STUDIO 4

ARCHITECTURE FOR EXTREME CONDITIONS:

ANOTHER EARTH

SPRING SEMESTER

FLIP OVER FOR AUTUMN SEMESTER

STUDIO 4

Master Studio 4 seeks to push the boundaries of what architecture is, by exploring what architecture can be. Our chosen theme this year has been architecture for extreme conditions. As a team, and with input from researchers in various fields, we have investigated the conditions for architectural design in extreme environments. Temporary architectural structures are increasingly needed globally, not only in crisis areas but also to meet needs that emerge in our digitalised society where people are distributed globally, yet have a demand for effective social spaces for communication and interaction.

To meet the challenges of global warming and our planet's limited resources, our nineteen students have explored new materials and innovative technologies that are applicable to extreme living conditions. This could be a tropical-heat disaster area in the southern hemisphere; a temporary building in the extreme north; or perhaps even a building on Mars. We have studied new composite materials generated within, for example, space industry and asked how these compare to traditional materials in architectural design, such as stone, wood, glass and steel. The autumn started with a focus on materiality during which the students experimented through combining and creating new materials and hybrid structures, resulting in twenty proposals for sustainable material production units in a chosen extreme environment.

As a next step, during the spring semester, the studio confronted the issue of temporary living and working in an extreme climate, with the design brief for a temporary rescue pavilion in a remote or extreme environment as its point of departure. Climatic concerns in combination with aesthetic concerns have conditioned the students' choices of materials and design. With a generally defined programme, the students were given the task to develop designs for temporary

structures that can be easily dismantled and transported, and where a small group of people can live, interact and carry out work or research together over a limited period of time.

The students' design proposals were submitted to a small architectural competition organised by KTH and the Swedish construction company NCC, a fruitful collaboration that has been of great value and enabled the students to work closely with practice-based concerns throughout this academic year. The winning project from this Inspired-by-Space Pavilion Competition, will be built on campus as part of the Dome of Visions collaboration between KTH and NCC, and inaugurated during the international astronaut conference at KTH in September 2015: the Inspired-by-Space Conference hosted by astronaut Christer Fuglesang, KTH Space Center. An external jury of prominent expertise was recruited for the assessment of the proposals and we are extremely happy that our student Stefania Dinea was awarded the 1st Prize in this competition. Further, Mattias Pedersen was awarded the Jury's Honorary Mention alongside the team constituted by Marie Maghe and Adélie Thollot.

Opening in September 2015, The Dome of Visions provides a temporary venue for public exposure of on-going research, artistic experiments and innovative projects on campus. Curated exhibitions will stimulate debates, seminars and other public events. The Dome of Visions project seeks to create impact by presenting innovative projects that can inspire the development and design of a sustainable society.

In sum, our year-long explorative process, has resulted in the 19 design proposals that are presented in this catalogue, and that accompanies an inaugural exhibition for the Dome of Visions. The students' choice of exhibition title – Another Earth – is design-oriented, constructive and forward-looking both in

form and content. It clearly shows that young architects want to make a contribution to needs that arise in various conflict areas around the world. We hereby invite you all to take part of our students' work.

Thank you everyone – our students, guest critics, jury members and new friends at NCC – for an excellent collaboration this year.

The team of proud teachers in Master Studio #4

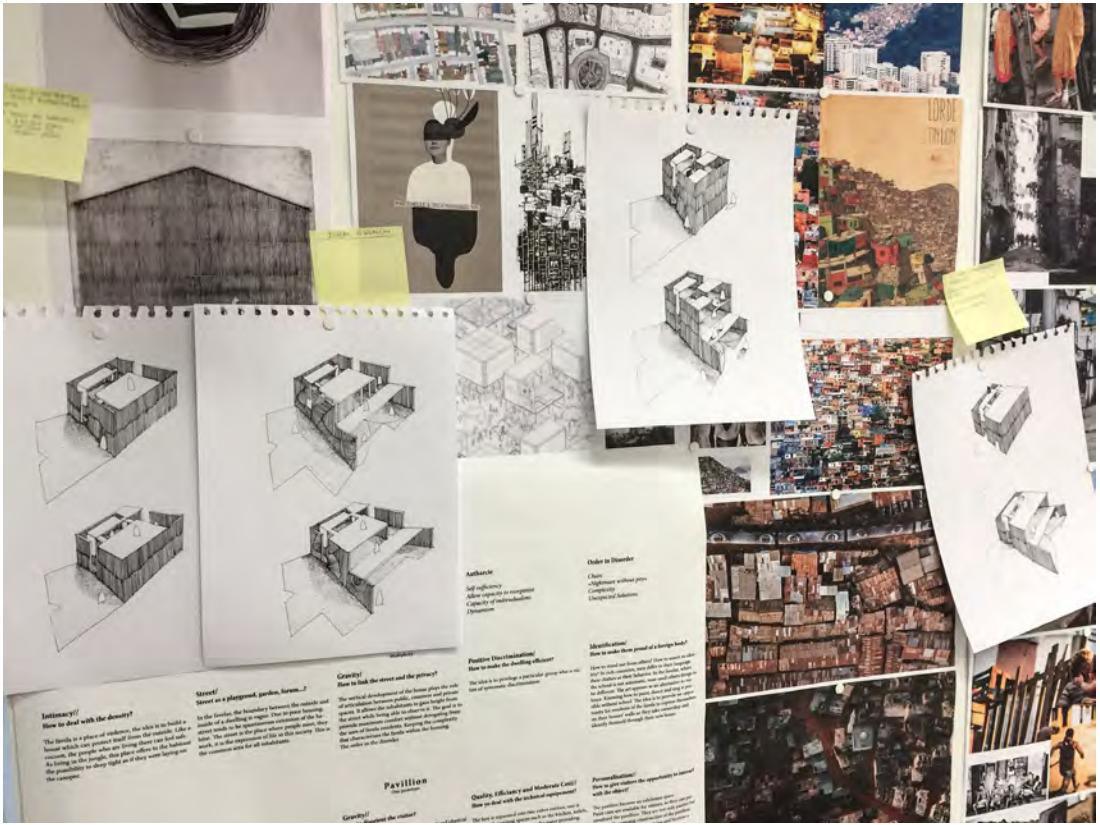
KTH in June 2015

Ori Merom, Charlie Gullström, Suzanne Maverley, Jarlath Cantwell, Farvash Razavi, Nandi Nobell

The Dome of Visions in Stockholm is a collaborative project run by NCC and KTH and will be open for the period September 2015 – September 2016. Other partners include Open Lab, IVL Swedish Environmental Research Institute, the City of Stockholm and UniArts. Find out more at www.domeofvisions.se

The construction of The Dome of Visions and the winning pavillion
Everchange Module by Stefania Dinea, KTH Campus, September 2015.

Eoghen McCarthy's final presentation of ImpermiHome for the jury.



Sketches in the studio.

Eva Nyberg finishing a model of her project *Raining House*.

Diploma student Axel Zedell presenting his project *Mycelium Connection*.

End of Year Exhibition by Studio 4 Architecture for Extreme Conditions,
KTH School of Architecture 2014/2015.

CHARLIE GULLSTRÖM

Charlie Gullström, PhD, Architect SAR/MSA, is a University Lecturer at KTH School of Architecture, where she combines teaching with research and heads the research group KTH Smart Spaces, a collaboration between KTH ABE Architecture and KTH CSC Media technology and Interaction Design. Current projects include EIT ICT Labs Mediating Presence; EU COMPEIT and KTH R1 Experimental Performance Spaces & Presence Lab. Her design-driven research and practice over twenty years address the fusion of architecture and media technology facilitated by new information and communication technology (ICT-mediated architectural design, mediated spaces). Her particular interest concerns the contribution from architects to a highly-mediated society, given that new digital tools have thoroughly changed the way humans interact and communicate (presence design). Recent projects include a Mediated Museum; Smart Collaboration Spaces and the Mediated Sketching Table.

ORI MEROM

Ori Merom, Architect SAR/MSA, is an award-winning practising architect whose architectural practice is characterized by many successful contributions to architectural competitions all over the world (www.meromarchitects.com). His 'Practice Based Research Studio' at the KTH School of Architecture, years 4-5, is since many years an established studio leading to the Master in Architecture Degree, which annually attracts about 25 students.

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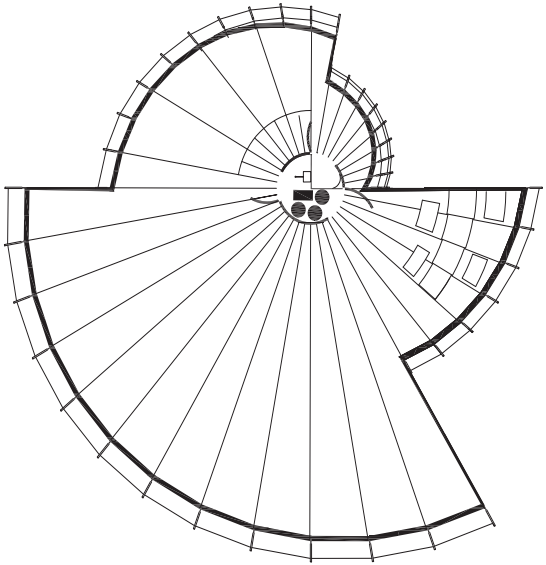
FLIP OVER FOR AUTUMN SEMESTER

MAM
Anais Racine

MAM is responding to the environment of high altitude mountains, where the lower air's density involves a limited proportion of oxygen. This atmospheric condition does not allow helicopters to fly safely - rescue teams need to come from the ground.

The proposal takes place on the Everest and consists in implanting on the way up to the summit dense core, called anchors, on regular points that will create the different camps.

The anchor is the centre of the proposal. It will produce water, oxygen and heat from melted snow by the use of electrolysis and hydrogen power. Around it, folded lightweight wings expand to create living spaces.

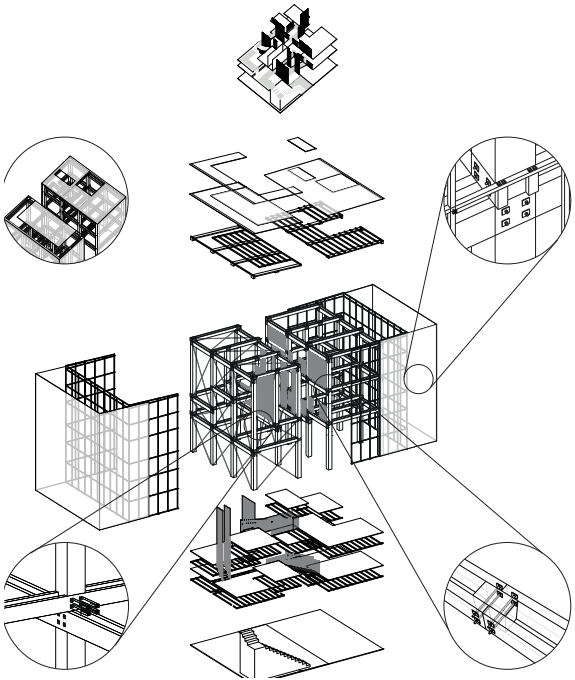


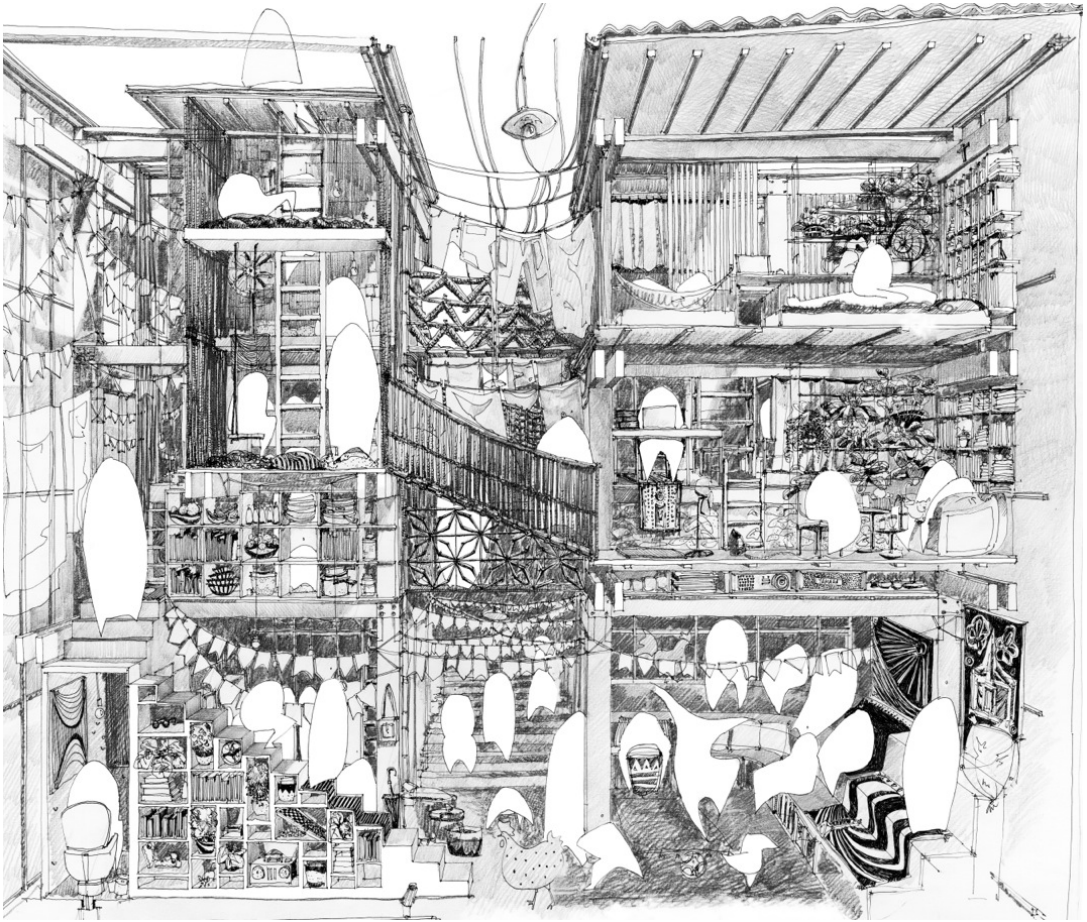
CAIXA

Adélie Thollot, Marie Maghe

The central concern of this project is based on a political ambition and social conscience to provide better living conditions for the most needy. In order to connect local populations to the whole society, this program creates a space adapted to the economic and social needs of the poorest. The aim has been to detect an order in the apparent chaos of the favelas, in order to combine heterogeneous elements and create a coherent architectural object.

The project questions the interior and exterior concepts of boundaries, between wealth and poverty, between high culture and “popular” culture and, the most important, between architecture and its inhabitants.





ARCTOCEPHALUS
Fanny Varga

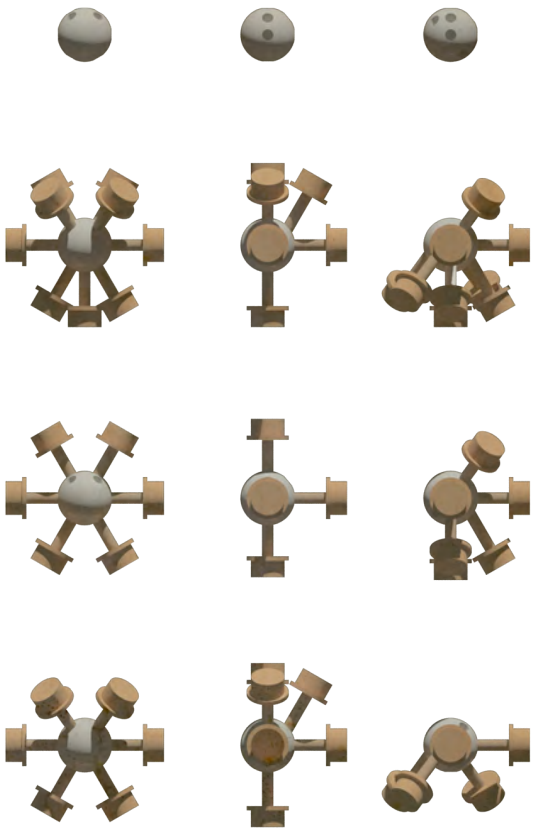
Arctocephalus is a small scale, moveable research station. The curved form creates a good volume to surface ratio, and follows basic aerodynamics. Thanks to the hydraulic legs, which can be independently operated, the structure can stand stable on any surface. Attached onto the legs are skis, which allow the station to be hauled to different sites as needed.

