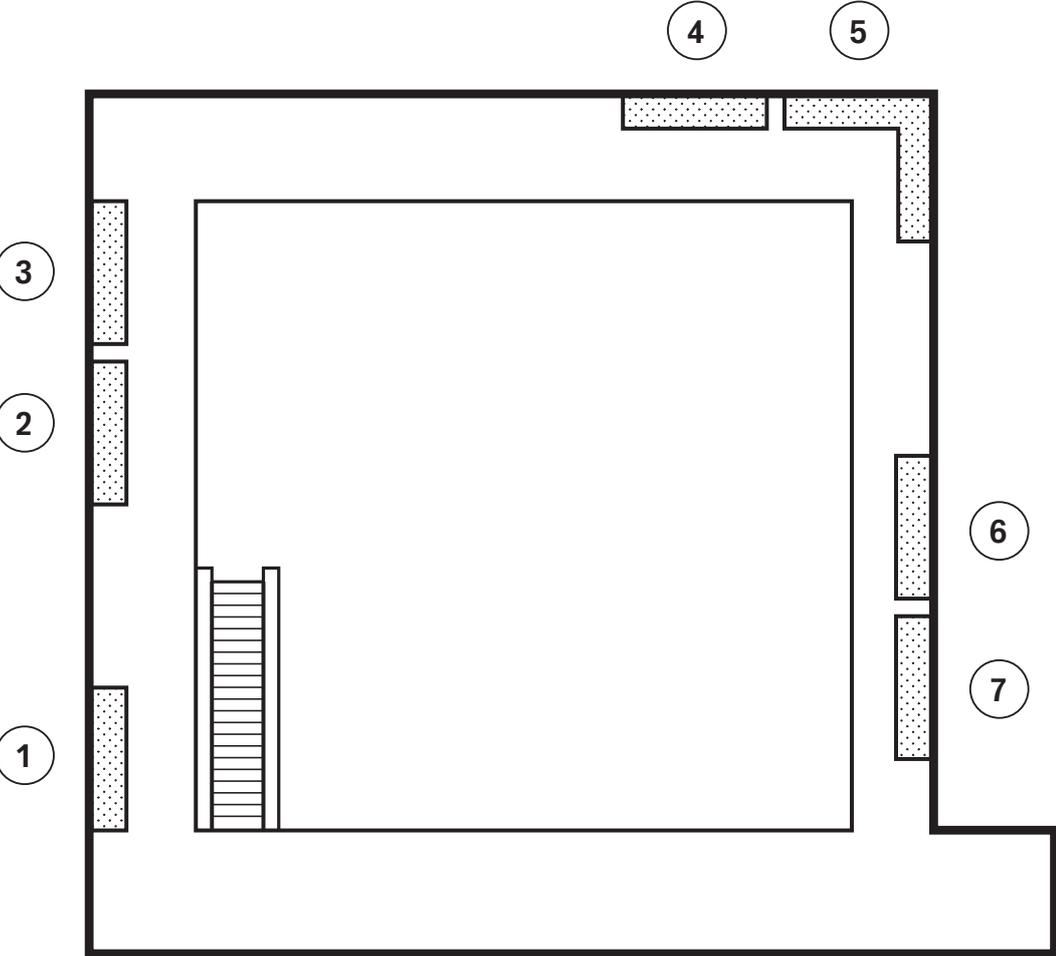


FUTURE OBSERVATORY LARGE PRINT GUIDE

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RESEARCH AND THE CLIMATE EMERGENCY

The climate emergency has forced designers to think carefully about how they work. Whether designing a tile, a jacket or a house, every decision has an environmental impact:

*What is this made of? What waste will it produce?
Can it be reused? How far have these materials travelled?*

Across this balcony, Future Observatory presents **design research** that is taking place today in different parts of the UK and in a variety of design disciplines. Moving from the restaurants of the Isle of Skye to a laboratory in Newcastle, from polluted seas to the future of the home, each of the six researchers is using design research to confront planetary crises and work towards liveable futures.

