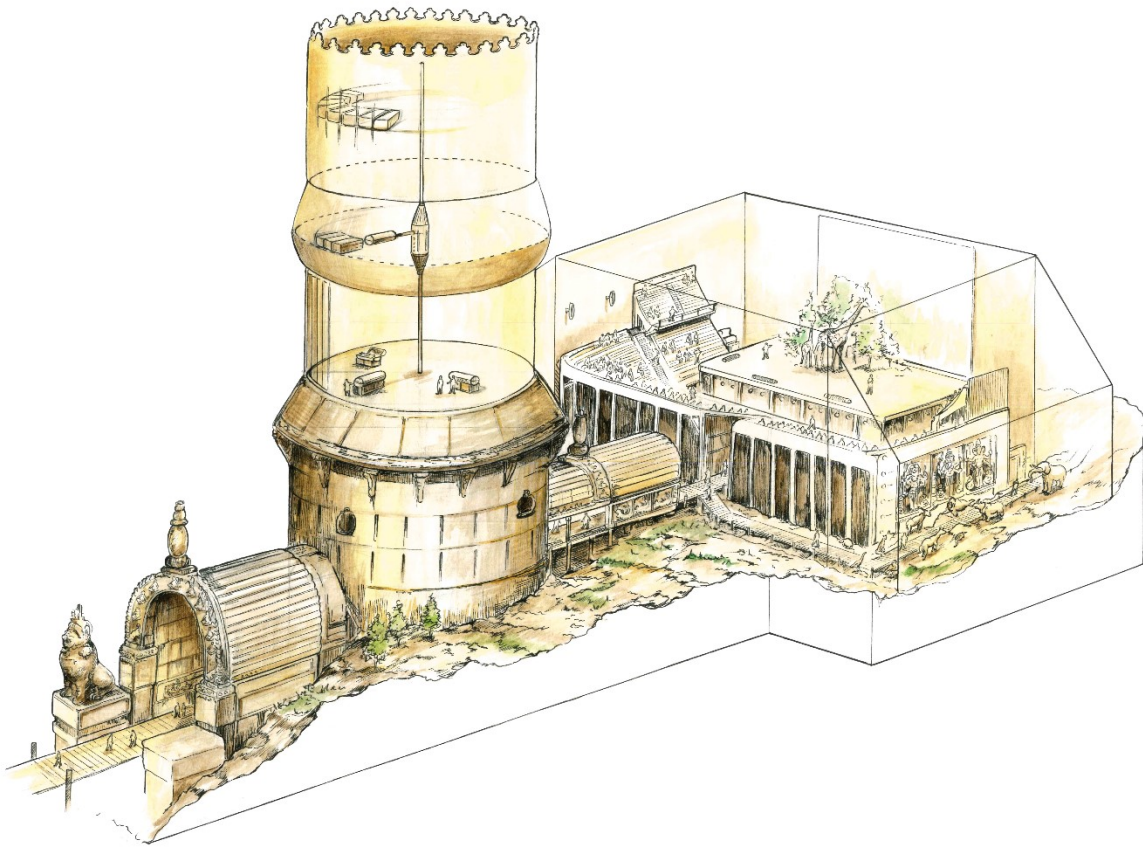
Medical center of the world

The transparent triangle structural elements in the city divide the public space into separate spaces (rooms). Many of the rooms are used for medical purposes, one of the specialties of this community. They use a mixture of the conventional and non-conventional medicine.

Mental health

Lots of rooms are converted into bathing pools and sauna's. The typical Eastern vision to focus on the health of the mind is equally important here. The practices focused on meditation and spiritual teachings are numerous.

Hibernation tower



Hibernation during harsh winters

From the outside it looks like an old tower but on the inside you find an elevator system with a robotic arm that stocks the hibernation capsules. These capsules contain humans that are in a hibernation sleep. People that are sent into hibernation, turn into a comatose condition in which all the inner body functions are limited. Inside the capsule the organs are taken over by a biological computer. They use the technology to overcome harsh winters.

Hologram nature shows

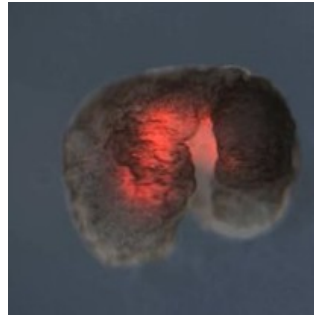
The spiritual community has some very well-known hologram theaters. The majority of the shows focus on nature, health, spiritual and philosophical topics.

Formicid robots

Swarm intelligence

Formicid robots (called formicids) are derived from ants. They are hybrids, living machines, programmable organisms or biological machines with mechanical parts. They act as one single organism. A decentralized, self-organized system in favor of their hosts.

In 2020 Xenobots were the first biological machines ever made. Robots derived from frog stem cells.

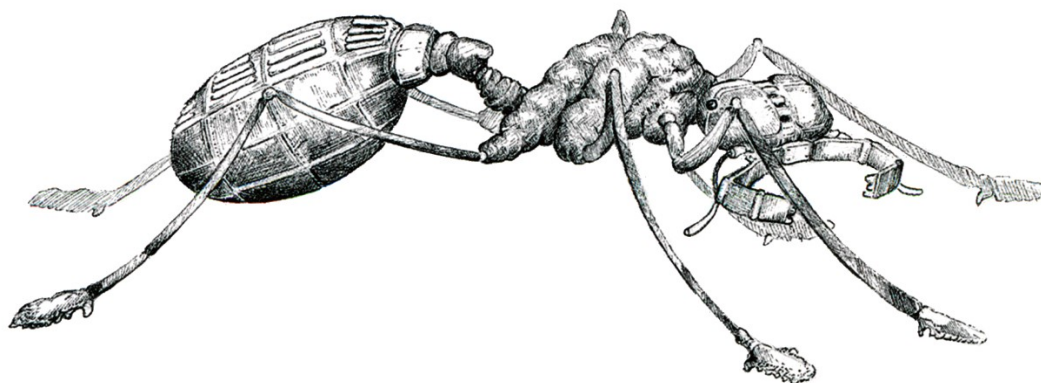


Picture: credits Xenobots research

Formicid Constructor

This extremely strong robot is designed to help during construction of new buildings, roads or infrastructure.

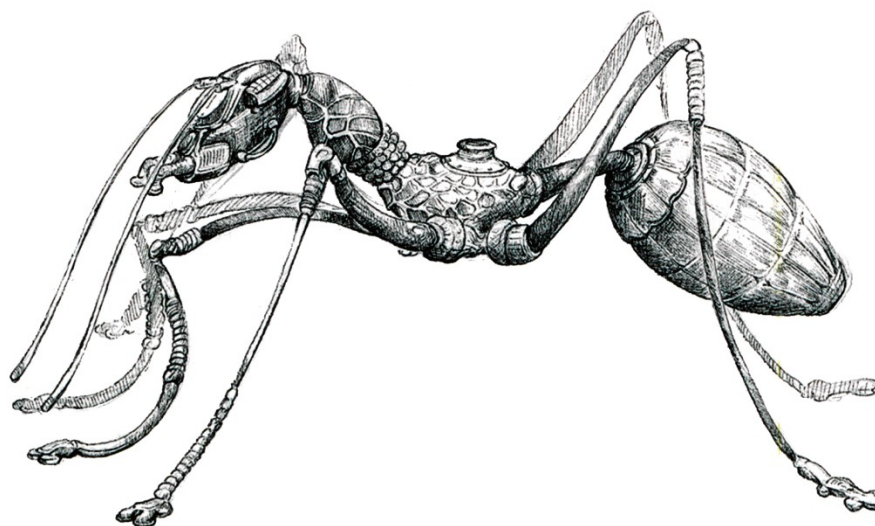
Length: 1,80 - 3,50 meter



Formicid Chemist

The chemist is a walking lab, it is used to design new materials and medicines. It derives its ingredients mostly from plants.