The first floor contains the necessary living spaces, which can be properly closed off from the rest of the structure to conserve heat and energy. The top floor is an open area which can be used for meetings or activities. While a larger station can have around 60 permanent researchers, this one is only designed to house 4-8. A larger number could be fitted for shorter stays, such as hikers or visiting guests.

SCARCITY
Åsa Rhodin

Scarcity is a unit based survival pavilion designed for the desert using decomposable and cheap materials. There are four different units with small programs responding to the basic requirements for survival in the desert. Each unit is independent and can be put up by itself or plugged into another unit resulting in great flexibility according to the specific needs. Scarcity relies on the bare minimum of the extreme environment, the materials used and the construction of the pavilion.

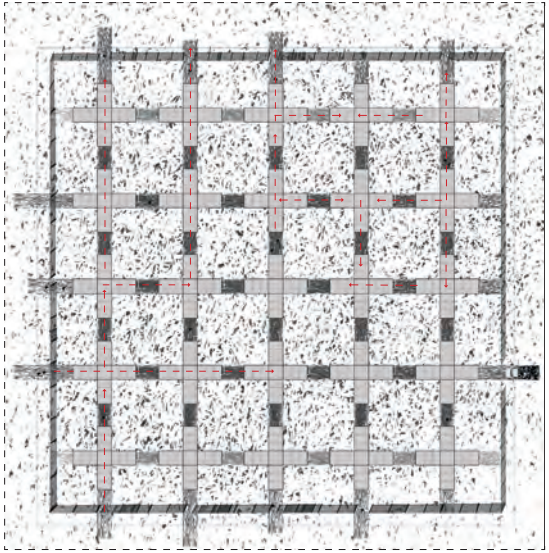
Scarcity is a temporary structure with the core idea that the pavilion can be left in the desert like a skeleton when moving to a different location with a more permanent form of housing. Therefore all the materials used are decomposable - all but some of the canvases that are meant to be taken along on the journey.



VIRUS OUTBREAK
Emilie Näslund

A rescue station in three steps to apply in different situations. To get the possibility of more options in organizing and dividing. Foundation - separation - isolation.

The steel frame
- Cross shaped red roofing as a symbol to advertise crisis for rescue to locate.
The sliding walls
- Separating sections from eachother
- Possibility to make a closed yard and create needed shadow.
- Yard could be used as a cultivating plot and make possibility to grow tobacco while staying (medical perpose, need 7-10 days and medical staff or realtives.)
The unit
- To isolate the patient and give them the privacy they need.
- Making the routine easier.



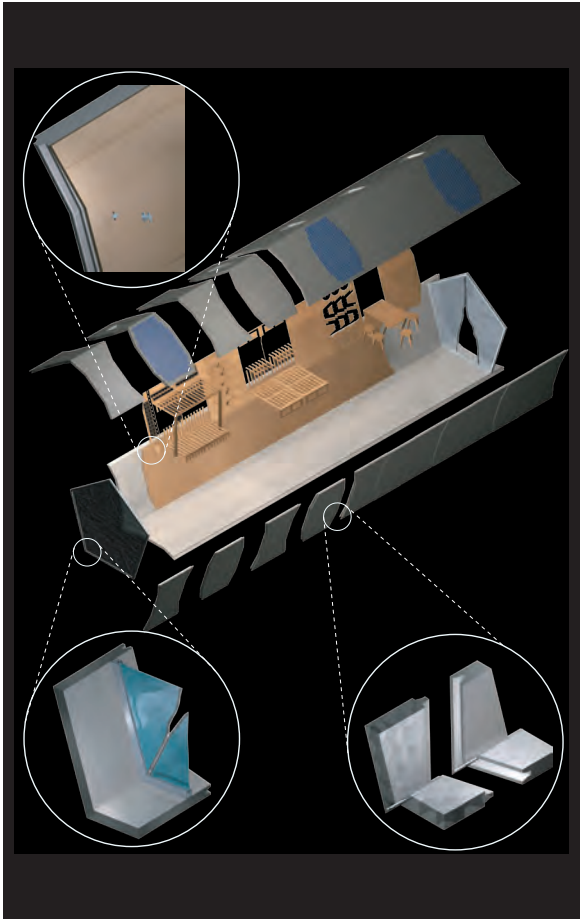
BALANCE
Emma Le Guellec

Nearly 70% of the worlds' capital cities are built on or around water. Even though rivers, sea coasts and lakes give a certain advantage for agriculture, industry or trade, water can quickly become a significant risk. Today, notably because of the increasing amount of impervious spaces and the rise of the water level, cities and villages are becoming more and more vulnerable to flood. In tropical regions, monsoons explain the particular danger of seasonable flooding. In those areas, there are three ways to deal with flood. You can choose not to settle in such risky areas. You can try to fight the elements by putting in place dams and drainage systems. Or you can choose to adapt architecture.

An open structure which can be adapted, dependent on the needs. Interprets the tropical building to adapt to another kind of extreme environment, where shade, light and poetry play the leading role.

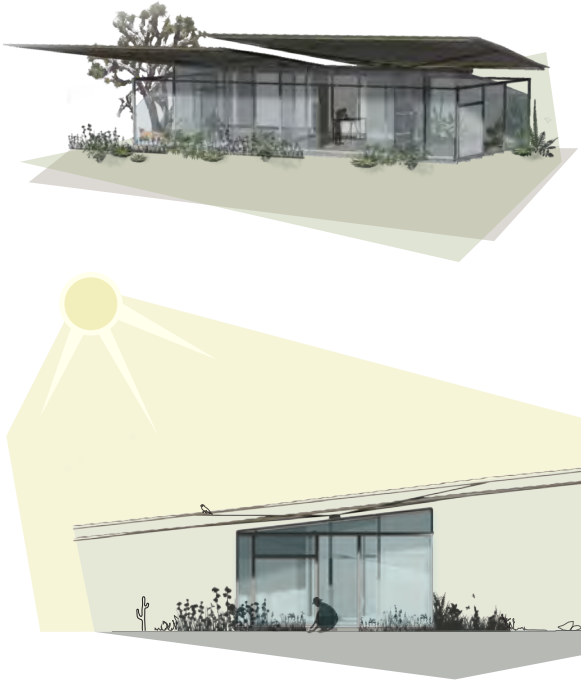
IMPERMIHOME
Eoghan McCarthy

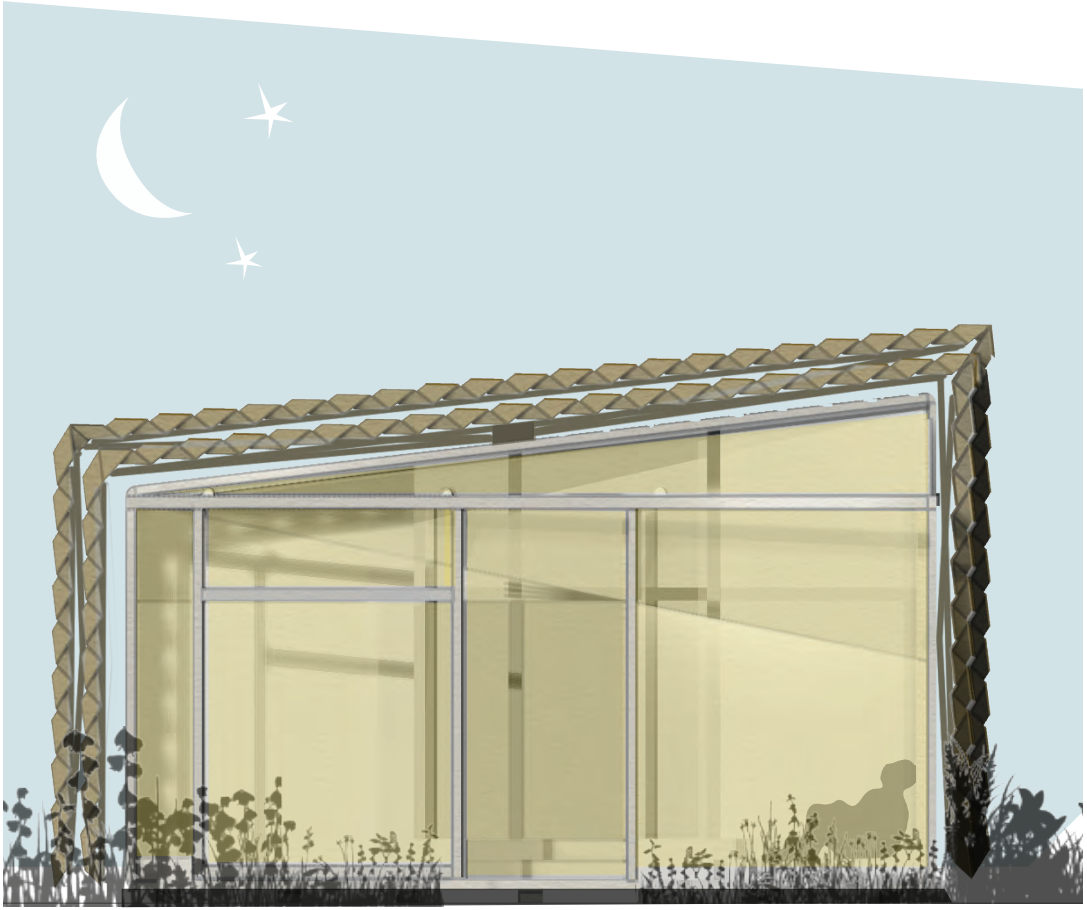
ImpermiHome is a transportable, compact, light-weight componental shelter system which can be assembled easily by anyone using language-less instructions. The components are self-fixing, which allows rapid assembly and disassembly if required. This requires a complex series of joints on each side of the panels to provide lateral stability, floor-wall rigidity, and impervious to the elements. The universality of the components mean that movement is only permitted in one direction; for assembly, so the panels can slide into each other, automatically become rigid in 3 axes. Each panel is composed of a layer of solid aluminium on the outside with a sandwich panel of hexcel honeycomb folded aluminium. A plug-in furniture system provides basic homely needs which can adapt to personal requirements. 12mm plywood panels are mounted to the aluminium panel using a plug system, which allows adaptability as the interior can be customized to the inhabitants requirements.



RAINING HOUSE
Eva Nyberg

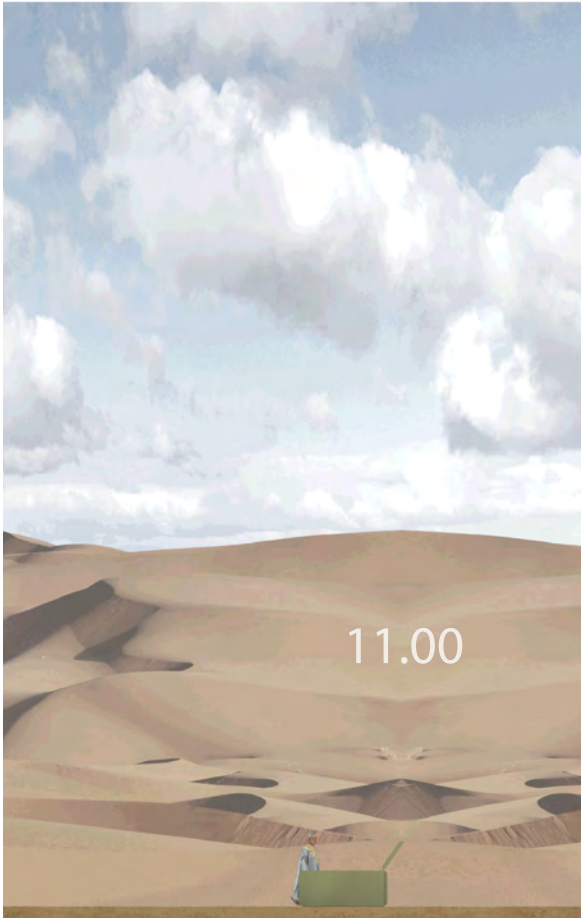
The Raining House is a desertification research station custom made for areas with no rainfall and high humidity, such as the Atacama Desert in Northern Chile - the driest desert in the world. The house's special folding roof has a hydrophilic shape and hydrophobic coating, inspired by the shell of the Namib Desert Beetle. The roof collects the humidity from the air and lets the water fall on the underlying building and ground, creating a very local rain. The rain that falls on the underlying roof is collected inside the building as drinking water. The rain that runs down the side walls goes to the plants and to the ground. The many folds in the roof ensure that there are always many surfaces facing the direction of the wind, optimizing the harvesting of water. Closing the roof makes the creases deeper and more hydrophilic. It also adds an extra protective climate shell to the house and tucks it in for the night.

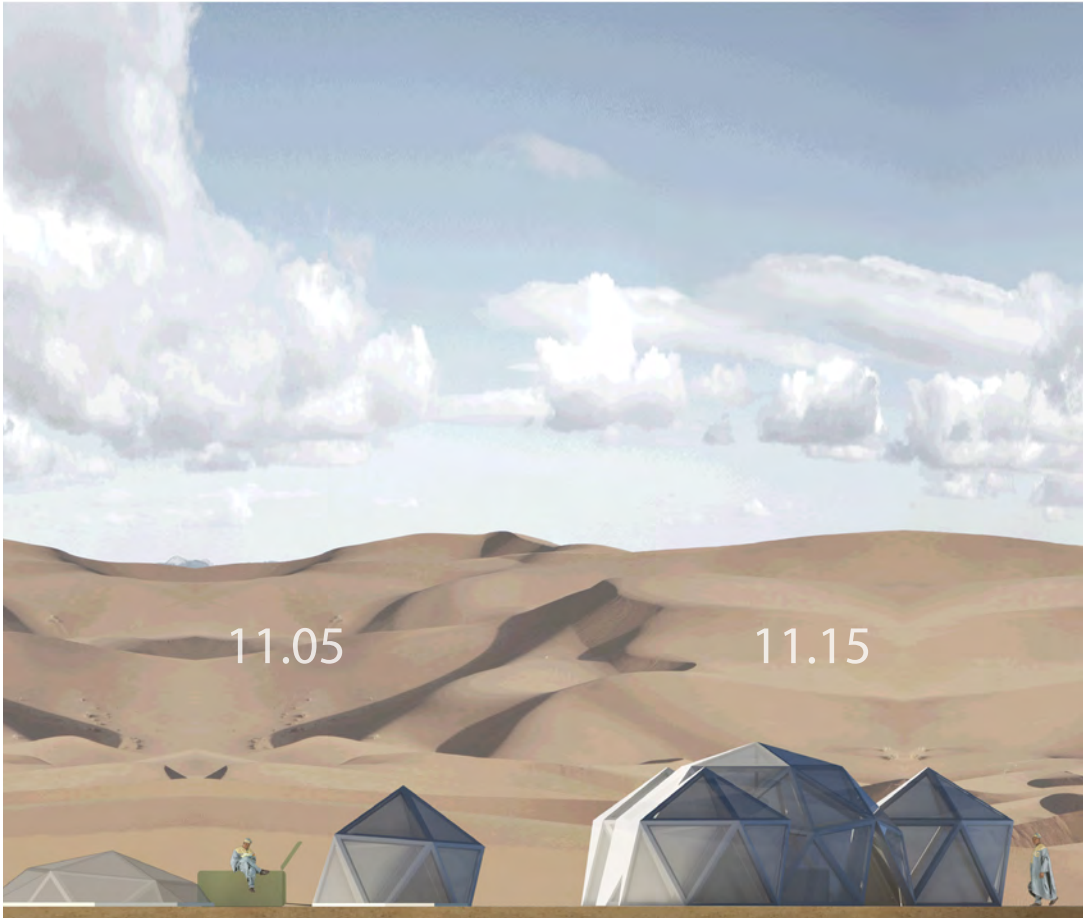




POP UP LIVING
Hjalmar Stenlund

Pop up living is a project about flexibility in life. It is about a small unit that in its unexpanded form is only 2, 2 cubic meters. It is lightweight and easy to take with you anywhere you want to go without the means of any other transportation but its own add-ons. It is extremely easy to use and the unit can be transformed to its full scale by one person in only 15 minutes. Just as easily as it is erected it is to dismantle and put up at a different place. The energy used to erect and move the structure will be minimal and the environmental impact on the site you choose to build it on can be almost none. This can be done only because the structural system of the building consists of high pressure air. The building is extremely adaptable to new uses and users and will fit the needs for both the family lacking a home as the one leaving it willingly to explore the world. With the flexibility of choosing how many extra spaces to take with you the building can be fitting for just one person and up to four families.