Design research is a field of study that aims to understand and shape the impact of design in the world. Most design processes have an investigative stage, but a commitment to research usually involves striving for better questions and solutions – new materials, processes, or ways of designing a system or service. Design research takes many forms, including lab-based experiments, prototyping, archival research and field work.

GLOSSARY

Design research is a field of study that aims to understand and shape the impact of design in the world. Most design processes have an investigative stage, but a commitment to research usually involves striving for better questions and solutions – new materials, processes, or ways of designing a system or service. Design research takes many forms, including lab-based experiments, prototyping, archival research and field work.

FUTURE OBSERVATORY

Future Observatory is the Design Museum's national research programme for the green transition. It is coordinated by the museum in partnership with the Arts and Humanities Research Council (AHRC), which is part of UK Research and Innovation (UKRI).

Future Observatory funds and promotes design research that tackles the environmental crisis — from reducing carbon emissions and waste to advancing regenerative practices. The Future Observatory team curates exhibitions, programmes events and publishes new research, all with the aim of championing new design thinking on environmental issues.

**Exhibitors: Faber Futures, CLIMAVORE, Julia King,
Hub for Biotechnology in the Built Environment, Dunne & Raby,
Dark Matter Labs**

Curator: George Kafka

Project Manager: Rebecca Gremmo

Curatorial support: Lila Boschet

Future Observatory Director: Justin McGuirk

Future Observatory Curatorial Director: Cher Potter

Interpretation Editor: Susan Dymond

**Exhibition Design: OS-Studio, according to OpenStructures
design principles**

2D Design: SPIN

Graphics production: Seacourt

Lighting: Beam Lighting Design

AV installation: Blue Elephant

Exhibition installation: Will Kendrick, Rowan Newton,

Max Pevsner, David Spicer, Alex Williamson-Bell, Lewk Wilmshurst

Display fabrication: Hydro

The display furniture on this balcony is designed by OS-Studio within the Open Structures system to have a low environmental impact. The furniture is made up of modular elements, meaning its parts can be used and recombined in different ways for different displays. A single element can be used as a shelf, a frame, a tabletop or a backboard. This reduces the need to produce new pieces or throw old ones away.

FUTURE OBSERVATORY

Across this balcony, Future Observatory presents design research that is taking place today in different parts of the UK and in a variety of design disciplines. Moving from the restaurants of the Isle of Skye to a laboratory in Newcastle, from polluted seas to the future of the home, each of the six researchers featured is using design research to confront planetary crises and work towards liveable futures.

FABER FUTURES

Which microbe made your clothes?

Dyeing fabrics to make clothes uses huge amounts of energy while causing water and land pollution.

Faber Futures work with nature to design new garments and research less environmentally damaging systems of production. As part of their biodesign practice, they have been working with a soil-dwelling bacterium called *Streptomyces coelicolor*. This microorganism naturally secretes a pigment which Faber Futures use to dye textiles.

More than designing individual fashion items, Faber Futures are researching entire new systems for the textile and fashion industries to evolve from extraction and waste to regenerative biodesign.

As researchers, they join the dots between different collaborators: designers, material suppliers, manufacturers, consumers and even other species.

PROJECT TEAM AND COLLABORATORS

Natsai Audrey Chieza, Ioana Man, Camille Thiery, Laura Vent, Magdalena Obmalko, Ebyan Rezgui, Helene Combal-Weiss, Yesenia Thibault-Picazo, Rosie Nolan, Jessica Barlow

The Exploring Jacket and accompanying Musette are a silk jacket and bag dyed using pigment from *Streptomyces coelicolor* bacteria. Their unique pattern is produced during a fermentation process, during which the bacteria grow onto silk and naturally secrete a pink pigment. The garment was produced for Normal Phenomena of Life (NPOL), a recently launched brand and platform that retails lifestyle products made with biotechnological processes.

