



THE ARCTIC

Architecture and Extreme Environments

by The Royal Danish Academy of Fine Arts, School of Architecture

Venturing into storms, sub-zero temperatures and endless winter nights in the Arctic regions, from Greenland to Iceland and Svalbard, 28 Master's students at The Royal Danish Academy of Fine Arts, School of Architecture (KADK), The Institute of Architecture and Technology explored new forms of spatial languages to enrich our built environments and daily lives through their own constructions and prototypes. In close collaboration with local communities, the students' work engages in enhancing critical architectural performance, sustainability and resilience.

* Constructions and prototypes are arranged alphabetically by Master's students' first names

MINERAL ACCRETION

SURVEYING AND TESTING TOOLS FOR GEOTHERMALLY GROWN ARCHITECTURE

ALEXANDRA HOLMAN

Investigating the surface conditions created by an industrial spill zone, the device here acts as a surveying and testing tool for the controlled growth of mineral deposits extracted from effluent fluid within geothermal sites. The investigation maps out explorations of the particularities of this unique phenomenon and comes up with suggestions about how this might be converted into an architectural tectonic.

SURFACE FLOW MONITOR

EXAMINING MATERIAL WIND RESISTANCE ON ICELANDIC SURFACES

AXEL KAABER

Do materials use affect winds in a built environment? My device here attaches to surfaces, both vertical and horizontal. I have tested winds blowing parallel to surfaces, at a 45° angle to a surface, and directly onto surfaces at 90° respectively, and recorded the measurements. The fan at one end produces a steady flow of air at a constant rate towards the anemometer which measures the strength of the output at the other end.

CONDITIONING HUMIDITY

INVESTIGATING CLIMATE AND SPACE

GRACE CHEN

This device explores the relationship between climate and spatial tectonics through a simple kinetic movement coupled with a test of material performance. Designed as a portable teahouse, the shelter registers humidity in different climatic conditions as its wood veneer façades expand or contract in response to fluctuations in temperature and humidity through both the climatological and physiological activities within the device.

OPEN KITCHEN

CULINARY PROCESSES AND LANDSCAPE POTENTIALS

KINE FAGERHEIM

As opposed to the modern kitchen in which resources are within reach, the device here stretches to reach the resources it needs. It imitates the growth of a plant – in particular how the roots branch out in the bowels of the earth to get nutrition. And if a target is out of reach, the human body moves as an extension of the device. By bringing the process of cooking to the great outdoors, the act of preparing a meal is slowed down.

A PNEUMATIC FOUNDATION

MORTEN FALBACH

The Foundation is a platform resting on large inner tubes from truck tires to take advantage of rubber's elasticity and adaptability. As a device, it questions what and how we think of the foundation, and what possibilities it could have regarding how we think of and design buildings. Do we need to carve and cast in the landscape? Is the relation between landscape and buildings constant?

PARASITIC THERMAL EXPLOITER

FORMALISING THERMAL BRIDGING

STINE BUNDGAARD

Based on thermoelectric methods, my device invests in the potential of generating energy from heat loss in buildings on Svalbard, where one will find a great difference in temperature between indoor and outdoor areas. The device consists of Peltier modules using the Seebeck effect, and is attached to surfaces with a heat loss or as an element of insulation filling the space between the inside and the outside.

VIBRATIONS OF THE NORTH

CONTROLLING ICE AND SNOW THROUGH SOUND

ANDERS BLINDHEIM NOTTVEIT

With my device, I explore how sounds and vibrations from human-made soundscapes affect our surroundings. This is done through experiments of pattern-making with snow as a granular material to see how different materials behave when affected by their own resonating frequencies, and to explore the limitations regarding destructive powers of sound waves for the purpose of crushing ice.