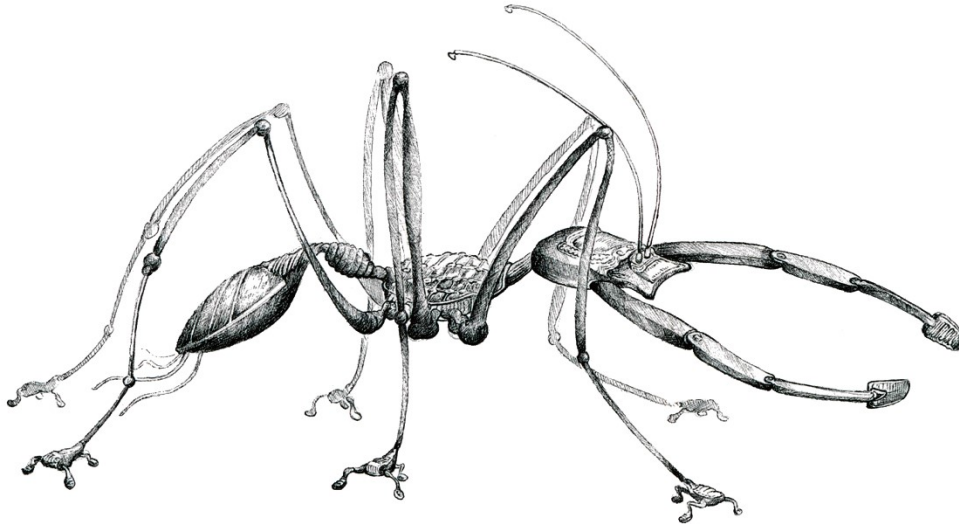
Length: 1,20 meter



Formicid Grabber

The grabbers help during the harvest of energy eggs. With his two strong grab-tools this robot can be used to help with numerous other tasks from construction works to waste-management.

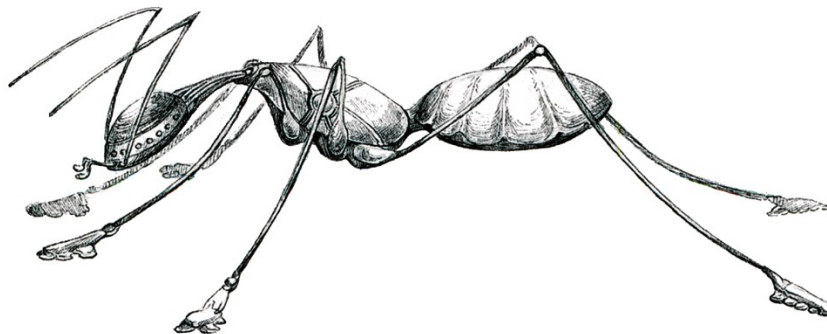
Length: 0,80 - 1,20 meter



Formicid Scout

This very fast and viable small robot is used to scout, it can stay away for weeks in search for information. It is highly intelligent and can collect information about food, useful locations for new settlements or roads, raw materials, weather and climate conditions.

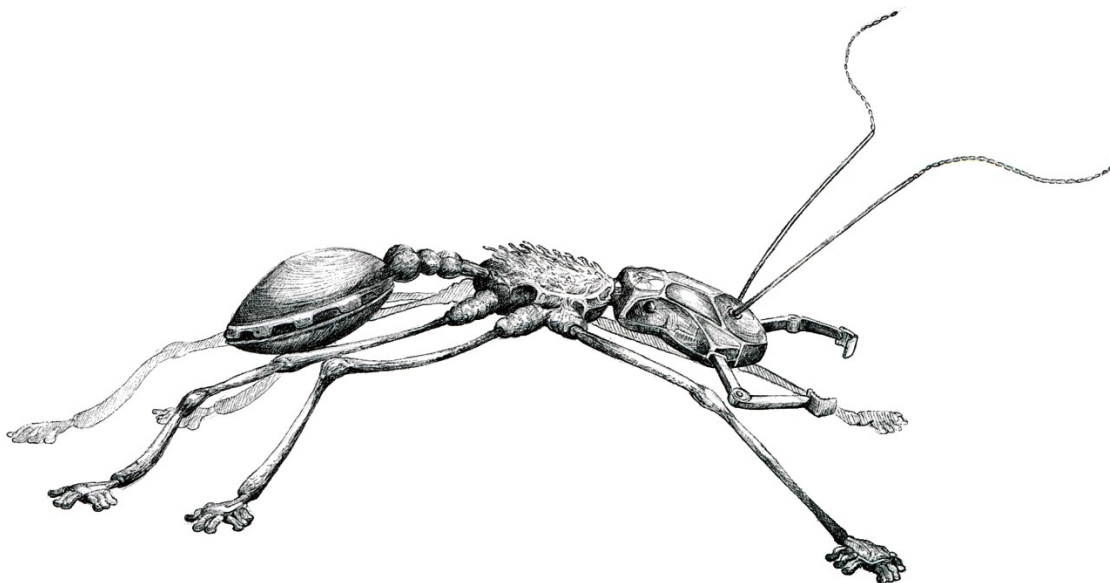
Length: 0,30 meter



Formicid Forager

The forager is programmed to collect crops, food and raw materials. They leave town in search for these resources.