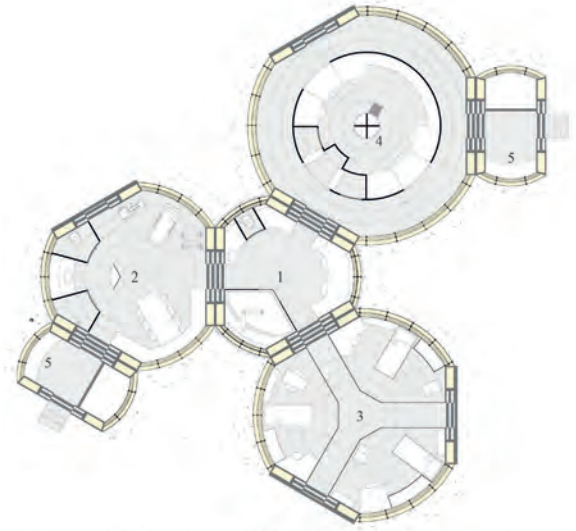


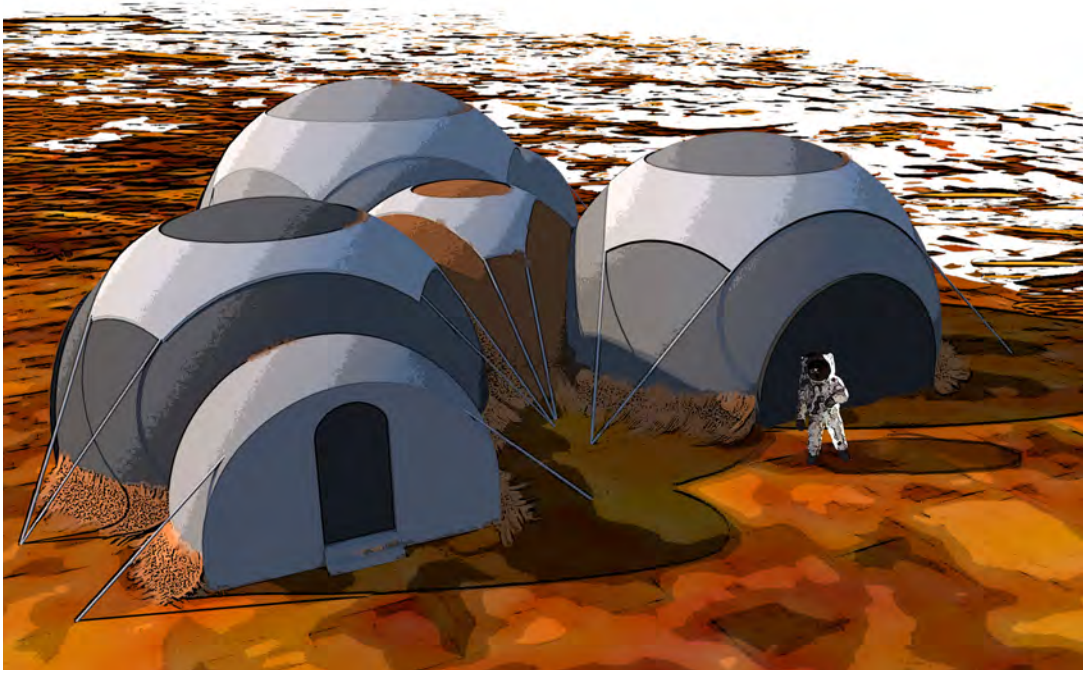

11.05
11.15

REDGENERATION
Joanne Jimmink

When imagining human settlement and research on Mars, which seemingly becomes a growing possibility in the foreseeable future, the first and foremost priority is survival. Because of an extremely low density atmosphere consisting of toxic gases settlers would require safe shelter. It is precisely such a shelter that the RedGeneration Project is designed to be.

As such, the RedGeneration Project consists of multiple airtight cells that can be closed off from one another, in case a cell gets compromised. These cells are of two types: survival cores and expansion cells. The survival cores are the most robust and therefore also smallest cells, they can provide the inhabitants with all they need in worst-case scenarios. The expansion cells have a lighter structure and vary in size. Each of these should be directly connected to at least one survival core to ensure everyone's evacuation to a core if need be.



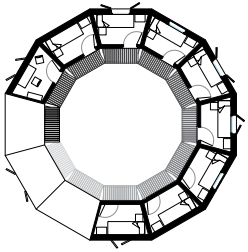


CARDBOARD ARCHITECTURE
Johnas Kvarnlöf

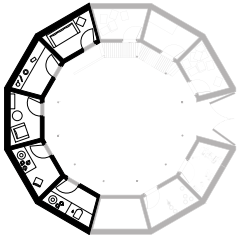
Homelessness and housing shortage is a growing problem in Sweden. Out of a total of 34,000 people living in homelessness in our country, 500 people are acutely homeless, meaning they might have to sleep rough. This project's goal is to find a temporary solution to some of the people who need accommodation. A place where they can sleep, eat and socialize without risking to be evicted.

The chosen material is Cardboard. It is easy to understand why Cardboard have long been associated with homelessness. It is cheap, easy to work with, easy to come by and it is surprisingly insulating, making it perfect to use as a temporary shelter.

VISIONS OF DOOM
Kristoffer Dahl

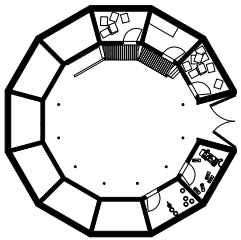


In a post apocalyptic time
where law and order is no more
when the dust is slowly settling
from a global nuclear war



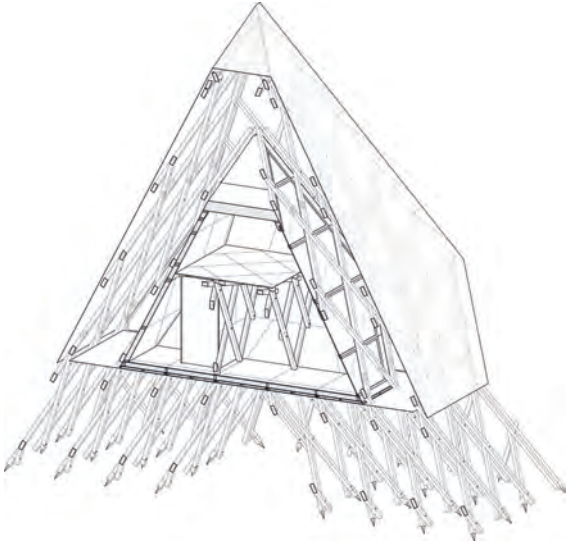
When humankind's diminished
and forced to eat its own
when technologies are lost
and wars are fought with sticks and stones

We hide behind the walls
in this fortress we call home



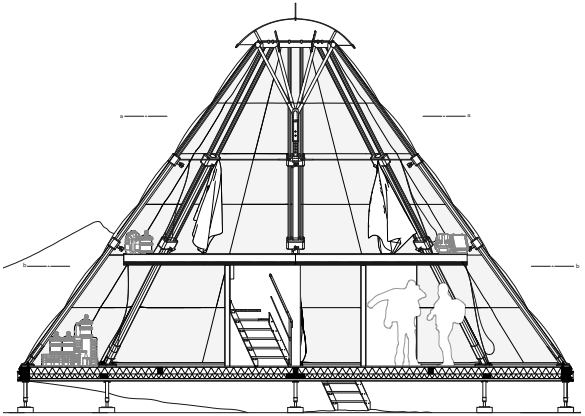
OUTPOST
Kuba Kolec

The Outpost is a concept for a mobile forest cabin. Its' vision is to serve communities of animal trappers / research scientists by providing a "temporary" outpost shelter that deals with the harsh environment while allowing it for moving to a new location. The structure made of foldable and detachable lightweight parts forms a portable solution for living and working under extreme conditions.



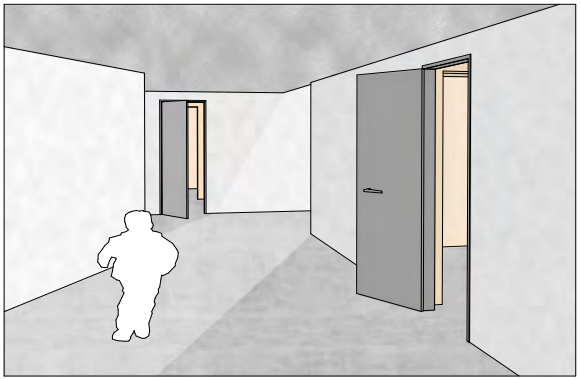
RESEARCH CLOUD
Mattias Pedersen

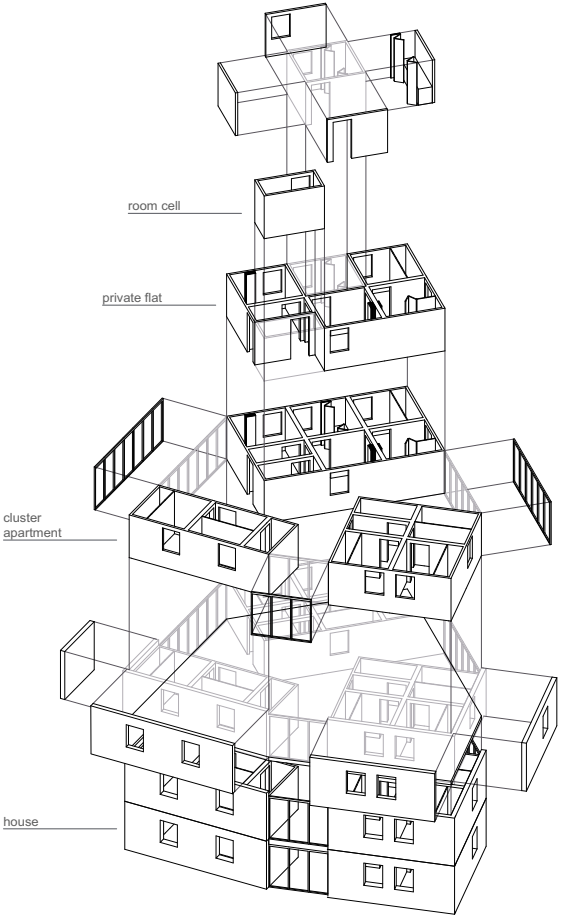
Research Cloud, the cushion-like research pavilion, examines how architecture can engage the scale of geography, and tests the possibility of an incremental, expandable and sustainable mobile system. The pavilion can serve as a seed of knowledge exchange and as a scientific station, highly adaptable to various extreme environments. The Research Cloud is an expedition unit able to respond, deploy and aggregate, to suit the diurnal cycle and seasonal temperature differences in various harsh climate conditions. The pavilion consists of a series of lightweight components built on the principle of foldability, much similar to the portable three-legged frame system tripods are based on. The whole construction can even be disassembled to facilitate transportation. The octagonal coned shape reminds of a capsule, but originally derives from the indigenous way of building; in this way the structure provides stability against downward and horizontal forces and movements about horizontal axes.



MODULA
Mena Traxler

Already half of the world's population lives in cities and this number will increase in the near future. These developments limit land and natural resources. Progressive housing models tackle these challenges by minimising individual space requirements through optimised architectural design. Innovative housing increases the density of residence and prevents cities from spreading out into large areas of land. At the same time, they protect land resources, save building material and reduce grey energy as well as energy used for heating. In the context of fast growing cities, we thus have to focus on housing solutions that optimise the living area required for each person. The system I have developed is fast to build and cost effective. It decreases land use per person and simultaneously ensures a high quality of living. The modular system based on small room cells is flexible and builds a structure that is adaptable to different contexts in a city. Individual room cells are combined to a small flat. Various flats are arranged around a large shared living area and build a cluster apartment. Each common living area thus has a unique outline based on the particular context.




room cell
private flat
cluster
apartment
house

EVERCHANGE MODULE
Stefania Dinea

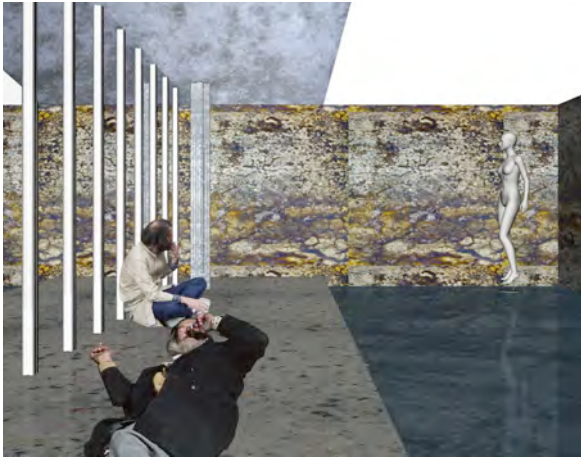
The proposal has 3 levels: The ground floor covers 72 sqm of street with the help of the structural system so the traffic of the area will not be disturbed and it also offers a private entrance from the construction site to the upper layers. First floor is where the offices are situated. It offers a total area of 52 sqm where the construction company may fulfil its daily duties at ease. The third level has a 35 sqm terrace that can be used for serving lunch or fika for the site crew. The upper level is a private level and used for upper management offices and can also back-up as sleeping quarters in the case of an on-site emergency. The outer zone, within the reach of the main (tower cranes, is where the auxiliary plants, workshops and yards are to be located, together with the secondary ("general" stores and deposits). Therefore the Everchange Module system is to be placed in the Outer Zone as well, intersecting with the neutral zone. This study case proposes on site offices for 1.5 year development of real estate buildings.

ΔΔΔΔΔΔΔΔΔΔΔΔ
Bort Jonsen

Are there hierarchies in the needs of homeless people receiving charity or in the expectations of the giver? What can I expect from my charity? Do I have a say in what the money I give should be used for?

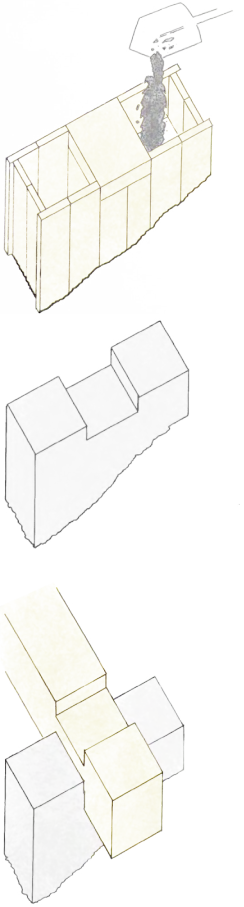
Psychologist Abraham Maslow suggests a hierarchy of needs, an influential theory of psychological health predicated on fulfilling innate human needs in priority, culminating in self- actualization. Maslow's theory suggests that the most basic level of needs must be met before the individual will strongly desire (or focus motivation upon) the secondary or higher level needs.

Should homeless people then disregard from "top layer" needs in order to only search for food and shelter? In order to live a dignified life one needs more than food and shelter, I for one wouldn't wait to fulfil these needs before I had any others.



NOTCH CABIN
Robert Kosinski

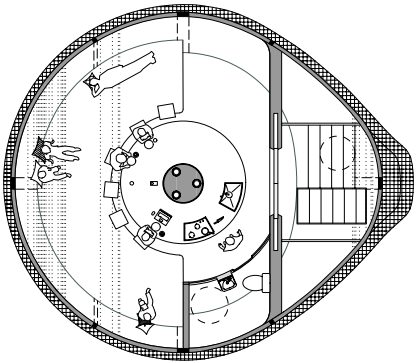
Two wooden cabins make way for new social gatherings between people engaged in outdoor activities around the lake. The cabin on the hillside is the first building near the bridge when walking from Tyresö towards Skogås. The cabin that stands in water is larger and welcomes the users of the lake in all seasons. The casting of concrete in the shape of a notch enables the construction of a timber cabin on a steady foundation. The technique of site casting small notch pillars may be applied to the steep hillside as well as to the bedrock under water. The technique revolutionizes the potential of Swedish timber architecture as two materials unite in one notch technique. Lake Drevviken was during a long time used for shipping large volumes of timber from the woods of Hanveden in the south to Sköndal in the north, and onwards to Stockholm. The timber history of the lake makes it highly suitable to host a renaissance of the old notch technique. The cabins tied by notches become notches themselves as they tie people together and make great architecture come to life.