WINDBELTS

EXPLORING WIND ENERGY POTENTIALS IN ICELAND

BJÖRN ZAHLBRUCKNER SVENSSON

The focus of this study is wind in relation to energy. I have developed the device generating energy by an aeroelastic flutter. The product is a ribbon with magnets attached. The ribbon goes in and out through coils when wind causes the ribbon to vibrate. I have tested these in different locations in Iceland under various wind conditions to explore the possibilities of implementing the technology in my thesis project.

GREENLAND INHABITED

RETHINKING A GREENLANDIC HOUSE

HANNAH ROSA RASCH

I took a research field trip in Greenland and brought along a device that works as a communicative aid. It provides people who are neither architects nor in the building industry with a tool to both show off and learn about their homes. It is also a tool that provides model buildings with a different approach to spatial investigation.

PERCEIVING LIGHT IN SPACES OF DARKNESS

EXPLOITING THE EXISTING LIGHT OF THE POLAR NIGHT

KRISTINE BEHRENSDORF

The unique daylight conditions found beyond the Arctic Circle ought to be reflected in how we handle architecture in the North. The device here mimics a façade, folded in accordance with original origami folding techniques, consisting partially of reflective materials. It uses the existing light to create an enhanced and aesthetically pleasing light experience within or around architectural spaces with a low-tech approach.

WAX PISTONS

THERMODYNAMIC MECHANICAL ELEMENTS

NICOLE STRELICHEVA

The Pistons are three mechanical elements which test and spatialise different thermal conditions. Wax Pistons, normally used for auto-ventilation in greenhouses, are used to convert thermal energy into mechanical movement and spatial transformation. In a process triggered by changes in temperature, they set a series of expandable and collapsible structures in motion. The aim of the project is to propose thermal diversity in architectural and spatial design.

LIGHT HARVESTER

AN EXPLORATION INTO THE ARCTIC LIGHT SPECTRUM

ØYVIND ANDREAS LIM

By using lenses that can be adjusted in any direction, this device is able to focus and concentrate on light from specific light sources. It allows for investigation into the qualities of light by creating a readable output for comparison and analysis. Furthermore, it explores the potential for harvesting and enhancing natural light for use in architecture.

STEAM AND LIGHT

STUDY OF WATER'S ARCHITECTURAL POTENTIAL

ANITA BONDE ERIKSEN

Although geothermal energy plays a very large role in Iceland's existence, there are only a few places where it is actually visible in the landscape or on the streets. The device investigates whether it is possible to use steam from heating and productions to reach architectural qualities. When the seven cubes are filled with steam, the steam will diffuse both the artificial light and the sunlight and in that way transform the light.

BIO-COMPOSITE FACTORY

WOOL AND CORN

CATHRINE MØLGAARD THORNFELDT

The project is a proposal at a factory that produces a bio-composite material consisting of wool fibre amplifier and corn flour as a binder. It is based on Tufted Saxifrage, a small plant that primarily grows in Iceland. The plant is unique because it creates antifreeze via proteins and can thus survive the Arctic climate.

ICESCAPES

ALTERNATIVE ENERGY SOLUTIONS

JULIEN NOLIN

The focus of the device is energy, put simply, and its creation. And with Svalbard's extensive history with coal mining, it quickly became apparent that a device focused around energy solutions would be my aim. Hence, I created a portable energy device, composed of three 'skins', with batteries activated by salt water to generate power.

SEAWEED SHELTER

EXPLORING THE ICELANDIC COAST

LINDA BJÖRLING

The shelter is an exploration of seaweed, a local and sustainable material, and how it can be used for insulation as well as spatial reading of the site. The various layers of the shelter enable both spatial transformations to take place and the seaweed insulation capacity to be measured during its drying and fully-dried states.

DIFFERENTIAL ENCLOSURE

AN ILLUMINATION OF THERMAL PROXIMITY

ROBERT BARON

Exploiting the thermoelectric properties of Peltier tiles which capitalise on the Seebeck effect, where the conversion of temperature differentials translates into electricity, the chair enclosure embraces the individual's corporeal warmth and its proximity to the sub-zero surroundings. Through air pockets embedded in the seat, the interface among the inhabitant's body, the seat and the sub-zero temperatures has been designed to not only channel body heat, but furthermore exploit the latent thermal friction between body and chair.