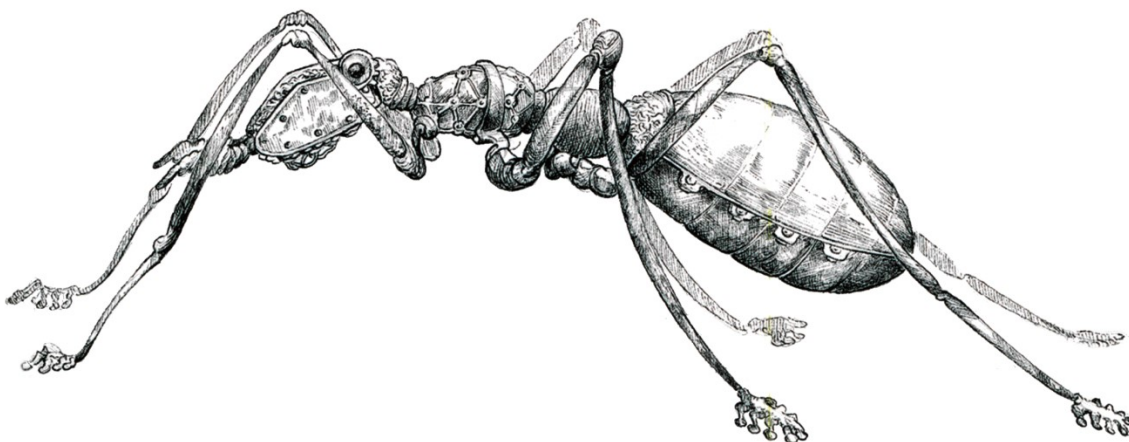
Length: 0,75 meter



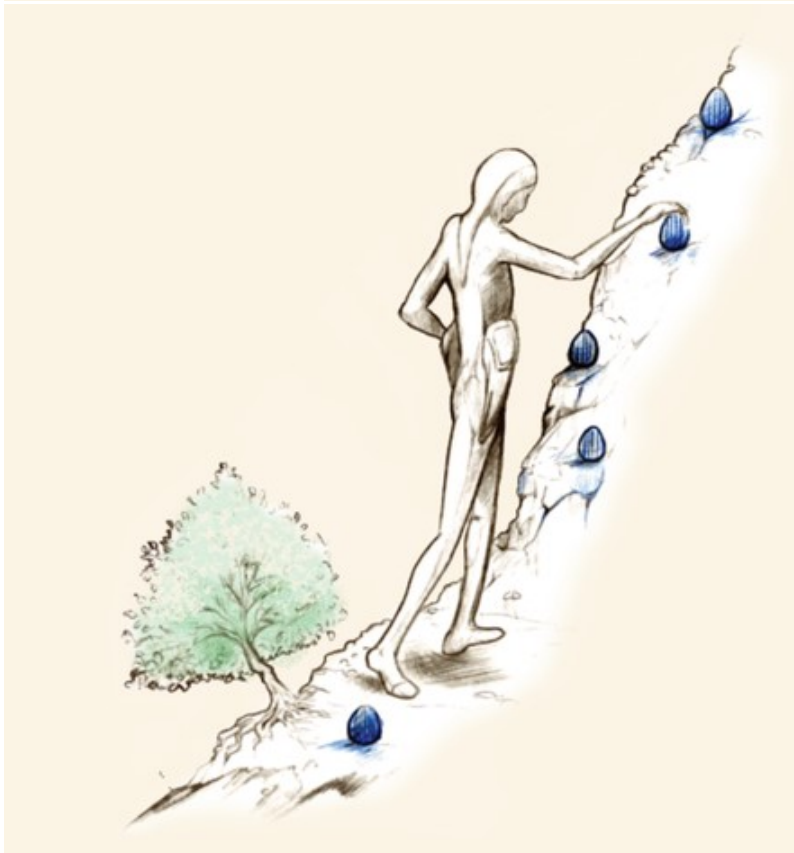
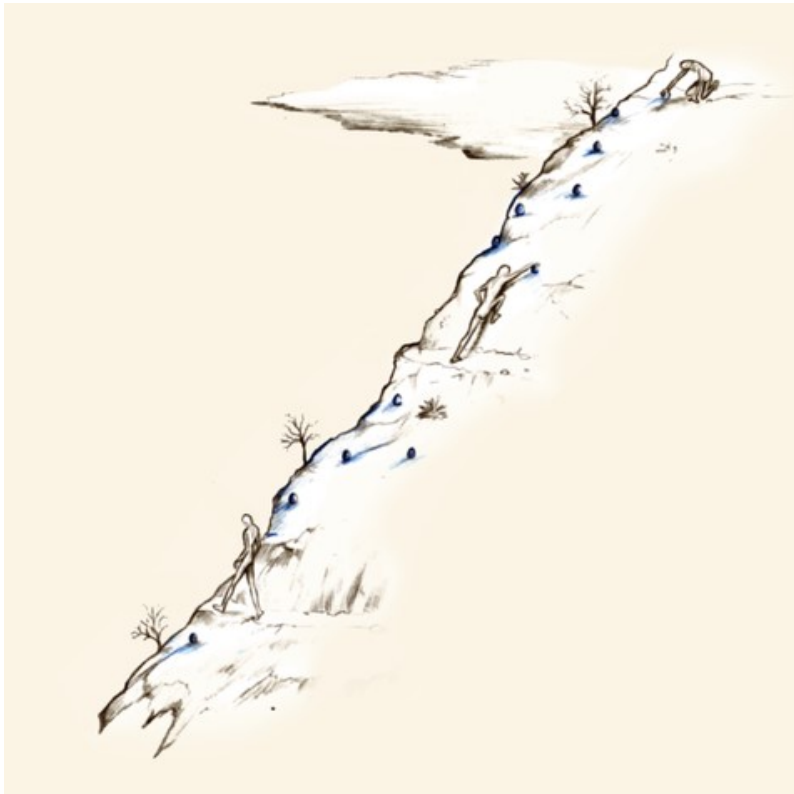
Formicid Transporter

This robot is used to transport products from city to city. This is the largest formicid to be found, it has a large storage cargo unit at his back.

Length: 4 meter

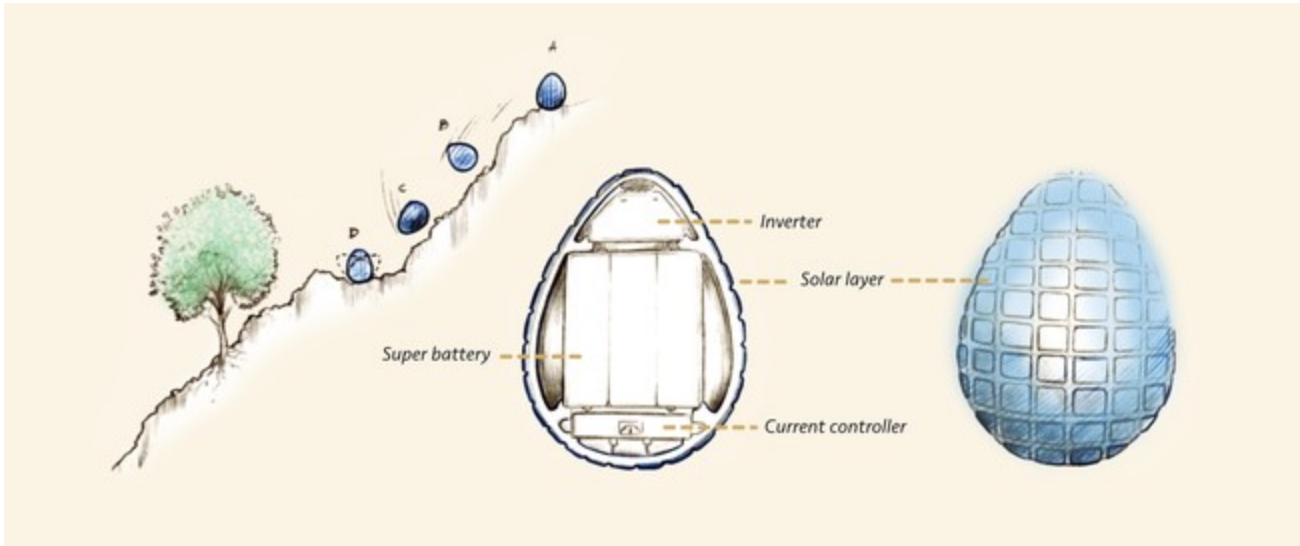


Energy eggs



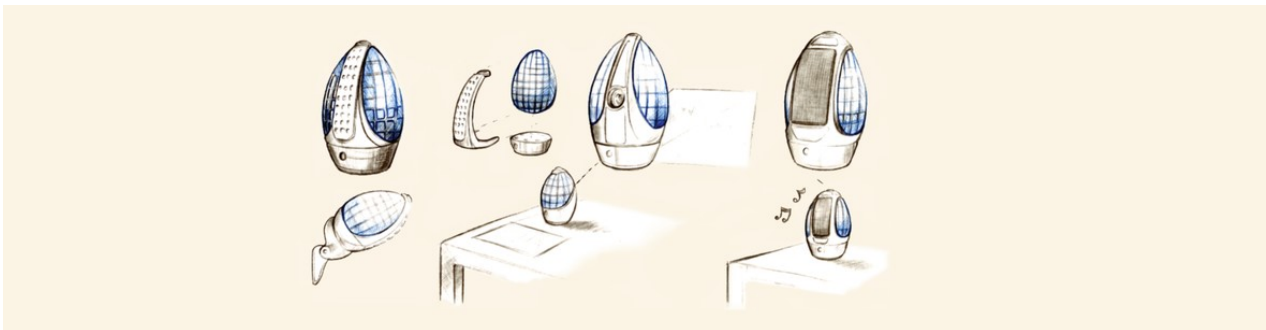
Super batteries

The egg super battery charges when it catches the sunlight. The residents of the mountain cities have developed a spiritual ritual around these energy eggs. They place the eggs on the cliffs surrounding their cities where the sun charges the eggs. Once fully charged they lighten up blue. Then an energy carrier prepares himself to collect the eggs. They believe it helps them to never lose their gratitude to our sun and solar system.