NPOL Original *Exploring Jacket and Musette*

2023

Faber Futures with Louise Bennetts

Silk, *Streptomyces coelicolor* dye

Courtesy of Faber Futures

A huge amount of research and collaboration goes into the production of a single garment. This film follows the journey of the NPOL Original *Exploring Jacket and Musette* from bacterial cell to fashion product. It moves across creative and scientific spaces, including a lab, **biodesign** studio and a high-end fashion manufacturer.

Making NPOL Originals: *Exploring Jacket and Musette*

2023

Faber Futures with Immaters

Courtesy of Faber Futures

6 minutes 51 seconds

GLOSSARY

Biodesign is an emerging field that incorporates living materials – such as fungi, algae and bacteria – into the fabrication of materials, products and buildings. By learning from nature, biodesigners are prioritising the ecological performance of objects and processes to create more sustainable futures.

CLIMAVORE

Planetary changes such as heatwaves, droughts, pandemics and pollution mean that familiar food systems are becoming unstable.

Initiated by artists Cooking Sections in 2015, CLIMAVORE is a community interest company bringing together craftsmen, fishermen, chefs and others to envision new ways of producing food.

CLIMAVORE Skye is a project supporting marine ecologies and building alternative economies in the Isle of Skye and Raasay. CLIMAVORE are currently developing a terrazzo tile made using seashell waste they collect from restaurants in Skye.

Cooking Sections demonstrate the variety of methods a design researcher might use, including material testing, filmmaking and cooking.

Do changing climates change what we eat?

PROJECT TEAM AND COLLABORATORS

Alon Schwabe, Daniel Fernández Pascual, Shona Cameron, Dani Burrows, Rosa Whiteley, Kalliopi Tsipni-Kolaza, Rachael Macleod, Joel Franklyn, Dawn Ashman, Jordan Young, Edinbane Lodge, The Oyster Shed, Loch Bay Restaurant, The Dunvega, The Stein Inn

CLIMAVORE is developing a new building material made from seashells. They collect the shells of oysters, mussels, scallops and clams from restaurants in Skye. The shells are then crushed, burnt and poured into a mould to produce the tiles. This film records the initial phase of material production in the Isle of Skye, from shells collected from restaurants to the production of a low-carbon building material, made entirely of waste seashells.

**Building Alternative Economies in the Isle of Skye
2023
CLIMAVORE with Jordan Young
Courtesy of CLIMAVORE CIC
5 minutes**

This is one of a series of five murals made from seashell tiles. Like the two shells of a mussel, each of the murals has an identical twin. One twin is displayed in a museum or gallery around the world, the other twin is permanently installed in a public place in Skye. This mural's twin will be installed in Portree Community Centre. In time, this mural will be sold to support CLIMAVORE's emerging community-led tile production industry in Skye, as part of an **alternative economic system** being developed across the island.

Being Shellfish

2023

Cooking Sections

Fabricated by Joel Franklyn

Seashell terrazzo

Courtesy of CLIMAVORE CIC

GLOSSARY

Different economic systems define the priorities of a society. Capitalism is an example of one economic system that is centred around private property and profit. Some argue that **alternative economies** are needed, which would prioritise social and ecological wellbeing.

JULIA KING

The polluting of the UK's rivers and coastlines with raw sewage has become a major concern in recent years.

Julia King is an architect and design researcher who has been working with activist group SOS Whitstable to tackle the polluted waters of the north Kent coastline.

Using collaborative design and mapping, she has been exploring ways of cleaning the waters, such as introducing a wetlands area to naturally filter dirty water. As well as revealing solutions, Julia King sees design research as a way to ask questions about how we interact with the infrastructure systems often hidden around us.

Why are swamps good for swimmers?

PROJECT TEAM AND COLLABORATORS

Dr Julia King, Sabba Khan, Amy Dyduch, SOS Whitstable

Aging pipes and sewage mismanagement mean that a dangerous amount of waste is being dumped into our seas and rivers: in 2022, only 14% of rivers were of 'good' ecological status. Julia King's research proposes a series of designs to tackle sewage dumping across the north Kent coast. As well as **infrastructural** upgrades, the designs include exciting new public spaces such as swimming pools and drinking fountains.