POLAR BEAR BIOMIMICRY

AN INSULATION SYSTEM

ASTRID BLICHFELDT

The project is an investigation into how to create a new housing insulation system based on the knowledge of polar bears' survival skills under the Arctic climate. By imitating the strengths of polar bears, the device tests different materials and structures in order to make a façade that reacts in the same way as fur with snow-repellent and insulating features.

INSULATION TESTING SHELTER

UPCYCLING TO THE EXTREME

GABRIELLE GUALDI

This device was designed to conduct further investigation into the comfort level associated with living in extreme environments, and to try and provide a solution to the issue of human waste pollution in nature. It is comprised of two main layers, the insulation and the waterproof membrane. The insulation layer is designed and constructed with built-in pillows that can be filled with trimmed plastic waste.

KNITTING ICELAND

TEMPERATURE AND MATERIALITY PERFORMANCE OF DIFFERENT WOOLLEN "FAÇADE SYSTEMS"

KATERINA EFRAIMOGLU

This is a device that tests the temperature as well as material performance of wool in various personal weaving experiments. Explorations of different material compositions and weaving patterns aim to test the insulating and spatial 'behaviour' of wool under Iceland's harsh climatic conditions characterised by coldness, wind and rain.

SOIL INCUBATOR

MARIUS COSTAN

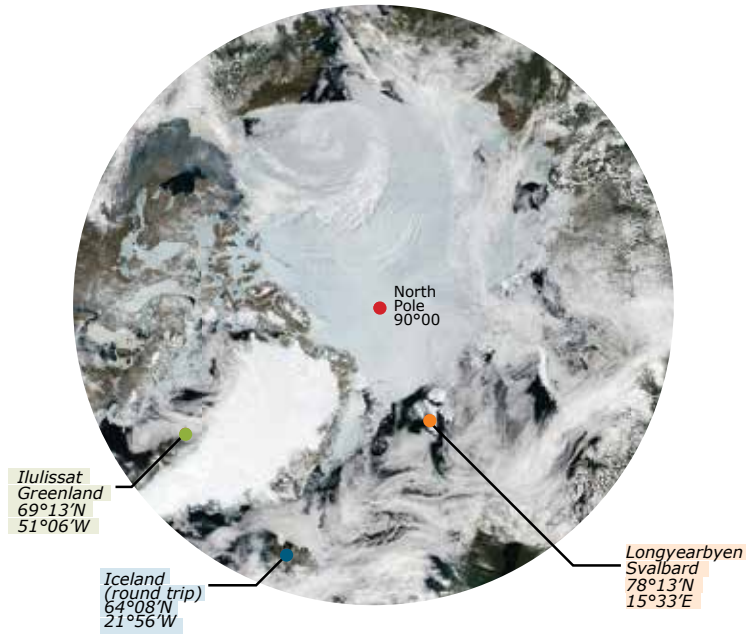
Since the first settlers came to Iceland, 70% of its vegetation has been lost, leaving the soil vulnerable to the harsh climate. Some areas have lost the entire concentration of carbon in the soil, halting future revegetation. The device here seeks to investigate how exhaled CO₂ can be used to revegetate land, turning the by-product of the human body into a renewable resource.

FABRIC FLUX

CAPTURING TENSION IN SUB-ZERO TEMPERATURES

SARA SANCHEZ Y GØTZE

Svalbard's polar night period presents the ideal conditions for shaping, saturating and crystallising fabric into shells. After forming the fabric into a three-dimensional shape in a 3mx3mx3m aluminium cube with the use of tension, the sub-zero air temperature activates the curing process. Just a few hours later, the result is an instant ice shell.



Artwork: David A. Garcia