NEUTRAL CLOUD
Daichi Sato

Sometimes human beings seem to need a neutral place. To resolve international troubles, some places are required to hold meetings for people with different backgrounds. When it comes to such examples, the issues are often very political and too much people are involved in them, so maybe the meeting place itself doesn't affect the result of the meeting. Human is human, though. The result of any meeting will somehow be affected by who is there and what their relationship is like.

The better their relationship has been so far, the higher the possibility is that the result of the meeting will be profitable for everyone. So it is important to create a neutral place to cultivate healthy individual relationships beyond borders. Such a place must be far from human society to make people forget what they have been involved with in in their daily lives and instead focus on the occasion. The environment must be unknown and harsh. That inconvenience makes them cooperate with each other, share the same experience and sympathise with each other.



FLIP OVER FOR AUTUMN SEMESTER

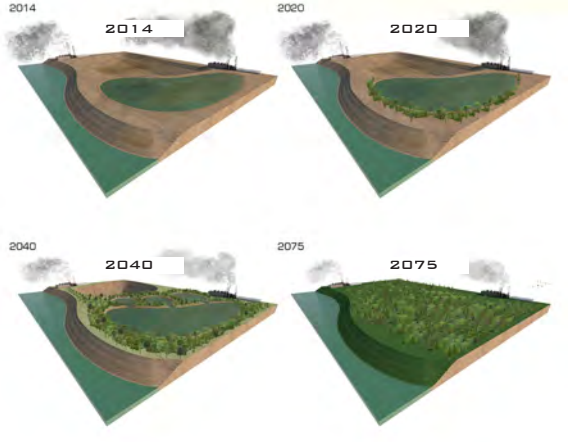
FLIP OVER FOR SPRING SEMESTER

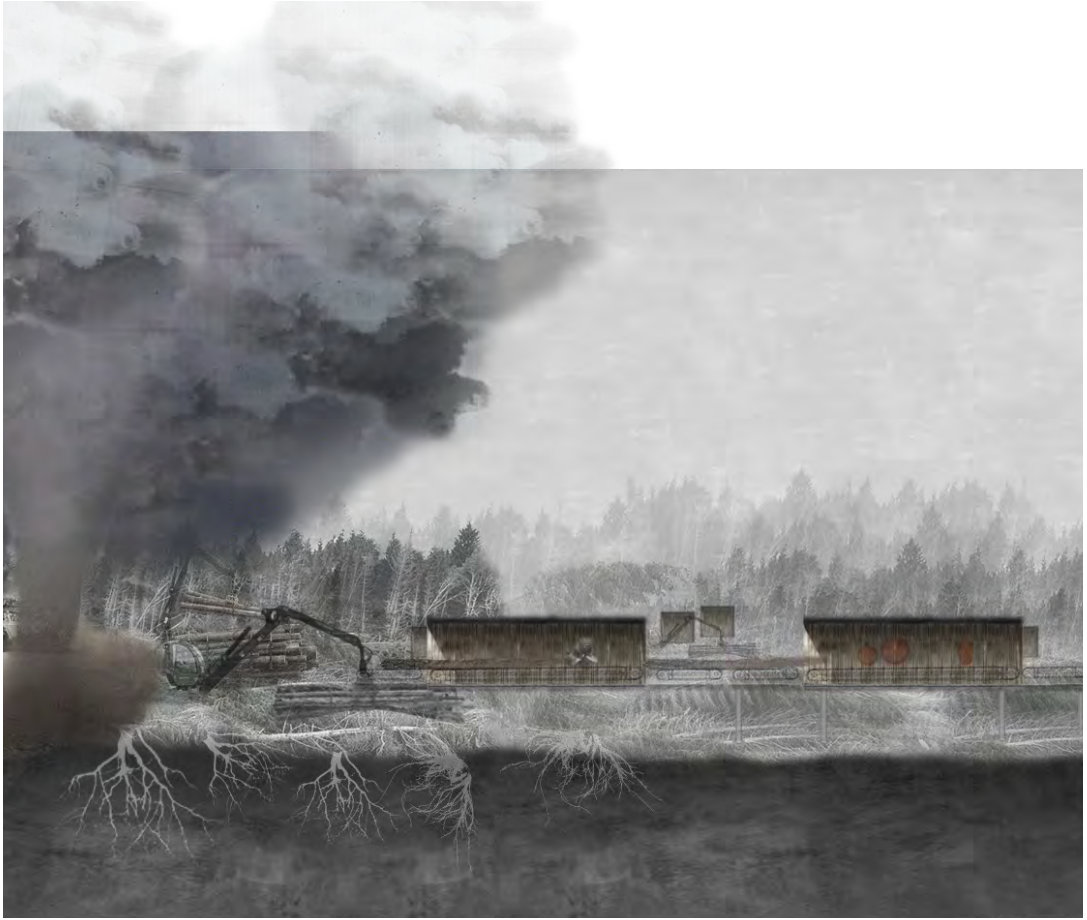
MYCELIUM FACTORY
Axel Zedell

The Mycelium Factory is 18 000 m2 structure, mixing a research facility and dwellings with a production line. During spring and summer the focus is to plant out petroleum eating mycelium and plants to protect the fresh water to get polluted. During these months the factory can produce enough mycelium to cover an area as great as 15 km2 , nearly not enough to cover all of the destroyed landscape, but to enough to cover the area closed to the tailing ponds.

During the cold months of the year the mycelium is used in producing bio-plastic and biofuel. Today there are eight mines up and running, devastating and polluting the landscape. The idea is to plug in one mycelium factory for every mine. This will speed up the recovery and at the same time produce clean material and fuel.

The need for growing medium is covered from the massive forest industry located close to the mining areas, producing tons of forest debris every year.
An oil mine has a life span around 40 years. The goal is to detoxify and recreate the area 20 years after it's closed.





WHEN THE STORM IS OVER
Linnéa Zickerman

The 9th of January 2005 the massive storm Gudrun ran over the south part of Sweden. The inhabitants woke up to a changed landscape. Sweden faced the biggest logistical challenges in modern history. The storm directly affected 50 000 of forest owners and 75 million m3 trees were fallen.

By using Pop Up Sawmills the forest industry can be more effective after a catastrophe caused by a storm. If the work of taking care of fresh wood happens quickly it avoids dead trees laying on the ground for a long time which can cause massive attacks by vermin's and destroy big areas of trees, cost a lot of money for the forest owner and waste income from fresh useful wood.

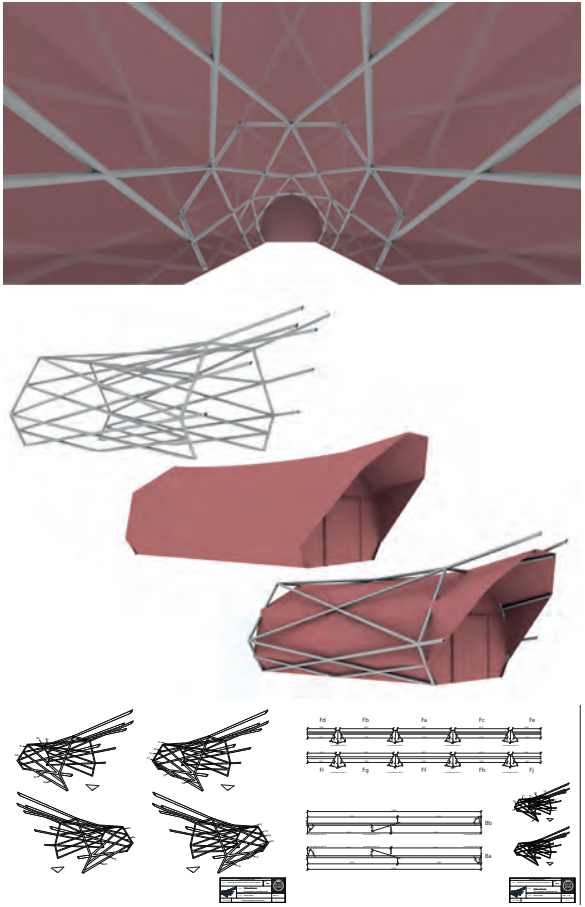
DZHERZHINSK_REMEDIATION

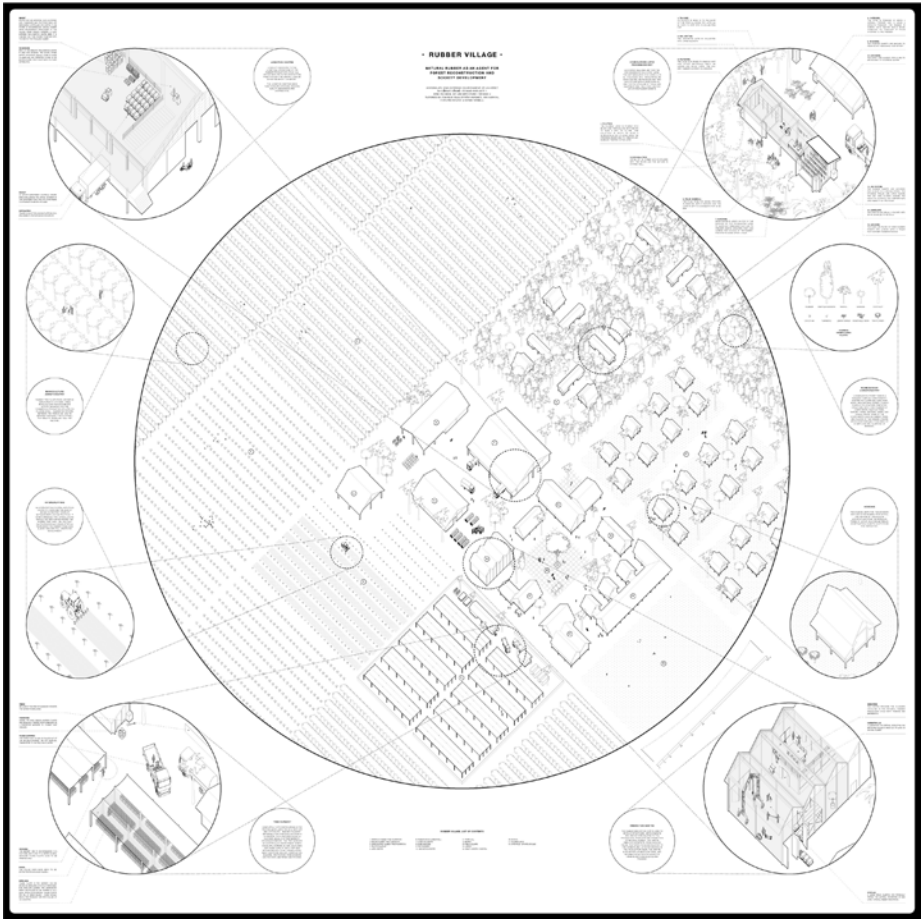
Daniel Flimel

My area of focus is on neutralization outcome from remediation technology, which will be used in acidic pond called “Black Hole“, on suburb of Dzerzhinsk. I got inspired with research on Leicester University in England which is dealing with a topic of plasticising starch.

With the help of my proposed machinery package and technological procedures, one may be able to use crystallized salt from neutralization procedure for structural components within the upcoming facility on the site.

This facility will later on host the technology, and be able to reproduce these structural components along ordinary labours connected with the environmental remediation.

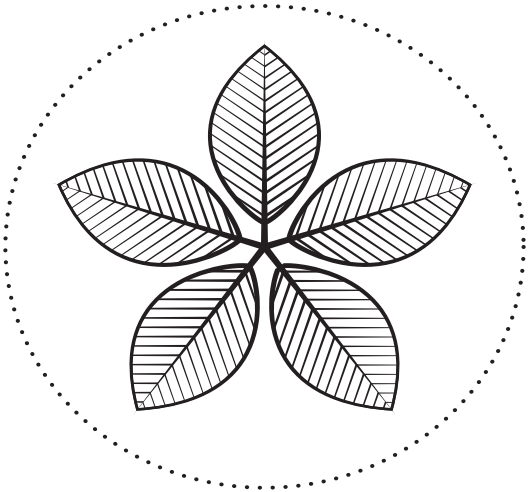



• RUBBER VILLAGE •
NATURAL RUBBER AS AN AGENT FOR
FOREST RECONSTRUCTION AND
SUSTAINABLE RURAL LIVELIHOOD

TREE OF LIFE / RUBBER VILLAGE

Dzenis Dzihic

This strategy aims at stimulating underdeveloped local economies while serving a bigger purpose of reconstructing tropical rainforests. Working along with nature, using the environment as an asset, the cultivation of rubber trees is the perfect agent - yielding natural rubber - a renewable and demanded resource with future potential and perspectives.



AEROGEL & AERO FREIGHTER FACTORY
Alexandra Paris

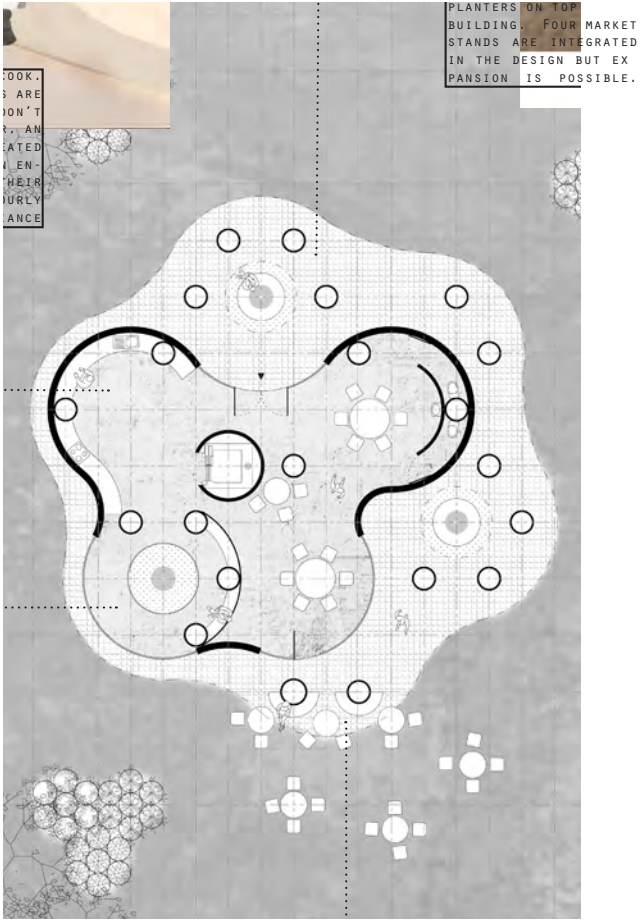
I decided to work with aerogel, together with the major climate issue global warming. I wanted to find a sustainable solution for acidification, which has caused this. I envisioned how the filtrating, floating, and insulating properties of the aerogel could be used in a strong, sustainable format. The Aerogel Freighter is a large ship with a recyclable base, which after it's been out to sea collects acidification and when it returns to the factory recycles this pollution into aerogel insulating material. Earth's population has growing pains, and this concept will heal the world.


BRING SOIL UP
LOCAL CULTURE OF THE BABUSHKAS
MEETING PLACE FOR SOCIAL ACTIVITIES
ATION IS WHAT SCARES ME. NOT RADIATION'
SS AND HEALTH TO MY MOTHERLAND'
IE FROM MY MOTHER;
)M MY MOTHERLAND'

CHERNOBYL'S DEAD ZONE

Lonneke Oosterwaal

• The biological metabolism in the most contaminated place on earth, Chernobyl, is interrupted because of the high radiation. The effect is a thick layer of plant litter.
• Decomposition of plant litter is 40% slower whereby soil is unsuitable for food production.
• Instead of fixing the natural cycle you could also see this as a possibility and use the created material as an asset.
• Radiation, compost, food production, Barbuskas and local culture.