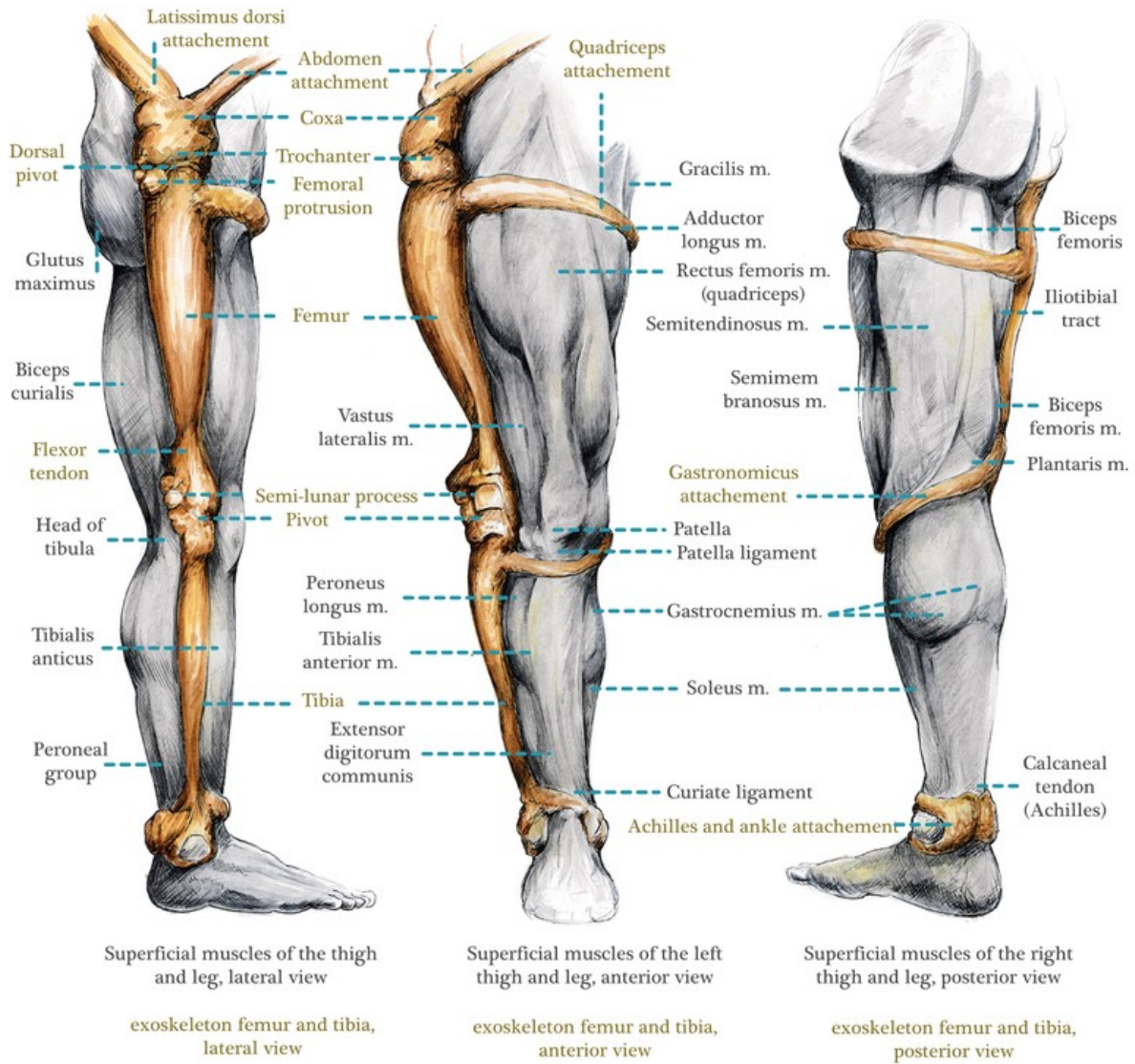


Biomimicry: Guillemot egg

Its form is derived from the Guillemot egg. The Guillemot is a sea bird that lays her eggs on steep cliffs. The eggs are self-cleaning and its form is optimized in such way it always rolls back in its best position to catch the light. The egg battery is used to power electric devices.

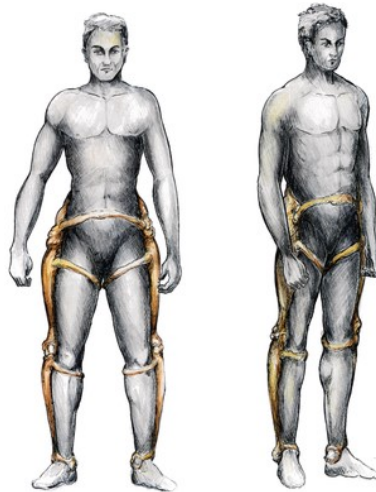


Exoskeleton



Exoskeletons

Some residents are selected and educated to fulfill a diversity of tasks outside the city walls. To help them to move on the rough, rocky mountain terrain they get an exoskeleton. This has some implications, a surgical interference is needed to attach the exoskeleton to the muscles and tendons of the human body. One of the most popular exoskeletons is the Hoptera legs.