Watch the films and open the drawers to explore the four case studies.

**Reimagining Infrastructures
2023
Sabba Khan with Julia King
Courtesy of Julia King**

GLOSSARY

Infrastructure systems - such as roads, telephone lines and power stations - are everywhere. These systems are often unseen, but we rely on them to eat, drink, move and communicate with each other. Sewers are another example of an infrastructure system. Much of London's sewer system was designed by Joseph Bazalgette, an engineer in the mid-to late-1800s, expanding the notion of infrastructure for public good by making significant social, cultural and civic contributions.

Films, from left to right

Oysters to Filter

2023

Julia King with Amy Dyduch

Courtesy of Julia King

2 minutes

Reeds to Clean

2023

Julia King with Amy Dyduch

Courtesy of Julia King

2 minutes

Machines to Treat

2023

Julia King with Amy Dyduch

Courtesy of Julia King

2 minutes

Resting Overflows

2023

Julia King with Amy Dyduch

Courtesy of Julia King

2 minutes

Oysters are natural water filters. They feed on algae and pollutants in water, which they digest and release when they are no longer harmful. Artificial reefs can be built for oysters to grow and clean the dirty water at Tankerton beach.

**Making artificial oyster reefs
2023
Courtesy of Julia King**

Wetlands, such as bogs and marshes, are like sponges. They can soak up polluted water and trap unwanted sediment at the bottom of their deep pools. Water is filtered through wetlands and flows back into rivers and streams free of contaminants.

Membrane bioreactors (MBRs) are small water treatment plants, roughly the size of a shipping container. They filter water in two ways: they contain bacteria that feeds on raw waste; and a membrane separates solids from liquids. Easy to transport and install, MBRs are an efficient solution for sites at risk of raw sewage contamination.

Sustainable drainage systems (SuDS) prevent floods in urban areas with different techniques for water absorption. A rain garden is an example of a SuDS. Flower beds with deep-rooted vegetation capture excess rainwater and stop drains from overflowing.

HUB FOR BIOTECHNOLOGY IN THE BUILT ENVIRONMENT

Does knitting belong on a building site?

The materials we use for buildings – such as steel and concrete – have large carbon footprints. At the Hub for Biotechnology in the Built Environment (HBBE), researchers are developing new low-carbon materials and construction techniques to design ‘living buildings’ which respond to their environments, reduce pollution and generate their own energy.

This display shows BioKnit, a lightweight archway made from fabric and mycelium. The structure experiments with new ways of building which can shape the architecture of the future.

The team at the HBBE show how design research happens in many different places, such as a construction site, a workshop or a lab.

PROJECT TEAM AND COLLABORATORS

**Dr Jane Scott, Professor Ben Bridgens, Romy Kaiser,
Armand Agraviador**

BioKnit brings together biotechnology, digital fabrication and computation to make a free-standing structure. The prototype is composed of mycelium, sawdust and 3D knitted wool. These materials have a dramatically lower environmental impact compared to conventional construction materials and provide an opportunity to radically rethink how we build.

BioKnit

2023

Mycocrete, wool, cotton

Courtesy of the Hub for Biotechnology in the Built Environment

The BioKnit structure is made using two key materials. Seamless knitted fabrics – produced from a digital design – form the outer layer of the structure. The fabric is filled with mycocrete: a paste made of sawdust, paper fibres, water and **mycelium**. Mycelium feeds on the sawdust to form a strong structural material. The bags show different stages of mycelium growth.

BioKnit fabric sample

2023

Wool, cotton

Courtesy of the Hub for Biotechnology in the Built Environment

Grow bags

2023

Mycelium, sawdust

Courtesy of the Hub for Biotechnology in the Built Environment

GLOSSARY

A fungus is typically made up of two main parts: a fruiting body above ground (the mushroom) and an underground **mycelium**. The mycelium is a network of thin strands called hyphae, which behave in a similar way to the roots of a plant. As a material, mycelium is strong and versatile and can be used to form complex structures. It has become a popular material for designers, who have used it to make objects including lampshades, bicycle helmets and shoes.