LYALL BAY
TARAKENA BAY
0
1 km

BREAKING WAVES, SAVING GROUND
Kristin Karlsson

• The project focus on how a certain type of large seaweed can be cultivated in the Sub-Antarctic zone to prevent erosion and damage caused by storms and other seaward hazards in highly exposed coastal areas, an increasing problem due to climate change.

• New Zealand is a country of dramatic topography, surrounded by strong winds and currents. The ever changing landscape is causing severe damage to coastal settlements and infrastructure, a rapidly increasing challenge that needs new and effective solutions.

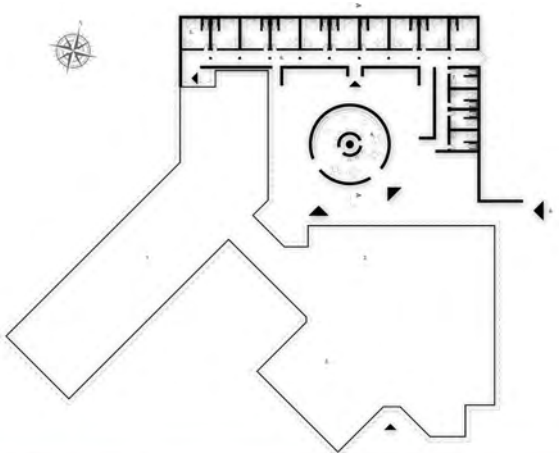
• Cultivating naturally occurring seaweed in the affected areas provide an economic and ecological alternative to coastal protection.

• The cultivation process aids marine biodiversity by providing nutrients, and the excess material is a resource which can be used as fertiliser, foodstuffs and as a base for alginate or biofuel.

PERFECTING ICE
Sara Kankaanpää

Perfecting ice –
Pykrete shelter against the arctic climate

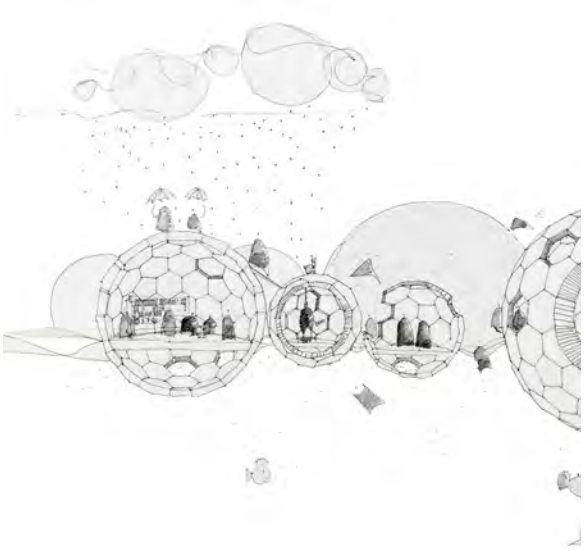
• Location: Svalbard, Longyearbyen
• Material: Pykrete and ice
• The strategy is to support winter tourism by a new innovative architectural solution that is sustainable and harmless to the sensitive nature of Svalbard. Developing tourism secures better services to local residents and helps to maintain basic infrastructure
• Building an winter extension to the local Polar hotel
• This will be constructed from Pykrete and ice. Pykrete is
a compound material of 14% wood pulp and 86% ice. It is
more closer to concrete with its properties than ice. The reason why wood pulp makes ice stronger is that cellulose will re-inforce the ice crystals. In this case the wood pulp will be replaced with moss that can be found at the location.

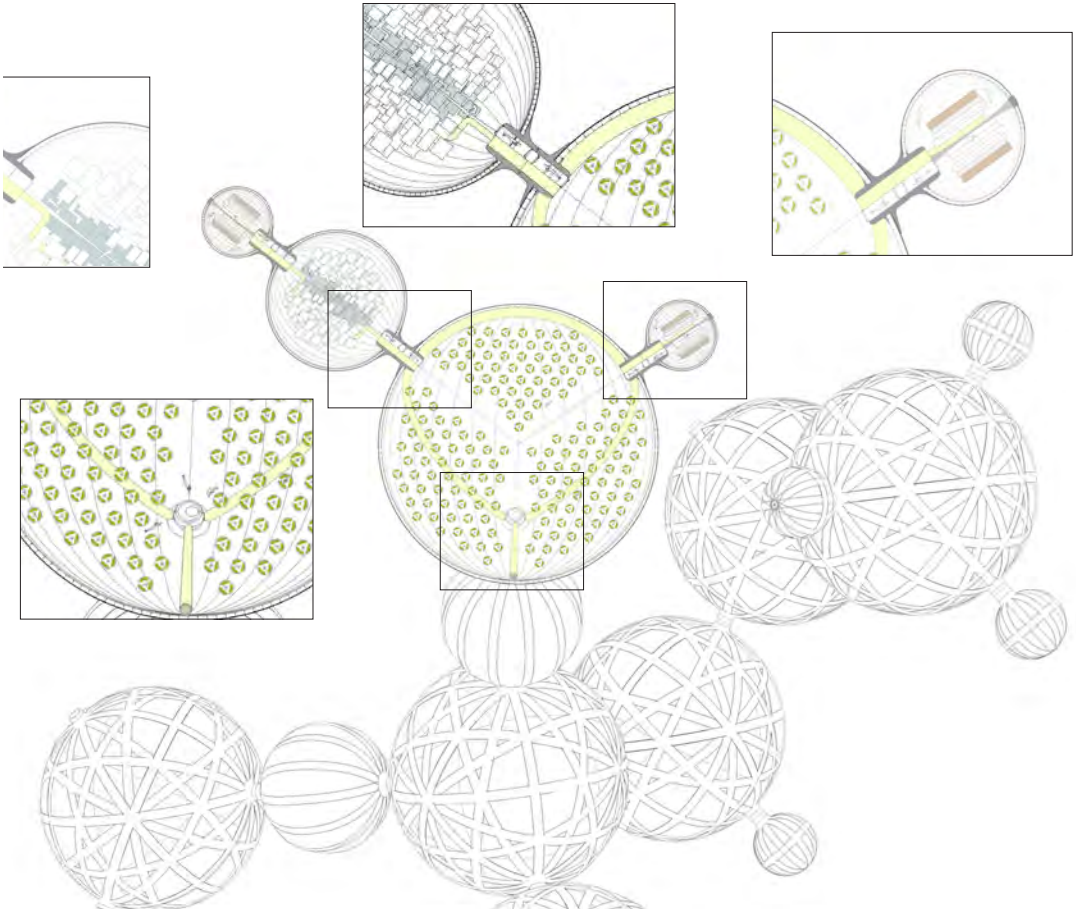


WATERSTELLAR FICTION
Adélie Thollot

Science fiction (noun):
Fiction based on imagined future scientific or technological advances and major social or environmental changes, frequently portraying space or time travel and life on other planets.

This project is developed on a fictitious basis in order to respond to a problem: How to live in a different environement? How to produce a material from an extrem environment, using the environmenet as an asset and not as a constraint.



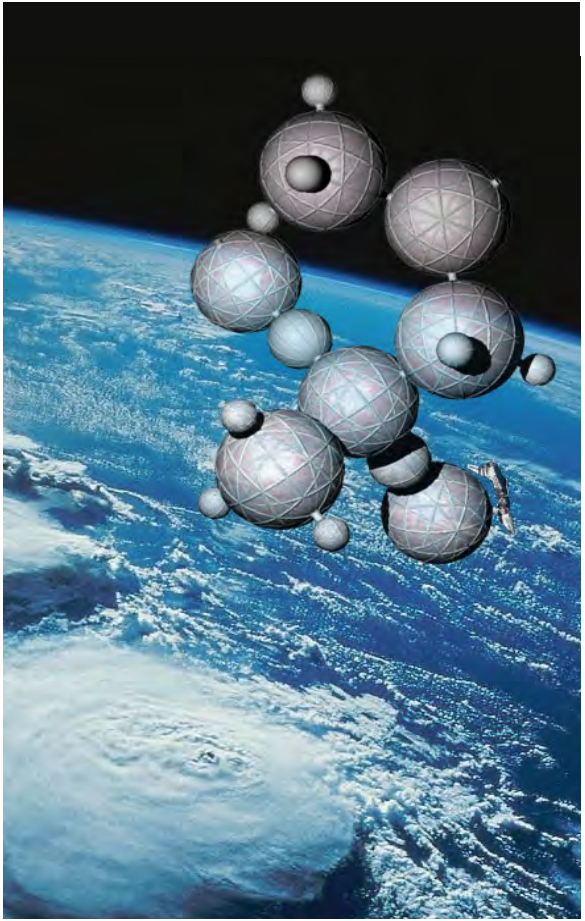


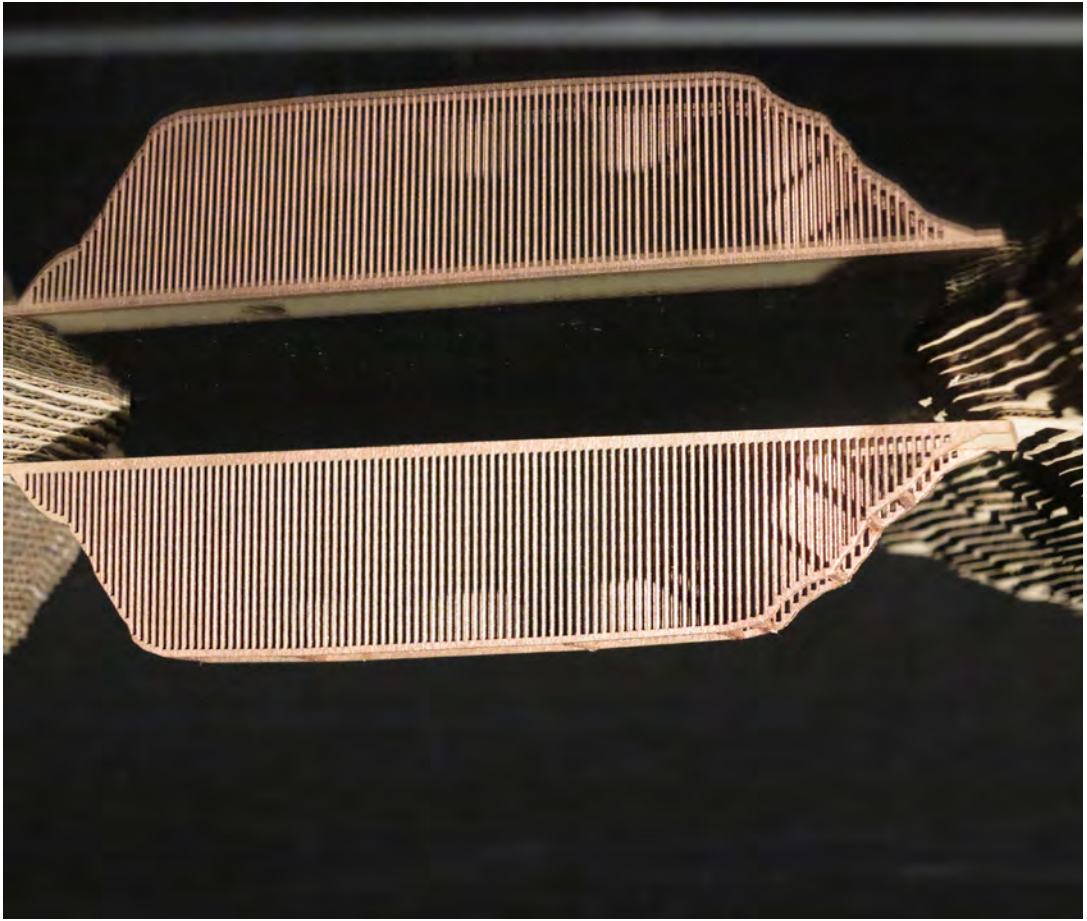
ZERO GRAVITY MOLECULE
Daichi Sato

When you make something in space one of the main problems is how to make it sustainable. Today ISS is almost depending on regular supply from earth. Every supply means launching of a spacecraft or unmanned supply unit at an astronomical cost. If sustainability was accomplished in the ISS space station the costs in the future would be reduced. In my proposal, the new units have a much bigger inside space than today. By utilizing such a bigger space we could get sustainability.

In Zero Gravity Molecule humans consume water, oxygen, vegetable and spirulina. Sewage of humans is resolved into smaller molecule weight by resolving equipment whose energy is provided by sunlight, and used as manure to cultivate vegetable. At the same time almost all water is extracted from the sewage.

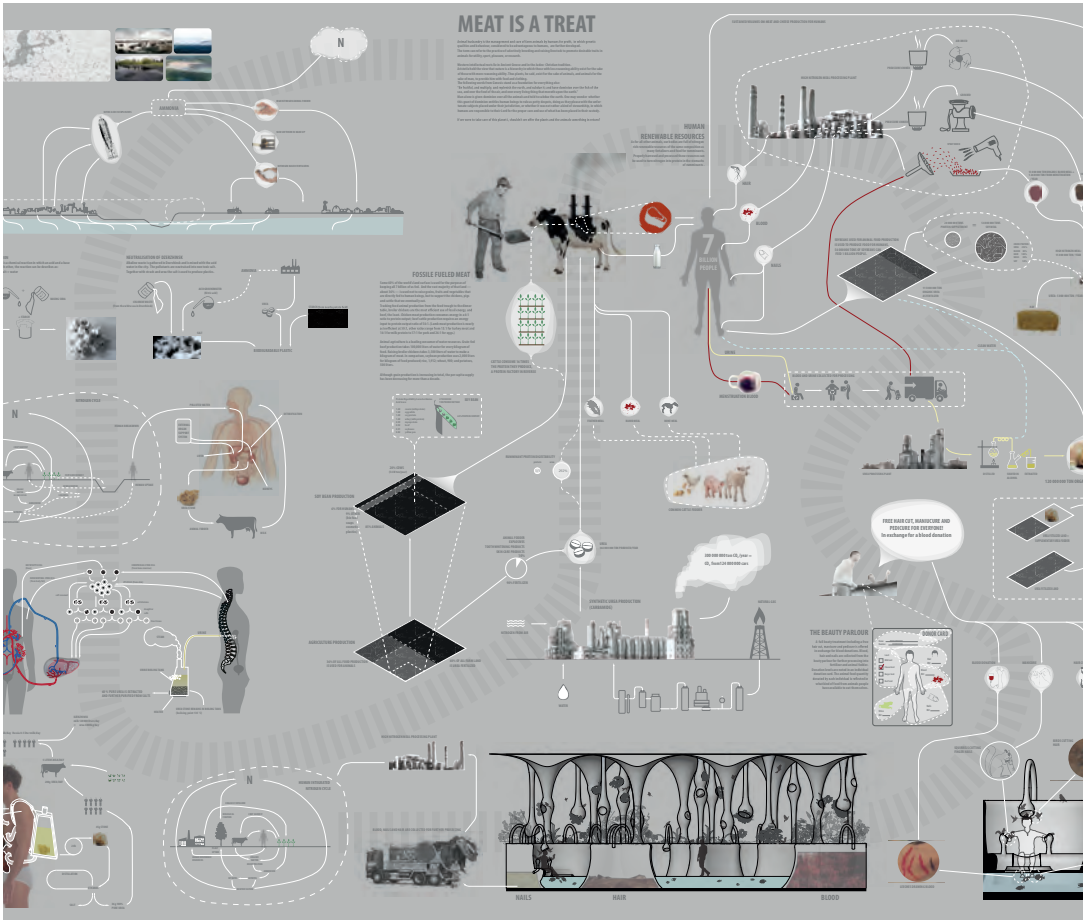
Photosynthesis of vegetable and spirulina provide humans with oxygen as they consume water, carbon dioxide and some manure. Electricity of sunlight origin can be used as much as possible and the infinite space can be used for cultivation of vegetable.





VISION DREVVIKEN
Robert Kosinski

Vision Drevviken proposes to enrich the existing infrastructure surrounding lake Drevviken through careful architecture that speaks the language of nature. The long-term vision for improving the infrastructure around the lake is to strengthen the wellbeing of the local citizens and to eliminate psychological ill-health in society. The vision includes a series of three bridges, of which one connects Huddinge municipality with Tyresö municipality, over the narrow Trångsundet. The bridge over Trångsundet (which is also the deepest spot in the lake, 15,4 m deep) connects existing walkways of the forest and creates an alternative infrastructure for pedestrians and cyclists to commute through nature. The circular hole in the bridge symbolizes the depth of the deepest spot in the lake, which is just underneath. The shape of the bridge is mirrored from the bedrock of the site. Therefore, when viewing the reflection of the bridge in water from distance, the eyes of the observer are perceiving the reflection of a reflection.