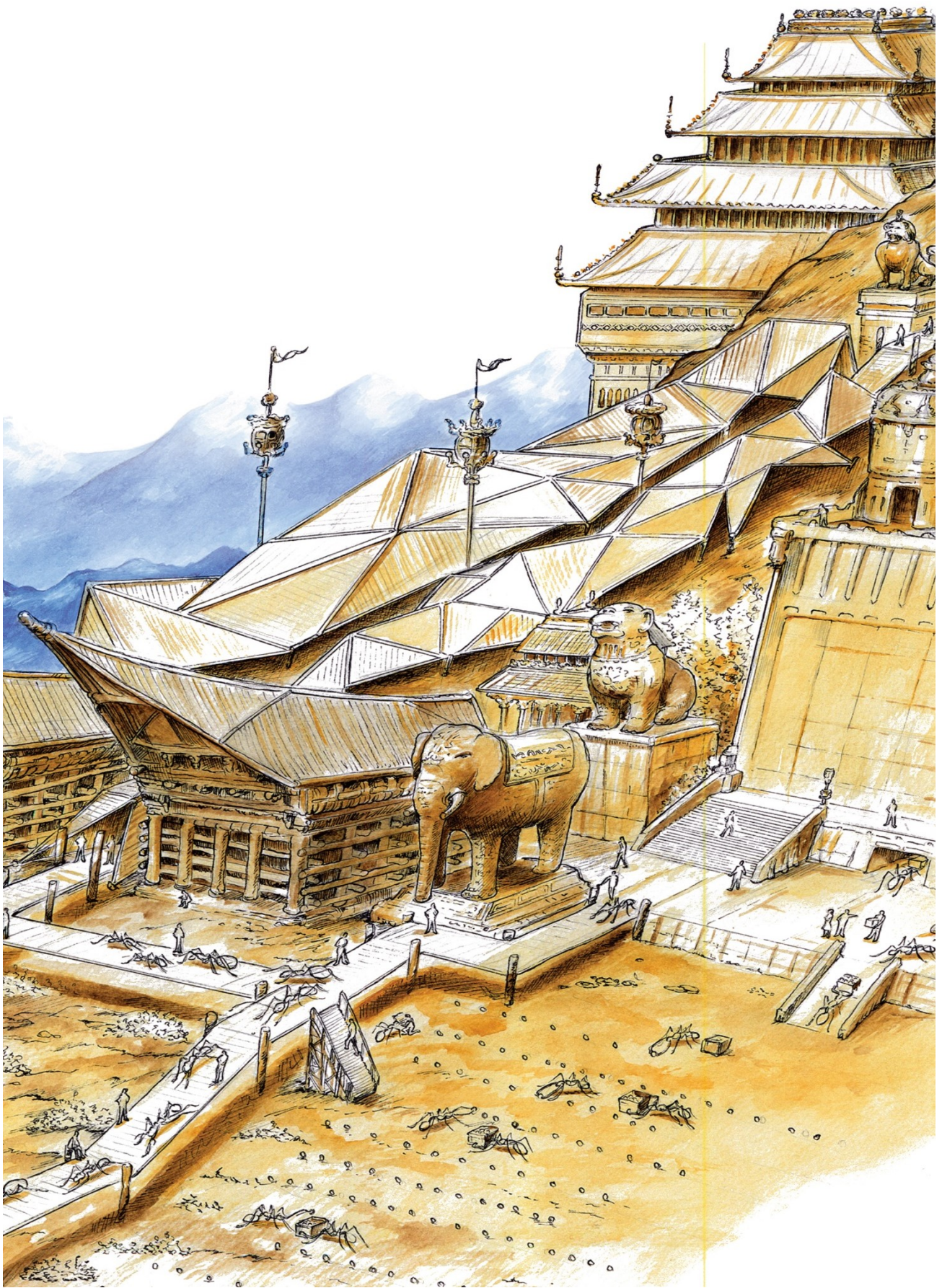


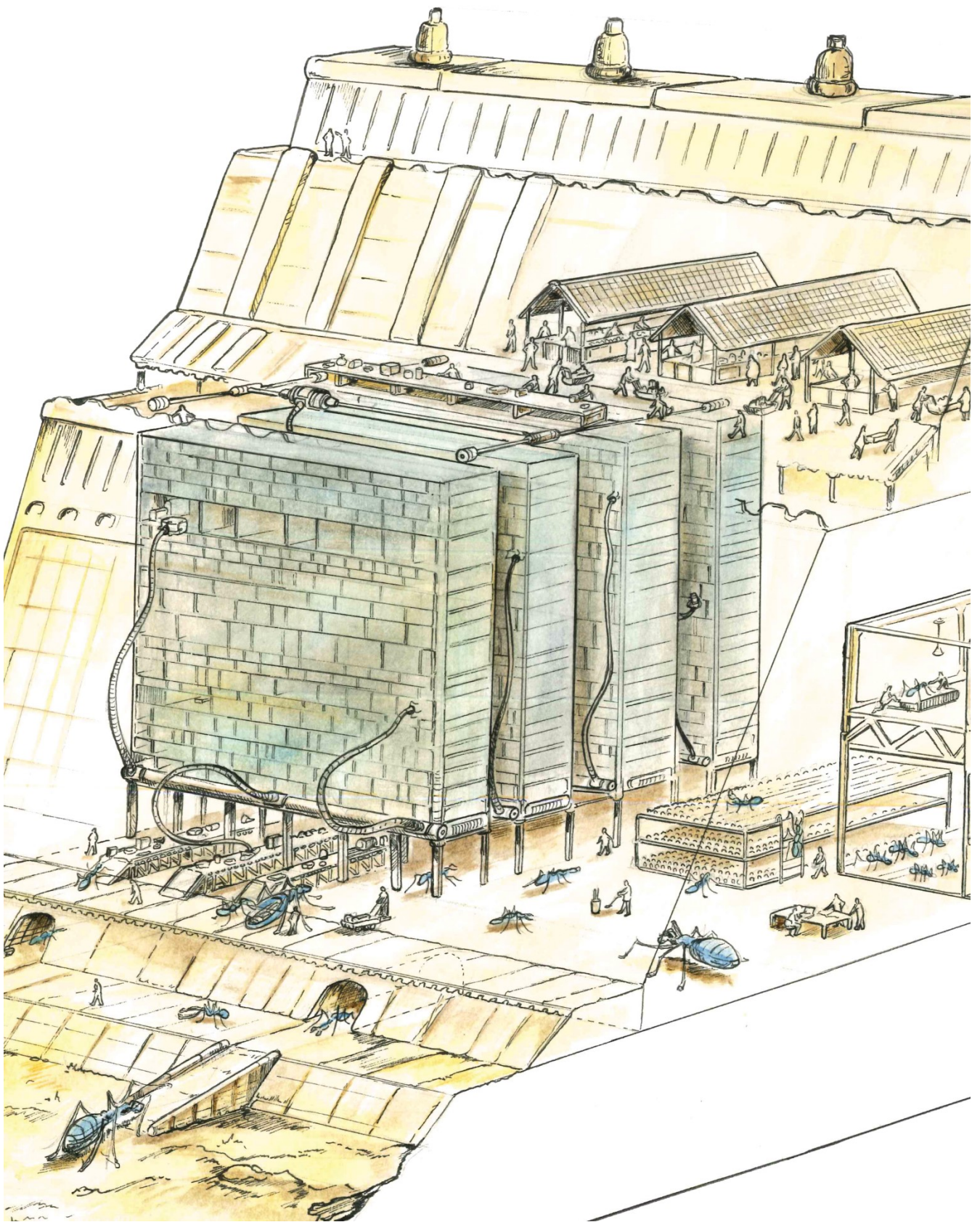
Hoptera hind legs

The unique jumping ability of the grasshopper is very well know and widely studied. It resulted in the design of the Hoptera exoskeleton. It enables people to jump from cliffs and jump on rocks without breaking bones. The joints from the exoskeleton can endure the enormous forces. The exoskeleton enforces the ankles, knees and hip.



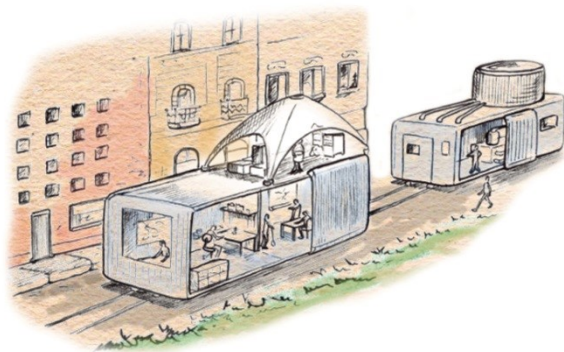
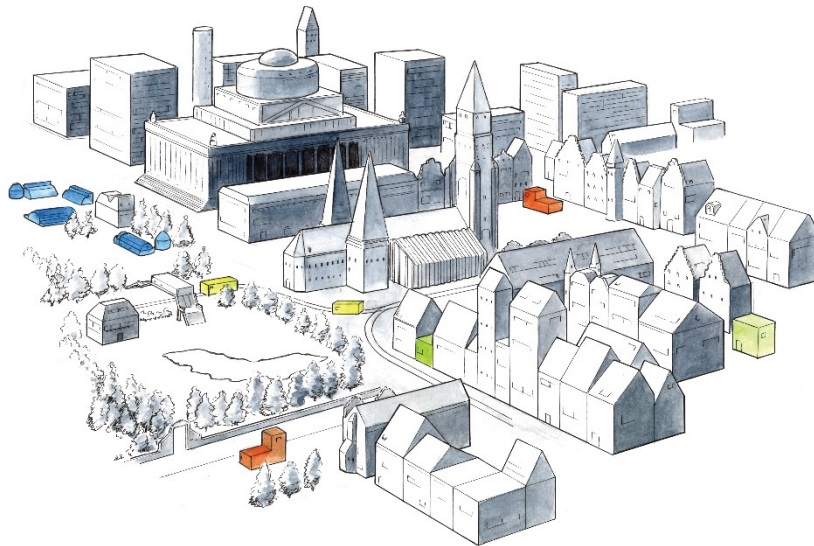
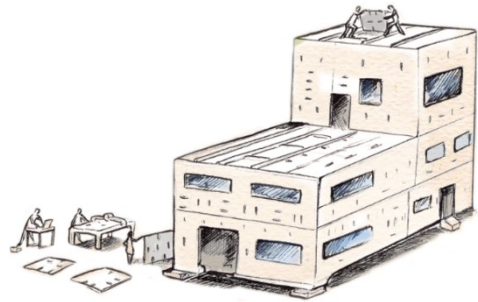
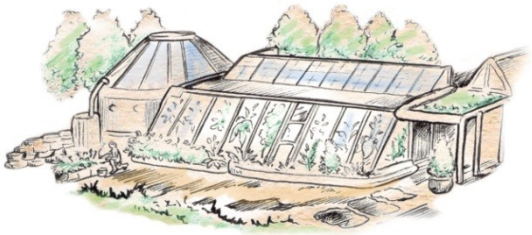
Credits: Brust, Mathew, Jim Thurman, Chris Reuter, Lonnie Black, Robert Quartarone, Amanda J. Redford. 2014. Grasshoppers of the Western U.S., Edition 4. USDA APHIS Identification Technology Program (ITP). Fort Collins, CO. [date of access] <<http://idtools.org/id/grasshoppers/>>





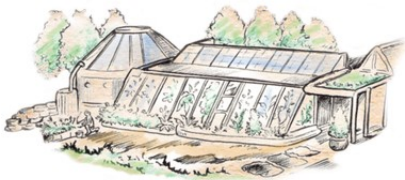
8 Artistic community

Survival in the ancient cities



A community of artists

Squatters live in cities that became abandoned at the end of the 21th century. Brussels is the capital city of the squatter community. The city is a sanctuary for artists, musicians, inventors and many other free minded souls. They have a festival like lifestyle.



Earthships and parks

Earthship like constructions in parks and overgrown ruins are used as residential houses. They use primitive solar technology and up-cycled materials. The parks function as an agricultural permaculture system.



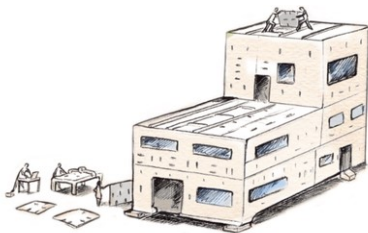
Mobile production workshops

The old rail infrastructure is used to move small production workshops in the city. The mobile production units are equipped with a wide range of machinery to construct and produce on the spot.