This BioKnit is designed using computer modelling to ensure the structure stands precisely on the Design Museum balcony. Its 'branches' are knitted using a 3D knit machine and a mycocrete paste is injected inside. The structure is hung upside-down while the mycelium grows and the paste hardens. Once the paste has hardened, it is ready to be lifted into place.

BioKnit drawing

2023

Courtesy of the Hub for Biotechnology in the Built Environment

Injecting the mycocrete

2023

Dilan Ozkan

Courtesy of the Hub for Biotechnology in the Built Environment

40 seconds

Hanging the structure during growth

2023

Courtesy of the Hub for Biotechnology in the Built Environment

The OME is the home of the Hub for Biotechnology in the Built Environment (HBBE). Located at Newcastle University, it provides a space where HBBE researchers come together to develop, test and demonstrate emerging technologies. It features a self-contained apartment and replaceable wall panels for testing new materials, as well as a small laboratory and exhibition space.

OME drawing

2023

Courtesy of the Hub for Biotechnology in the Built Environment

CLIMATE CLOCK

The Climate Clock is designed to communicate what must be done to tackle the climate crisis and by when.

At the top of the screen, in red, the clock displays a countdown to a deadline: the time remaining to prevent planetary global warming rising above 1.5°C.

At the bottom of the screen, in blue-green, the clock displays four lifelines: the percentage of energy produced worldwide from renewable sources; the climate debt owed by G20 countries; the amount of money currently committed to the Green Climate Fund, a global fund to support developing countries in limiting the effects of climate change; and the amount of land protected by Indigenous people worldwide.

Climate Clock

2021

**Gan Golan, Greg Schwedock, Graeme Kennedy and
Marcin Borzęcki, with support from Urban Office, Glasgow
LED panels, wood, API
Courtesy of Climate Clock**

The original Climate Clock in New York was co-created by Andrew Boyd, Gan Golan, Katie Peyton Hofstadter and Adrian Carpenter.

Additional thanks to Dave Ashton

DUNNE & RABY

What is it like to be a bat?

Design has always been focused on human needs, often with unfortunate side effects for other species. What if we tried to imagine the world from the perspective of non-humans?

In this project, Dunne & Raby research the *umwelt* – worldview – of different creatures. They have developed a series of human figures as viewed, heard or smelt by different species. Rather than scientifically accurate models, these are abstract figures that reflect the impossibility of truly seeing the world as another animal does.

Dunne & Raby use design research to shift how we see and understand the world, as well as how we act in it.

PROJECT TEAM AND COLLABORATORS

Fiona Raby, Anthony Dunne, Franco Chen, Joshua Riesel, Osmose, The New School/Parsons, IASPIS Residency Program, National Gallery Victoria (NGV), Royal Melbourne Institute of Technology (RMIT)

Non-human species perceive light, sounds and smells in different ways. A bear, for example, can smell food up to a mile away. What shape would a human body have if its smells and sounds could be seen?

These figures experiment with human shapes: a plume of breath follows one walking figure; the other is surrounded by a cloud of other atmospheric disturbances.

Figure 1
2023
Dunne & Raby with Osmose
Mycelium, cornstarch
Courtesy of Dunne & Raby

Figure 2
2023
Dunne & Raby with Osmose
Mycelium, cornstarch
Courtesy of Dunne & Raby

Figure 1 drawing
2022
Dunne & Raby with Franco Chen
Digital drawing
Courtesy of Dunne & Raby

Figure 2 drawing
2022
Dunne & Raby with Franco Chen
Digital drawing
Courtesy of Dunne & Raby

The figures are 3D printed using a wood and cornstarch filament. In the next stage of their research, Dunne & Raby are experimenting with growing mycelium – the body of a fungus – on the figures, bringing another non-human perspective into play.