MEAT IS A TREAT
HUMAN RENEWABLE RESOURCES
7 BILLION PEOPLE
FOSSIL FUELED MEAT
FREE HAIR CUT, MANICURE AND PEDICURE FOR EVERYONE! In exchange for a blood donation
THE BEAUTY PARLOUR
NAILS
HAIR
BLOOD

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Bort Jonsen

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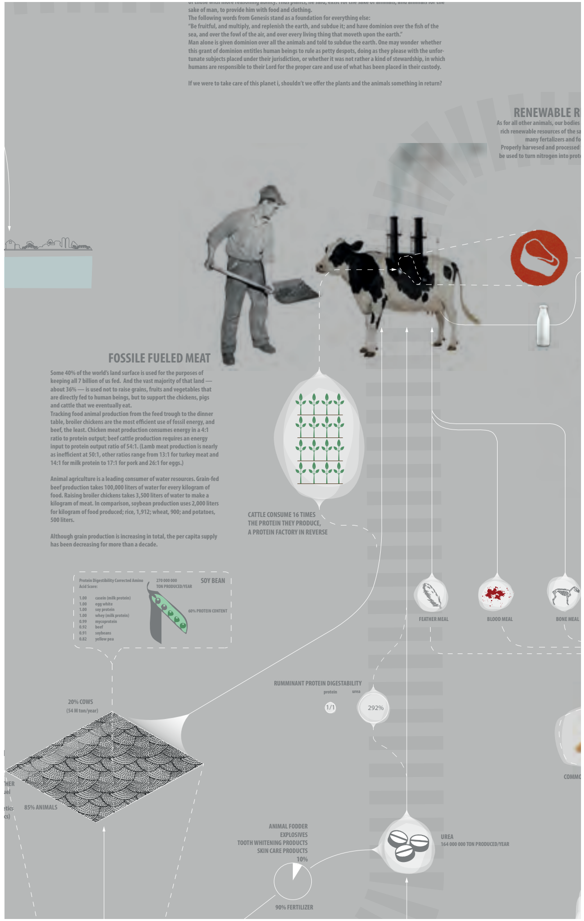
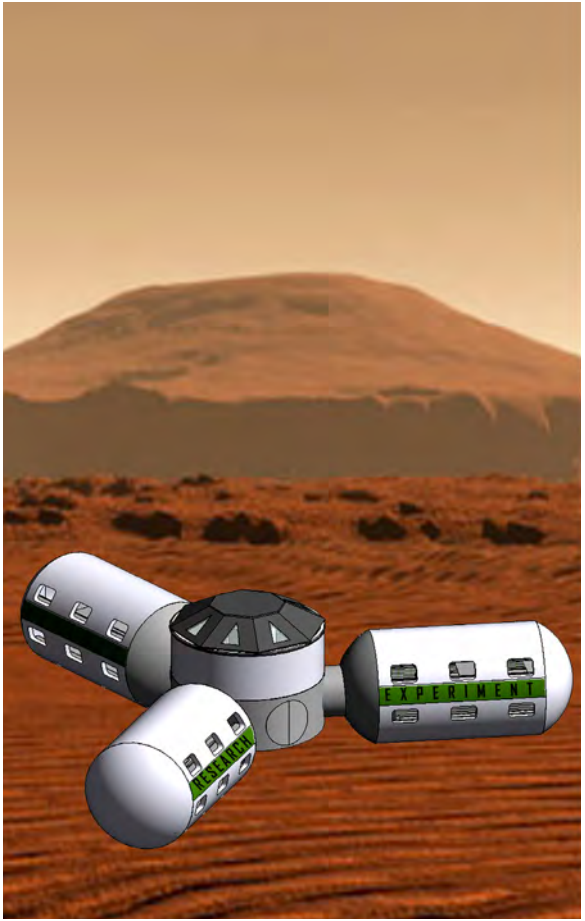

sake of man, to provide him with food and clothing.
The following words from Genesis stand as a foundation for everything else:
"Be fruitful, and multiply, and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth."
Man alone is given dominion over all the animals and told to subdue the earth. One may wonder whether this grant of dominion entitles human beings to rule as petty despots, doing as they please with the unfortunate subjects placed under their jurisdiction, or whether it was not rather a kind of stewardship, in which humans are responsible to their Lord for the proper care and use of what has been placed in their custody.
If we were to take care of this planet i, shouldn't we offer the plants and the animals something in return?
RENEWABLE
FOSSILE FUELED MEAT
Some 40% of the world's land surface is used for the purposes of keeping all 7 billion of us fed. And the vast majority of that land — about 36% — is used not to raise grains, fruits and vegetables that are directly fed to human beings, but to support the chickens, pigs and cattle that we eventually eat.
Tracking food animal production from the feed trough to the dinner table, broiler chickens are the most efficient use of fossil energy, and beef, the least. Chicken meat production consumes energy in a 4:1 ratio to protein output; beef cattle production requires an energy input to protein output ratio of 54:1. (Lamb meat production is nearly as inefficient at 50:1, other ratios range from 13:1 for turkey meat and 14:1 for milk protein to 17:1 for pork and 26:1 for eggs.)
Animal agriculture is a leading consumer of water resources. Grain-fed beef production takes 100,000 liters of water for every kilogram of food. Raising broiler chickens takes 3,500 liters of water to make a kilogram of meat. In comparison, soybean production uses 2,000 liters for kilogram of food produced; rice, 1,912; wheat, 900; and potatoes, 500 liters.
Although grain production is increasing in total, the per capita supply has been decreasing for more than a decade.
CATTLE CONSUME 16 TIMES THE PROTEIN THEY PRODUCE, A PROTEIN FACTORY IN REVERSE
SOY BEAN
270 000 000 TON PRODUCED/YEAR
60% PROTEIN CONTENT
Protein Digestibility Corrected Amino Acid Score:
1.00 casein (milk protein)
1.00 egg white
1.00 soy protein
1.00 whey (milk protein)
0.99 mycoprotein
0.92 beef
0.91 soybeans
0.82 yellow pea
FEATHER MEAL
BLOOD MEAL
BONE MEAL
RUMMINANT PROTEIN DIGESTABILITY
protein
urea
1/1
292%
20% COWS
(54 M ton/year)
85% ANIMALS
ANIMAL FODDER
EXPLOSIVES
TOOTH WHITENING PRODUCTS
SKIN CARE PRODUCTS
10%
90% FERTILIZER
UREA
164 000 000 TON PRODUCED/YEAR

FROM EARTH TO MARS

Stefania Dinea

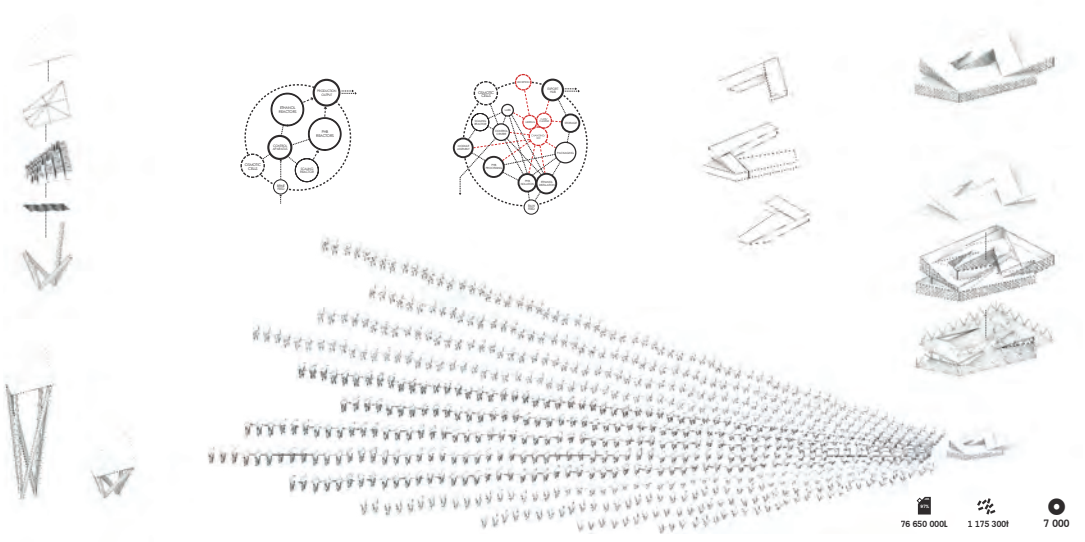
• A manned mission to Mars is bound to happen. The Bio – Mars project suggests that once there we should use our resources to terraform the red planet so we can explore new territory and build a second home.
• Problems, resources and solutions are presented within the project and its previous steps.
• The project focuses on algae as a source of oxygen, energy and the main component in creating an improved strengthen bioplastic. The bioplastic will be used by an adapted 3d printer to create different products locally, on Mars, in order to have a self-sufficient working unit.
• The project has an ongoing simulation on Earth - Devon Islands and a 10 year test period on Mars, if successful an extension to the project will be added.



ALGINATE, RESOURCE FROM THE SEA

Mattias Pedersen

Aleuts have become their own agents of assimilation and modernization through their involuntary participation in the fishing industry. This major wave of acculturation has resulted in the most profound and rapid changes to the Aleutian culture. A local, cultural, and environmental movement has grown up to counteract the loss of Aleut identity, community cohesiveness, subsistence skills, and connection to the land and sea. In the process of cultural recovery, self-governance, self-reliance, and self-sufficiency are emerging in the community. The aim for the project has been to produce an alginate polymer derived from kelp, used in the building and construction industry of the Aleutian Islands.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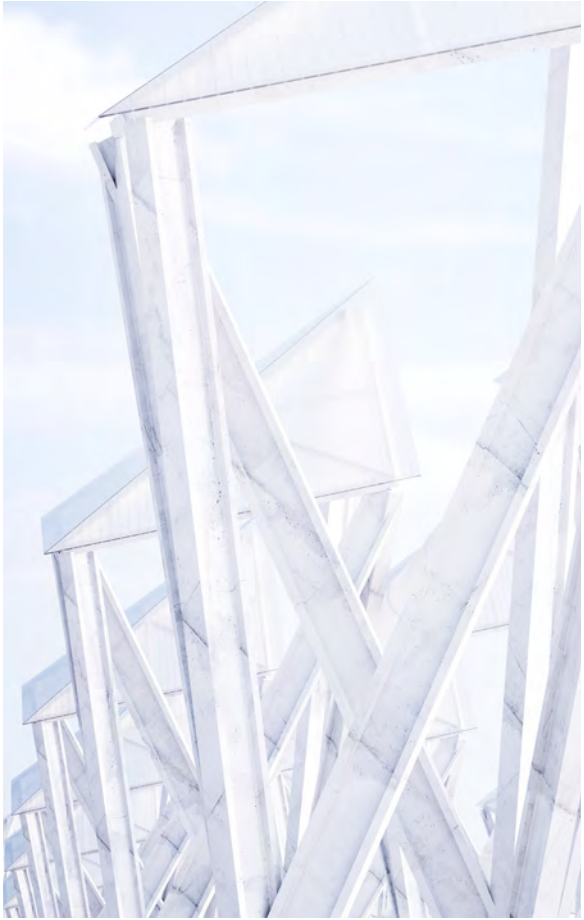
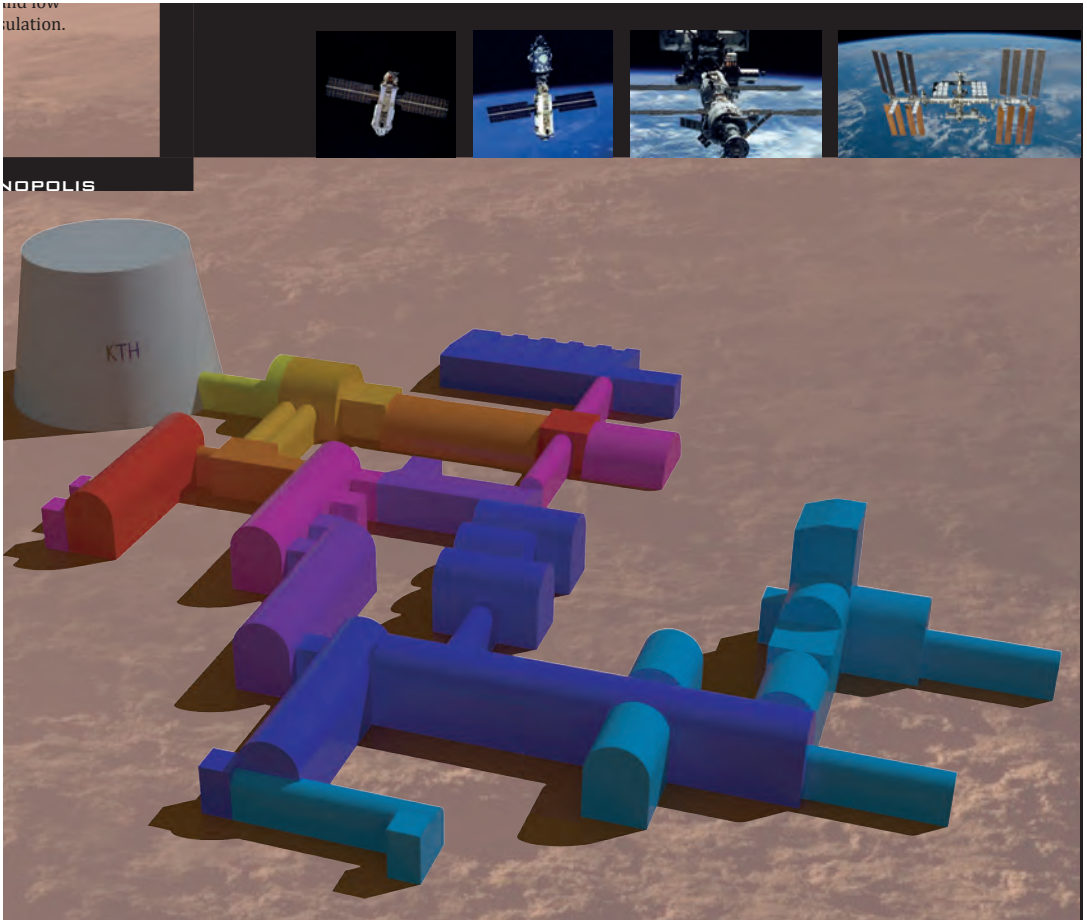
7 000