Tiny houses

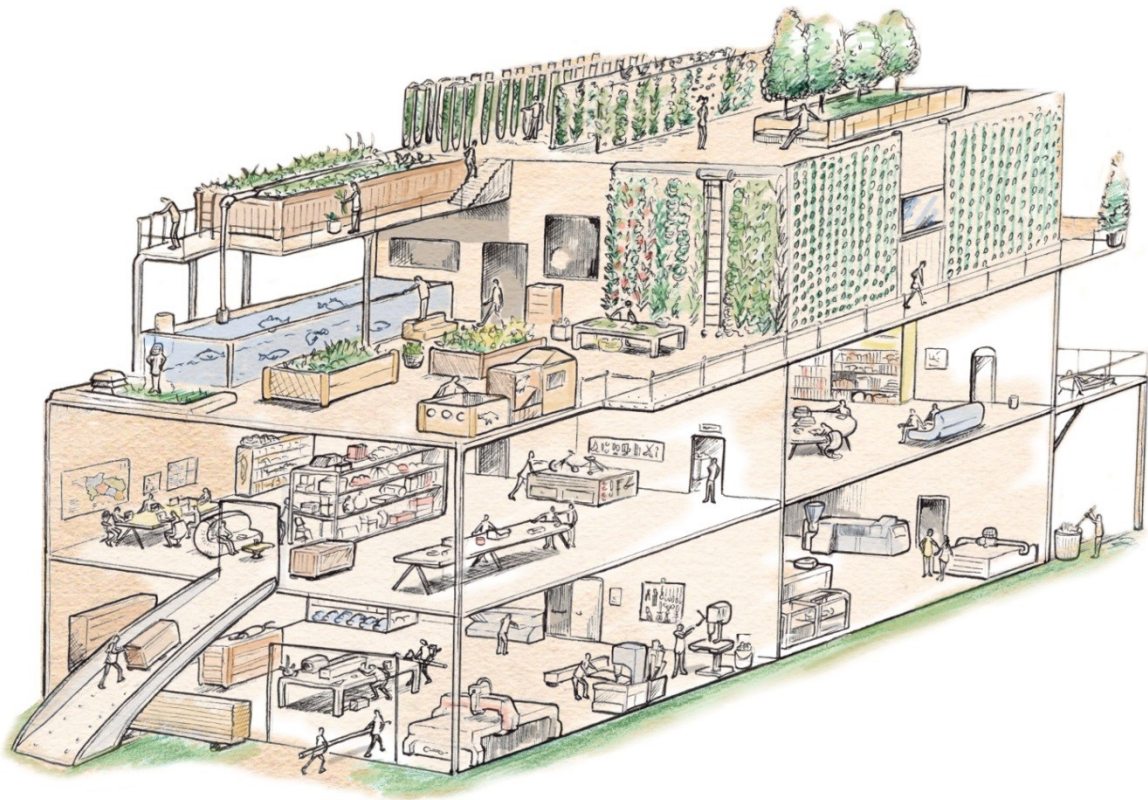
In the past century the tiny house movement had a significant influence. Narrow alleys, parking-lots, squares, old roads or other public space are all used to build tiny houses.



Digital fabrication

Squares and open spaces count many digitally fabricated houses. Houses built with prefab demountable parts. Construction waste from the old buildings is often used.

City Hall

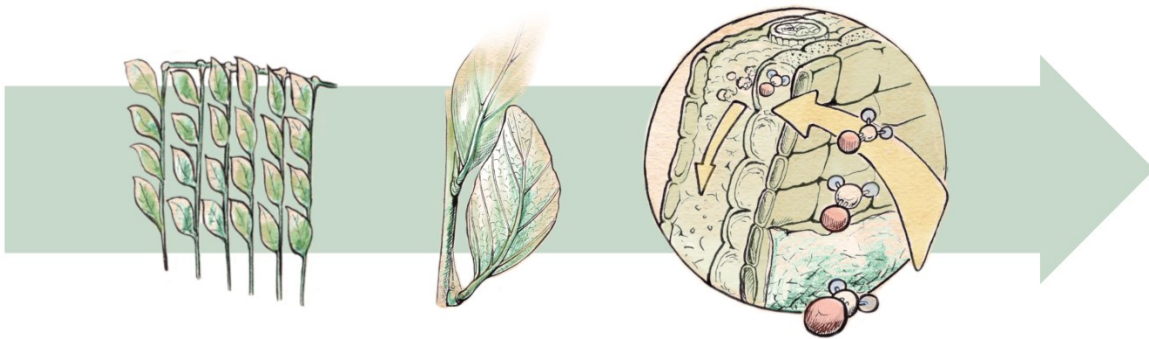


City hall

Each neighborhood has a so called knowledge hub. A place for public discussions. A knowledge hub is a mixture between a City Hall, a library, a school and a FabLab.

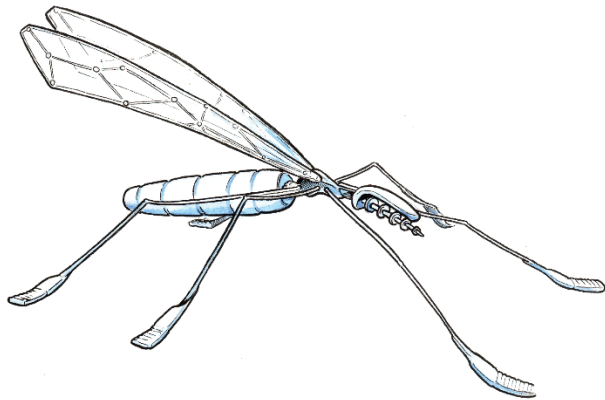
VOC pollution cleaners

Human based pollution afflicted the world in the past century. Carbon based particles are still present in huge harmful quantities in the urban environments atmosphere. Here they use plenty of inventive technology to clean the air. The VOC pollution cleaner is wide spread. It is Biomimicry inspired technology. A wall covering of artificial leaves mimic the ability of certain plants to metabolize and destroy oxidized VOC's.



An enormous variety of wild robots

In the cities exists a very important informal economy. Nomadic tribes come and go here to trade goods. Many unique robots are produced here. A consequence of the informal robot economy is the abundance of wild robots in the cities. Some are hunted down for their desired spare-parts and others just live in peace among the human inhabitants.



1. Sound detector

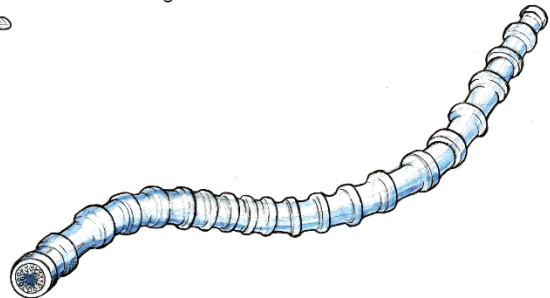
Function:

- Detecting sounds
- Locating sound waves

2. Glycer

Function:

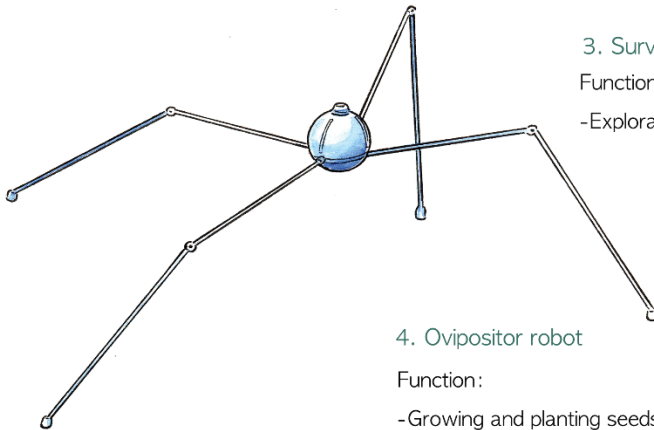
- Searching rare metals



3. Surveillance robot

Function:

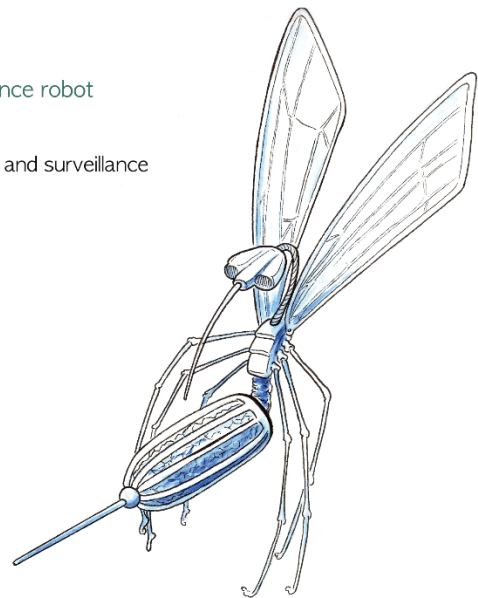
- Exploration and surveillance



4. Ovipositor robot

Function:

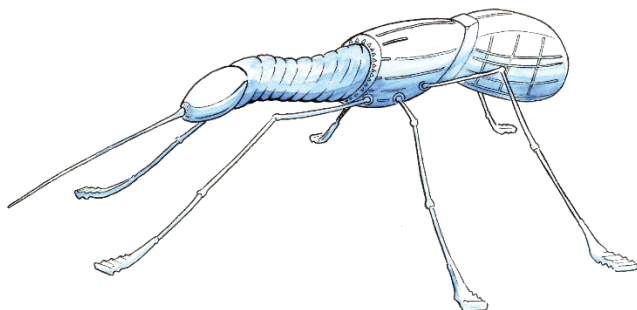
- Growing and planting seeds



5. Proboscis robot

Function:

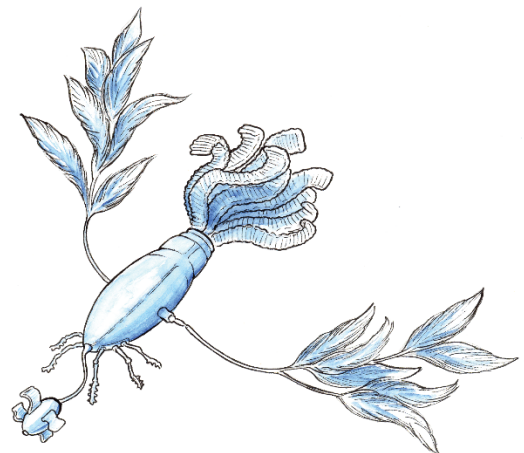
- Making incisions,
- Injecting substances

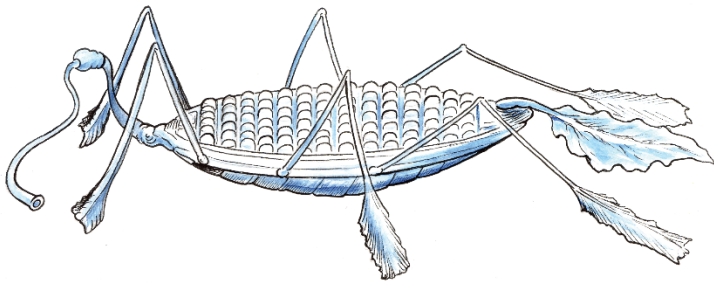


7. The Fairy fly

Function

- Detecting leaks in pipes
- Repairing small leaks in pipes





7. Pill robot

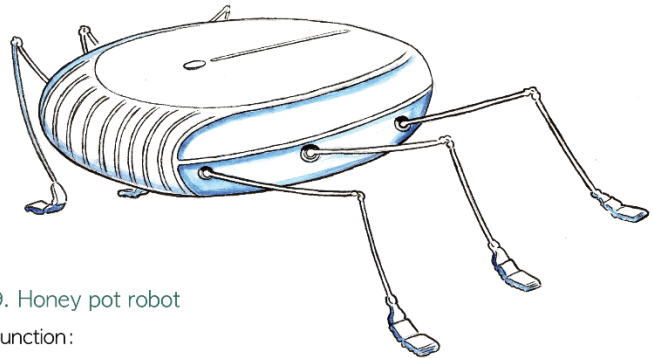
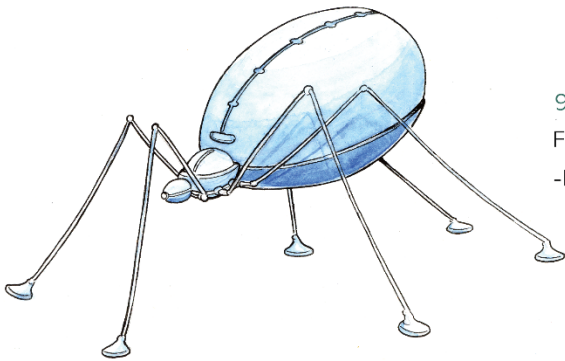
Function:

- Delivering pills (healthcare)

8. E-nose

Function:

- Detecting industrial and environmental contaminations
- Detecting diseases



9. Honey pot robot

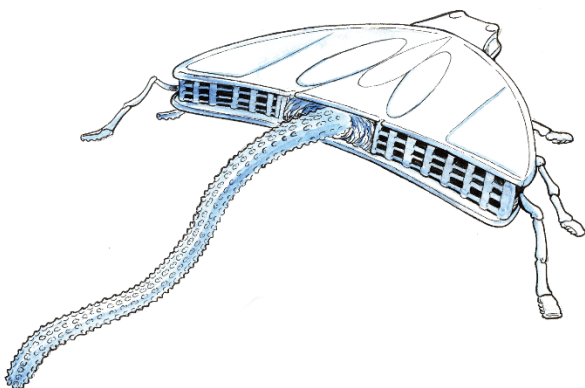
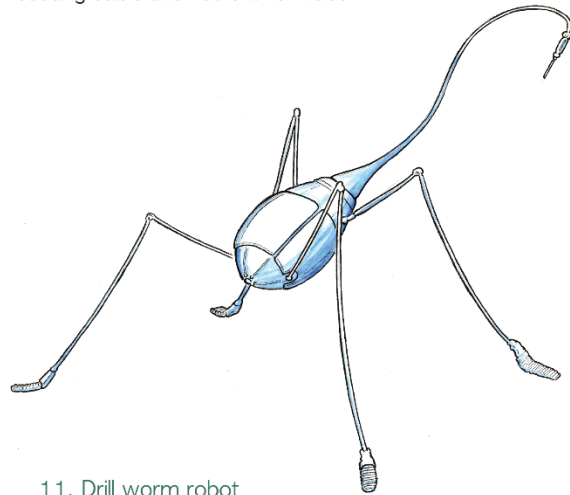
Function:

- Producing edible and nutrient rich fluids

10. Welding robot

Function:

- Welding



11. Drill worm robot

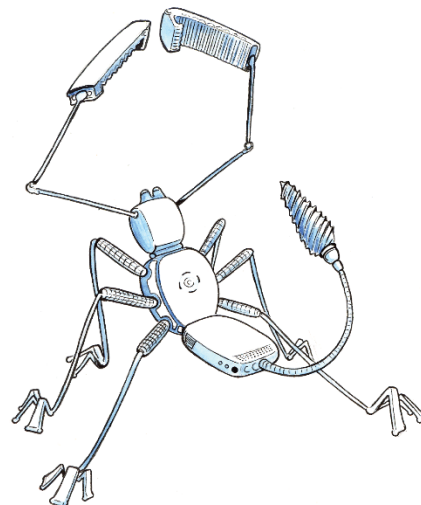
Function:

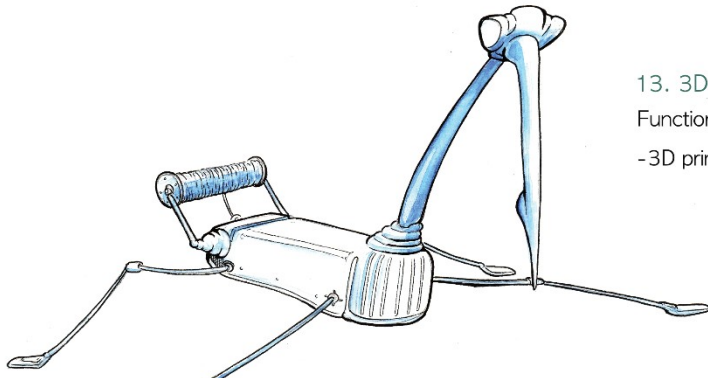
- Drilling

12. Mini demolition robot

Function:

- Operating demolition works





13. 3D print robot

Function:

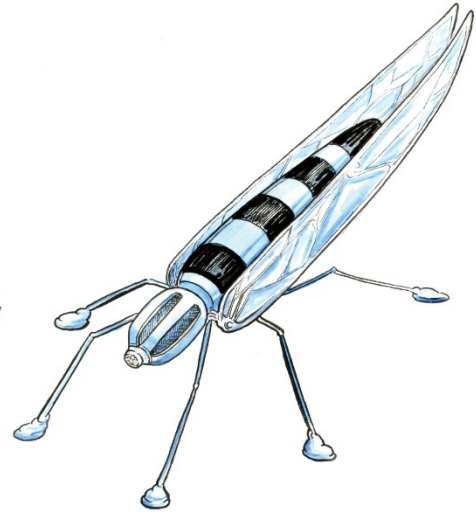
-3D printing



14. Solar hornet robot

Function:

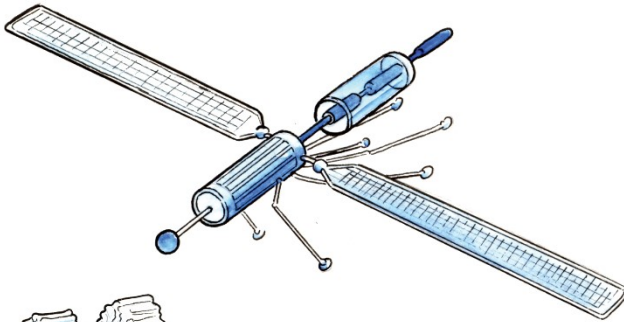
-Experimental robot used to test solar energy technology



15. CO detection robot

Function:

-Detecting carbon dioxide



16. Egg robot

Function:

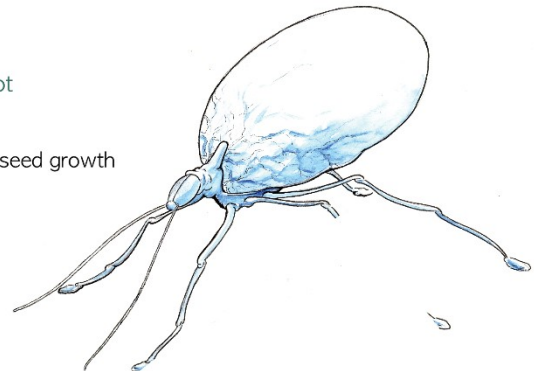
-Agriculture: seed growth



17. Sea horse robot

Function:

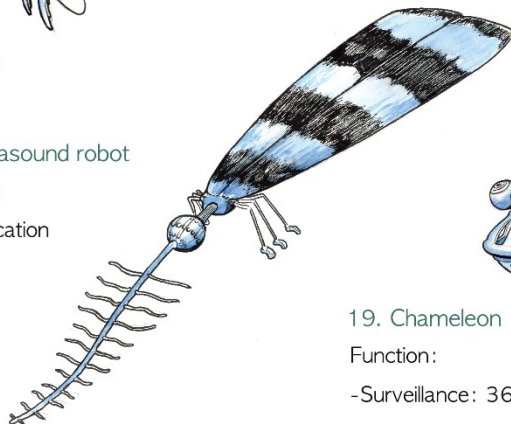
-Toy



18. Ultrasound robot

Fuction:

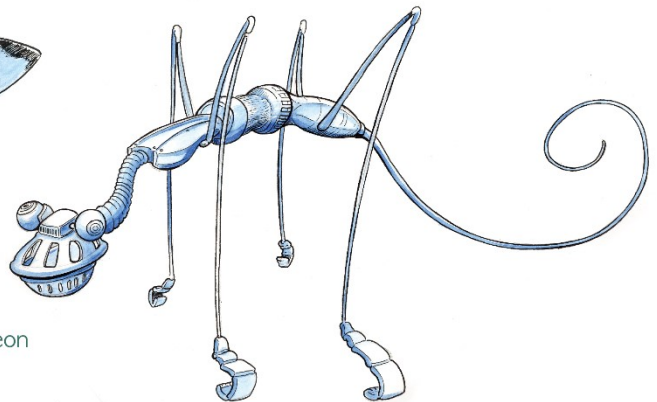
-Echolocation

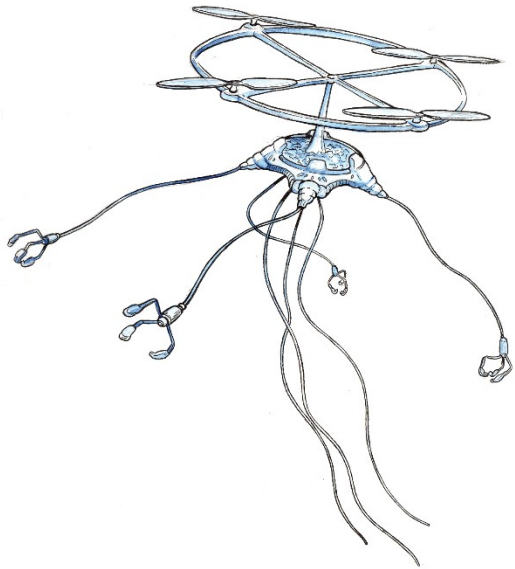


19. Chameleon

Function:

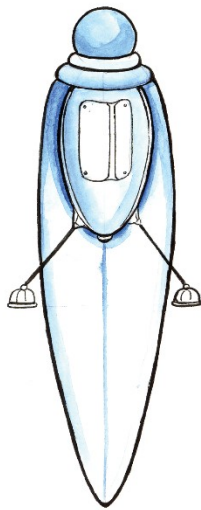
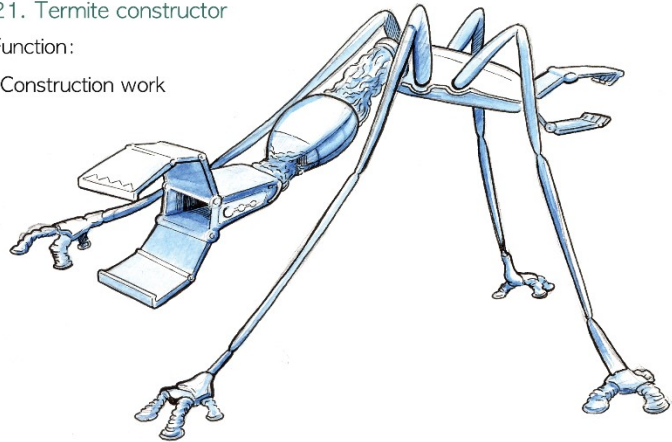
-Surveillance: 360° camera





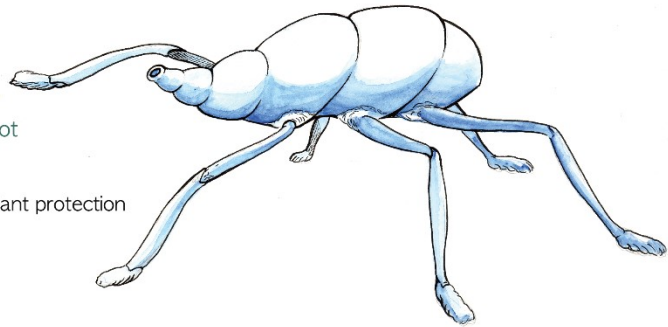
20. Harvest drone
Function:
-Agricultural: harvesting

21. Termite constructor
Function:
-Construction work

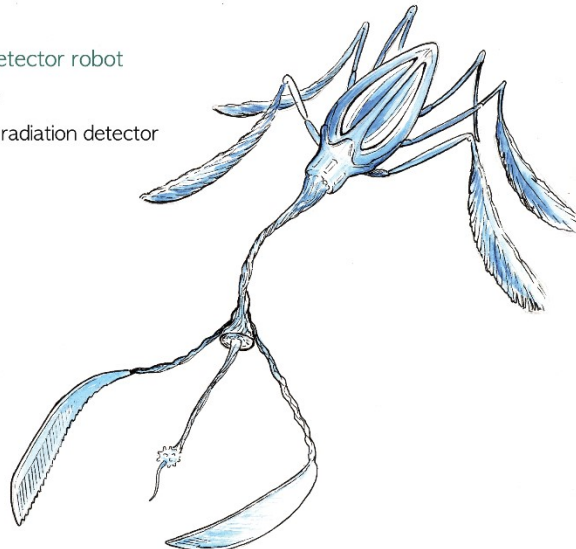


22. S-robot
Function:
-Data storage and postal services

23. Spittle robot
Function:
-Agricultural: plant protection



24. IR detector robot
Function:
-Infrared radiation detector



25. Surgical robot
Function:
-Medical: surgical operations

Hanging gardens



Vertical farming

Vertical farming is the agricultural practice of growing crops in vertically stacked layers. “GrowSacks” are used to grow crops. The sack itself is made of organic matter and behaves like a vine. It attaches itself onto the walls. Once its anchored it can carry full grown fruit bearing plants. The plants start to grow and once the fruits are ripe they get harvested.