Mycelium — Living Material
2023
Osmose
Courtesy of Dunne & Raby
1 minute

From left to right

**‘What is it like to be a bat?’ in *Mortal Questions*
1979 (originally published in 1974)
Thomas Nagel
Cambridge University Press**

**The Sounds of Life: How Digital Technology is Bringing Us Closer
to the Worlds of Animals and Plants
2022
Karen Bakker
Princeton University Press**

**‘Defining Speculation: Speculative Fiction, Speculative
Philosophy and Speculative Finance’ in *Speculation*
2023 (originally published in 2019)
Steven Shaviro
MIT Press**

**‘A Stroll Through the Worlds of Animals and Men: a Picture Book
of *invisible Worlds*’ in *Instinctive Behavior: The Development of
a Modern Concept*
1957 (originally published in 1934 in German)
Jakob von Uexküll
International Universities Press, Inc**

Dunne & Raby combine scientific and creative methods to understand and imagine the **umwelt** of different creatures; how they might see or hear the world. Schlieren photography shows disturbances in air flows caused by breathing and other human actions. Numerous animals can hear lower - or higher-pitched sounds than humans.

Schlieren photography example

2020

Matthew Staymates

**Courtesy of National Institute of Standards and
Technology, rights reserved**

GLOSSARY

German biologist Jakob von Uexküll (1864–1944) used the world **umwelt** to describe the worldview of an organism. Whether it is a human, a tick or a squid, each creature sees the world in its own way. Uexküll theorised that different organisms can have different umwelten, even if they share the same environment. Uexküll's work has become influential in recent years, as more-than-human consciousness is explored amidst biodiversity and other environmental crises. Uexküll is the subject of ongoing reassessment as he was an active supporter of Adolf Hitler and the Nazi party, and expressed anti-semitic beliefs. The concept of the umwelt, however, remains highly influential.

DARK MATTER LABS

What if your house owned itself?

Responding to the climate emergency has to happen in the homes and neighbourhoods where we live, as much as it does in ‘natural’ settings such as forests or oceans.

Dark Matter Labs are interested in the design of invisible systems that shape our everyday lives: ‘dark matter’ such as regulation, policy, and finance. Their FreeHouse project reimagines the home not as a piece of property, but as a generator of environmental and social value.

As researchers, Dark Matter Labs use provocative questions to imagine fairer and more ecologically-friendly futures. If we can imagine a better future, we can design the steps required to build it.

PROJECT CREDITS:

Oliver Burgess, Fang-Jui “Fang-Raye” Chang, Meggan Collins, Indy Johar, Eunsoo Lee, Shuyang Lin, Martin Lorenz, Calvin Po and the rest of the Dark Matter Labs team

FreeHouse is a proposed approach for housing that demonstrates new ways of living. This animation explores three key questions:

What if the building materials of a house were rented and not owned?

What is the value of a house beyond its price?

How do you live in a house that isn't property?

FreeHouse animation

2023

Courtesy of Dark Matter Labs

6 minutes

These artifacts demonstrate the ideas of the FreeHouse in physical form. The wooden sample shows signs of use and re-use across multiple buildings, linked to a digital record of its past lives. The printed receipt records transactions of **ecological value** generated by the FreeHouse.

Rent-a-Timber

2023

Reused cross-laminated pine panel, repairs, paper QR codes

Courtesy of Dark Matter Labs

Receipt for Ecosystem Services

2023

Receipt printer, thermal paper roll

Courtesy of Dark Matter Labs

GLOSSARY

In natural settings, species and environments have an **ecological value** to each other, such as for food or shelter. Healthy ecosystems have multiple benefits for human societies: street trees clean the air, bogs absorb carbon dioxide, birds and insects pollinate plants. What ecological value can humans offer in our ecosystems?

Who gets to live in FreeHouse?

Decisions about the FreeHouse would be made with agreements across a neighbourhood using democratic technologies.

Help Dark Matter Labs continue their research by completing the interactive poll.