SALAR
Kuba Kolec

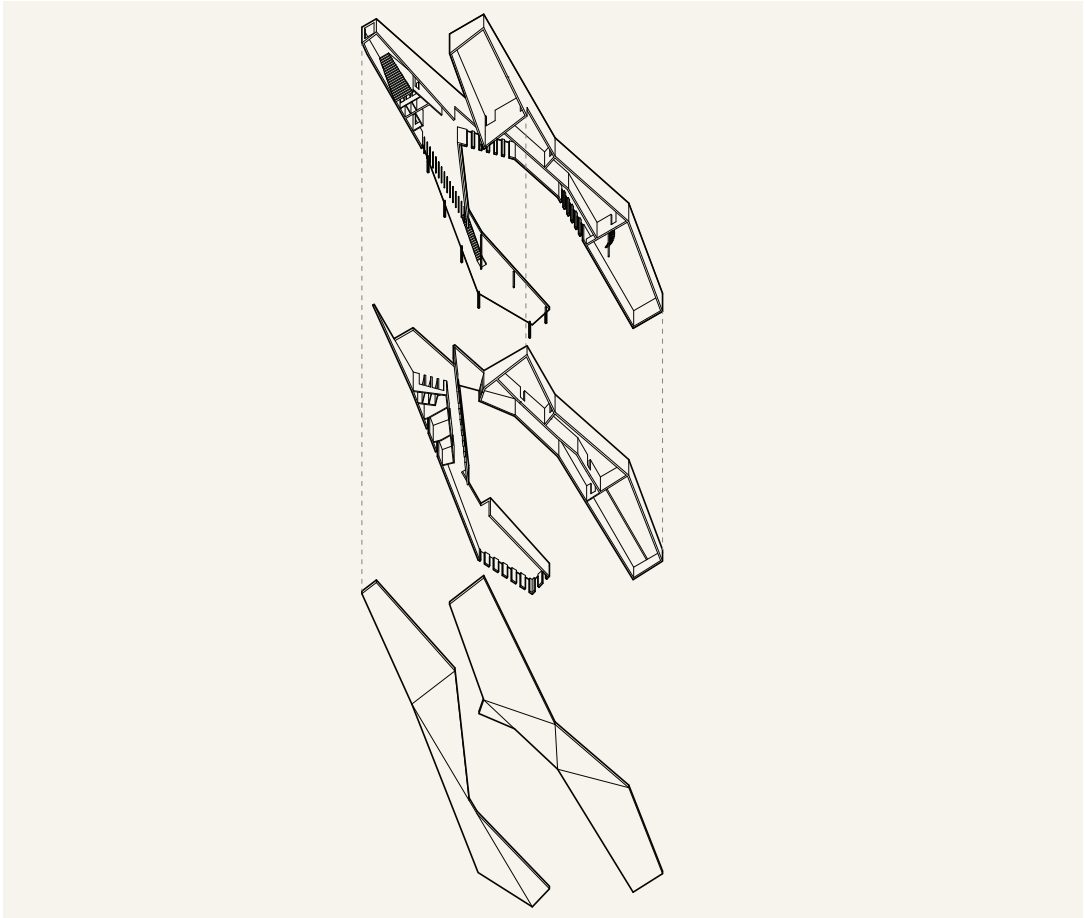
• Salar is a concept for a biomanufacturing centre in Salar de Uyuni, Bolivia.
• The aim is to utilise local site resources and turn the non-organic environment into an organic manufacturing site.
• Manufacturing of Polyhydroxybutyrate (PHB) – biodegradable plastic derived from bacteria bio-reactors
• Manufacturing of Ethanol derived from algae bio-reactors




ulation.
NOPOLIS
KTH

POLYETHELYNOPOLIS
Kristoffer Dahl

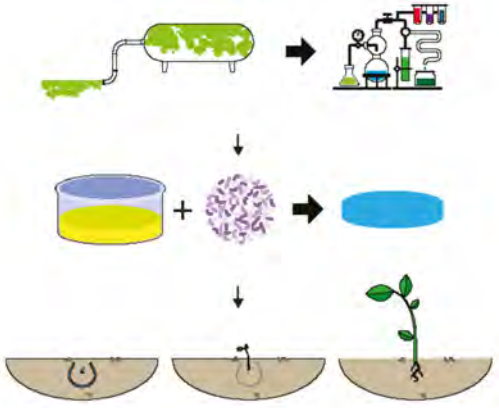
Since the dawn of time mankind has travelled, discovered, conquered. The widest oceans, the deepest depths, the highest mountains, few challenges are left on Earth. It is time to take the next step; it is time for humans to become bi-planetary. With this material and way of production it is possible for us to do more than just put a few astronauts on the Red Planet, to do more than just discover. It is possible for us to conquer, to make this new planet ours, and it all starts here, in Polyethylenopolis – The Plastic City on Mars!

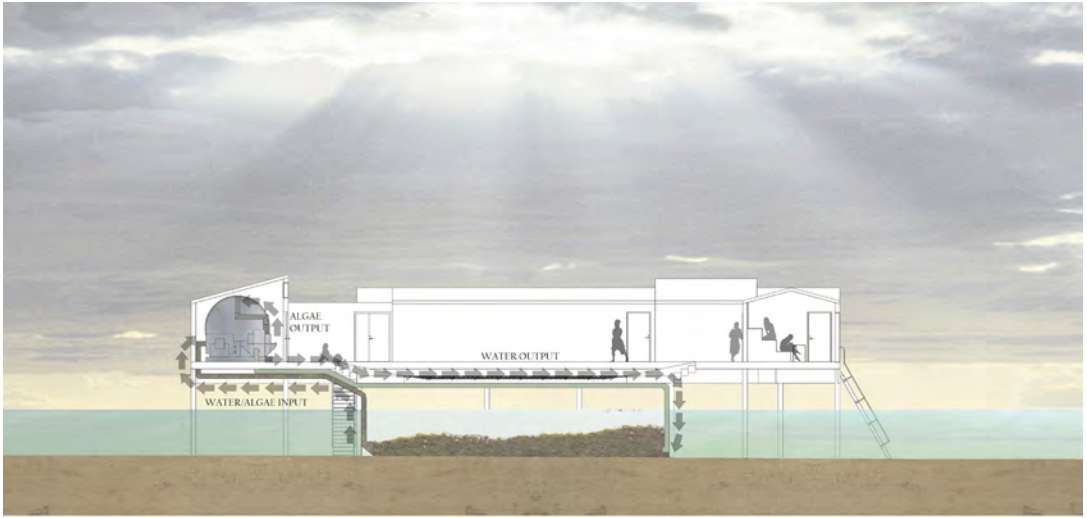


THE FACTORY
Johnas Kvarnlöf

Australia's highly variable rainfall from year to year and the occurrence of droughts that may last for many seasons and cover large areas, have a huge impact on the environment. Extended drought can result in devastating agro-ecological impacts including crop failures and huge stock losses. Soil loss and long-term changes in vegetation where weed species invade native perennials can result in long-term land and pasture degradation.

When rainfall occurs the soil can't store enough water for new plants to root and survive. This project is about to produce a water absorbing material that can store water in the ground so that plants can survive in the desert. To produce this material there has to be a factory in the desert near the lake Eyre. The factory is located at the inlet of the cooper creak river, at the shore of the lake Eyre in the Tirari desert. This is one of the first places in the region to be filled with water when the area gets rainfall.



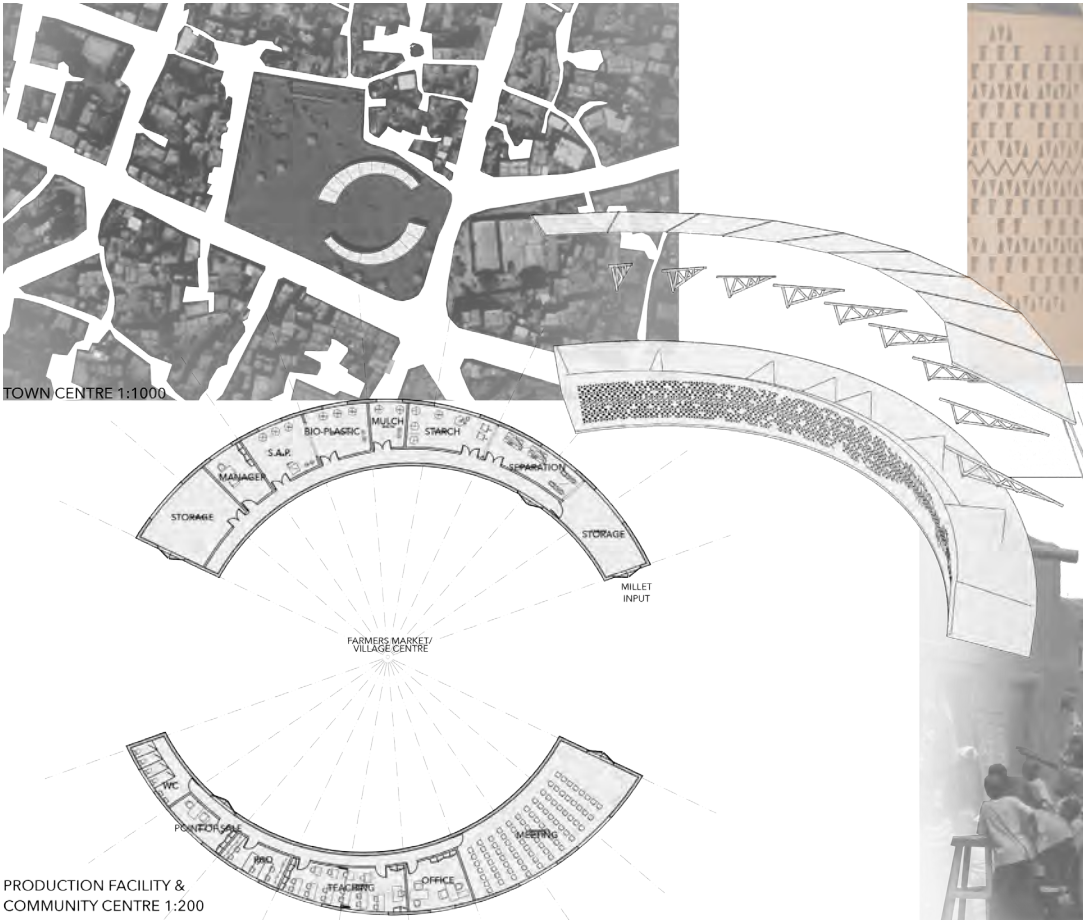

ALGAE
OUTPUT
WATER OUTPUT
WATER/ALGAE INPUT

TURNING ALGAE BLOOMS INTO AN ASSET

Hjalmar Stenlund

My project is about turning something that is now seen as a problem into an asset. It is about using the macroalgae that drift ashore in the countries around the Baltic Sea into a resource. Today a lot of waste nutrition is leaking out into the Baltic Sea mainly from our cities and farms. This in turn leads to major algae blooms and eventually to the death of the ocean floor. In my solution to this problem I want to capture the algae before it drifts ashore and starts to decompose and stink. I want to trap the algae when the product is still fresh and clean, before it has been washed up to land and been mixed with sand, before it has even become a problem. I believe that instead of treating what the sea gives us as something bad we should start using it as an asset and a useful material. Taking care of the algae and using it for making biogas and fertilizers would turn the one way release of nutrition that we have today into a working cycle.

TOWN CENTRE 1:1000

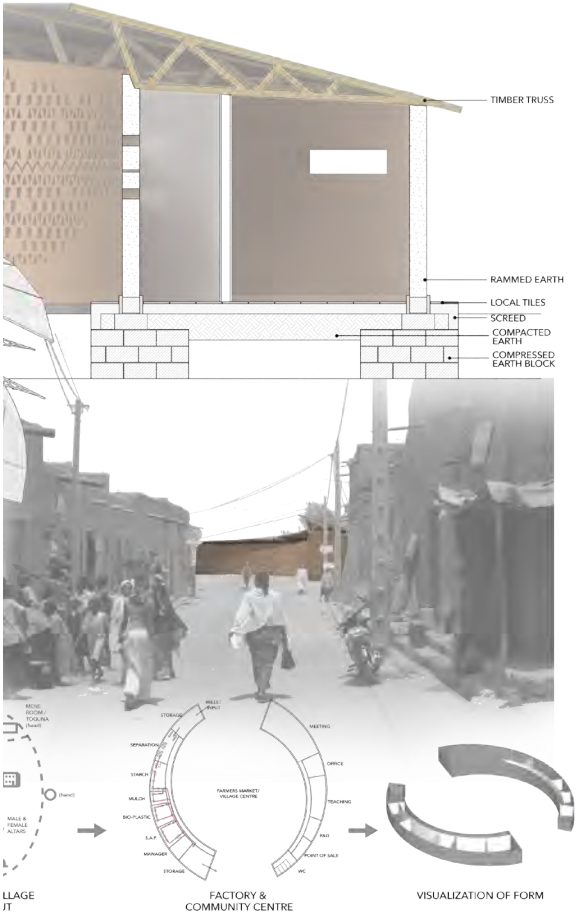


PRODUCTION FACILITY &
COMMUNITY CENTRE 1:200

RE-SEEDING THE DESERT

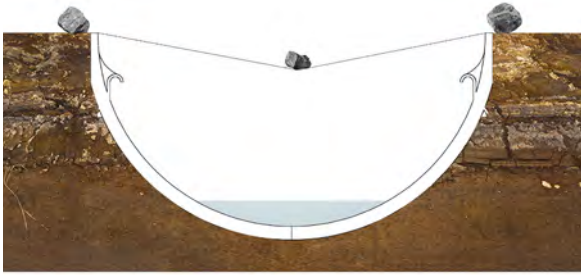
Eoghan McCarthy

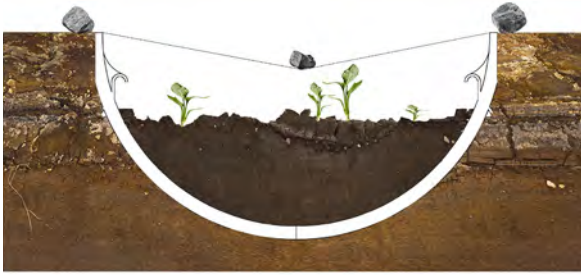
The Sahelian region of northern Africa suffers from some of the worst socio-economic issues on the planet. Malnutrition, illiteracy, war and disorder are synonymous with the northerly extremes of Mali - a.k.a. cultural heart of Africa. My scrutiny of this extreme environment lead me to suggest a project whereby local farmers can use the common, stalwart crop, Millet in different ways to help repair and improve their lands cheaply and effectively, without severely damaging their income. For my architectural strategy, I propose to create a brand new, village and farm module for the people of Bandiagara, Mali, where this strategy could act as an example for future development. I envisage local and national, social, economic and physical (soil) improvements through the rehabilitation of the most fundamental of industries - Agriculture.

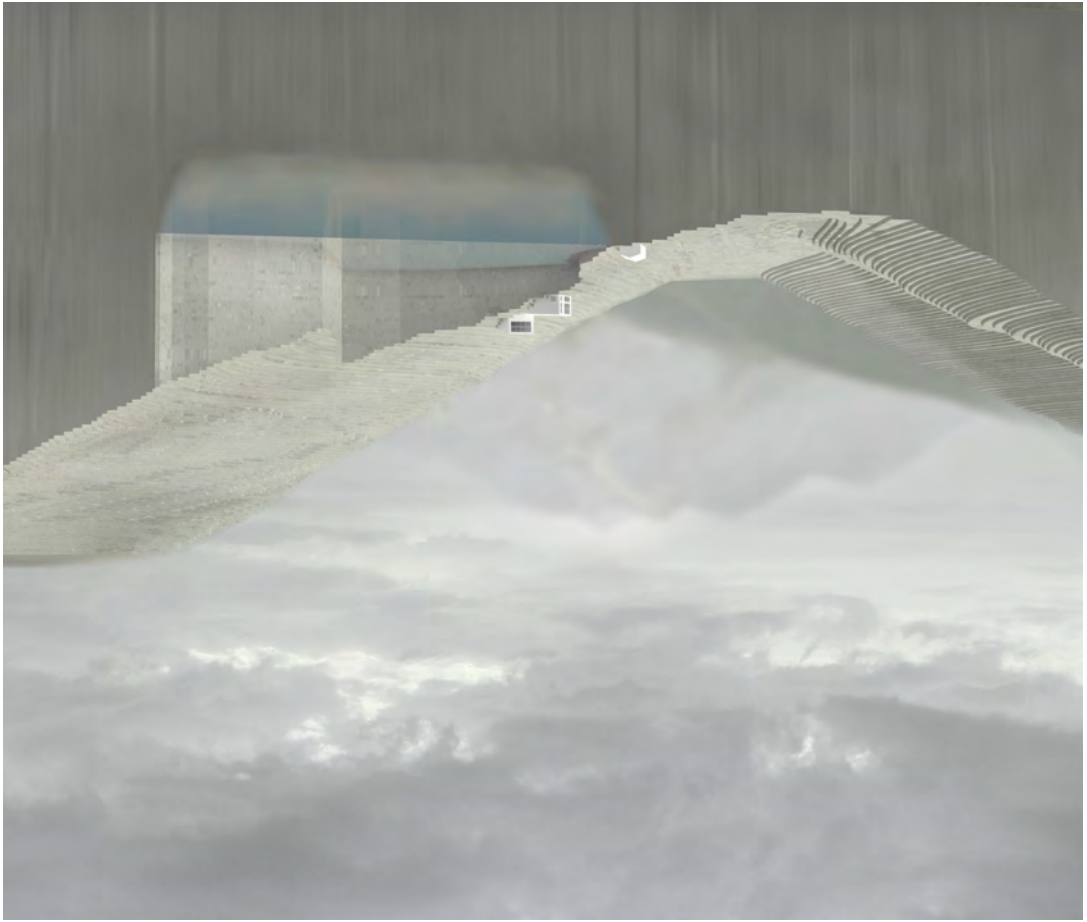


PVCITY
Emilie Näslund

• Dallol – extremely hot town in Ethiopia.
• Inhabited but quite hostile.
• Great demand for tourism, but lack of water and living space.
• Old salt mines, sedimentary rocks, acidic pools, volcanic activity, windy flat fields, geysers and so on.
• Possibility for PVC making from salt and gas in the area. A material that withstands acids, heat and have other beneficial properties.
• Building a PVC factory and produce modules – create living space, piping for water etc. to get this city on track. Both for inhabited and for the future tourism.



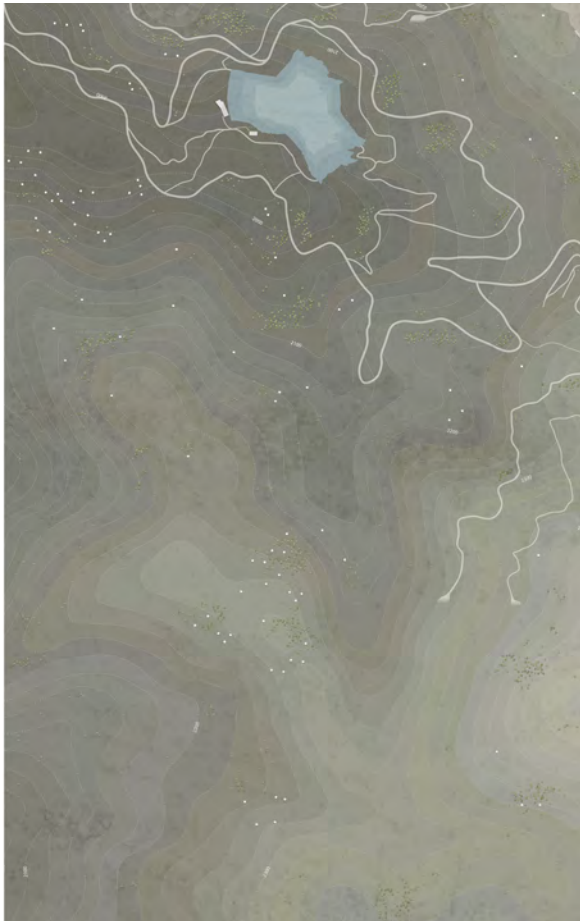


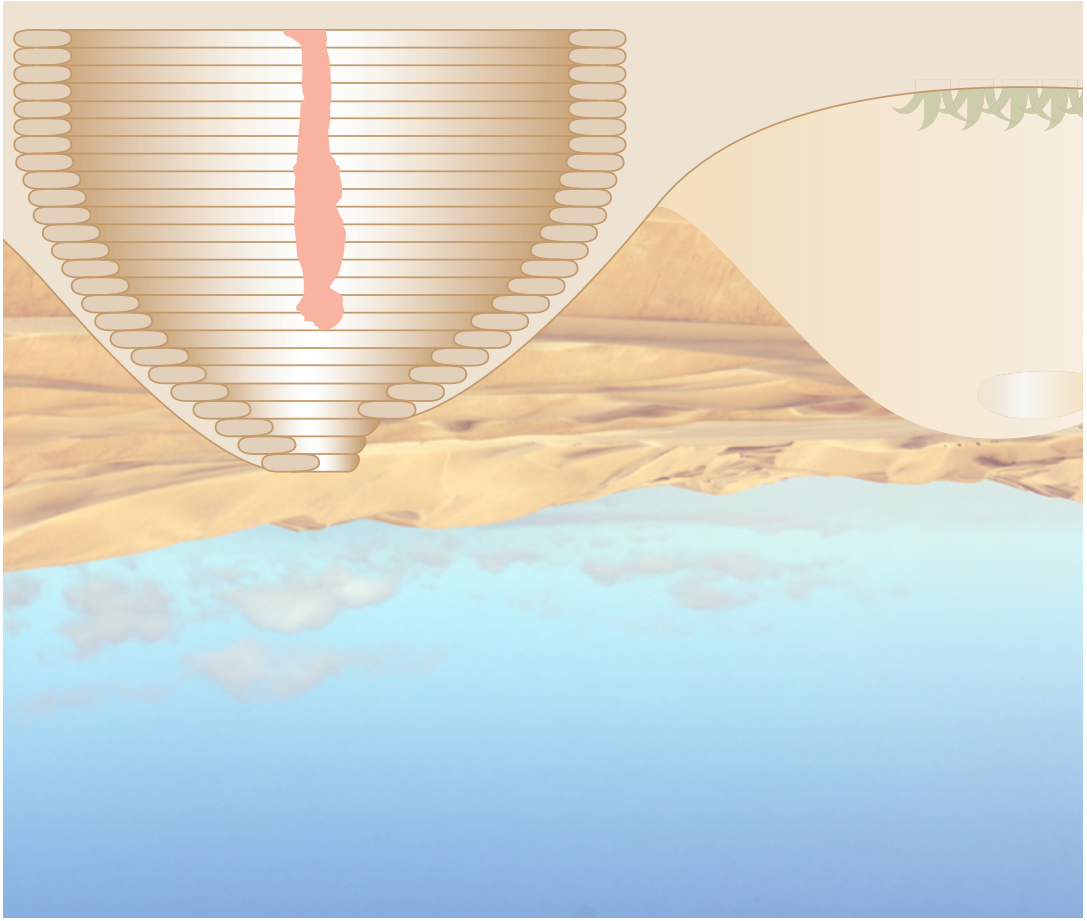


GEOLOGICAL INSTITUTE OF TWANGIZA

Åsa Rhodin

A project looking at different aspects of the use of clay in the Democratic Republic of Congo - as a waste product into an asset. The DRC is one of the world's largest exporters of minerals, most of which are found in a clay-based geology. These minerals, often called «conflict minerals», are as the name suggests a source of conflict and war, historically and present-day. This project aims to find an ethical use of clay as an asset and to utilise local site resources to turn the environment into an organic brick manufacturing site operated and owned by the Congolese. The brick factory will eventually produce the material and labour to build a geological institute to offer higher education to the local population and eventually enabling control over the mineral extraction and its profits in the area.



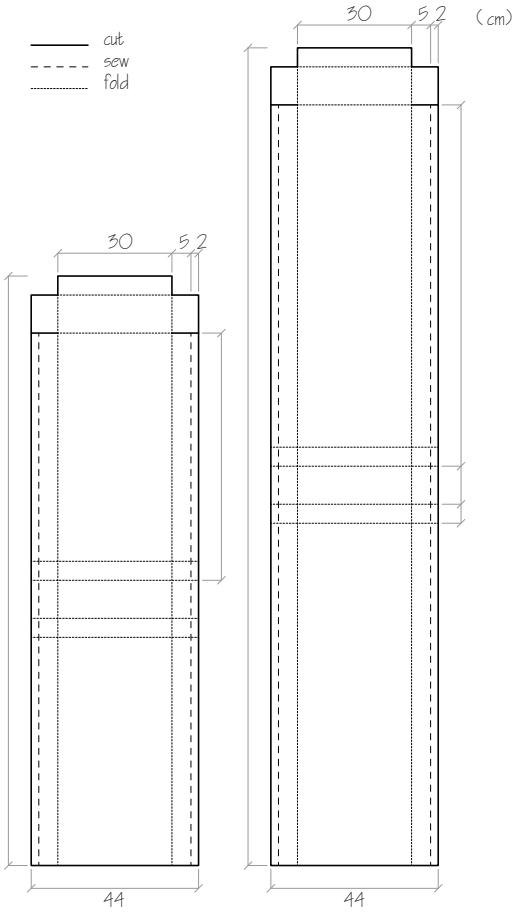


RECLAIMING THE DESERT
Fanny Varga

I wanted to find ways to sustain life and community in the most rapidly spreading environment on earth, deserts, and at the same time transform them into more habitable landscapes.

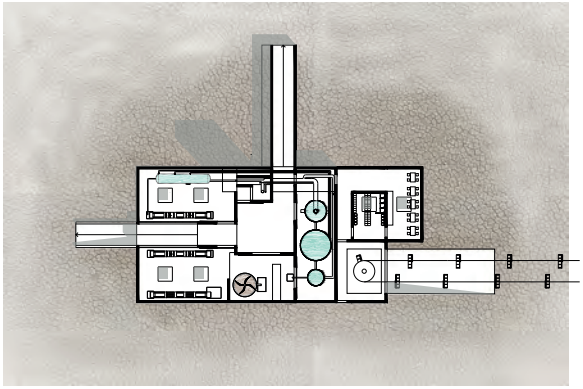
The one thing that exists in abundance in most deserts is sand. There are two main techniques when building with sand; mixing it with an agent to solidify it, or using a form/shell to pack it in. Since water is scarce, using a mixing agent (which would most likely include water) did not seem like a good starting point. My goal was to minimize the import of building materials and use what already exists on site. Hence the idea of sandbags came up. The empty bags weighing very little can easily be transported to the site and then filled and stacked. Also, the material for the bags is easily obtainable throughout the world.

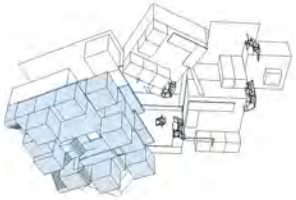
The manual contains instructions on how to sew your own sandbags, calculations and constructions for different structures, as well as some basic desert survival techniques.

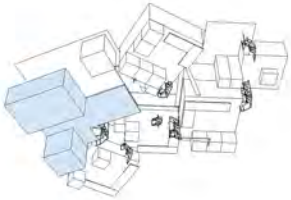
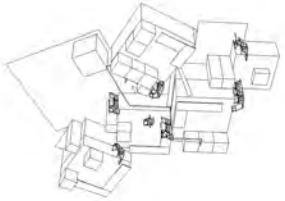


DEAD VLAI
Marie Maghe

This project seeks to link research on an extreme environment and its resources, in a way to create an innovative material. To create a material, it is necessary to design a factory and think about all the logistics around to make it work well such as houses, water and electricity supplies. This project takes place in the Namibia desert, more specifically the surroundings of the Big Daddy Dune, which is 300 meters high. My material is the expanded clay, which can be produced from salt, clay and heat. This material provides a good insulation because it reacts with the fog to provide good insulation. The specificity of this desert is that it is a coastal desert so there is fog in altitude. The site consists of a flat bowl with salt, clay and sand dunes around. The factory is placed near the material, and it is partly buried to protect from the heat. The houses enjoy an important amount of fog that activates the material insulating properties. The dunes are constantly moving, to deal with that the houses are placed on a structure able to move with the dune. The structure extends over the three sides to the bottom of the dune. The top of the dune consists of a hard base for the houses, and also in the part that is down the dune to create a balance.








SALTY CRYSTAL
Anais Racine

Salar de Uyuni is famous for its high level of exploitable lithium, but is threaten by it. The dryness of the basin makes it really sensitive to a water and lithium exploitation by the actual method, solar pond, will make impossible life around the Salar because of the lack of drinking water.

This project proposes an exploitation solution based on the assets of salt such as the osmosis principle that can be used for electricity. Salts are collected by brine going through magnets and membranes, and by only electrical process they are combined into materials with different proprieties such as Lithium battery salt, Phase changing material and fertilizers.

The industrial building itself would be arranged by the connection's need between the salts and would have a salty facade due to evaporation.

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FLIP OVER FOR SPRING SEMESTER

CHARLIE GULLSTRÖM

Charlie Gullström, PhD, Architect SAR/MSA, is a University Lecturer at KTH School of Architecture, where she combines teaching with research and heads the research group KTH Smart Spaces, a collaboration between KTH ABE Architecture and KTH CSC Media technology and Interaction Design. Current projects include EIT ICT Labs Mediating Presence; EU COMPEIT and KTH R1 Experimental Performance Spaces & Presence Lab. Her design-driven research and practice over twenty years address the fusion of architecture and media technology facilitated by new information and communication technology (ICT-mediated architectural design, mediated spaces). Her particular interest concerns the contribution from architects to a highly-mediated society, given that new digital tools have thoroughly changed the way humans interact and communicate (presence design). Recent projects include a Mediated Museum; Smart Collaboration Spaces and the Mediated Sketching Table.

ORI MEROM

Ori Merom, Architect SAR/MSA, is an award-winning practising architect whose architectural practice is characterized by many successful contributions to architectural competitions all over the world (www.meromarchitects.com). His 'Practice Based Research Studio' at the KTH School of Architecture, years 4-5, is since many years an established studio leading to the Master in Architecture Degree, which annually attracts about 25 students.

form and content. It clearly shows that young architects want to make a contribution to needs that arise in various conflict areas around the world. We hereby invite you all to take part of our students' work.

Thank you everyone – our students, guest critics, jury members and new friends at NCC – for an excellent collaboration this year.

The team of proud teachers in Master Studio #4

KTH in June 2015

Ori Merom, Charlie Gullström, Suzanne Maverley, Jarlath Cantwell, Farvash Razavi, Nandi Nobell

The Dome of Visions in Stockholm is a collaborative project run by NCC and KTH and will be open for the period September 2015 – September 2016. Other partners include Open Lab, IVL Swedish Environmental Research Institute, the City of Stockholm and UniArts. Find out more at www.domeofvisions.se

structures that can be easily dismantled and transported, and where a small group of people can live, interact and carry out work or research together over a limited period of time.

The students' design proposals were submitted to a small architectural competition organised by KTH and the Swedish construction company NCC, a fruitful collaboration that has been of great value and enabled the students to work closely with practice-based concerns throughout this academic year. The winning project from this Inspired-by-Space Pavilion Competition, will be built on campus as part of the Dome of Visions collaboration between KTH and NCC, and inaugurated during the international astronaut conference at KTH in September 2015: the Inspired-by-Space Conference hosted by astronaut Christer Fuglesang, KTH Space Center. An external jury of prominent expertise was recruited for the assessment of the proposals and we are extremely happy that our student Stefania Dinea was awarded the 1st Prize in this competition. Further, Mattias Pedersen was awarded the Jury's Honorary Mention alongside the team constituted by Marie Maghe and Adélie Thollot.

Opening in September 2015, The Dome of Visions provides a temporary venue for public exposure of on-going research, artistic experiments and innovative projects on campus. Curated exhibitions will stimulate debates, seminars and other public events. The Dome of Visions project seeks to create impact by presenting innovative projects that can inspire the development and design of a sustainable society.

In sum, our year-long explorative process, has resulted in the 19 design proposals that are presented in this catalogue, and that accompanies an inaugural exhibition for the Dome of Visions. The students' choice of exhibition title – Another Earth – is design-oriented, constructive and forward-looking both in

STUDIO 4

Master Studio 4 seeks to push the boundaries of what architecture is, by exploring what architecture can be. Our chosen theme this year has been architecture for extreme conditions. As a team, and with input from researchers in various fields, we have investigated the conditions for architectural design in extreme environments. Temporary architectural structures are increasingly needed globally, not only in crisis areas but also to meet needs that emerge in our digitalised society where people are distributed globally, yet have a demand for effective social spaces for communication and interaction.

To meet the challenges of global warming and our planet's limited resources, our nineteen students have explored new materials and innovative technologies that are applicable to extreme living conditions. This could be a tropical-heat disaster area in the southern hemisphere; a temporary building in the extreme north; or perhaps even a building on Mars. We have studied new composite materials generated within, for example, space industry and asked how these compare to traditional materials in architectural design, such as stone, wood, glass and steel. The autumn started with a focus on materiality during which the students experimented through combining and creating new materials and hybrid structures, resulting in twenty proposals for sustainable material production units in a chosen extreme environment.

As a next step, during the spring semester, the studio confronted the issue of temporary living and working in an extreme climate, with the design brief for a temporary rescue pavilion in a remote or extreme environment as its point of departure. Climatic concerns in combination with aesthetic concerns have conditioned the students' choices of materials and design. With a generally defined programme, the students were given the task to develop designs for temporary

STUDIO 4

ARCHITECTURE FOR EXTREME CONDITIONS:

ANOTHER EARTH

AUTUMN SEMESTER

FLIP OVER FOR SPRING SEMESTER